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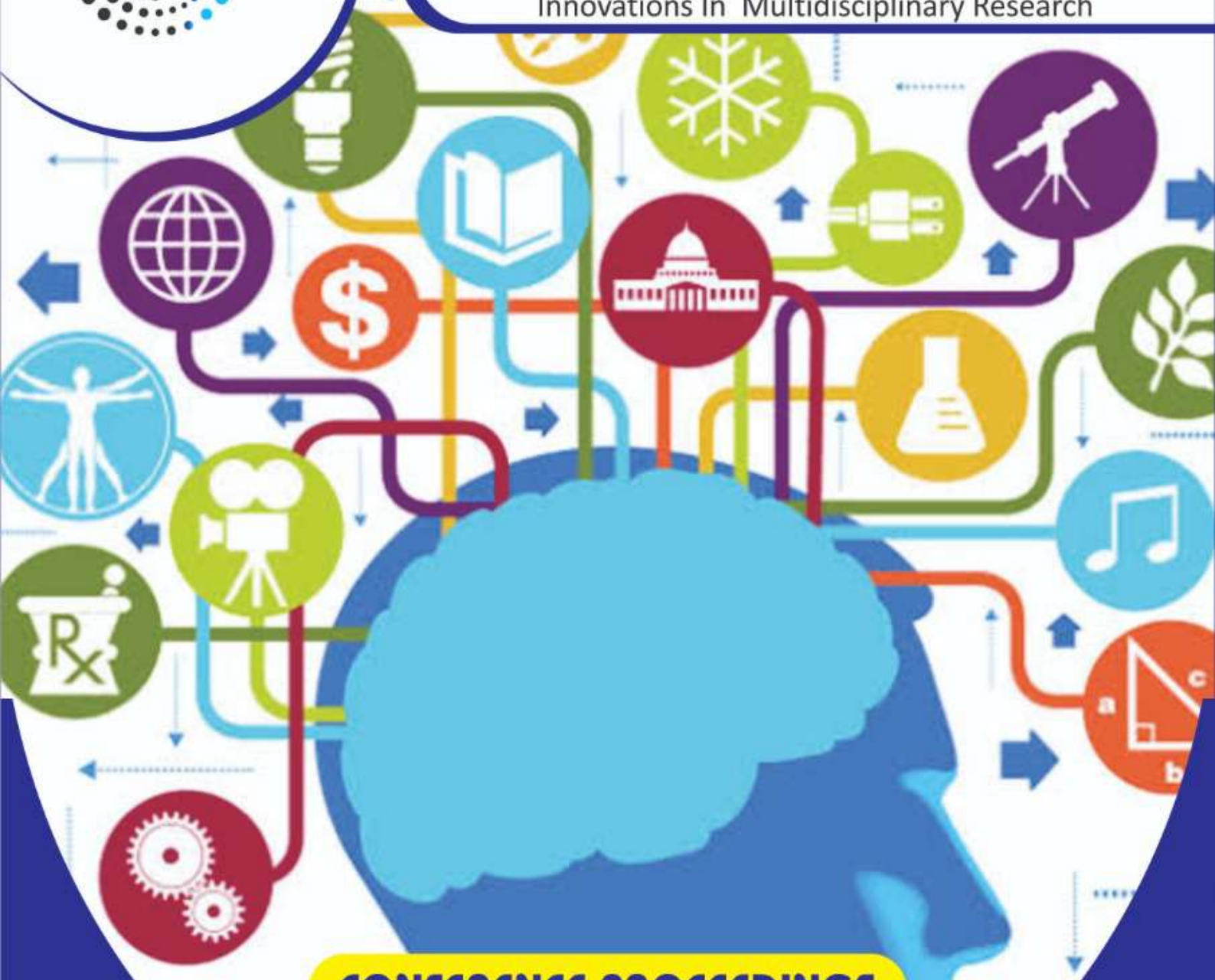

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India Iraq

23rd & 24th August 2021

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Conference Proceedings

INTERNATIONAL CONFERENCE ON INNOVATIONS IN MULTIDISCIPLINARY RESEARCH (ICIMR-2021)

23rd & 24th August, 2021

India & Iraq

Committee of ICIMR-2021
IConference
New Delhi, India
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www.iconference.in

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ISBN: 978-81-953272-9-4

Official website of the conference
www.iconference.in

Edited By: Dr Gunjan Bansal

Published by International Research Academic Publication,
New Delhi, India.
www.irapublication.com
info@irapublication.com.

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ICIMR-2021: 23rd & 24th August, 2021

A STUDY OF EUPHEMISM IN POLITICAL DISCOURSE

Dr. Bushra Saadoon Mohammed Al Noori

Professor, Department of English, Ibn Rushd for Human Sciences, University of Baghdad, Iraq

Abstract

Language is a good tool to conduct communication in order to show ideas and emotion. In fact, language affects speech norms of a particular community, it depends on how the society using language. In this study, the researcher is interested in analyzing euphemism in political discourse, it is about using mild language to prevent the harsh language in particular terms. The researcher examines euphemistic expressions used by President Barack Obama in inaugural address and election victory. The analysis is based on Warren's model of euphemism (1992). She gives four devices for euphemism formation: word formation devices, phonemic modification, loan words, and semantic innovation. This study uses a qualitative approach to analyze the data in form of transcript that containing euphemistic expression used by Obama.

The results show that by applying Warren's model of euphemism to two speeches of President Obama, the semantic level is the most dominated. It has been noted that metaphor and metonymy are the most dominated figures of speech that are employed .The motives behind using euphemistic expressions are for the propaganda purposes and to lessen the reality of what is being communicated.

Keywords: *euphemism, taboo, communication, Politics, Dysphemisms.*

Introduction

Language is a good means to conduct communication in order to express ideas and emotion. It has been developing ever since as people tend to be polite when talking and avoid embarrassment, being offensive or being offended by others. This social phenomenon is called "Euphemisms". This study investigates ways of using euphemistic expressions in President Obama's speeches. This study attempts to answer the questions (1) Does euphemism belong to semantic or pragmatic

spheres? (2) What are the motives in using euphemism in of President Obama's speeches? (3) What are the various devices used for euphemism formation in Obama's speeches.

This study hypothesizes that it is possible to use euphemistic expressions through diverse figure devices. Euphemism is used pragmatically through covering up function where euphemism covers up the facts of some events for the purpose of making the politics and economy. The study also hypothesizes that President Obama uses euphemistic expression in his speeches investigating what the motives behind using euphemistic expressions. The aim of the current study is to investigate the different devices which formulate euphemism and the reasons behind using euphemism. This study also aims to explain types and classification euphemism and the relationship between euphemism and other terms such as taboo, dysphemism etc.

Euphemism is a unique linguistic phenomenon that is worth studying as people use it in everyday life situations whether spoken or written. Euphemism is used in sensitive social areas where direct speaking is unsuitable, like death, diseases or sex. Based on that, it is important to know how euphemisms are formed, used and functioned.

The Concept of Euphemism

Historical and Etymological background of Euphemism

Jačková (2010:12) states that it is more convenient and comfortable for people not to talk about unpleasant or offensive topics directly. So, people tend to euphemize words and expressions in order to look more polite. The aim of the use of euphemism is to avoid using unsuitable words in order not to offend hearers.

Etymologically, the word euphemism is derived from Greek where the prefix 'eu-' means 'good, well'; the stem 'phem' means 'speak'; the suffix '-ism' means 'action or result'. Thus, the words are combined together to signify the meaning of "speaking well" (McArthur, 1992: 387).

Primarily, euphemism was a milder term used as a substitution for taboo expressions only. Later, the use of euphemism was enlarged for any vulgar, offensive, harsh, embarrassing, blunt or other indelicate term. Historically, euphemism can be traced back to the early times of language history as it was a demonstration of mythological thinking of people. At that point, people avoided attaching direct names to God, more specifically in Christianity. In Christian cultures God's name was euphemized into several words and expressions. Interestingly, the Devil was also euphemized as Old

Nick, Prince of Darkness, Old Gooseberry (Ryabova, 2013: 37).At the moment, it is normal to address God as God and not by any another word or expression in which they are outdated and only exist in historical manuscripts.

Definitions of Euphemism

Definitions to euphemisms do not differ very much from each other .According to Holder (2002:VI) euphemism is a milder term, which is used to replace an unsuitable or insolent expression. Wardhaugh(2006: 239) defines euphemism as "the prohibition or avoidance in any society of behavior believed to be harmful to its members in that it would cause them anxiety, embarrassment, or shame". Another definition to euphemism is provided by Allan &Burridge (as cited in Pesola, 1999: 3) in which they refer to euphemism as a substitute to an unwanted word, phrase or expression so that to prevent the loss of one's face or the faces of others addressed. This leads to consider the notion of saving faces as a social instrument that explains the usage of euphemism.

Warren (as cited in Pesola, 1999:8) suggests more comprehensive definition, she explains that an expression is a euphemism if the interpreter realizes that using some words as evidence of a wish on the part of the speaker to indicate some sensitive issue in a polite manner.

Basis for the Use of Euphemism

There are two major motivators behind using euphemisms, taboo and politeness which are considered the most important motivator. Linfoot-Ham (2005: 228) argues that the urge to use a euphemism is both an emotional and social one in which it enables people to discuss of taboo topics without disturbing others.

Yule (2010: 60) refers indirectly to the usefulness of using a euphemism in terms of politeness and face-saving, in which both relate to pragmatics. He puts it this way: "face means the public self-image of a person. It refers to the emotional and social sense of self that everyone has and expects everyone else to recognize". However, it seems that there are other motivations for using euphemism. Katamba (2005: 130) indicates a specific type of euphemism which includes the use of language in a

contradictory manner to hide thought, it is called doublespeak. This manner is rather a disguise to the truth and is a distortion to the reality that makes the bad looks good, etc. It seems to be that it is not surprising that people use euphemisms in everyday talk unaware of them due to the fact that people, as previously stated, tend to be polite and not to upset people.

Classification of Euphemisms

Definitely, euphemisms are classified according to their semantic fields. Jačková (2010:16) states that there are various areas in today´s English, where euphemisms are used most often. These areas deal with socially unaccepted or feared issues, which people are ashamed to talk about directly. Among the most common and oldest belong euphemisms connected with death, religion and sex.

Euphemisms Connected with Death

Allan & Burridge (2006: 222) believe that death is a fear-based taboo. People have been determined not to use the term "death" directly and nowadays they still search for substitutions. That is why there exist many euphemisms for the topic. It involves the fear of losing relative or close friends. People are afraid of what will come after death and the fear of supernatural spirits as well as the fear of the souls of the dead people.

Holder (2002: 2) supplies a set of euphemistic expressions for death commonly used in today´s English. He clarifies that words that are often used denote leaving for unknown places or sleeping: to pass away, pass on the other side, pass over, pass into the next world, leave the land of the living, go to heaven, go to our rest, go to a better place, go to our long home, go west, go under, sleep away, return to ashes.

Euphemisms Connected with Religion

Euphemisms used in religion are motivated by human respect for God, fear of devil and evil forces. Enright (as cited in Jačková, 2010:17) shows the word God is a euphemism because it is a universal term. People cautiously replace the word God by euphemisms. Euphemisms for God and Jesus: gosh,ye gods! ,gracious,jee wiz, jeepers.

Holder (2008: 3) states that people who was afraid of evil give flattering euphemistic expressions to evil spirits: black gentleman, black prince for Devil .English language has a lot of euphemisms for

devil. Many of them could be recognized by words black or old : black man, black lad, black Sam, black spy, black gentleman, old Nick, old dad, old chap, old Roger, old smoker or old sooty.

Euphemisms Connected with Politics

Crespo-Fernández (2014: 5) states that politics has taken much interest in language and to politicians who consider language as an important means to deliver their ideas and influence, control and manipulate others. Thus, the usage of euphemisms has been of a significant value to politicians in their speeches. Politicians employ the use of euphemisms as a cautious manner to treat disagreeable topics and to criticize their competitors without showing any negative effects upon their audiences. Politicians look like actors when they talk to people. They try to appear as caring for people, but they do not do so. They have their own purposes as well because politics is a science of the possible and intended goals. Therefore, one may understand that the use of euphemisms in politics can be said to be deceiving to the public. This phenomenon is referred to as "Doublespeak".

Holder (2008:4) gives examples of the word special, which refers to illegal or inhuman activities. The expression special treatment means to torture or kill political opponents, nuclear weapons are referred to by the term special weapons. The expression special operations signifies secret and illegal operations. The word strategic, is used by politicians in reference to unsuccessful actions.

Euphemisms Connected with Business

Allan & Burridge (2006: 230) state that many euphemisms in today´s English referring to jobs. The reason for that is to avoid offending people working in low positions or people whose jobs are considered in a lower rank. The word agent is commonly used for elevating the title of a job (press agent which means publicist), or the euphemistic expression exterminating engineer, which refers to a rat catcher. They claim that today´s English is rich in terms suggesting loss of a job or unemployment, e .g. reduction in force, relieve, redundant, to reduce the headcount, to be selected out, to seek fresh challenges.

Another field dealing with euphemisms is related to financial problems. In company records could be referred to as financial difficulties, cash flow problem or in the red. Situations when competition threatens market shares of a company could be called challenging (ibid).

Euphemisms Connected with Diseases and Medicine

Concerning euphemisms that are connected with diseases and medicine, Allen and Burridge (2006: 232) show that the medical jargon is often used by doctors instead of generally understandable reference to the illness. Scientific terms are not clearly euphemisms, but the message is indirect and understanding might be doubtful. Heart conditions are issue which is covered by euphemistic substitutions. A bad heart condition or heart attack could be replaced by cardiac incident, cardiac arrest, heart problem.

It seems that some diseases, especially the ones which are difficult to speak of explicitly Syphilis, for instance, historically, was the most fearful disease, not because of its accounts of mortality, but was because of its relation to sexual organs. It was euphemistically called in different names; social disease, S. T. D., V. D., terponemal disease, luetic disease (from Latin, lues), and special disease. Cancer, on the other hand, is one of the most serious diseases. Some euphemistic expressions which help hide cancer, doctors feel unwilling to use the word when mentioning it to the patients due to its discouraging effect on them. Doctors, in general, prefer mitotic disease instead of cancer. The Big C and CA are other euphemisms refer to it (ibid).

Relationship between Euphemisms &Dysphemisms

Euphemisms and dysphemisms are strongly connected to each other. Dysphemisms contain many subjects into them such as taboos, swearing, profanity and blasphemy etc. Gathigia (2010: xii) defines a dysphemism as a statement with insulting implications either about what the word is normally used to refer to or to the audience or both of them. Because of that, it is replaced by a euphemistic or neutral expression.

Allan & Burridge (2006: 31) define a dysphemism as "a word or phrase with connotations that are offensive either about the denotatum and/or to people addressed or overhearing the utterance". They state that people use dysphemisms to speak about other people and things which disappoint and disturb them, to deal with such topics they hate to address and want to deteriorate and weaken them (ibid.).

This suggests that the concept of dysphemism, like that of euphemism, is a social means to talk about people and subjects differently in order to reach a level of achieving social needs by using language. Hughes (2006: xv) defines a taboo as "referring to human experiences, words, or deeds that are unmentionable because they are either ineffably sacred (like the name of God) or unspeakably vile (like incest)".

Euphemisms and taboos are closely related to each other. Euphemisms would not have existed unless there were taboos waiting to be euphemized. Taboos are euphemized in the process of euphemisation which transfers them into more acceptable expressions by the society or community which uses them (ibid).

Euphemisms and taboos are linked to each other by many linguists as linguistic phenomena. Taboos appeared as a result of forbiddance of performing definite tasks and discussing prohibited subjects. It is difficult sometimes for people to decide whether their statements are good or bad.

Therefore, Taboos can be regarded as the outcome of the humans' thinking capacity, i.e. cognition (Arif, 2015: 152).

Model of Analysis

Warren's Model of Euphemisms

Warren's model of euphemisms is based on the concept that "novel contextual meanings", i.e. new meanings for words in a particular context, are created in language. The acceptability of new meanings depends on the strength of ties between the novel term and its referent, whether the novel term is considered to be of lasting value, or if the novel term is a desirable alternative, Warren (as cited in Linfoot-Ham, 2005: 230).

Warren gives four devices for euphemism formation. To organize the wide variety of euphemisms that exist, these categories are divided into sub-categories affirmation devices (ibid).

A. Word Formation Devices

Word formation refers to the" process of morphological variation in the construction of words" (Crystal,2006:523).Such a variation in word form falls into two main divisions :inflection and derivation. Warren gives five ways to form euphemisms using this mechanism. Consider the following:

1. Compounding: Warren means by compounding is a combination of two individually inoffensive words which form a euphemism for an otherwise unacceptable term. For example collateral damage (killing or wounding civilians by mistake).
2. Derivation: What Warren means by derivation is the modification of a foreign term to form a printable modern English word.
3. Blends: Warren gives no examples of what she means by this term, or of how a blend is formed.
4. Acronyms: An acronym is a word or name formed from the initial components in a phrase or a word. They are pronounced as single words (NATO, North Atlantic Treaty Organization). SNAFU (Situation Normal All Fu**ed Up), a military euphemism for a possibly catastrophic event.
5. Onomatopoeia: It is the formation of a word by an imitation of the sound associated with the thing. Examples of Onomatopoeia in English include buzz, cuckoo, hiss and sizzle.

B- Phonemic Modification

Warren (as cited in Linfoot-ham, 2005: 231) states that phonemic modification simply indicates that the form of an offensive word is modified or altered. Consider the following subcategories:

1- Back Slang: The words are reversed to avoid explicit mention.
2- Rhyming slang: refers to substitute words, usually two, as coded alternative for another word.
3- Phonemic replacement: Many loan words contain examples of systematic replacement of certain phonemes. Rawson (1981:254) names these replacements euphemistic mispronunciation, in that one should replace another sound of the offensive term.
4- Abbreviation: Is a shortened form of a word or phrase. It consists of a group of letters taken from the word or phrase.

C- Loan Words

In the category of 'loan words' the sub-categories of 'the Latin language 'and' the other languages' is empty which implies that there are not any political euphemisms borrowed from these languages. However, the sub-category of 'the French language' contains four euphemisms detainee, gaffe, demonstration, and restraint which proves that there are a lot of French words in the English language and political euphemisms are not an exception. Some examples of this include:

1) French: 'mot' [c**t] ,'affair(e)' [extramarital engagement] and 'lingerie' [underwear], (Allen and Burridge, 1991:95).
2) Latin: 'faeces' [excrement]. Aside from typical motivations for
3) Euphemism, Latin is often favoured as the uneducated and the young cannot interpret the meanings .However, "often such substitutions are just as vulgar if one understood the meaning of the latinate," (ibid).
4) Other languages: 'cojones' [testicles], is Spanish and 'schmuck' [p***s] in Yiddish literally means 'pendant'.

D- Semantic Innovation

Warren (as cited in Linfoot-ham, 2005:231) states that semantic innovation is the creation of a novel sense for some established word or word combination to avoid offensive expression . Examples of Warren's seven categories of semantic innovation are:

A. Particularization: a general term is used, which is required to be ‘particularized’ within the context to make sense.
B. Implication: In this case, several steps are required to reach the intended meaning, e.g.'the connexion’ [sexual intercourse].
C. Metaphor: Metaphor is according to American cognitive linguist George Lakoff (2006: 232), “a mapping across domains, from a source domain which is usually very concrete, to a target domain, usually more abstract.” There is no direct link between these domains. (Rawson, 1981:38).

D. Metonymy: is the act of referring to something by the name of something else that is closely connected with it. It is a “cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same domain, or Idealized Cognitive Model (ICM)” Kovecses (2002:145).

E. Reversal: It is a technique used in speaking and writing to express something by giving its opposite meaning.

F. Understatement: It means lessening. It is a rhetorical device in literature and other types of writing in which circumstances or any events are intentionally understated.

G. Overstatement: is a figure of speech when the speaker exaggerates and overemphasizes some words or phrases in order to produce more noticeable effect or to stress a specific point of the speech, (1981:11).

The Analysis of Euphemism in Two of President Obama's Political Speeches.

Methodology

The data source used in this research is the script of President Obama's political speeches. The first speech is bout Barack Obama's 2008 election victory which is delivered in 4 November 2008, Chicago, Illinois. The second one is about Barack Obama's First Inaugural Address which is delivered in front of the White House in January , 2009.First, to collect the data, the researcher reads the script for several times to have enough understanding the content. Second, the researcher chooses the words, phrases, and sentences which are indicated to contain euphemism depending on the context. Last, the researcher analyzes the data using Warren's Model of Euphemism which is explained previously in a separate section.

Data Analysis

The analysis will be accomplished using Warren's Model of Euphemism (1992) on the semantic level with some amendments of the model by adding synonymy, this technique is used to reduce the negative evaluation of some words.

1. ***Particularization***

Particularization a general term is used, which is required to be 'particularized' within the context to make sense, e.g. 'satisfaction' [orgasm] and 'innocent' [virginal], both of which require contextually based inference by the reader/listener to be comprehensible.

Particularization	Context	Explanation
challenges	"And we know the government can't solve every problem. But I will always be honest with you about the challenges we face. I will listen to you, especially when we disagree."	Obama indirectly refers to war, plant warming and financial crisis in America in more general way in that he promises to conquer these problems.

2. Implication

It refers to the implied meanings that can be deduced from an utterance with the help of the context of situation.

Implication	Context	Explanation
It is the answer	"It's the answer told by lines that stretched around schools and churches in numbers this nation has never seen; by people who waited three hours and four hours, many for the very first time in their lives."	Implying a promise that Obama will solve problems.
Recriminations	"There criminations and worn out dogmas, that for far too long have strangled our politics."	Here a negative reference to the policy of the Republican Party which is based on unpopular decisions
Dust ourselves off	"Starting today, we must pick ourselves up, dust ourselves off, and begin again the work of remaking America."	Implies the abandonment of certain past habits to adopt new ones. It is a new era, new habits and new political leadership intended to make a new America.

3. Metaphor

According Lakoff(2006: 232), metaphor is "a mapping across domains, from a source domain which is usually very concrete, to a target domain, usually more abstract." There is no direct link between these domains. Instead, metaphor is based on perceived similarity between the source and the target.

Metaphor	Context	Explanation
Path	"It has never been the path of the faint-hearted"	It means that the political activity is conceived as a journey; it can be long and difficult road and is therefore not for the faint-hearted; everybody should on honest in this process.
Dark chapter	"And because we have tasted the bitter swill of civil war and segregation, and emerged from that dark chapter stronger and more united, we cannot help but believe that the old hatreds shall someday pass."	Obama refers to racism with another compelling image. This metaphor reminds American people that racism, which has created hate and divided people, will be soon eradicated.
Rock	"The unyielding support of my best friend for the last 16 years, the rock of our family, the love of my life, the nation's next First Lady."	Obama uses metaphor to paint a picture of the invaluable support and role of his wife. She is the pillar of the Obama family. He tries to elevate her status.
Dawn	"But our destiny is shared, a new dawn of America leadership is at hand"	Obama is persuasive because of his highly captivating metaphors which directly engage the emotions of his audience trying to convince them of new America.

Long, rugged path	"It has never been the path of the faint-hearted…but more often men and women obscure in their labor, who have carried us up the long rugged path towards prosperity and freedom."	Political activity is thought as a path which is not plain road but aroad full of impediments, in reference with the difficulties he will face.
Darkest hours	"See a friend lose their job which sees us through our darkest hours."	It means the idea of darkness is a negatively associated determinant to convey people´s suffering metaphorically.
Might of our arms	"Tonight we proved once more that that the true strength of our nation comes not from the might of our arms or the scale of our wealth."	Obama portrays war as destructive; it leads to Loss of life. He explains that the strength of America comes not from leading wars, but from unity and liberty.

Threaten our planet.	"Each day brings further evidence that the ways we use energy strengthen our adversaries and threaten our planet."	Obama criticizes war as it lead to lose people's life and strengthen enemies
Steep	"The road ahead will be long. Our climb will be steep. We may not get there in one year or even in one term."	Obama explains that political activity is like a journey which will face problems and difficulties.

4. Synonymy

This technique is formed by lexically decreasing the degree of the negative evaluation of some concepts through the usage of Synonymy.

Synonymy	Context	Explanation
Pass	"We cannot help but believe that the old hatreds shall someday pass."	Obama refers to enemies that someday will be eradicated to overcome racism.
Spin out of control	"But this crisis has reminded us that without a watchful eye, the market can spin out of control."	To become progressively worse or deteriorated

5. Metonymy

Metonymy is the act of referring to something by the name of something else that is closely connected with it. It is a "cognitive process in which one conceptual entity, the vehicle, provides mental access to another conceptual entity, the target, within the same domain, or Idealized Cognitive Model (ICM)" Kovecses (2002:145).

Metonymy	Context	Explanation
Wall street	"We cannot have a thriving Wall street while Main street suffers-in this country, we rise and fall together."	By Wall Street is meant to refer to the financial market of the United States as a whole. Obama wants to show that the financial market cannot be flourished if the financial crisis still exists.
Voices	"At a time when women's voices were silenced and their hopes dismissed."	Obama refers to women's rights to vote. At a time, they could not vote because of racism.
Starved bodies	"To the people of poor nations, we pledge to work alongside you to make your farms flourish and let clean waters flow; to nourish starved bodies and feed hungry minds."	Obama refers to poor people who suffer from starving and illiteracy. He promises to offer clean water, food and education for them.
Hungry minds.		

Willing heart	"On our ability to extend opportunity to every willing heart."	Obama refers to people here promising to provide jobs. This is a way of making a speech more emotive and expressive. He is evasive.

6. Overstatement

It is a figure of speech when the speaker exaggerates and overemphasizes some words or phrases in order to produce more noticeable effect or to stress a specific point of the speech. Instances include 'fight to glory' [death], visual engineer' [window cleaner] Rawson's (1981:11).

Overstatement	Context	Explanation
Unsung hero	"And to my campaign manager, David Plouffe the unsung hero of this campaign, who built the best political campaign, I think, in the history of the United States of America".	Obama achieves impressive effects on the listener. So that is why, he exaggerates the size of the phenomenon.
Campaign team	"To the best campaign team ever assembled in the history of politics you made this happen, and I am forever grateful for what you've sacrificed to get it done."	Obama tries to effect his audience by overstating to focus certain ideas.

7. Reversal and Understatement

It seems that Obama does not use such techniques in his two political speeches.

Conclusion

This study has reached to the following conclusions:

1- The reasons behind using euphemistic expression in Obama's speeches:

   a. For propaganda aims

b. To decrease the reality of what is being communicated. Obama manipulates the language to influence listeners' perceptions and their subsequent actions, and

c. To deceive people

2- There are various kinds of euphemisms which are classified according to themes such as: death, sex, illness, politics, jobs and religion.

3- By applying Warren's model of euphemism to two speeches of President Obama, it has been figured out that the semantic level is the most dominated though the absence of some figures of speech in this level in Obama's speeches .The other levels of the model are absent due political speeches are full of metaphor and other figures of speech which make the discourse more vague .They are captivating for their cognitive, pragmatic and linguistic qualities. Most of them take into account the deepest social and ideological American values and depict positive associations.

4- Though the positive side of euphemism, there is a negative side if it. This focuses on the political discourse which is mostly characterized of disguising the truth, deceiving intentionally and make false promises.

5- After analyzing two speeches of President Obama, It has been noted that metaphor and metonymy are the most dominated figures of speech that are employed.

6- Euphemism uses pragmatic and semantic influences that have been noted in the paper because of the significance of context situation in the interpretation of euphemistic expressions.

7- Warren's Model of euphemism is amendable at the semantic level where one can add synonymy, this technique is used to reduce the negative connotation of some words.

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DEVELOPING A PROGRAMME OF USING HANDOUTS FOR TEACHING GRAMMAR IN MIDDLE-SCHOOL AND STUDYING THE EFFECTIVENESS

Prof. Sami Abdulazeez Muhammad

Head of Department of English Al-Mansour University College, Iraq

Abstract

Various methods have been used for teaching grammar at all levels. Teaching grammar to students who study English as a second language has always been a trying experience for teachers in spite of implementing innovative methods and techniques. The researcher realized the special attraction of students for any kind of material that is distributed in the classroom. Students showed special interest and engagement in the printed hand-outs rather than in books. The researcher decided to try using hand-outs for teaching grammar in ESL classrooms.

Introduction

Whatever method is used for teaching English as a second language in classroom situations, it is necessary to teach some basic grammar. Grammar is complicated and the nature of grammar appears to be meaningless, mechanical, uninteresting and dull. Many concepts in grammar are complicated. The subject requires practice and drilling. Grammar is taught in SL classrooms either deductively or inductively. Yet, the methods fail to sustain the interest of learners for long. Better results are obtained from grammar based activities. However, activities need a lot of preparation, materials and competent teachers. Activities are also time-consuming.

The researcher observed that young children are highly interested when something is distributed in the class. Sometimes, they are so anxious that if a paper is being distributed to student row by row, they wait impatiently for their turn. The moment it falls into their hands, they start examining it, going through details and show tremendous interest in it. There is psychological pleasure in something that

is given to them, individually, to keep for themselves. It has a kind of special value attached to it. The researcher decided to take advantage of this tendency on the part of students to use hand-outs for teaching grammar in ESL classrooms. The hand-outs can contain formulas, examples, exercises or all these. To sustain the interest and keep the key ideas in the bag until the opportune moment, planned a series of hand-outs that are to be distributed one after another, at critical junctures during the course of the session. The researcher prepared a programme for teaching adjectives and their kinds to middle school students.

Background

Teaching and learning of grammar pose various challenges for both teachers and learners in general and second language learners in particular. Teachers and researchers have experimented with a large number of innovative techniques for teaching grammar in ESL classrooms. Some have met with a great degree of success. Yet, no definite and specific method has yet been discovered that not only succeeds in enabling learners to acquire all the rules of English grammar and yet keep them engaged with retained interest. Different methods are successful with different age groups and the success depends largely on learner involvement, motivation and teaching techniques. The researcher realized the keen interest that middle-school children have in hand-outs that are distributed in the classroom. The researcher observed the following behaviour patterns in several middle school children in a pilot study conducted in order to confirm the notion.

Students are curious to know what the hand-outs might contain.

Students get a special satisfaction when they get something from the teacher in printed form.

Middle school children attach special value to what teachers give them and they cherish the hand-outs carefully, keep them safely and neatly for long periods.

Students carry a notion that what the teacher gives them in printed form is the best, correct, standard and most valuable.

Students read the content in hand-outs carefully, without missing any details. If the same content exists in the text-book, they most likely ignore it.

Students seem to have a fear about so much matter contained in a text-book. They feel that they will not be able to manage it. If content is presented to them in small amounts in the form of hand-outs, like small doses, they are more receptive.

Middle-school students enjoy solving assignments, especially home assignments printed on hand-outs, however, they are reluctant to part with the hand-outs and submit them for correction. If hand-outs are distributed regularly, many students file them and preserve them systematically.

If hand-outs are given too frequently, students lose interest in them. There has to be sufficient gap between grammar lessons using hand-outs.

The results of the pilot study that included interaction with teachers and students and minute observations assured the researcher that there was a possibility of taking advantage of this tendency of learners of English as a second language to teach grammar by using hand-outs.

Hand-outs

Hand-outs are printed papers used as teaching material in classrooms. Hand-outs are used by teachers for several purposes:

Some hand-outs contain a brief outline or points to be covered during a teaching session so that learners can be mentally prepared and aware about what they are going to be taught.

Some hand-outs contain instructions for following a step-by step- procedure that each student has to follow.

Hand-outs contain brief notes of topics covered in the classroom, so that there is no need for students to take down notes.

Hand-outs that contain questions or exercises are used for the purpose of evaluation.

Hand-outs can contain a judicial combination of all things mentioned above and suited and adapted for teaching or testing.

The hand-outs can contain different kinds of tasks identified by Willis (1996) like listing, fact-finding, comparing, matching, finding differences and similarities and creative tasks.

Advantages of using hand-outs

- Students get time to concentrate on the lecture when they are not required to write down anything.
- All students share the same content.
- The information in hand-outs is brief.

- They are not very expensive and can be prepared easily by teachers.
- Any number of copies can be obtained.
- Once hand-outs are prepared for a particular topic, they can be used repeatedly.
- They are time-saving.
- Students can work independently.
- They are especially useful when the teacher does not want to reveal all details at a time. A new hand-out can be presented after the first step is completed.
- Hand-outs can be tailor-made to suit the purpose.

Teaching English grammar in ESL classrooms

Researchers and language experts are not yet sure whether grammar for its own sake should be taught in ESL classrooms. Students look upon "grammar instruction as a necessary evil at best, and an avoidable burden at worst." (Al-Mekhlafi et al). The Communicative and humanistic approaches do not believe in teaching rules of grammar. They focus on form and meaning. Krashen (1983) argues that grammar teaches us about language and not the language. Generally, the inductive or deductive method is used to teach grammar. In the inductive method, the rule is provided followed by examples. In the deductive method, it is the other way round. Examples are given and rules are deduced from the examples. The researcher observed that these methods involve learners in the rules to such an extent that they fail to keep track of the meaning being conveyed through a particular sentence structure. Grammar can be taught by combining the deductive and deductive methods in addition to presenting grammar items through literary pieces and drawing the attention of learners towards them. This can be done with the help of hand-outs.

Attempts have been made to teach grammar through games, simulations and activities. These methods have proved to be more successful than teaching grammar rules or focussing only on examples.

Review of Related Literature

According to Janis Milkits, hand-outs are a very useful tool that enhance the learning process. He differentiates between hand-outs and lecture notes and states that "This variance allows a professor to adjust the hand-outs to fit the need of the class and the expected student effort. The professor must

evaluate the costs and benefits to student development before deciding whether to provide hand-outs and, if so, the form of hand-outs to be used." In their article related to the effect of varying the detail in classroom hand-outs, written as a response to previous research by Boreham, N., Lilley, J., & Morgan, C., showed an increase in performance by students who received outlines for a class rather than no hand-outs at all. The researchers concluded that a moderate amount of material in the hand-outs is optimal.

Caris, T., Harris, G., Hendricson, W., & Russell, describe the results of an experiment conducted with medical students. The experiment contained three randomly assigned groups of students differentiated by the types of classroom hand-outs. The three types of hand-outs included full lecture notes, detailed notes with diagrams, and a class outline. The findings showed that students preferred the full lecture notes but actually performed better when given an outline format.

Fjortoft N. studied the factors that contributed to student class attendance. Among other factors, the study found that partial hand-outs motivated students to attend class. Additionally, full lecture notes were a major factor that contributed to student absences.

Titsworth B evaluated the quality of student notes in a variety of situations. The results show that students who are given organizational cues participate in classes that develop ideas rather than rushing through several topics generally prepared notes that were more thorough and accurate than their counterparts. The study emphasized how instructor classroom techniques can impact student note-taking.

In an article titled "Why Hand-outs?" by an unknown writer, the reasons for using hand-outs are exhaustively listed. The writer mentions the following important benefits of hand-outs that are useful in the current study:

According to the writer, Hand-outs can accomplish three purposes:

All students share the same basic background on which you intended to build new, related, or more complex content.

Hand-outs can be used to save time, containing content you don't have to present, and that leaves time for students to ask questions or for you to explore how well they understand.

Hand-outs can relieve some of the tension students often feel when presented with large amounts of new information. With some of the key ideas, terms, equations, graphs, whatever on the hand-out, students don't have to get everything in their notes.

Significance of the Study (Value)

There is a need to develop several methods and techniques for teaching grammar that forms an important part of the syllabus in ESL classrooms. Techniques have been developed that include activities to retain the interest of learners and ensure their active participation. The ABL (Activity Based Learning) method is interesting but expensive and time consuming. Competent teachers are necessary to manage ABL programmes. A similar difficulty is involved in teaching with the help of technology.

Using hand-outs is different from the traditional method. It captures the interest of students, sustains their motivation and keeps them engaged and involved actively. A vast and complicated subject like grammar can be delivered in small and digestible doses that do not hamper the spirit of learners who already have a fear regarding the English language. Previous studies in using hand-outs in the classroom show that most hand-outs contain notes or instructions.

Hand-outs in English classes are chiefly used as work sheets contain exercises for practice. The researcher did not come across any instance of hand-outs used in classrooms for teaching grammatical concepts in middle-school. Hence, this study has a valuable place in the pedagogy of English.

Research problem

To develop a teaching programme for teaching types of adjectives in middle school by using hand-outs.

Aims and objectives

To prepare sufficient number of hand-outs for teaching types of adjectives.

- To prepare practice sheets for types of adjectives.
- To plan a lesson for teaching types of adjectives to ESL learners.
- To implement the plan and study its effectiveness.

Limitations

- The study is limited to middle school students.
- The plan is meant only for a selected unit of grammar.
- The study includes only ESL learners.

Hypothesis

There is significant difference between means of scores of Group-A and Group-B.

Null- Hypothesis

There is no significant difference in the mean of scores of Group-A and Group-B.

Research Method

The first part of the study consisted of an informal pilot study conducted in order to understand the attitude of teachers and students towards hand-outs, the extent to which teachers used hand-outs in the classrooms and the purposes for which they were used. The researcher also inquired about what methods were used by teachers of middle school to teach grammar. A couple of visits to the school were enough for the researcher to gather the necessary information that served as a basis for proceeding with the research and formed the basis of the programme.

The researcher used the experimental method to ensure reliable results of implementation of the new method for teaching grammatical concepts to middle-school students of ESL.

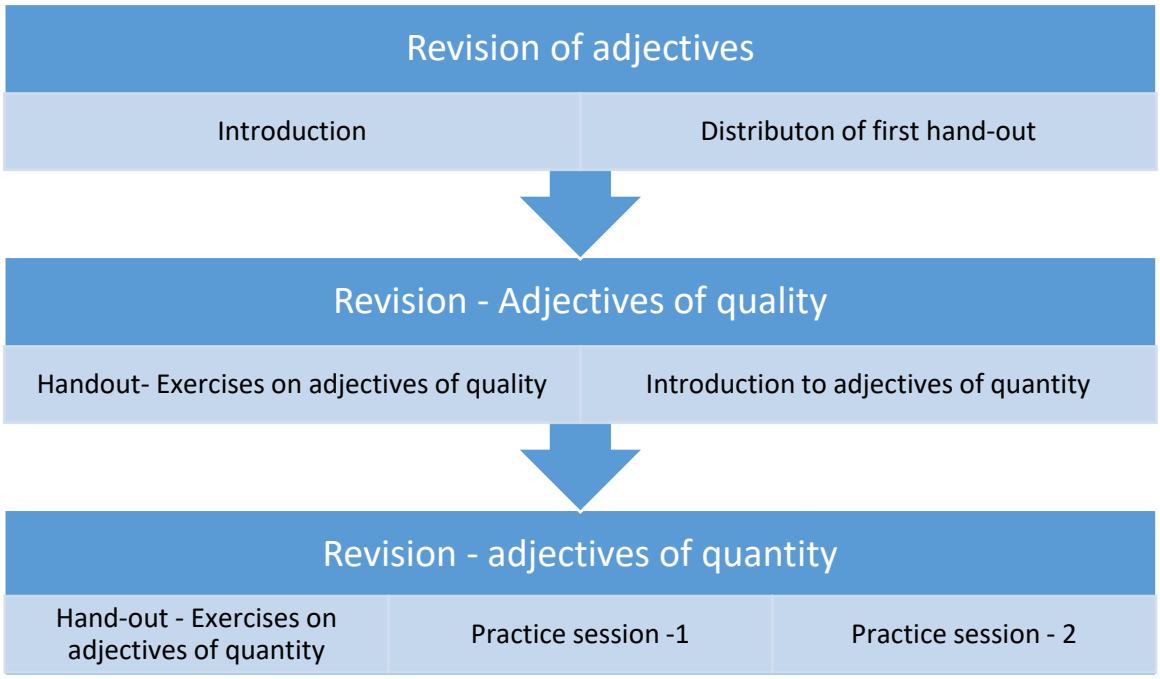
Population

Middle school students studying English as a second language

Sample

The sample consisted of 16 students from Vidyanchal English School studying in class VI. The learners had started the study of English in Class –I. They all had knowledge of nouns and adjectives. They were able to identify adjectives or supply appropriate adjectives in sentences.

Implementation of the programme



Hand-out number 1

Name of the student…….Roll no……
Date:

Look at the following examples:

1. Happy girls – State of mind
2. Wooden furniture - material
3. Loud voice – sound quality
4. Big house - Size
5. Red balloon - …….
6. Old woman - age
7. Beautiful garden - quality
8. Long way - distance
9. Tall mountains - …….
10. Complex problem – nature of problem

a. What kind of information does the word ‘red’ give you about the balloon?
b. What kind of information does the word ‘tall’ give you about the balloon?

All the above adjectives tell you about some kind of QUALITY of the noun. They are called **Adjectives of Quality.**

c. Write any 10 adjectives of quality.

Hand-out number -2

Name of the student…….Roll no……
Date:

Look at the following examples:

1. Ten students
2. Many children
3. Little water
4. Few people
5. Some ideas

All the above adjectives tell you about the quantity or number of nouns. They are called **Adjectives of Quantity.**

Adjectives of quality	Adjectives of quantity
Big mistake	Much commotion
Precious stones	Many books
Attractive face	Few things
Beautiful garden	All children

Research Design

The two-group post-test design was used in the study. The students were divided into 2 groups, consisting of 8 students each. The first group was taught adjectives of quality and quantity by using traditional method. The second group was taught by using hand-outs.

Group-A	Group-B	Post -test
Conventional method	Method using hand-outs	Post-test

Data Collection and Analysis

After the teaching sessions, two practice sessions were conducted in both the groups. A short test was administered to both groups and the scores of performance of students in both the groups were compared using ANOVA test.

Analysis of data

Group-A was taught types of adjectives by using conventional method. A test was conducted after two practice sessions and the scores of the test were tabulated as follows:

Sr. No.	Scores
1	3
2	4
3	5
4	5
5	6
6	6
7	7
8	8

Group – B was taught by using hand-outs for teaching types of adjectives. The scores of the students in the test were as follows:

Sr. No.	Scores
1	9
2	6
3	7
4	7
5	6
6	8
7	8
8	9

$\sum X_1 = 44$

$\sum X_1^2 = 260$

$\sum X_2 = 60$

$\sum X_2^2 = 460$

Where X_1 are the scores of Group-A and X_2 are the scores of Group – B.

Mean of Group-A is 5.5

Mean of Group-B is 7.5

Grand Mean = 6.5

Grand total of all 16 scores = 104

F = 8

The value of F at 0.05 level of significance is 4.60

F > 4.60

Hence, the mean difference is significant at 0.05 level of significance.

Therefore the null hypothesis is rejected.

The research hypothesis is accepted.

Observations

Significant difference is observed in the scores of students in experimental group and control group. This shows that using hand-outs for teaching selected units of grammar and making concepts clear. There is improvement in the performance level of the two groups A and B.

Conclusions

The students showed great enthusiasm during the sessions. They treasured the hand-outs given to them and arranged then carefully date-wise. The test-scores of the experimental group were much higher than those of the control group. This shows that grammatical concepts can be taught in an interesting way by using hand-outs in the classroom for ESL students.

However, all grammatical units cannot be taught by using hand-outs. Hand-outs are more useful for providing exercises for practice.

The teachers were in favour of the programme particularly because they could adapt the printed material to suit the level of the students. Printed content in text books is the same for all students studying for the same board examination. However, some ESL students are very weak in English grammar and far behind their class. At such times, teachers are required to design their own content starting from scratch and bringing the students up to the standard level gradually. For this kind of project, hand-outs prepared by teachers are very handy.

Hand-outs cannot be used in lower classes as small children fail to realize their importance and are likely to tear them, crumple them or misplace them. Hand-outs can be used in higher classes but in a limited way. The use of hand-outs is most successful in case of middle-school students.

Suggestions:

There is a need to identify those units of English grammar that can be taught by using hand-outs in ESL classrooms. Pair activities can also be prepared by using specially prepared hand-outs. Once in a while, teachers can ask students to prepare hand-outs. This can be a group activity. In order to prepare hand-outs, students will try to understand the concepts in a better way. The class can be divided into groups and each group can be assigned the task of preparing hand-outs for a particular unit of grammar. The hand-outs prepared by each group can be shared by the whole class.

Recommendations

- Similar experiment can be carried out for other units of grammar.
- Besides grammar, one can teach literary concepts like figures of speech by using hand-outs.

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Difficulties in Teaching and Learning Grammar in an EFL Context

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THE INFLUENCE OF USING DIGITAL GAMES IN LANGUAGE TEACHING

Dr. Bushra Ni'ma Rashid Al- Eqabi

The University of Baghdad, College of Education, Ibn Rushd for Human Sciences, The Department of English, Iraq

Abstract

Digital games play a significant role in the life of the new generation. Although there are many criticisms, many studies focus on the importance of digital games in improving learner's vocabulary in the target language. Researchers have begun conducting several types of research on how using games in the class can foster vocabulary learning. This paper aims to investigate the impacts of digital games on children's vocabulary learning depending on a literature review. Many studies focus on the impacts of digital games on different aspects of education. This conceptual paper aims to shed light on some games' benefits, and challenges which educators and children face in the use of digital games. The findings of this paper show that Games are used not only for making children successful in EFL classes but more importantly, for motivating them and increasing the cooperation among children. Besides, the findings state that there are advantages as well as disadvantages in using games for learning English vocabulary.

Key words: *Digital games, learning depending, challenges, benefit*

COMMUNICATION SKILLS IN HEALTH PROFESSIONS EDUCATION

Dr. Jagdish Prasad Agrawal

Former Dean, Institute of Medicine, Kathmandu, Nepal

Communication skill is important behavior of Health Professionals. It is essential in all aspects of health care whether it is medical consultation or nursing care or laboratory investigations or dispensing drugs in pharmacy. There is wide variation in teaching learning of communication skills in health professions education curricula in South Asian countries.

In this presentation, a few case studies related with communication skills, importance of communication skills and it's training, recommendations from various related organizations, prospective studies done on intern doctors and post graduate resident doctors at T.U. Teaching Hospital, Institute of Medicine, Kathmandu, a conceptual frame work for systemic communication skills training will be discussed.

Communication skills training course in graduate and postgraduate health professions education could improve the existing communication skills of the health Professionals.

INNOVATIONS IN MULTIDISCIPLINARY RESEARCH

Prof A.P Olannye

Dean, Faculty of Management Sciences,n Delta State University, Abraka

Abstract

The global evolution in research output has placed a premium on inter and intradisciplinary collaborations which appears to address the multi-faceted knowledge gaps in societies today. This is an initiative public and private sector policymakers are drawing from because of the shared view among academics and policymakers that this mode of research, by favouring innovation will further promote domestic and global economic competitiveness amongst nations through increased revenues and job creation. However, there is a challenge of empirical data to establish this nexus between novelty and multidisciplinary studies against the back drop of research ethics. This qualitative paper comparatively filled the knowledge gap by addressing thought-provoking questions around multidisciplinary collaborations in research such as: will knowledge from subdomains of discipline yield the right results scientifically in multidisciplinary research when taken from the point of innovation? The views canvassed from this presentation exposed the import of refined and defined knowledge properly communicated as a panacea for inventions and innovation in our world today. It was also insightful for academics on the need to always leverage on strengths, weaknesses opportunities, and threats (SWOT Analysis) in carving a niche using multidisciplinary research. Recommendations were made to set the tone, support the phenomenon and establish the right relationship culture, parameters using the town, gown, and research tripod encapsulating the university environment.

MITIGATING CORPORATE RISK IN THE BUSINESS WORLD

Dr. Maryam Abdu

Department of Business Administration Faculty of Management Sciences Kaduna State University, Kaduna

Introduction

The global financial crises which started in the United States and spread all over the world had a devastating effect on economies and business. The crises came unexpected and at a time when some businesses were beginning to grow, and some economies were beginning to record positive results. Businesses that were able to survive the economic meltdown made their strategic plans to cover risks associated with such markets, hence the effect of meltdown did not affect them greatly. The generality of the corporate world was however affected by the melt down. Companies operate with the view to grow in size or market share and maximize on their profits. Profit maximisation and growth to a larger extent guarantees the survival of the company and the survival has to be well augmented with strategies that mitigate risk. Risk therefore becomes an important factor for companies to take into consideration when running their organisation.

Risk defined in simple terms is the uncertainty about the effects or implications of what will happen given the outplay of an event. Fischhoff, Watson and Hope (1984) expressed their views on risk to be one which is fraught with confusion and controversy, as there is no one definition that is suitable for all problems. As risk looks at actions or choices made to take a decision, organisations are mindful as to the level of choices they make so that any inherent loss can be minimised as much as possible. Risk therefore is a concept of choice.

The theory on risk explains the decisions people make when they are faced with many combinations of many situations. Decisions are predicted based on the success hinged on the outcome. Insurance companies whose success depends on the frequency and magnitude of claims use risk theory to determine their exposure to risks (DeLee, 2014).

Kinds of Risk

There are different kinds of risks categorised into different sectors according to their peculiarity. In investment activities risk is categorised into Systematic and Unsystematic risk. Verma (2021) categorized the kinds of risk into business risk, non-business risk or financial risk.

a) Systematic risk

Systematic risk is one which is inherent in the market and known as undiversifiable risk, volatility or market risk. This risk affects the overall market as against a particular stock. This kind of risk reflects on the impact of economic, geo-political and financial factors. Systematic risk is one which is unpredictable and impossible to completely avoid (Chen, 2021).

b) Unsystematic risk

Unsystematic risk is unique to a given business or industry. It is known as specific risk, non-systematic risk, residual risk or diversifiable risk. Unsystematic risk is usually caused by internal factors, so it can be avoided, controlled and minimised by diversification (Bhavana, 2021). Unsystematic risk is risk associated with asset or company specific uncertainties.

c) Business risk

Businesses can experience risks arising from operations. This is most common and efforts should be made to mitigate it. Example of a business risk is when a company undertakes a high cost in marketing or introducing a product so as to get a market share. The risk element is not knowing whether the product will be a success in the market or not. Ideally when such happens, companies are expected to have conducted a research on the viability or acceptability of the product in the market.

d) Non-business risk

Non-business risk arises out of risks that is not in the control of the business. Such risks include political risk, or risk arising from the imbalances of the economy.

e) Financial risk

Financial risk arises out of financial loses to the firm. Instability and losses in the financial market caused by movements in stock prices, currencies, interest rates and so on explains financial risk (Verma, 2021). Examples of financial risk are market risk, credit risk, liquidity risk and operational riskas illustrated in figure 1.

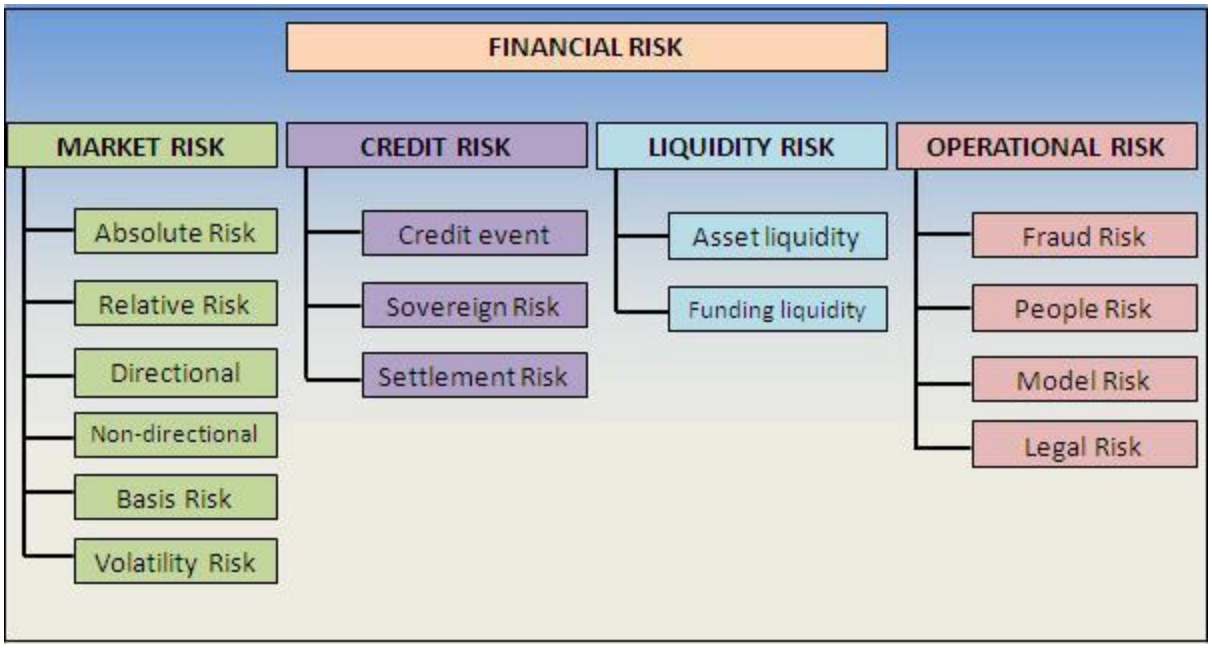

Figure 1: classification of financial risk

Source: Verma (2021)

- Market risk.

Market risk is risk arising as a result of movements of financial instruments in the market. These movements are further explained in the direction the risk is being experienced which could be absolute, relative, directional, non-directional, basis or volatility. When it is directional, it could be as a result of movements in stock prices, fluctuations in exchange rates or movements in interest rates. Market risk can also be systematic and uncertain and whatever risk experienced measures should be taken to mitigate the risk.

- Credit risk occurs when one is unable to fulfil obligations.

This type of risk according to Verma (2021) is further classified into sovereign risk and settlement risk. sovereign risk may happen as a result of difficult foreign exchange policies and settlement risk when one party makes payment and the other party fails to fulfil the obligations.

- Liquidity risk

Liquidity risk according to Verna (2021) is risk associated with inability to execute transactions. Kenton (2021) further explains liquidity risk to be the ability of a firm, company, or even an individual to pay its debts without suffering catastrophic losses. This risk therefore stems from the lack of

marketability of an investment that can be bought or sold quickly enough to prevent or minimise a loss.

- Operational risk

Operational risk arises as a result of operational failures, such as mismanagement or technical failures. Examples of such risk are fraud risk arising out of lack of controls and model risk arising as s result of incorrect model application (Verna, 2021).

Legal risk

Legal risk arises due to legal constraints and lawsuits. Whenever a company faces financial losses out of legal proceedings and lawsuits, it is defined as legal risk (Verna, 2021).

Other types of risk are inflation risk, investment risk, interest rates risk, policy risk, mortality risk, global risk and technology risk.

- Inflation risk are risks arising out of inflationary pressures. Such examples include prices of consumable goods which can affect one's savings in the short period.
- Investment risk arises as a result of or the likelihood of occurrence of losses relative to the expected return of an investment. Interest rate risk arises due to fluctuations and changes in interest rates.
- Interest rates directly affect investments especially in fixed deposit schemes.
- Policy risk arises due to changes in government policy such as economic conditions, labour market movements, country debt rates and so on. These changes affect liquidity and stock returns and government bonds.
- Mortality risk is a factor calculation where one's life span is estimated as long term and savings are made accordingly.
- Global risks are risks associated with international investments. As an investor one has to take into condition global risks like laws and policies, foreign exchange rates, natural disasters, terrorism and insurgencies and so on.
- Technology risk is one of the greatest levellers of our times. Companies and investors invest heavily in technology which is bound to change constantly as upgrades and innovations is a

continuous process. Obsolescence in machines brings about changes in technology and risks in technology.

Ways of Mitigating Risk

Once risks are identified and assessed, organisations have to devise a method or ways in completely avoiding it, eradicating it or accepting it with minimum losses as much as possible. Risk can be avoided when good policies are put in place. There are several ways in mitigating risk and some typical mitigating strategy actions that companies can adopt are explained as well as the on the risk in respect to action on likelihood, action on impact, and action on proximity are explained as follows:

1. Accept the risk

If the impact of the risk is low and with minimal impact on the business, the risk can then be accepted. Examples of risk acceptance with minimal consequences is when a company decides to take part in a risky activity, which while well managed and supervised is still risky. Going ahead with an event despite the risk of rain.

Effect on risk when the decision is to accept is:

- Action on likelihood – there is effect
- Action on impact – there is effect
- Action on proximity – there is no effect

2. Avoid the risk

Risk is avoided if the outcome has dire and with drastic consequences. Companies should avoid embarking on any activity where the outcome of risk is grievous and would affect the company negatively. Lock (2007) points out that this kind of action requires a complete abandonment and total cancellation of the project. Examples of such activity is a company abandoning a research and development project due to risks of finding a cost-effective alternative.

Effect on risk when hedging:

- Action on likelihood – there is effect
- Action on impact – there is effect
- Action on proximity – there is effect

3. Hedge the risk

4. Hedging the risk is used to manage financial risk. This risk is offset or limited by taking opposite positions in the market. An example of hedging a risk is where a company is exporting a forward contract with the bank and decides to exchange a certain amount of foreign currency so as not to lose out because of currency fluctuations.

Effect on risk when hedging:

- Action on likelihood – there is no effect
- Action on impact – there is effect
- Action on proximity – there is no effect

5. Provide a risk buffer

In this situation, the impact of a risk is reduced when an alternative is made available. Example of such is where a manufacturer keeps a stock of raw materials in case a supplier is unable to deliver a shipment on time.

Effect on risk when providing a risk buffer:

- Action on likelihood – there is no effect
- Action on impact – there is effect
- Action on proximity – there is no effect

6. Share the risk

Here when sharing a risk, the impact or liability is shared between or among the various departments.

Effect on risk when sharing:

- Action on likelihood – there is effect
- Action on impact – there is effect
- Action on proximity – there is no effect

7. Find options or alternatives

Here, the risk is mitigated when alternatives or options are identified. Example of such a situation is constructing a power station that has the option of either using gas or oil to mitigate the risk of increases in cost of gas or oil.

Effect on risk when finding options or alternatives:

- Action on likelihood – there is effect
- Action on impact – there is effect
- Action on proximity – there is no effect

8. Transfer the risk

When transferring risk, some or all aspects of the risk are transferred to another party. This is mainly done through insurance or other contractual obligations.

Effect on risk when transferring the risk:

- Action on likelihood – there is no effect
- Action on impact – there is effect
- Action on proximity – there is no effect

9. Defer the decision

Deferring the decision here means to delay taking a decision on a particular approach until more data are gathered or until when the company is willing to embark on the project.

Effect on risk when deferring the decision:

- Action on likelihood – there is no effect
- Action on impact – there is no effect
- Action on proximity – there is effect

10. Limit or reduce the risk

Here, safeguards are put in place to limit or reduce potential impact of risk or the likelihood of the risk occurring. Example of such is when authorising expenditure on phases rather than on the whole project.

Effect on risk when limiting or reducing the risk:

- Action on likelihood – there is effect
- Action on impact – there is effect
- Action on proximity – there is no effect

11. Create a plan B or a contingency

Here another plan is put in place in case the risk deployed in one plan is high.

Effect on risk when creating a plan B or a contingency:

- Action on likelihood – there is no effect
- Action on impact – there is effect
- Action on proximity – there is no effect

Risks Which Businesses Are Expected to Plan For

Boitnott (2019), identified the kinds of risk which businesses are expected to plan for. These are economic risk, compliance risk, security risk and fraud, financial risk, reputation risk, operational risk and competition or comfort risk.

1. Economic Risk

As the economy is constantly changing, risks are associated with such changes. Market fluctuates some with positive consequences, and others with negative consequences. Some economic events might bring a boom to the business, whilst others a decline in business. To counteract economic risk, it is advisable that companies save as much as possible by maintaining a steady cash flow, and also operate with a lean budget with low overheads throughout the economic cycles of the business plan.

2. Compliance Risk

As businesses are faced with a lot of compliance laws, especially those affected by particular industries, it becomes advisable for companies to stay in line and in compliance with the laws they are operating in. Noncompliance will amount to fines and penalties which will affect business. Companies therefore have to be vigilant in tracking compliance and reviewing government agency information and seeking assistance where necessary.

3. Security Risk and Fraud

As the world is witnessing a lot of fraud, internet and on-line fraud and other security challenges, it becomes important for organisations to protect themselves against such fraud. Data that is shared on the internet, identity theft and payment fraud all illustrate how such risks affect businesses. Not only does risk impact on trust and reputation, in some instances companies could be liable for data breeches. To achieve enterprise risk management and security solutions, fraud detection tools and employee and customer education should be adopted and implemented to safeguard organisations against fraud.

4. Financial Risk

Businesses as explained earlier are prone to financial risks. This involves credit extension to customers company debt overload, interest rate fluctuations and so on. Businesses have to make adjustments in their plans that will avoid harming cashflows or creating unexpected losses. It also becomes important not to rely on one source of income but diversify so that other channels of incomes can be enjoyed. To keep debt to a minimum, plans that will lower debt load is also encouraged.

5. Reputation Risk

Sometimes, companies experience negative publicity which affect their reputation as a result of unhappy customer utterances, product failure, negative press or lawsuits. All these affect company reputation and brand name. One tweet or bad review can bring about a drop in sales and customer patronage which could bring losses to the organisation. It becomes important for businesses to be prepared to address such problems that may arise and keep quality at the top. This will help in avoiding lawsuits and product failures which could damage a company’s reputation.

6. Operational Risk

Business risks occurs both internally and externally as a combination of factors can cause businesses to encounter losses. Unexpected events, power outages and cuts, technical problems and so on. Operational risk can have an impact on the business and affect the company in several ways including finance, time, reputation. The business needs to provide a means of how to address this problem and also establish proactive measures and a backup plan as measures to ensure that operations are not affected.

7. Compliance or Comfort Risk

As competition is always in the industry, it can be easy for businesses to miss out on what competitors are offering that may appeal to customers in the market. Businesses have to keep abreast of events and ensure that they are always ahead. It therefore becomes important for businesses to continuously reassess performance, refine strategy, maintain strong interactive relationships with their customers.

Financial risk outlines to minimise on risk and reduce business risk

It becomes mandatory for companies to device mechanisms on how to minimise risk or reduce the risk as much as possible. In the good interest of ensuring the survival and success of businesses, policies put in place must be one which is healthy and can guarantee continued operations with minimum risk. The following techniques and outline are part of measures to be taken in order to avoid putting businesses in difficult situations.

1. Never under-price your solutions to get a market share as this move may likely result to the inability of the business to break even.
2. Do not hire or employ until the company has the funds to do so, as resisting to hire employees without funds could spell problems for the business.
3. Do not borrow money that is not needed, as this will amount to incurring more debt for the business.
4. Do not depend on just one source of revenue. Diversification is business wise and sense. Revenue base will be widened and more enhanced.
5. Do not fill too many overhead positions as it will decrease the company's return on investment (http://tolmanandwiker.com/5-financial-risks-every-business-avoid/).

Conclusion

As risk is inherent in business, it is important that organisations should devise means and way in mitigating risk. Businesses have experienced bankruptcies and losses as a result of risk neglect. All businesses are affected with one risk or the other but the severity of risk associated has to do with the manner in which the organisation prepares and handles the risk. As the business world is now a global village, it becomes important and paramount that organisations plan ahead and take measures to cushion the effect of losses arising out of neglect in risk mitigation.

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MULTIFUNCTIONAL NANOSTRUCTURED MATERIALS FOR HIGH PERFORMANCE SUPERCAPACITOR APPLICATIONS

Dr. A.T. Ravichandran

National College (Autonomous), Tiruchirappalli-620001, Tamilnadu, India.

High performance energy conversion and storage devices got great attention in recent days in order to reduce the conventional fossil fuel usage. In this context, enormous demand has been raised for flexible and extremely effective energy storage devices such as supercapacitors due to their huge power density, rapid charge/discharge rate, lightweight, easy handling and high stability. Such high-performance supercapacitors can be obtained from nanostructured materials because of their larger surface area and high shape anisotropy. Here, we demonstrate that Zr doped ZnO and Sr doped CdO nanostructured materials can be a potential candidate for supercapacitor applications. For that, Zr doped ZnO hexagonal wurzite-like nanostructures and Sr doped CdO nanoplatelets were synthesised by chemical coprecipitation and their phase formation was verified by X-ray diffraction and FTIR studies.

The significant capacitive behaviour of these nanostructures was investigated by cyclic voltammetry (CV) studies, galvanostatic charge-discharge (GCD) analysis and electrochemical impedance spectroscopic (EIS) methods in aqueous 1 M KOH. The Zr doped ZnO electrode exhibited excellent specific capacitance of 518 Fg−1 at a current density of 1 Ag−1.The estimated specific capacitance value for Sr-doped CdO at a current density of 1 Ag-1 was752 Fg-1. Such higher values of specific capacitance pointed out that these nanostructured materials are suitable candidate for supercapacitor applications.

ICIMR-2021: 23rd & 24th August, 2021

PROFESSIONAL ETHICS FOR RESEARCH, INNOVATION & PUBLICATION

Dr. Hardeep Singh

IKG Punjab Technical University, Jalandhar, Punjab, India

Introduction:

"Researchers, authors, sponsors, editors and publishers all have ethical obligations with regard to the publication and dissemination of the results of research. Researchers have a duty to make publicly available the results of their research on human subjects and are accountable for the completeness and accuracy of their reports. All parties should adhere to accepted guidelines for ethical reporting. Negative and inconclusive as well as positive results must be published or otherwise made publicly available. Sources of funding, institutional affiliations and conflicts of interest must be declared in the publication. Reports of research not in accordance with the principles of this Declaration should not be accepted for publication."

Academic research involves many coordinated steps and processes – appropriate study design, study execution, data collection, data analysis, and finally publication. While going through these steps and culminating in a publication can be an exhilarating experience, one should be aware of ethical code of conduct that binds researchers at every stage. The Committee on Publication Ethics (COPE) is an international forum for editors and publishers of peer-reviewed journals that provide the "code of conduct" and "best practice guidelines" that define publication ethics and advises editors on how to handle cases of research and publication misconduct. In this editorial, we introduce concepts collectively called "publication ethics" including statutory and ethics approval, informed consent, data manipulation and research fraud, plagiarism, simultaneous submission, duplicate publication, self-citation, consent to reproduce published material, ethics of authorship, and conflicts of interest. We also discuss the repercussions and consequences one may face if such misconduct is detected.

Ethical Guidelines for Researchers:

1. Researchers should accurately present their research & innovation findings and include an objective discussion of the significance of their findings.

2. All and only those who qualify should be included as authors/researchers/innovators and their contribution given in the manuscript.

3. Any facts that might be perceived as a possible conflict of interest of the researcher(s)/author(s) must be disclosed in the paper prior to submission.

4. Data and methods used in the research need to be presented in sufficient detail in the paper so that other researchers can replicate the work. Raw data must be made publicly available unless there is a compelling reason otherwise (e.g., patient confidentiality).

5. Simultaneous submission of manuscripts to more than one journal is not permitted.

6. Original research results must be novel and not previously published, including being previously published in another language.

7. For any content previously published (including quotations, figures or tables), any necessary permission to publish must be obtained from the copyright holder.

8. Errors and inaccuracies found after publication must be promptly communicated to the Editorial Office.

Plagiarism, Data Fabrication and Image Manipulation

Plagiarism is not acceptable.

Plagiarism includes copying text, ideas, images, or data from another source, even from your own publications, without giving credit to the original source.

Reuse of text that is copied from another source must be between quotation marks and the original source must be cited. If a study's design or the manuscript's structure or language has been inspired by previous studies, these studies must be explicitly cited.

If plagiarism is detected during the peer review process, the manuscript may be rejected. If plagiarism is detected after publication, we may publish a Correction or retract the paper.

Image files must not be manipulated or adjusted in any way:

That could lead to misinterpretation of the information provided by the original image. Irregular manipulation includes 1) introduction, enhancement, moving, or removing features from the original image, 2) grouping of images that should obviously be presented separately (e.g., from different parts of the same gel, or from different gels), or 3) modifying the contrast, brightness or color balance to obscure, eliminate or enhance some information.

If irregular image manipulation is identified and confirmed during the peer review process, we may reject the manuscript. If irregular image manipulation is identified and confirmed after publication, we may correct or retract the paper.

Data presented must be original and not inappropriately selected, manipulated, enhanced, or fabricated. This includes 1) exclusion of data points to enhance significance of conclusions, 2) fabrication of data, 3) selection of results that support a particular conclusion at the expense of contradictory data, 4) deliberate selection of analysis tools or methods to support a particular conclusion (including p-hacking). We strongly recommend preregistration of methods and analysis.

Conclusion:

There are various forms of unethical practices that authors resort to, sometimes intentionally and occasionally by accident. Being aware of publication ethics enlisted herein will help readers to consciously avoid such misconduct and perform honest ethical research and pursue publications.

DETECTING DISEASES IN PLANTS USING DIGITAL IMAGE PROCESSING (PREDICT RED PALM WEEVIL INFECTION)

M. A. Ashabrawy

Reactors Department, Nuclear Research Center, Atomic Energy Authority, Egypt

Abstract

Image processing has become one of the most important means by which to obtain a large amount of correct data, through the image, with the least effort and as soon as possible and at the lowest cost, to make the ideal decisions to address the common problems early before inflation and spread significantly, This method is currently used in many medical, industrial, agricultural and biological fields as well as modern applications such as nanoscience science and its wide use in various sciences.

The red palm weevil is one of the most serious pests affecting palm trees. It is preferred to attack palm trees that are less than twenty years old. The palm trunk is juicy and porous, and there are two cases of infection:

Modern infection (superficial) that does not exceed the age of 2-3 months.

The advanced infection with the Palm body gap, which is between 4 - 12 months.

The cracks and openings on the palm and in the palms of the palms and wounds (resulting from agricultural processes such as fumigation, lethargy, and other work that causes wounds to the palm) are among the most common places where females lay their eggs after mating. The number of eggs is about 200-300 eggs The egg is about 2-3 millimeters long), the females lay their eggs in the holes of the other rigs (the palm stalk digger), and the eggs hatch after about 3-5 days to give the larvae, which is the harmful phase of the insect, causing damage to the palm tree and make the leg empty cylinder Completely empty, only from the histrionic tissue The larvae of feeding, and the color of the larva is yellowish or milky white and palm larvae are almost pearly.

USING IMAGE PROCESSING METHOD TO PREDICT RED PALM WEEVIL INFECTION

استخدام اسلوب معالجة الصور للتنبؤ بالإصابة بسوسة النخيل الحمراء

M. A. Ashabrawy

Reactors Department, Nuclear Research Center, Atomic Energy Authority, Egypt

ملخص باللغة العربية:

أصبح اسلوب معالجة الصور من اهم الوسائل التي يمكن من خلالها الحصول على كم هائل من البيانات الصحيحة، من خلال الصورة، بأقل جهد وفي أسرع وقت ممكن وبأقل التكاليف، لاتخاذ قرارات مثالية لمعالجة المشاكل الشائعة بصورة مبكرة قبل تضخمها وانتشارها بصورة كبيرة، وذلك من خلال تحليل البيانات بالاساليب الإحصائية المختلفة بعد الحصول عليها من خلال تحليل الصور باسلوب معالجة الصور وتستخدم هذة الطرق حاليا في العديد من المجالات الطبية والصناعية والزراعية والحيوية وكذلك التطبيقات الحديثة مثل علوم تقنيات النانو واستخدامتها الواسعة في مختلف العلوم.

تعتبر سوسة النخيل الحمراء من اخطر الآفات التي تصيب النخيل وتفضل مهاجمة النخيل الذي يقل عمره عن عشرون عاما حيث أن جذع النخلة يكون غض وسهل اختراقه، وهناك حالتين من الإصابة:

الاصابة الحديثة(السطحية)التي لا تتجاوز عمرها 2-3 شهور.

الإصابة المتقدمة ذات الفجوة بجسم النخلة والتي يتراوح عمرها من 4- 12 شهرا.

تعتبر الشقوق والفتحات الموجودة على النخلة وفي ابط السعفة والجروح (الناتجة عن العمليات الزراعية كالتكريب وقلع الفسائل والسعف وغيرها من الأعمال التي تحدث جروح في النخلة) من أكثر الأماكن التي تضع فيها الأنثى بيضها بعد التزاوج حيث يبلغ حيث يبلغ عدد البيض حوالي 200 -300 بيضة(يبلغ طول البيضة حوالي 2 – 3 مليمتر)، كما تضع الإناث بيضها في الثقوب التي تحدثها الحفارات الأخرى (حفار ساق النخيل)،وتفقس البيضة بعد حوالي 3- 5 أيام لتعطي اليرقات والتي تعد الطور الضار للحشرة حيث تسبب أضرار بالنخلة وتجعل من الساق اسطوانة فارغة فارغة تماما، إلا من الأنسجة المهترية لأنها شرهة التغذية، ويكون لون اليرقة أبيض مصفر أو حليبي وتتميز يرقة سوسة النخيل بشكلها كمثري تقريبا.

EMERGENCE OF PATANJALI IN FMCG MARKET IN INDIA

Prof. Md. Tarique

Dept. of Economics Aligarh Muslim University, Aligarh (India)

Fast Moving Consumer Goods (FMCG) is the 4th largest sector in the Indian economy. It is considered as a barometer of consumer demand in every country. This sector is mainly divided into three categories: Food & Beverages (19%), Healthcare (31%), Household & Personal care (50%). Growing awareness, easier access and changing lifestyles have been the key growth drivers for the sector.

The emergence of Patanjali as potential entrant in FMCG market is seen as disruptive for incumbents. According to CLSA and HSBC, Patanjali was the fastest growing FMCG Company in India in 2016. It was valued at ₹3,000 crore (equivalent to ₹35 billion or US$490 million in 2019). The market capitalization of the company currently stands at nearly Rs 36,800 crore. In 2019, Patanjali acquired Ruchi Soya, which is listed on stock exchanges, through an insolvency process for Rs 4,350 crore.

Recently, Swami Ramdev, owner of Patanjali group, has said that in this fiscal year Patanjali along with Ruchi Soya would have a turnover of around Rs 25,000 crore and expects to grow up to around Rs 35,000 crore and by Rs 40,000 crore by the next fiscal year. He further said that in next five years, Patanjali would have a turnover of around Rs 50,000 crore to Rs 1 lakh crore and will become the largest FMCG company, replacing HUL. For FY'21, Patanjali Ayurved posted a turnover of ₹9,783.81 crore, according to a statement issued by the Haridwar-based group. While Patanjali Natural Biscuits reported a turnover of ₹650 crore, Ayurveda arm Divya Pharmacy ₹850 crore, and food processing arm Patanjali Agro ₹1,600 crore.

One of the FMCG companies, Patanjali, came into existence in 2006 as a private limited company, has been utilising indigenous resource and technique of production to benefit the Indian nationals. This company changed the face of FMCG market in India by integrating technology with ancient system of cure, well known as Ayurveda. It has also changed the consumer's perceptions towards FMCG products. The company claims that its products are safe for human health and revenue proceeds generated by the production process stays in home country. The company uses agricultural and allied products as inputs, which is supposed to have positive effects on agriculture and rural development. It is therefore important to investigate the effects of Ayurveda based FMCG products on consumer perception, human health, agriculture and rural development. The fast growth of Patanjali could be understood by looking into its motives, advertising policy and its access to the government. The basic motives of Patanjali are creating avenues of job opportunities for local farmers and promoting indigenous products by reviving our own traditions of Ayurveda. The business model of this emerging firm is to give maximum benefits to Indians.

In this backdrop, it is pertinent to analyse the influence of Patanjali brand on Indian FMCG market under the gratification of spirituality/religion/nationalism to capture the market. Further, the effects of Ayurveda based Fast Moving Consumer Goods on human health, consumer's perception and rural development can be analysed by using both primary and secondary data. The study is multi-disciplinary, as assessment will involve the expertise of the concepts involved in Economics, Psychology and field of Medicine.

FALSEHOOD AND DECEPTION IN NADINE GORDIMER'S THE PICKUP AND NURUDDIN FARAH'S A NAKED NEEDLE

Raphael Seka

Department of English The University of Yaoundé 1, Cameroon.

Abstract

Most often than not, some people decide to build their relationships before marriage in falsehood and deceit. Many fail to be themselves hence, painting a false picture of who they really are to their partners and this explains why some relationships do not work. Some relationships do not also work because some individuals fail in their responsibility to guide themselves as far as what is obtainable in their various cultures and traditions is concerned. In the novels under study, some characters deliberately decide to build their relationships on falsehood and deceit which acts as a barrier or hindrance to the construction of a fruitful intercultural dialogue. From the prism of postcolonial theory therefore, this paper, hinges on the premise that Farah and Gordimer in their narrative fictions believe that falsehood and deceit act as opposing forces in building an intercultural dialogue.

Keywords: *Falsehood, deceit, relationship, postcolonial theory and intercultural dialogue*

ICIMR-2021: 23rd & 24th August, 2021

STUDY OVER DIFFERENT NOZZLE PROFILES FOR NOZZLE FLOW SEPARATION CONTROLS

***Ankit Kumar Mishra, *Ashutosh Kumar, **Gundam Venkata Harsha Vardhan Reddy, **Gubba Rakesh**

**Department of Research and Development, Abyom Space tech and Defence Pvt. Ltd, Gorahkpur-274402, India*

***Department of Mechanical Engineering, Sreenidhi Institute of Science and Technology, Telangana-501301, India*

Abstract

Since the dawn of the space age, flow separation issue in rocket nozzles has been an unwanted phenomenon for the engineers. So, naturally, this became a task for the engineers which is to be brought under control. But it turned out to be a daunting task; even though many were able to explain the physics behind this phenomenon, it is not fully understood even to the present day. So, there are not many methods, which explains how to control or suppress this phenomenon. This paper aims to study about two of those few methods which affectively are able to suppress flow separation in rocket nozzles.

Keywords- *Flow separation, FSS, RSS, Nozzles*

Introduction:

The nozzle is the main part of the rocket, which provides the required exhaust flow to propel the rocket into space with supersonic speeds. Up to this date, different types of profiles are used based on the different requirements and applications. But all these nozzles are based upon the de-Laval nozzle; de Laval nozzle consists of a convergent section, a throat, and a divergent section.

Rocket nozzle profiles can be classified as follows; conical, Truncated Ideal Contoured (TIC), Thrust Optimized Contoured (TOC), and Thrust Optimized Parabolic bell (TOP), Compressed Truncated perfect (CTP) nozzles. Even though these nozzles are being used since the dawn of the space age, there is a concept of nozzle flow that is not fully understood to the present day, which is nozzle flow separation.

Nozzle flow separation occurs when the boundary layer gets separated from the nozzle wall; this phenomenon is quite undesirable. When exit pressure of nozzle is in the range of 0.4 to 0.8 of local atmospheric pressure [3], ambient air tries to enter into the viscous layer. Thus, due to the adverse pressure gradient, the boundary layer will get separated from the wall.

In general, overexpanded nozzles are used to obtain optimum nozzle flow pattern, which helps to attain maximum thrust at the desired altitude. But these overexpanded nozzles experience nozzle flow separation. The nozzle flow separation patterns vary which operating pressure, nozzle profile, exhaust gas properties, back pressure, etc. The nozzle flow separation patterns can be classified as follows; Free Shock Separation (FSS) and Restricted Shock Separation (RSS) [1]. Both these flow separation phenomena and then modes to suppress the RSS phenomena are discussed in detail.

Literature Review

Most of the works which study nozzle flow separation, concludes that the ambient pressure is the main reason why flow separation occurs. The presence of adverse pressure gradients causes the flow to separate from the nozzle wall and this separated flow inhibits several side loads on the nozzle, ultimately leading to its damage. So, a method was suggested to suppress the flow separation; this method involves adding an aerospike profile to the lip of the nozzle.

Until 2000, it was widely assumed that RSS occurs only in Thrust optimized cold flow subscale nozzles. So, no attention was paid to whether the design of the nozzle affects the occurrence of RSS. Later these subscale cold flow tests were also conducted with TIC [8-9] and conical nozzles, where no reattachment occurred, and only FSS occurred. It is due to the lack of formation of internal shocks in TIC and conical nozzles. Hence, the RSS phenomenon can be attributed to the nozzle contour based on these results [5-7]. So, by doing modifications to the existing nozzle contour, we can suppress RSS. This method involves adding a step to the divergent section of the nozzle.

Discussion

NOZZLE FLOW SEPARATION PATTERNS:

1. **Free Shock Separation (FSS):**

In a thrust optimized contour nozzle (TOC), when the pressure ratio is low, FSS is observed. FSS is the continuation of the flow as a free jet after separation from the nozzle wall, which implies that

there is noreattachment of the flow to the wall downstream of the separation point. Besides the TOC nozzle, the FSS pattern is also seen inother nozzle profiles such as conical,TIC, and TOP.

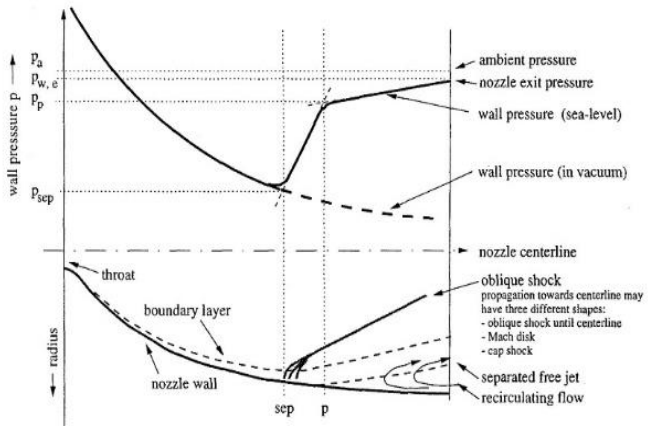

Fig 1: Free shock separation in overexpanded rocket nozzle [1]

Restricted shock separation (RSS)

RSS occurs during the startup and shut down of the engine and is only seen in the TOC nozzle. RSS is reattachment of the flow to the wall downstream of the separation point. Reattachment takes place due to the formation of cap shock in thrust optimized nozzle. A cone-shaped oblique shock is a part of a cap shock pattern that is inclined to the central axis of the nozzle. Because of this inclination of the shock, momentum is generated, which is greater than momentum induced by the separation shock, resulting in the flow getting deflected towards the nozzle wall in the radial direction [2]; this reattachment results in the formation of a recirculation bubble. RSS occurs in the TOC nozzle due to the different wall pressure profiles downstream of the reattachment point. RSS doesn't happen in conical nozzles and TIC nozzles [1]. The transition of FSS to RSS is known as the hysteresis effect. RSS causes lateral load or side load, resulting in the damage of the nozzle and its components. So, it is vital to suppress the RSS [4].

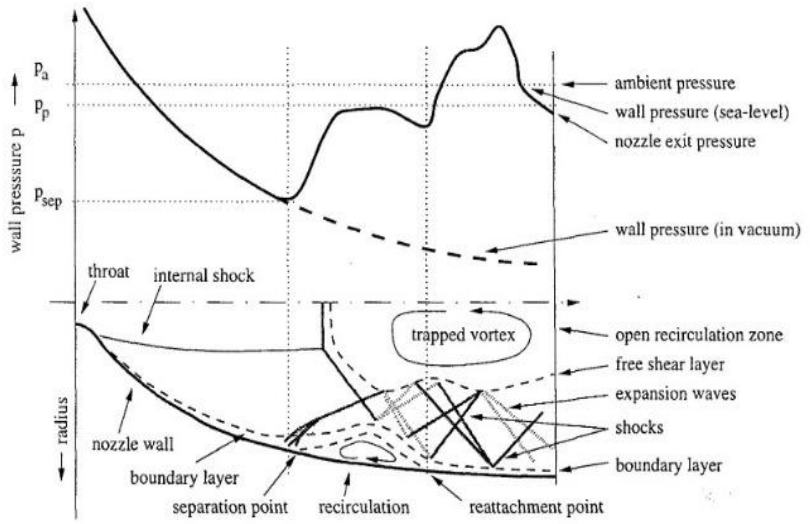

Fig 2: Restricted shock separation in overexpanded rocket nozzle [1]

Flow Separation Control by Adding an Aerospike Profile to the Lip of the Nozzle

The basic idea involved here is to prevent the action of adverse pressure gradient on the main exhaust flow. So, an aerospike profile is added to the lip of the basic bell nozzle design. The flow generated by the aerospike profile acts as a barricade to the ambient pressure gradient; So that this pressure gradient won't be able to penetrate this high momentum barricade andaffect the main exhaust flow. The addition of this aerospike profileto the main bell nozzle doesn't affect the performance and efficiency. [12]

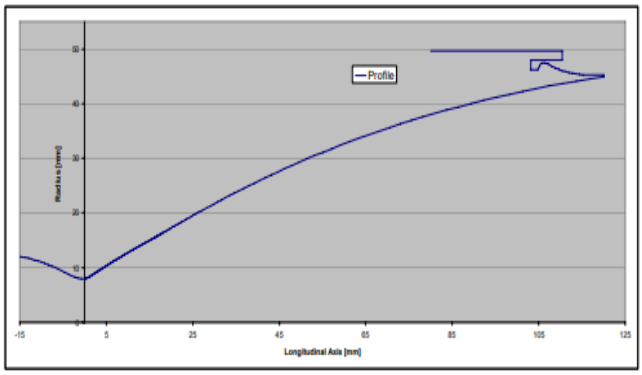

Fig 3: Bell nozzle with added aerospike structure [12]

This addition also allows for increase in specific impulse and also allows for increase in throttling range even at low altitudes without inducing any side loads.

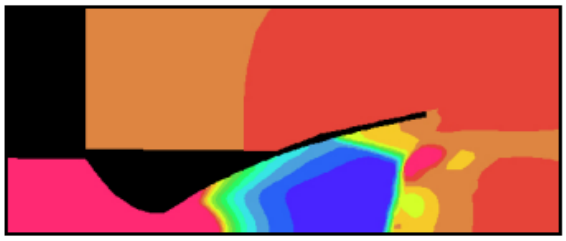

Fig 4: Pressure field for bell nozzle [12]

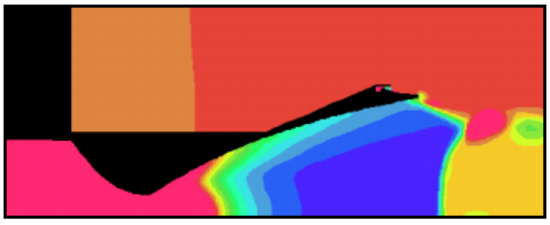

Fig 5: Pressure field for bell nozzle with added aerospike structure [12]

The numerical simulations shown above illustrates the state of flow separation in the bell nozzle with and without the aerospike profile. The fig 4 pressure contour clearly shows us the flow separation in the nozzle and the fig 5 which is equipped with the aerospike profile doesn't show any flow separation as it is totally suppressed.

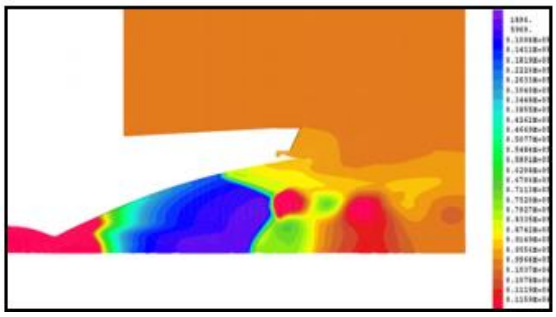

Fig 6: Pressure field for bell nozzle without aerospike flow at NPR= 37 [12]

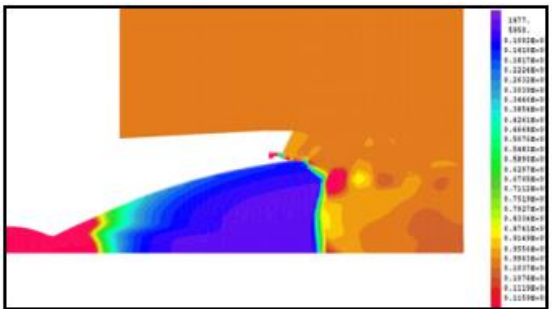

Fig 7: Pressure field for bell nozzle with aerospike flow at NPR= 37 [12]

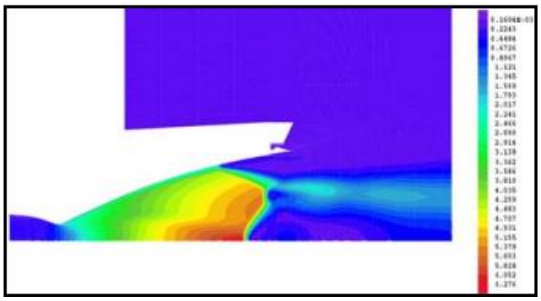

Fig 8: Mach field for bell nozzle without aerospike flow at NPR= 37 [12]

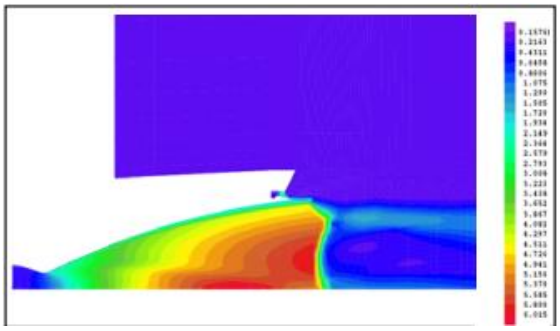

Fig 9: Mach field for bell nozzle with aerospike flow at NPR= 37 [12]

The numerical analysis was done by using turbulence model is a large range Reynolds number (k, ε) model with reliability condition. The above figures (5-8) illustrate pressure and Mach field contours at different NPRs with and without the aerospike flow.

RSS Suppression by Step Inside the Nozzle:

The step inside the nozzle contour modification was first done on the LE-7A engine. LE-7A is a Japanese engine used by JAXA on the H-IIA Launch Vehicle. It has experienced two major troubles; the large side loads and the damage of regenerative cooling tubes due to heat loads caused during startup and shut down. Later, it was found that the cause for this damage is due to the hysteresis effect. So, to counter this, a step is introduced inside the nozzle at a suitable axial location and height. It is crucial to identify the position for the step; the ideal location near the Reattachment on the nozzle inside the wall. In this case this position is at 37%L* of the nozzle inside wall axially.

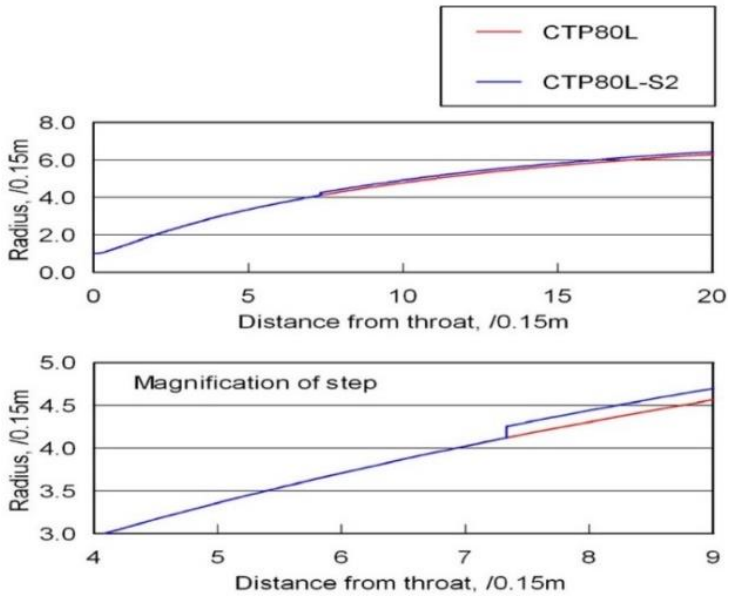

Fig 10: Illustration of nozzle profile with and without step [11]

During the shutdown sequence, the separation point moves upstream of the nozzle; the transition from FSS to RSS occurs, and the recirculation bubble starts moving upstream due to the decrease in NPR. But with a step inside the nozzle wall, when the separation point reaches the step, the reattachment flow separates from the nozzle wall, and the transition from FSS to RSS will not occur.

Numerical analysis was done using Compressible Navier Stokes equation, Spalart- Allmaras one equation Turbulence model using ideal air as working fluid. For convective terms, the AUSMDV

scheme with second-order upwind biased MUSCL interpolation, and for viscous and time terms central difference scheme and three points back differencing scheme, LU-SGS are used respectively.

The nozzle is designed for a pressure range of 0.1-12 MPa at a rate of 7.93 MPa/s and a total temperature range of 300-3300 at a rate of 60000 k/s.

Fig 11 shows the numerical simulation for CTP80L and CTP80L-S2 which are nozzle configurations without and with step respectively [10]; during start-up, for CTP80L configuration, we can see that for NPR 30 to 50, the separation point moves downstream, whereas, for CTP80L-S2 configuration, RSS doesn't occur due to the presence of step.

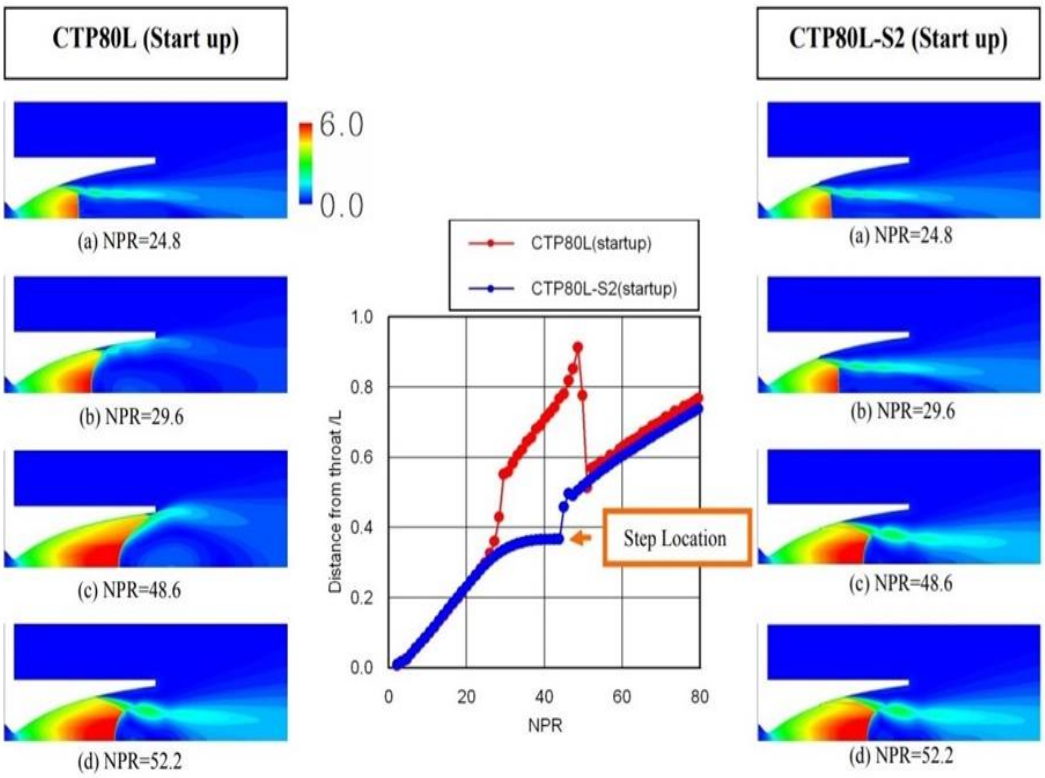

Fig 11: Comparison of Mach field for flow separation in CTP nozzle during startup [11]

Fig 12 shows the numerical simulation for CTP80L and CTP80L-S2 which are nozzle configurations without and with step respectively; during shut down, for CTP80L configuration, we can see that for NPR 30 to10, the separation point moves upstream, whereas, for CTP80L-S2 configuration, RSS doesn't occur due to the presence of step.

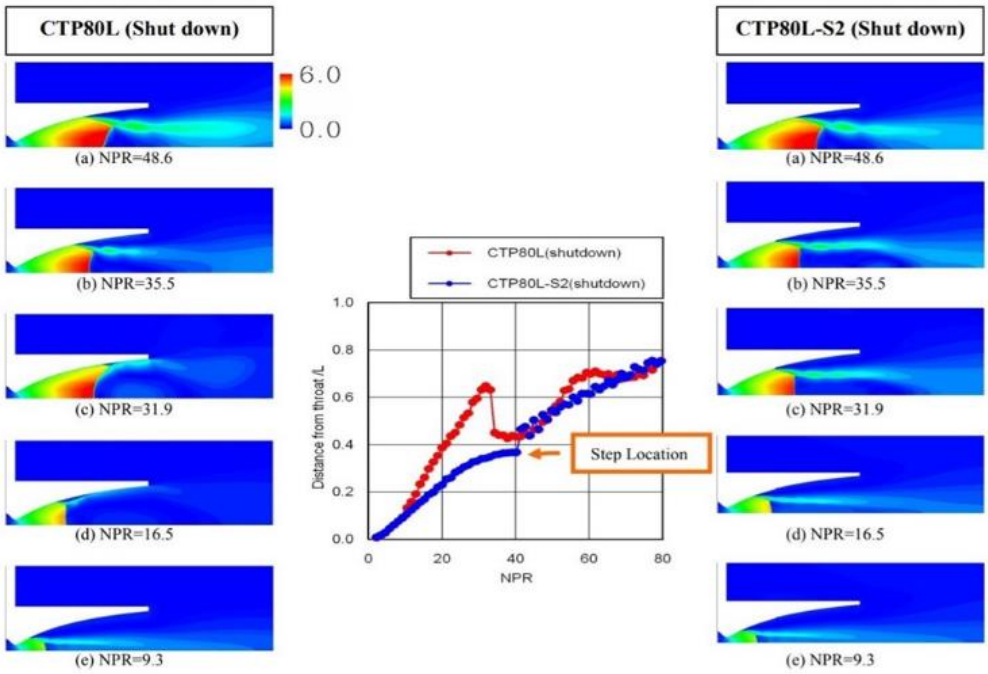

Fig 12: Comparison of Mach field for flow separation in CTP nozzle during shutdown [11]

Conclusion

After studying both the aforementioned methods it is evident that, flow separation in nozzles can be suppressed by making changes to the nozzle contour. With the addition of aerospike profile to the lip of the classical bell nozzle, both FSS and RSS are being suppressed. Apart from suppressing flow separation, we can also achieve higher specific impulse and the throttling range can be widened even at low altitudes. Now coming to the study on step inside the nozzle in case of the LE-7A engine, even though the complete flow separation is not being suppressed, RSS effect is getting suppressed. RSS may cause significant structural damage to the nozzle and its components, so, it is a significant leap suppressing this effect.

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STUDIES ON CD1-XTIXS THIN FILMS AS HIGHLY SELECTIVE PHOTOSENSORS SENSITIVE TO GREEN LIGHT

***D. B. Borse, **H. V. Jadhav, *D. R. Patil**

**Bulk and Nanomaterials Research Laboratory, Dept. of Physics, R. L. College, Parola, Jalgaon, MHS India.*

***Dept. of Chemistry, Kisan Veer Mahavidyalaya, Wai, Satara, India*

Abstract

The nanostructured Cd1-xTixS thin films were fabricated by chemical bath deposition technique, at 41^{o}C in a constant temperature water bath. The films were dried at 80^{o}C temperature under an IR lamp and annealed at 150^{o}C for 30 min in ambient air. Silver contacts were prepared by vacuum evaporation technique and monitored the photo-sensing performance of the prepared Cd1-xTixS thin films. The surface morphologies, chemical compositions and crystal structures of the films have been investigated by FESEM, E-DAX, XRD, UV-Vis Spectroscopy, etc. It is very interesting to note that, the fabricated thin films are very sensitive to the visible band of colors. Thin film shows higher response for the exposure of green light. As the contents of Ti is increased, the current generated upon incidence of green color increases up to 5 wt% and further decreased for 7 wt%. The thin films show negligible photo response for the red and white colors of light. The 5 wt% Ti doped CdS thin film has the highest photo-response. This may be attributed to the excitation of the material by photon of the wavelength in between 520 nm to 560 nm. Upon exposure of the photon of wavelength in this region, the free electrons move to the conduction band and constitute to enhance the photo current.

Keywords: *Nanostructured CdTiS, Thin films, Green Light Photo Sensor*

MIXED METAL OXIDE BASED E-NOSE

D. R. Patil

Bulk and Nanomaterials Research Laboratory, Department of Physics, R. L. College, Parola, Dist. Jalgaon, MHS, India

Abstract

There is a strong interest and need in the development of wide band gap (~ 3.4 eV) semiconductor sensors, for the detection of toxic, hazardous, combustible and inflammable gases [1-3]. They are utilized for security, safety, food freshness, medical diagnosis and monitoring environmental pollution [4-9]. Nowadays, available traditional type semiconducting gas sensors have major problems. Many international leading industries viz. Figaro Engineering Inc, Sierra Monitors Inc, IST, etc., already fabricated the gas sensor models [10]. However, few of them have limitations of sensing the gases below Threshold Limit Value, high cost, difficulties in availability, etc. Most of the researchers are taking efforts in developing the sensor models. For large applicability to Laymen, features of the sensors must be improved, viz. high response at trace level of the gas (ppm, ppb or even sub-ppb level), quick response-recovery profile, longer life time, long-term stability, high selectivity to a particular gas among the mixture of gases, low cross sensitivity, sensor location judgment, low cost, low power consumption, portable in size, etc. These features mainly depend on and co-related with crystallite size, thickness of sensor, nature of additives and their concentrations, microstructures and nanostructures, temperature, etc. The efforts are made in the said direction to develop the smart gas sensors from bulk and nanomaterials viz. ZnO, Bi2O3, SnO2, MnO2, ZrO2, etc [11-15].

Nanostructured material composites were synthesized by disc type ultrasonicated microwave assisted centrifuge technique. The electrical behavior, gas sensing and food freshness of such nanocomposites have been investigated in our laboratory [16-21]. The efforts are made to develop the sensors monitoring food freshness at low cost. The quick response and fast recovery are the main features of this sensor.

Key words: *Bulk and Nanomaterials, Smart Gas Sensors, Threshold Limit Value, Trace level, quick response-recovery, etc.*

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THE SPIRITUAL DIFFERENCE BETWEEN THE HINDU AND NAZI SWASTIKA

***Dr Jayant Balaji Athavale, **Mr Sean Clarke**

**MBBS, Clinical Hypnotherapist, Founder of Maharshi Adhyatma Vishwavidyalay (also known as the Maharshi University of Spirituality), Goa, India*

***MBA (Information Technology), Maharshi Adhyatma Vishwavidyalay*

Abstract

Depending on the context, the Swastika is recognised as one of the most auspicious or heavily vilified symbols in the world. Originating as a sacred symbol in Hinduism and it was also used by other Eastern religions. Despite its sacred origins, the Swastika has become so widely associated with Nazi Germany that any contemporary usage of the symbol frequently incites controversy. So, is the Swastika symbol spiritually beneficial to society or not, and should it be embraced or discarded?

With 40 years of spiritual research experience, the team at the Maharshi University of Spirituality has studied the Swastika in great detail from a spiritual perspective. This research has been conducted by using aura and subtle energy scanners along with the advanced sixth sense of its research team.

Listed below are some key aspects (found through spiritual research) related to the form and the colour of the Swastika, which can significantly affect the subtle vibrations it emits.

- Straight, tilted or inverted
- The corners and ends- straight or curved
- With or without dots
- Thickness of the arms
- Colour used

It was found that if drawn incorrectly like the Nazi Swastika, it emits negative vibrations. On the other hand, if drawn in a spiritually correct manner like the Hindu Swastika, it was found that the Swastika has the capability of attracting and emitting positive spiritual energy. In such a form, it can be utilised decoratively for auspicious occasions as it provides a spiritual healing effect to the immediate environment.

Keywords: *Indian Swastika, Nazi Swastika, Religious Symbols, Subtle Vibrations from the Swastika*

RECENT ADVANCES IN JOINING TECHNIQUES AND ITS PARAMETERS FOR ALUMINIUM ALLOYS-REVIEW

***Ankit Kumar Mishra, *Janani Kavipriya. S, **Fathima Hibathur Reema Mohamed Nassimdeen, #Shaik Faraz Hussain, $Sankar Raj R**

**Department of Research and Development, Abyom Space tech and Defence Pvt. Ltd, Gorahkpur-274402, India.*

***Department of Mechanical and Manufacturing Engineering, University Tun Hussein Onn Malaysia, Johor Bahru-86400, Malaysia.*

#Department of Mechanical Engineering, Lakirddy Bali Reddy College of Engineering, Andhra Pradesh-521230, India.

$Department of Mechanical Engineering, Chennai Institute of Technology, Chennai-600069, India.

Abstract

The primary goal of industries is to provide higher-quality products at a lower cost and to increase productivity. Welding is the most important and widely used method of joining two similar or dissimilar materials. Especially automobile and aircraft manufacturers are interested in using innovative processes and advanced materials to reduce weight, cost, and increase part performance. Techniques for joining lightweight dissimilar materials, particularly aluminium, steel, and plastics, are becoming more essential in the fabrication of hybrid structures and components for engineering applications. The most broadly used joining methods for aluminium alloys are TIG,MIT, Variable Polarity Plasma Arc, Laser Beam Welding(LB), Friction Stir Welding, Riveting. However, Aluminium alloys are difficult to weld due to their high conductivity, reflectivity, reactivity, and coefficient of thermal expansion. In this review paper, the research and progress of three main welding techniques for joining Al alloy are reviewed. Which is Friction Stir Welding(FSW), Laser Beam Welding(LB), and Riveting along with its key parameters and applications. The key rolesin recent progress in the welding of Aluminium alloys to provide a basis for future research.

Keywords: *Aluminium alloys, Welding techniques, FSW, LB, Riveting.*

Introduction

Aluminium alloys have seen a significant expansion in application areas in recent years, which has prompted considerable research on new generation aluminium alloys. Aluminium alloys are particularly useful in the building of lightweight fortification structures in industries including aerospace, defines, locomotives, automobiles, and energy. Aluminium's remarkable qualities, such as low density, high specific strength, high specific energy absorption capability, good corrosion resistance and thermal conductivity, formability, machinability, non-magnetic nature, and low cost, have led to its widespread use [1]. Welding is one of the most essential production processes utilized in the aluminium alloy sector as part of the fabrication process. Friction Stir Welding (FSW), Laser Beam Welding (LB), Riveting, Tungsten Inert Gas (TIG), Metal Inert Gas (MIG), Variable Polarity Plasma Arc (VPPA), and Electron Beam (EB) welding are the most often utilized joining methods for aluminium alloys. Aluminium alloys, on the other hand, are difficult to weld due to their high conductivity, reflectivity, reactivity, and coefficient of thermal expansion. Due to the high heat input, high thermal conductivity, and high coefficient of expansion, parts may be severely distorted during welding.

The Welding Institute (TWI) created friction stir welding in December 1991. Friction stir welding (FSW) is a relatively recent joining technique that has been employed in high-volume manufacturing since 1996. Because no melting occurs and joining takes place below the melting point of the material, a high-quality weld is created. Friction Stir Welding is a revolutionary solid-state joining process that does not melt or recast the material being welded. As a result, solid-state phase transitions occur during the cooling of the weld when alloys are friction stir welded. In reality, the purpose of this study is to assess the potential benefits of FSW over TIG and MIG, considering the decreased heat input of the solid-state joining method and the high hardening particle stability.

Helmholtz-Zentrum Geesthacht (HZG) in Germany developed and patented the Friction Riveting technology (FricRiveting) in 2007 as a way of attaching hybrid metal–polymer structures. This method uses a cylindrical rivet to unite metallic and/or thermoplastic elements using frictional heat and is based on mechanical fastening and friction welding concepts. A number of applications for laser beam welding of specific aluminium alloys have been approved. The automobile, aerospace, construction, and electronics industries are the most affected. In some situations, laser beam welding is being investigated as a replacement for mechanical fastening and adhesive bonding in the aircraft

sector. Because high-powered lasers have just become commercially available, welding can now be considered as a viable alternative to riveting in the assembly of commercial aircraft structures [2].

The rivet first appeared in Egypt around 3000 BC as a connecting element for the manufacture of various tools and items. Because the earth's energy supply is diminishing, car manufacturers would prefer to adopt lightweight structures to save energy. The lightweight structures are made of a difficult to weld aluminium or magnesium alloy. The Self-Piercing Riveting procedure is a cold forming technology that uses a semi-tubular rivet to link two or three sheets. It can link materials that are dissimilar and difficult to weld since the process depends on mechanical interlock rather than fusion. This technique is used by several automobile manufacturers to construct aluminium automotive bodies for space frame and monocoque body assemblies [3]. The mechanical properties of FSW, LB, and Riveting were mostly focused on tensile strength, microstructure, fractography, yield strength, and hardness by most researchers. Tensile strength, microstructure, and hardness tests were evaluated and assessed in this article by using FSW, LB, and Riveting joining methods.

Literature Review

Shigematsu et al (2003) have reported that Friction stir joining techniques is good for solid state joining especially for aluminum alloys and it’s most suitable for similar materials. A comparative study on microstructure, tensile strength, and elongation for the materials and joint specimens of alloy 5083, 6061 and Joint 5083-5083, 6061-6061, and 6061- 5083.FSW on the similar materials and dissimilar materials are examined and the combination of all materials was joined successfully. So, these results shows that even though it is FSW used for similar materials, it can be used for dissimilar material. But the welding properties like tensile strength and hardness distribution hast to be considered strongly when selecting the material combination.[4]

According to Liu et al (2014). The work in this paper is focusing on friction stir welding of dissimilar aluminium alloy to advanced high strength steel. Aluminium alloy 6061-T6 and type of high strength steel has successfully joined by using friction stir welding technique. The parameters in this paper include tensile test and microstructure analysis. The maximum ultimate tensile strength acquired is 240 MPa which is 85% of the base Aluminium alloy. From the findings, a thin intermetallic compound layer of FeAl or Fe3Al with thickness of less than 1 micrometer was formed at the interface of Al-Fe because of diffusion and reaction which has created the high joint strength.[5]

Guo et al (2014) focused on the friction stir welding of dissimilar materials between AA6061 and AA7075 Al alloys. The parameters in this paper focused on microstructure, micro hardness analysis, and tensile properties. From the finding it is clearly brought out that tensile strength of the dissimilar joint is directly proportional to the heat input. This difference occurred due to the different etching response to the Keller's reagent. Based on this paper all the joints investigated had a good tensile property with ultimate tensile strength more than 215 MPa and the percentage of elongation is more than 6%.At the minimum hardness, all the joints on AA6061 in HAZ regions close to the TMAZ in tensile testing were failed. [6]

Fu et al (2015) made complete study on the Friction stir welding process of dissimilar metals of 6061-T6 aluminium alloy to Az31B magnesium alloy. The parameters of tensile property and microstructure were investigated. The tensile strength achieved under the different position at the rotational speed of 600-800rpm and 30-60mm/min. The maximum tensile strength reached at 175MPa at 700rpm and 50mm/min which was nearly 70% of the Mg base metal. The formation of intermetallic compound layers, the light etching interfacial layer of thickness 3μm was obtained.[7]

Pourali et al (2017) have made a complete study on friction stir welding on Aluminium and steel joints. This paper includes the parameters of microstructure, tensile strength, Al-Fe interface, and fracture surfaces. 93 micrometer of thickness were the intermetallic compound layers formed at the inter joint of FeAl and Fe3Al. The highest tensile strength was founded at low welding speed and high rotation speed. By using overlap shear tests, mechanical properties of the joints were investigated. It has the dimensions of 100mm× 10mm with 400mm2. The highest tensile load obtain was 1925N at the joint welding speed of 50mm/min. During the tensile shear test, specimen failure happened in Al-nugget zones.[8]

Huang et al (2018) have reported that chemical and physical properties have the main impact on joining polymer and metal. The main joining techniques between polymer and metal are adhesive bonding and mechanical joining techniques. Comparatively, FLW and FSLW has the huge potential to the polymer structures. The parameters of 6061-T6 Al alloy havebeen examined. Such as Tensile strength, elongation, density, and modulus of elasticity. FSW process of Al alloys, the welding peak temperature is between 70-90%. During the examining, the maximum shear bond strength of 20.2 MPa was achieved at the speed of 50mm/min. [9]

Goyal et al (2018) have reported the parameters for joining Al-Mg4.2 alloy. This report includes the parameters of Microstructure, tensile properties, microhardness, and microstructure and fractography. The microhardness of the parent alloy was obtained 88Hv when the load of 500g for 10s. The grains in the nugget zone of the joint increase the hardness. The joint with 15mm shoulder diameter and the pin profile tool more likely to have a better tensile strength.[10]

Borrisutthekul et al (2005) have examined about the dissimilar material laser welding between Mg alloy Az31B and Aluminium alloy A5052-O. This report includes the parameters of tensile shear test and joining strength. From the tensile shear test, the results shown that the failure occurred inside intermetallic compound layer as it decreases the strength of the joint. The maximum strength achieved at 20 MPa and the failure occurred at the load 520N at the welding speed of 2mm/min which is around 37% of yield load of A5052-O alloy. After the experimental results it has concluded that the thin intermetallic and higher joining strength achieved in the edge line welding lap joint. [11]

Mathieu et al (2007) have studied about the dissimilar material joining using laser beam welding technique. Tensile test and microstructure parameters have included in this paper. Based on the microstructure analysis the darkest region near the aluminium alloys is richer in aluminium alloys and the lightest regions are richer in zinc. After the experiment it was observed that the thickness of reaction layer is less than 15μm. From the tensile tests it is decided that all the joints have a good performance.[12]

Wang et al (2018) have done the experiment on welding parameters on microstructures and mechanical properties of disk laser bean welded 2A14-T6 Aluminium alloy joint. This paper includes the parameters of microstructure, hardness, and tensile properties. The grain size and the porosity ration in the disk laser weld is directly proportional to the heat input. The highest hardness, maximum tensile strength, and the finest microstructure were achieved at the state of laser power of 2500W, welding velocity 2.0m/min and the heat 75kJ/m. The maximum tensile strength obtained at 261.7MPa which is about 62% of the base metal.[13]

Bunaziv et al (2016) have reported about the Fibre laser-MIG hybrid welding of 5mm 5083 Aluminium alloy. The parameters of microstructure and tensile strength were investigated in this paper. The results show that, during the welding process the heat input can be affected the microstructure in the joining zone. Compared to Argon-Helium mixture, pure argon shielding gas has the higher tensile strength due to stable process of hybrid welding in argon.[14]

Pakdil et al (2011) have examined the microstructural and mechanical characterization of laser beam welded AA6056 Aluminium alloy. Microstructural observation, hardness analysis, and tensile properties were investigated in this paper. From the experiment it is decided that, when base material has the yield strength of 347 MPa, yield strength achieved for the all-weld metal micro tensile specimen was 226 MPa. The efficiency of the joint for yield and tensile strength obtained about 65% and 75%. Hardness decreases was observed in the heat affected zone and the fusion zone.[2]

Nahmany et al (2019) have examined the laser beam welding process of AlSi10Mg specimen. The parameters of tensile strength, microstructure, and hardness were examined. The base metal microstructure of AlSi10Mgspeciments after the heat treatment at 3000C for 2 hours are 100µm, 100µm, and 1 µm. From the experiment it is very clear that welded samples have higher tensile strength, yield strength, and elongation values compared to cast. The yield strength and the tensile strength of the welded samples are 210-220 MPa, 320-330 MPa respectively. While cast has the yield strength of 180 MPa and tensile strength of 220 MPa.[15]

R Porcaro et al had done the modeling and the analysis of the self-piercing riveting in the software named as the LS-DYANA using inverse modeling. The team have done the analysis part and did the test of static and the dynamic on the double hat sections in conjunction with the aluminium foil sheets slaughtered with the approach of the self-piercing rivets in the vicinity of the flanges to authenticate the pegged rivet model. Here failure is likely to transpire in real crash conditions. And it shows that the behavior of the rivet is likely elastic and have given conclusion that 50% of the shear strength is equal to the tensile strength of the single rivet specimen.[16]

Richard R. et al have come up with the importance of the Aluminium as it is considered as the one of the primary metals in the wide range of the applications and in the present era the Aluminium is customizable and can be use and compete with the composite materials. By using the various joining techniques, the property of the materials is changed which bespeak devaluation in the material management and scraping, improved life expectancy of the material handling.[17]

Dong Hyuck Kam et al had come up with the examination of the quality trait of the Self piercing riveted joints and the issues arise with the various die types like flat die, cone die, and nipple on the geometrical and mechanical achievement of joints. It finally ends the paper with the conclusion of that with the advice / aid of the SPR (self-piercing riveting) case the vibration damping Al panel on

the top and die type of nipple spectacle the elite cross-sectional characteristics and the peak tensile shear strength.[18]

J Kang et al had given the result of the parameters like tensile and the fatigue behavior of the SRP (self-piercing riveting) with the CFRP (carbon fiber reinforced plastic) to Aluminium. The fatigue cracks growing in the kinked manner along with the width of the bottom aluminium sheet. It tells that the fatigue crack advance regularly in the cold treated plastically crippled field of the aluminium sheet. And it says that the friction betwixt CFRP and the aluminium sheet commence produces fretting. And the assertive mode of the break down was crack expanded along the width of the aluminium sheet. The nonappearance of the fretting may have subsidized to the upgrade fatigue life.[19]

Jing Zhang et al here it brings about of the reinforcing fibers on the composites bruise behaviour has described. Their result shows that the SPR (self-piercing riveting) is the adequate approach for accompany the fiber reinforced thermoplastic composite panels along with the aluminium alloys sheets. During the testing of the lap shearing the highest strength is observed as a result to the reinforcement of matrix with the fibers. Inclusively the strength of the thermoplastic matrix FRP composite exfoliate, and the aluminium alloys is much lower that of the Al joint.[20]

Deekshat et al had written the paper which is basically the review paper and they have focused on the application and the usage of the aluminium metal in the past from the period of the 2008-2019. This paper has given a detail information on the evolving of the joining techniques maybe it is a Mechanical processing, or the Welding process and it shown the application of the metal joining in the various avenue maybe it as a similar or the dis-similar metal joining. He has the objective to optimize the strength and welding parameters of the aluminium alloys of the various grades.[21]

Rujira Deekhunthod has come up with a paper which tells the present understanding in Aluminium alloys and how other metals will clout the weld strength and cracking susceptiveness. In his experiment shows that the tensile strength of all the specimens have breakdown in the heat affected zone area (HAZ). Change in the microstructure of the base metal and the weld material after welding. This paper conveys that the porosity doesn’t affect the stability of the welding because the fissure occurs in the HAZ. [22]

Stephanine Timpone has given the information of the Laser welding of the cooling pipes he compared the welding with the arc welding, soldering and brazing as the higher cooling rates that occurs under laser welding conditions changes the way the weld pool and the necessitates a higher ratio to reduce cracking susceptibility, Vickers hardness testing can be useful when welding metal that may form hard phase upon solidification and material composition plays a role in the final microstructure and cracking susceptibility.[23]

N. Bhardwaj et al (2019) have discussed that friction Stir Welding method is mostly used in aerospace industry and it is used for manufacturing high strength aluminium alloy and the application areas are large fuel storage tanks of space shuttles and spaceships and it is accepted as a suitable method to join high strength aluminium alloys in aerospace sector. The success of space vehicle series using FSW such as space shuttles, Ares I launch vehicle, Orion spacecraft proved that FSW is an acceptable welding process.[24]

Guoqing Wanga et al (2017) have reported that the accelerated use of aluminium alloys in automobile industry is due to the high weldability using FSW for similar or dissimilar aluminium alloys. The application areas of FSW are engine parts. car rims, fuel storage and tailor welded blanks for automobile and wings, fuel container, stringer for aircraft. The main reason for using FSW is due to its more strength and low weight of the welds. The other application areas include hull, superstructure, decks for ships and walls, floor areas for trains and frames, pipes, reactors, electronic components housing and connectors for construction, power plant and electrical industry.[25]

Alessio Gullino et al (2019) have reported that the laser welding is used in automobile industry in automobile components such as closures, pillars, and seats, in automobile assembly lines laser welding source can be controlled using remote and focused on the workpiece with higher welding speed and productivity. [26]

Eva Vaamonde Couso et al (2011) have examined that tailored blank in automobile are welded using laser welding process at 6m/min to 15m/min to be profitable. Aluminium alloys of different thickness used in sheets, extrusion and casting will be laser welded and with development of high-power lasers, heavy structures can we welded.[27]

Li Han et al (2010) have reported that the SPR process is used mostly in the joining of the aluminium sheet metals due to no need of the predrilled hole and ability to join two dissimilar metals and there will be no fume emissions.[28]

Dezhi Li et al (2017) have made a study that the main application area for SPR is the automobile industry and which is the main reason for the SPR development. SPR developed in 1960s, however became more efficient in the past 25 years in joining lightweight aluminium alloys.[29]

Yohei Abe et al (2020) have reported that the different types of materials are used in the automobile industry to lower the weight. The steel, aluminium alloy and carbon fibre reinforced plastics are commonly utilised for automobile body parts. Automobile sheet metal components such as steel and aluminium sheets were joined by SPR and clinching processes.[30]

E.Schubert et al (2001) have reported that the aluminium alloys are used in transportation industry due to its less weight capability. The aircraft structures such as skin and stringer which is riveted can be laser welded due to the less cost and weight using AA6013 and also structures made up of titanium could be manufactured by using both laser beam welding in wing and fuselage components.[31]

F Hönsch et al (2018) have reported that in the automobile industry thermal joining of dissimilar metals are difficult and due to that the use of mechanical joining increases constantly. Self-Pierce Riveting has become a most common type of mechanical joining process for lightweight materials in automobile body parts. SPR can be used for joining for both similar and dissimilar materials such as aluminium alloys or aluminium alloy with thermoplastic composite or steel sheets.[32]

Daniel Wallerstein et al (2021) have reported that 5xxx and 6xxx series are the most common aluminium alloy series used in dissimilar aluminium steel joints used in aerospace and automobile applications. Laser welding has become a better decision when it comes to joining of dissimilar materials and the joints used for welding of dissimilar joints are lap and butt joints. The dissimilar aluminium steel joints are used to obtain a very good weight reduction and also for better assemblies.[33]

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Discussion

1.Joining Methods

In this modern and the advancement of the technology the joining is the main factor which has the many advantages for the futuristic purpose, and these will also have some of the constraints for the joining of the various polymer based or the Dis-similar materials like same composition of the metals or the combinations of the alloys. In the manufacturing industries, epically while manufacturing the solid products its very complicated to make such parts directly by casting or any other methods due to its complicated design and having the multifarious geometrical features. To reduce such complexity the complex parts are made and divided into the subparts and joining them in a best possible way to get the replica of the designed solid product. In simple words to explain about the joining means nothing but its assembling of the two or the more products in order to make one single unit with or without the interference of the external elements. The joining is done by the using the some of the fabrication techniques like welding, having the strong bonds between the materials using the Adhesives, riveting and some of the fasteners (like nut-bolt, clip, nail, button, zipper, hook, clutch) etc., In general, the joining can be categorized into the two categories mainly permanent joint and the temporary joints, Basically Welding, Soldering, Brazing and Mechanical fastening will come under the permanent joining. Fasteners, press fit, Cotter joint & knuckle joints are the some of the temporary joints which can be used in the various metal joining process. In the either comparison of the joining process there are many Advantages and limitations for the Joining of the same or the different type of the compositions of the metal and materials. So here, let's get an idea and overview about the some of the joining techniques.[51]

Friction Stir Welding

In today's world the joining has come up with a huge research and development factors for the implementing the joining of the complex solid models. For the joining, the recent developing technology is the Friction Stir Welding (FSW). This project of this technique was carried out in the three modules in which Module-I was proved that the Friction Stir Welding (FSW) is the realistic and the practical welding technique for the Aluminium alloys with the series of 6000, in Module-II the friction stir welding (FSW) was carried out on the Aluminium alloys of 2000 & 5000 series which are generally used in the application of the Aerospace and the Ship industries. They have processed the parameters like the mechanical properties, tolerances, and the metallurgical characteristics. In the last module they have pertinent data for further industrialization of this Friction Stir Welding technique. It has been proven that it can be used for the low melting temperature metals like the brass, copper, Aluminium. The next milestone of this technique is to weld for the materials having the high melting points and can withstand the high temperatures and the pressures to get the perfect weld and have the effective joint. In FSW, the welding metals and a cylindrical shouldered tool with a profile probe are used the weld is produced by the plunging and rotating the profile probe tool into the two welding metals which are fixed and clamped side by side in which solid state is produced by the friction generated during the rotation of the plunged profile probe tool. With the help of this technique there are some of the salient features in the weld quality some of them are having no porosity as it doesn't melt, as this is an extruding and the forging joining method which is controlled by an accurate heat so no lack of fusion, having greater weld strength than the parent metal due to formation of the fine grain structure in the weld nugget, no change in the material as the extra filler material or the any other substance are not used. So, these are the general information about the friction stir welding which would be helpful in getting knowledge about the new trending technology about the joining of the similar or the dis-similar metals.[52]

Riveting Process

In the joining process the welding is not only the solution for getting two materials to make it as single unit but instead of the welding process there is one other method called as the fastening. Generally, this mechanical fastening is having their separate appraisal in the field of the manufacturing industry for the joining of the two materials, the main importance is given to the fastening when we need to join the plastic materials. The mechanical fastening is differentiating into the two categories that are

permanent joints and non-permanent joints. The Screws are the main example for the non-permanent joints as then can be removable, replaceable, and reusable. In similar way the working of the rivets is also similar as the only difference is that it is a permanent joint and we cannot use the rivet as reusable. The rivet nomenclature is like it contains the head part and the cylindrical tail later on its other side is also converted into the head of the hemispherical shape. These are mainly used in the lap joint or the butt joint with the large range of the configuration along with the single pin riveting, double pin riveting and the zig-zag form riveting patterns. This riveting can be done by drilling or b placing the rivet on to the place to get join and the tail portion of the rivet is then smashed or deformed into the similar manner of the head shape as this can be made into the movable, fixed, closed and closed-fixed. For the maintenance of the joint the rivet cannot be replaceable as this are needed to destroy to fix the joint again separately. These rivets are made by the process of the cold heading or the cold upsetting from the rollers. These rollers can be used in many areas of application like aerospace, marine, shipping, space industries etc., The one more advantage of this riveting is that it can be mass produced with the accurate and required dimensions. During riveting easy deforming material is required which required the characteristics of lower hardness so, wrought iron or the soft steels metals are used for the making rivets.[53]

Laser Welding

The main source of joining the metal is heat and by using this heat with the maximum concentration at one place with the help of the laser on the metal can be joined or welded this process of joining of the metal using the laser is called as the Laser welding. The weld joint is formed by the laser light intensity which heats the metal material rapidly typically we can say in the milliseconds. Generally, there are various type of lasers into which they are categorized like gas lasers, solid state lasers and diode lasers. This laser beam is coherent and can precisely spot on the area spot without any divergent. This concentrated light beam can be impinged upon the surface to get welded. The lens plays a key role in defining the spot for the joint to be get welded, the larger the spot the high amount of intensity gets generated and used for the heat treatment process and the smaller the spot the more amount of the intensity will get concentrated, and a sharp pot would be helpful in the cutting of the metals. The lasers don’t require any vacuum as it can get interact with the any material. In the laser welding the absorption of energy may get effected with some factors like incident power density, the type of the laser used and the condition of the base metal surface that is going to be used. The type of the welding

can be done using these three ways with the help of the laser welding there are conduction mode welding, penetration mode welding, keyhole mode of welding. The metals that are used for the laser beam welding are Aluminium, Titanium, Carbon steels, Platinum, nickel, Molybdenum, Kovar, and stainless steels. [54]

Parameters

Tensile properties

The tensile test for joining the type of Aluminium alloy Al-Mg4.2 was thoroughly examined. Figures 1 and 2 shows the Tensile properties of Ultimate tensile strength (UTS), yield strength (YS), and joint efficiency of the joints formed with different pin profile and shoulder diameters tools, sequentially. Each joint received three tensile test specimens, with the mean of three measurements used to produce the bar diagram as shown in the fig (1)(2). The ultimate tensile strength and yield strength of the joints were determined using UTM's software interface. The joint efficiency was calculated as the ratio of the joints' UTS to the parent alloy's UTS. Joints made with a 15 mm shoulder diameter tool and a square pin shaped tool have greater tensile properties than those made with other tools. The UTS of all joints was resulted lower values [10]. 2A14-T6 Aluminium alloy welded by laser beam welding process and the tensile results brought out that, when the heat input is 75 kJ/m, maximum tensile strength was obtained at 261.7MPa which is about 62% of the base metal as shown in the figure 3 [13].

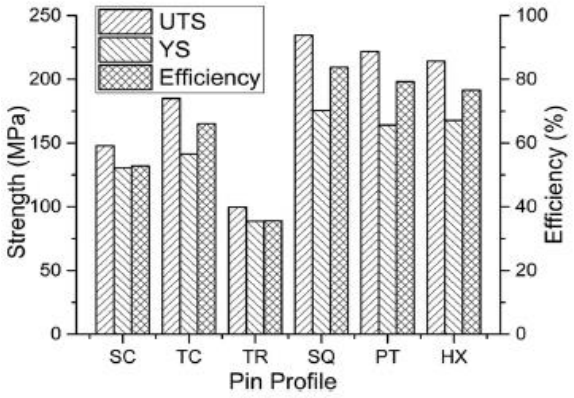

Fig 1. Effect of tool pin profile on strength properties [10]

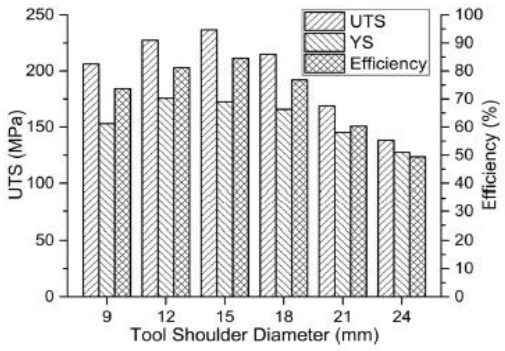

Fig 2: Effect of tool shoulder diameter on strength properties [10]

By using FSW joining technique, dissimilar metal 6061-T6 Aluminium alloy to Az31B Magnesium alloy was examined [7]. With Mg on Advancing Side (AS) and a tool offset of 0.3 mm, the maximum tensile strength of 175 MPa was attained at 700 rpm and 50 mm/min, which was about 70% of that of the Mg base metal. From the result it can be seen that, the low joint strength was caused by the high rotation rate and traverse speed [7]. The maximum joint strength acquired when the speed of the welding process was at the greatest value [7].The welding property tensile strength has to be considered strongly when selecting the material combination [4].

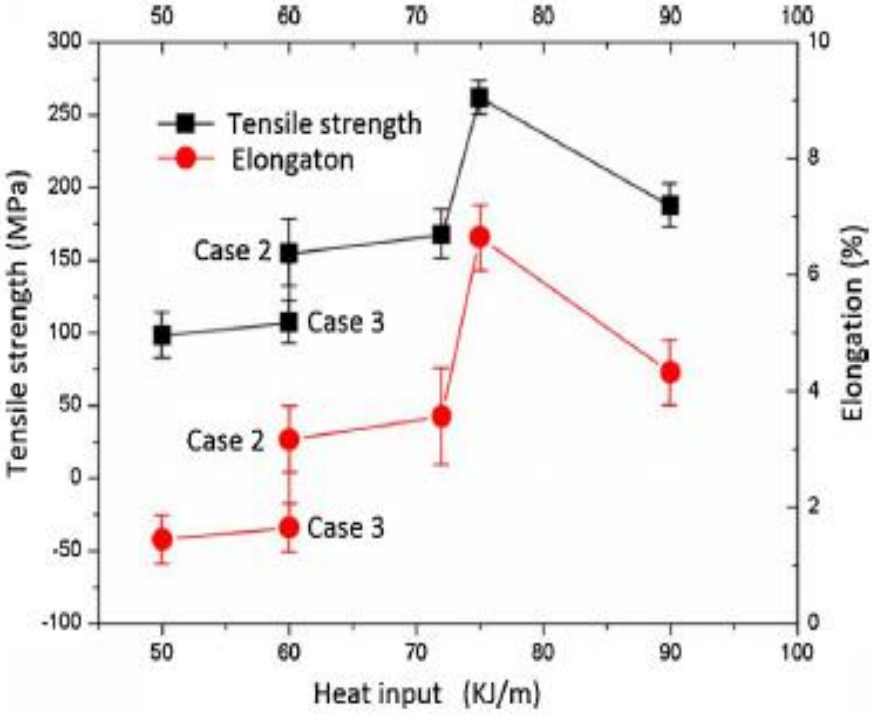

Fig 3: Tensile strength and elongation of the laser beam weld of 2A14-T6 Aluminium [13]

Microstructure and Metallography Analysis

Typical cross-sections of Al–Mg dissimilar metal FSW joints welded at 700 rpm and 60 mm/min with Mg on AS and tool offset of +0.3 mm are shown in Fig 4(a). Scanning electron microscope (SEM) investigation was focused on the interface between Al and Mg, as well as the nugget zone on the Mg side, which revealed distinct characteristics from similar metal FSW joints [7]. The microstructure of the formation of defect-free weld nugget depends on the shoulder diameter and the pin profile of the welding tool [10]. A light-etching interfacial layer about 3 m thick existed, representing the production of intermetallic compound (IMCs), as shown in a typical SEM picture of the interface in Fig 4(b).

The existence of Al and Mg elements across the interface was shown by energy dispersive X-ray (EDX) line analysis of the IMCs layer (Fig 4(c)), and the variation in relative concentration of Al and Mg suggested that the IMCs layer was made up of two layers: which are Al12Mg17 and Al3Mg2 respectively. The nugget zone was divided into three zones: the shoulder impacted zone (below the shoulder during welding), the banded zone (upper and middle regions of the joints on AS), and the severe intercalated zone (bottom). Both banded zone Fig 4(d) and severe intercalated zone Fig 4(e–f) revealed Al–Mg intercalated structures induced by severe deformation during the FSW process and varying deformability of Al and Mg. Fig 4(g)(h) illustrate the distributions of Al and Mg elements in the banded zone and severe intercalated zone, respectively. The coexistence of Al and Mg elements in places highlighted by arrows revealed the presence of reaction between Al and Mg elements during FSW. Fig 4(i) shows a typical eutectic structure in the severe intercalated zone, with the bright phase being Al3Mg2 and the dark phase being a mixture of Al solid solution and Al3Mg2[7].

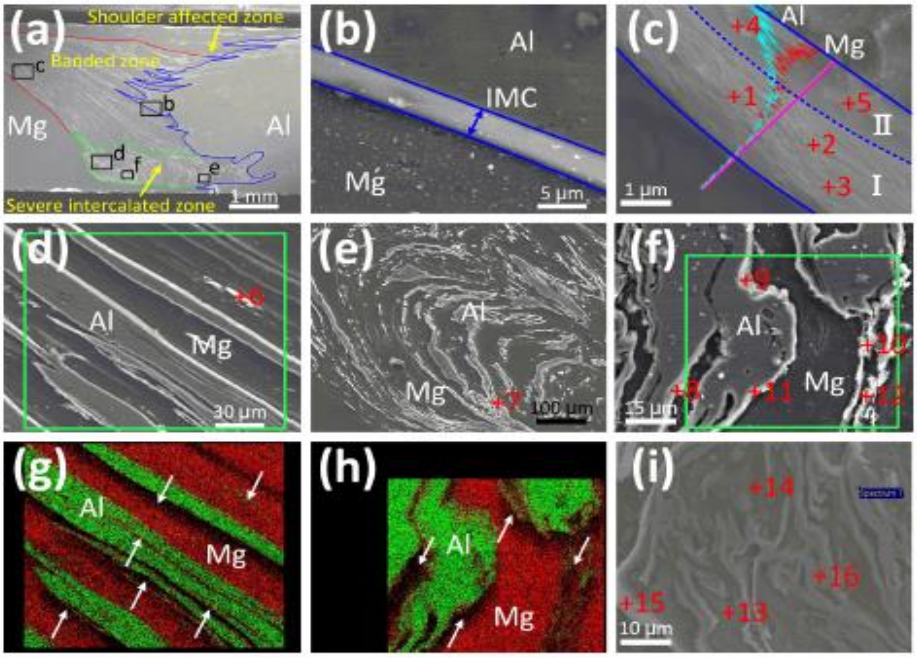

Fig 4. SEM microstructure and EDX analysis of Al-Mg dissimilar metal FSW joint produced at 700 rpm and 60 mm/min with Mg on AS, tool offsetting to AS 0.3 mm [7]

Increases in rotational speed and joining time resulted in greater heat inputs and process temperatures for the PEI-AA 2024-T351 joints. The heat input and temperature of the assessed joining conditions are projected to increase as the rotating speed and joining time at constant joining pressures increase. The increase in the value of the aspect ratio of the anchoring zone with increasing processing temperature is closely related to the heat input and local plasticizing of the metal, as increases in rotational speed and joining time generated higher processing temperatures, according to this analysis of joint manufacturing process parameters. The high heating and deformation rates during the joining process are known to have a major impact on the microstructures of FricRiveted joints [35].

Fig5 shows the microstructures of disc laser beam welded joints of 2A14-T6 aluminium alloy beneath neath diverse welding conditions. The welding pool begins to solidify from the fusion line to the welding pool's centre. The major dendrites grow from the fusion line to the weld's centre and in the temperature gradient's direction. With the solidification of the welding pool, constitutional supercooling increases in the fusion zone (FZ), and numerous crystal nuclei form. The crystal nuclei then start to expand and create fine grains. The average values of primary dendritic arm spacing at the fusion line and grain size in FZ are measured along with micro analysis [13]. Heat input can be

affected the microstructure in the joining zone [14]. With an increase in heat input, the average grain size drops at first, then increases. When the heat input is 90 kJ/m, the maximum primary dendrite arm spacing at the fusion line and the maximum grain size in the FZ are 12.67 m and 6.67 m, respectively.

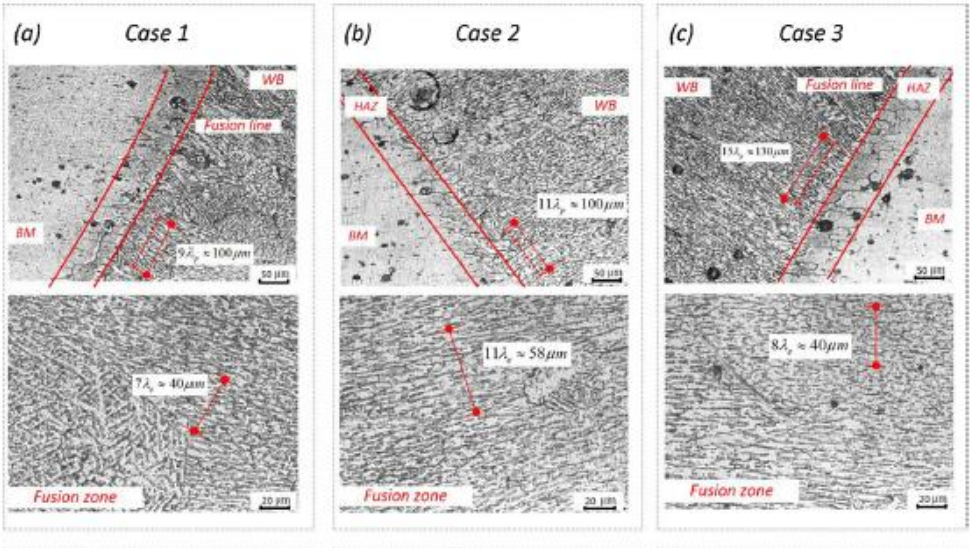

Fig 5. Microstructure of the disk laser beam welded joints under different welding parameter [13]

The microstructure data revealed that laser oscillation influenced the growth of the equiaxed grains in some way [36]. When the heat input is 75 kJ/m, the minimum primary dendrite arm spacing at the fusion line and the minimum grain size in the FZ are 7.69 m and 4.0 m, respectively [13]. The porosity ratio of the disc laser beam weld with 72 kJ/m and 75 kJ/m heat input is substantially lower than that of others. The porosity ratio is higher when the laser power is 2500 W, and the heat input is 50 kJ/m and 60 kJ/m. The reason for this is that due to the low heat input, an incomplete fusion can be seen at the bottom surfaces of the weld, resulting in the production of several significant porosity defects at the bottom of the weld [13].

Microhardness

The microhardness of distinct zones of the welded joints was determined using the Vickers microhardness test. With a load of 500 g for 10 seconds, the microhardness of the parent alloy was measured to be 88 HV. As illustrated in Fig (6), the microhardness of the intermediate layer across the joint was measured. Regardless of the pin shape and shoulder diameters of the welding tools, the nugget zone of all joints was found to be harder than the parent material. The hardness of both the heat affected zone (HAZ) and the weld nugget (WN) is lower than that of base metal (BM) [37]. The

improvement in hardness is justified by the refining of grains in the nugget zone of the joints. In all joints, the retreating side's hardness was found to be higher than the advancing sides. Among all the joints manufactured with different shoulder diameter tools, the joint produced with 15 mm shoulder diameter tool showed the greatest improvement in stir zone hardness [10].

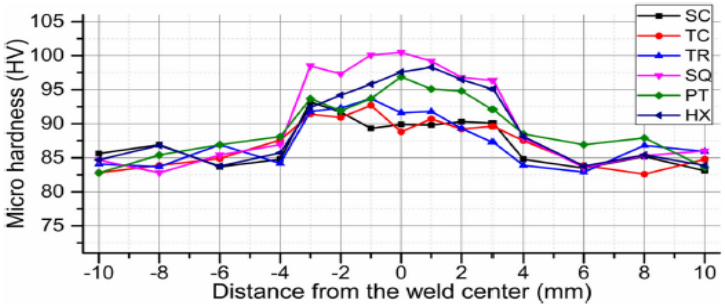

Fig 6. Effect of pin profile on microhardness [10]

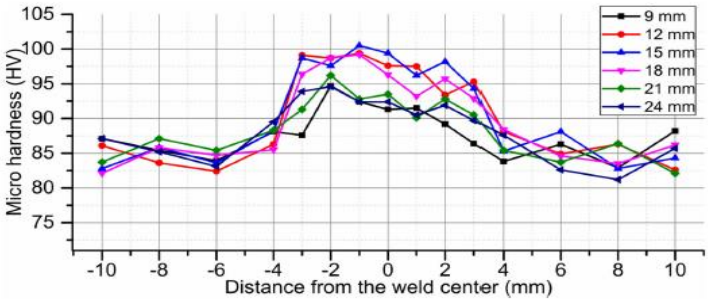

Fig 7. Effect of tool shoulder diameter on microhardness [10]

Furthermore, insufficient heat generation causes coarsening of grains in the nugget zone, which reduces the hardness of the weld nugget. Joints produced with shoulder diameters smaller than 12 mm and bigger than 18 mm suffer from a loss of strength and efficiency due to decreased hardness, coarse grains, and the presence of flaws. The joint fabricated with a 15 mm shoulder diameter tool had a high hardness value and fine grains in the stir zone, as well as a fracture surface with well-distributed fine dimples, which are the reasons for the joint's high strength and efficiency when compared to others. [10].

After examining the 2A14-T6 Aluminium alloy by using disk laser beam joining technique, micro-hardness is reduced at the fusion boundary and gradually increases from the heat-affected zone (HAZ) to the base metal for the same disc laser welded connection (BM). Because gains in FZ are finer, the hardness in the centre of FZ is greater than that at the fusion boundary. The micro-hardness of BM is

the maximum, while it is the lowest at the fusion border. The maximum micro-hardness of BM is due to the fact that it is strengthened by solution heat treatment and ageing strengthening treatment, as evidenced in the microstructures in Fig8 [13]. In contrast to arc welding, where the hardness minimum is in the overaged HAZ region, a hardness drop (strength undermatching) was seen in the HAZ and the FZ, with the hardness minimum located in the FZ. Overaging occurs as a result of heat input during the welding process, which results in a loss in hardness in the HAZ. [2]. The fusion border has the lowest micro-hardness because the strengthening effect is reduced due to the loss of alloying components. The welding thermal cycling coarsens the grains and causes HAZ to age prematurely. As a result, HAZ has a lower micro-hardness than BM. With increasing heat input, micro-hardness near the fusion line and in the FZ increases at first, then declines. The maximum hardness at the fusion line and in FZ is attained when the heat input is 75 kJ/m [13].

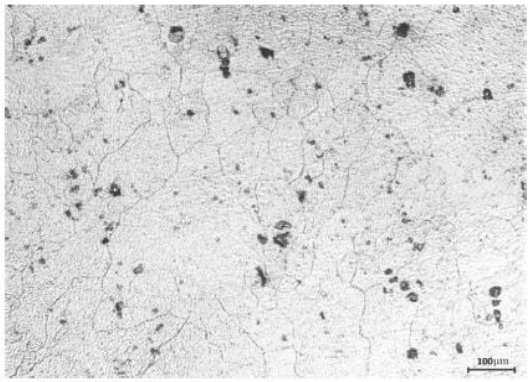

Fig 8. Microstructures of 2A14-T6 Aluminium alloy [13]

The grain shape of the sheet changed from equiaxed, which was far away from the rivet, to streaky, which was close to the rivet. The macro morphology of the joint can be split into five sections. The average hardness at the various location of the joint is observed as 171HV,66.5HV,149HV and 68.9HV [38]. The hardness distribution increases from 72.374.9 [HV] in the base metal to 97.3 [HV] in the B2 transition zone of the upper plate, and 82.285.5 [HV] in the C2 transition zone of the lower plate; the highest value is found in B1 upper plate self-locking area 102104 [HV], and 100 [HV] in the C1 lower plate self-locking area. [3].

Vickers hardness was mapped out on the joints at various process parameters to identify the hardening/softening of aluminium in the F-SPR joint. In comparison to the BM, the aluminium alloys close to the rivet have lower hardness in all three joints. The softened zones were highest in the 3600

rpm-2.0 mm/s junction, measuring 6.2 mm in the upper sheet and 4.8 mm in the lower sheet outside the rivet as shown in Fig 9(a). The minimum hardness was around 130 HV, or 77 percent less than BM's 169 HV. When compared to 3600 rpm-2.0 mm/s, the 1800 rpm-2.0 mm/s joint has a similar overall hardness distribution with a slightly narrower softened zone width as shown in fig 9(b). However, as the feed rate increased from 2.0 mm/s to 8.0 mm/s, the width of the softened zone shrank considerably as shown in fig 9(c). In the 3600 rpm-8.0 mm/s joint, the minimum hardness was around 140 HV, or 83 percent of the base material. TEM images of zones I, II, and III outside the rivet of the 3600 rpm-2.0 mm/s joint. As the materials approach the rivet, the original strengthening precipitates coarsen and show increasing size from zone I to III. Many of the BM's precipitates are coarsened or grow into, resulting in an overaged state[34].

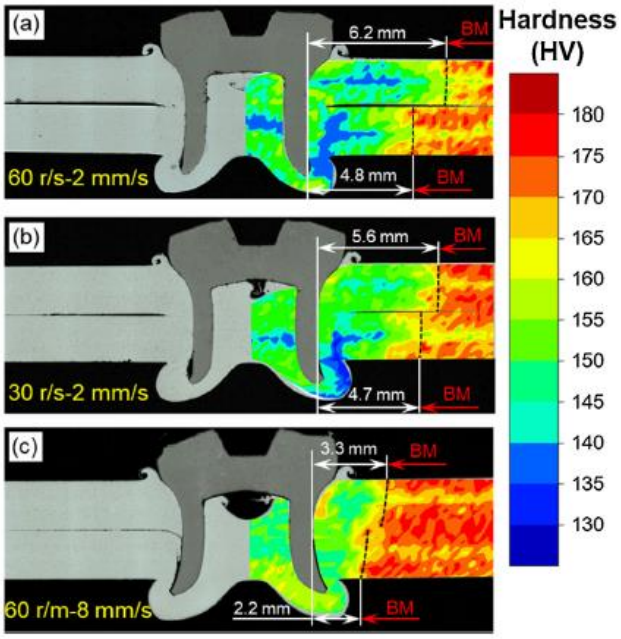

Fig 9. Vickers hardness distribution maps of F-SPR joints under different process parameters. (a) 3600 rpm, 2.0 mm/s, (b) 1800 rpm, 2.0 mm/s, (c) 3600 rpm, 8.0 mm/s [34]

All of the precipitates dissolved in the lower section, where the aluminium was entirely recrystallized, indicating that the temperature is higher than the solution heat-treatment temperature of AA7075-T6 (4800C). As a result, while grain refinement strengthens the materials inside the rivet, the drop in hardness caused by precipitate dissolving and coarsening is difficult to compensate for. Furthermore, due to fine grain strengthening, the lower region of the aluminium inside the rivet cavity was tougher than the remainder of the softened zones. Furthermore, the upper sheet had a wider softened zone

than the lower sheet due to the up-to-down heat generating direction when the rivet fed from the upper sheet to the lower sheet during the F-SPR process [34]

Applications

There are various methods to join the aluminium alloys and based on the cost involved in the process and required strength by the joint, the selection of joining process is done. By comparing the application areas of the friction stir welding, laser welding and self-pierce riveting, the friction stir welding has a wide range of applications in areas of automobile, aviation, railway, marine, electrical and construction industry. In automobile industry FSW has its role in manufacturing of vehicle rims, vehicle frames and chassis, engine parts, fuel tanks[39][40] and in the aerospace industry FSW process is used in the manufacturing of fuel tanks of space shuttle and space ships and also in the manufacturing of stringer and wings in the aircraft.[41] In the marine industry the FSW technique is used in the manufacturing of ship main structures such as hull, decks and offshore accommodations and in the railway industry the FSW is used in the container bodies and railway tankers.[39] Laser welding and self-pierce riveting also has its application in automobile and aerospace but its usage is limited to the few areas. Self-pierce riveting is mostly used in the joining of sheet metals in the automobile industry [42] and the sheet metal is made up of materials such as aluminium alloys with composite or steel [43].SPR requires no predrilled hole and emits no fume emission and light weight structures can be joined[44][43].Laser welding is used in manufacturing of tailor blanks in the pillars, seats, closures [45] and used to weld the heavy structures in the automobile[46]Laser welding is used instead of riveting in the wings and fuselage components due to its less cost[47].

Conclusion

In this paper we have compared the joining techniques of the Aluminium by Friction Stir Welding (FSW) with the Laser welding along with the Riveting.

1. As in this method of joining done on the Dp 590 sheet steel. Dissimilar gauge tension tests (1.6/1.0 mm) showed that transverse tensile ductility in the laser welded specimens could reach the same level of performance as the friction stir welded specimens. As this Friction Stir Welding (FSW) has a greater formability than the Laser welding.[50]

2.The methods like Friction Stir Welding and Laser welding will have the higher strength of the joint while compared to all other techniques, Main advantage of this technique is that it has the capability to reduce the weight of the whole body.

3.For the Industrial application of this techniques the fatigue crack propagation and residual strength tests on centre-crack tension specimens, C(T)-specimens, or middle-crack tension specimens, M(T)-specimens), are needed to be get certified for the best quality of the welding for both Friction Stir Welding & Laser Welding.

4. In many of the cases found that for maintaining the surface quality the only method found seems to be feasible that is Friction Stir Welding when compared to the others joining techniques.

5. While the microstructure part, grains in the FSW are fine and equiaxed, which would help in the having the stronger bonds in welded part than the other techniques for the joining.

6. In many of the cases of joining of the metals they have found that FSW process modifies the microstructure of the metal by refining the grain structure.

7. In some other cases it is found that Friction stir welding could not produce the higher productivity (Welding speed) so, instead of that Laser Welding is used.

8. During the fatigue test of the material which was gone through the Laser welding & Friction Stir Welding the failure mostly occurs in the welded part and on the base material due to Geometric notches respectively.

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SURFACE ACTIVATED BISMUTH OXIDE BY GALLIUM OXIDE CHLORINE SENSORS BY EMPLOYING THICK FILM TECHNOLOGY

***Snehal D. Patil, *Harshal A. Nikam, *Dipali R. Patil, *Dhanashri S. Chaudhari, *Y. C. Sharma, **Y. B. Patil, **D. R. Patil**

**Dept. of Physics, Vivekananda Global University, Jaipur, India*

***Bulk and Nanomaterials Research Laboratory, Dept. of Physics, R. L. College, Parola, Jalgaon, MHS India, 425111*

Abstract

The nanostructured Bi2O3 powder was synthesized by disc type ultrasonicated microwave assisted centrifuge technique. Thick films of pure Bi2O3 powder were fabricated by screen printing technique followed by firing at 400oC for 30 min. The films were surface functionalized by dipping them into 0.01M aqueous solution of Gallium Nitrate for different intervals of time. The surface morphologies, chemical compositions and crystal structures of the pure and surface activated Bi2O3 thick films have been investigated by FESEM, E-DAX, XRD, etc. Ga2O3 activated Bi2O3 (30 min) sample exhibits crucial response to 20 ppm Cl2 gas at 250oC. Electrical behavior and gas sensing performance of thick films of pure and activated Bi2O3 have been studied and discussed.

Keywords: *Nanostructured Bi2O3, Ga2O3, Thick films, Cl2 Sensor*

CONCEPTUAL DESIGN AN ANALYSIS OF TWO STAGE SOUNDING ROCKET

***Ankit Kumar Mishra, **Kshtij Gandhi, **Kuldeep Sharma, #Neerumalla Sumanth, #Y.Krishna Teja**

**Department of Research and Development, Abyom Space tech and Defence Pvt. Ltd, Gorahkpur-274402, India.*

***Department of Aerospace Engineering, School of Aeronautics, Rajasthan- 301705, India.*

#Department of Aerospace Engineering, Hindustan Institute of Technology and Sciences, Tamil Nadu -521230, India.

Abstract

The objective of this paper is to design a two stage sounding rocket and its nozzles using fusion 360 and analysis of different properties using simulation on ANSYS software. The rocket is designed to reach maximum apogee to perform scientific experiments and can be recovered safely after use. Number of CFD simulations were done on structural design with different parameters to analyze the aerodynamic characteristics of the different stages of rocket and the verification of the nozzles.

Keywords – *rocket, nozzle, ANSYS, CFD, fusion 360.*

Introduction

Sounding rocket- sounding rockets are specialized rockets designed for research and scientific purposes, at different orbits of earth. They can attain an apogee of 100km to 2000km. As orbital mission rockets are very costly, bigger in size and take a lot of time to design but for simple research purposes it will be extremely expensive, taking these causes in consideration, sounding rockets are built.

Nose cone- a nose cone is the forward section of the rocket vehicle which guides the rocket during the flight to outer space. It is conical in shape so that it can accumulate maximum speed and reducing drag to minimum achieving highest possible apogee during the flight. It can be used to carry satellite/payload for the mission as it gets detached after the required height is achieved. There are

various nose cone such as 'Conical, Ellipsoid, Ogive, Parabolic, Power series, Haack series' designed and selected as per mission requirement.

Fins- fins are appendage attached to the structure of the rocket body, they play very important role to provide stability to the space craft during the flight that allows the rocket to maintain its flight path and orientation, the shape and design of the fins will decide how stable a vehicle will be. General stability factor falls under 1 to 2, under which it will be under-stable and above which it will be over-stable. Stability is calculated by using

stability $= \frac{C_g - C_p}{2}$ Where, C_g= location of center of gravity, C_p= location of center of pressure.

There are a lot of different type of fin shapes namely trapezoidal, clipped delta, rectangular and parallelogram fins, they are tested in wind tunnel experiment and chosen according to mission requirement. Number of fins attached to the body will decide stability of rocket, preferably 3 to 4 fins should be used to stabilize the rocket.

Rocket engine- rocket engine nozzle plays a vital role in space flight, they are used to expand and accelerate combustion of fuel and gases produced by burning propellants at high velocity out of the exit of the nozzle which produces thrust and lift the body from ground to reach orbit and outer space. Usually "de-Laval" type of rocket engine is used. To get optimum results it is preferred that the pressure at exit of nozzle to be equal to ambient pressure outside of nozzle, i.e. "Pe=Pa" below which it will be under expanded which will provide a weaker force and above which it will be over expanded increasing the probability of nozzle explosion. For vacuum use it is almost impossible to match exit pressure with ambient pressure, rather, nozzles with larger area ratios are more efficient.

Multistage rocket- multistage rocket generally termed as step rocket is a vehicle that uses two or more stages having its own engine and respective propellants. Multistage rocket provides multiple advantages over normal single stage rocket as it consumes less fuel and achieve greater height while reducing the weight of the rocket and propellant requirements. Every stage has its own purpose and after fulfilling it is detached from the main body lessening the overall weight of the rocket and providing extra impulse to the vehicle, for this paper two staged rocket is used in which the first stage which works as booster stage, which will up-lift the rocket from ground and will attain a desirable height after that the second stage which is sustainer stage will carry out its mission of taking the payload to required apogee, this process is called staging of rocket, it is performed until the desired velocity is achieved.

Multiple software are used to design and analyze the rocket described in the paper, for rocket structure and stability open rocket software is used, Rocket propulsion analysis(RPA) is used to calculate dimensions for nozzles required in the rocket. Both the rocket and nozzles design are then 3 dimensionally put up in fusion 360 CAD software. For analysis as well as simulation of rocket and nozzle bodies, ANSYS is used.

Literature Review

Lucas de Almeida Sabino Carvalho et.al: calculated and analysed the drag force due to different shapes of a nose cone of a rocket. A nose cone is an important component of a rocket structure and the drag forces over it are required to be measured to make it better for a rocket mission. The four discussed shaped are – Tangent Ogive, Parabolic Ogive, ellipsoidal ogive and conical shape. The designs and computational domain were made in SOLIDWORKS and the simulations were done in ANSYS FLUENT using the Shear Stress Transport k-ω turbulence model. The Mach no. range taken is about 0.05 to 0.62. The results show the conical shape has the most drag while other three having almost the same. Elliptical one has the least of three but it starts increasing suddenly as the Mach closes in to sonic. In conclusion the elliptical shaped nose cones are best for sub sonic flights while for supersonic- parabolic or tangent should be considered. [1]

LC Ji1 et.al: studies and compares the Wrap around fins (WAFs) with flat fins. The WAFs provide a rolling motion to the rocket. Various configurations are studied like, span to chord ratio, curvature radius and setting angles. The Spalart-Allmaras turbulence model is used. Data that was observed from the analysis is, drag is slightly lesser in M=4 than that in M=3, Flat fins have higher lift characteristics and pitching moments but WAFs have better stability in longitudinal axis. The self-induced moments and extra forces are due to the asymmetric shape. The extra moments and forces can be reduced at negative angles that can also lead to improved flight conditions at bigger angle of attacks. [2]

M. Abhinav et.al: analysed blunt nose cones with different fineness ratios in supersonic conditions. Fineness ratio is the ratio of nose cone length and the base diameter. The drag coefficient was found using ANSYS FLUENT. The observations showed that the drag coefficient reduces as we increase the fineness ratio but we cannot increase it infinitesimally as the skin friction drag will start becoming very prominent. It was also stated that wave drag contributes the most in supersonic speeds and the base drag is negligent. [3]

Girish Kumar et.al: analysed the flow over nose cones at transonic speeds. The author tried to find the aerodynamic heat over the different nose cones and which one will have the least drag coefficient. The designs were made in CATIA and simulated in ANSYS using SST k-omega model. It was observed that the conical nose shape experiences the normal shock and is reduced to subsonic speeds. Blunt nose cones experience the highest pressure. Ogive have least drag coefficient but the aerodynamic heating is higher. Flow separation is most prominent in blunt nose cones. [4]

A Sanjay Verma et.al: Comparison of various nose profile is carried out to know performance over existing nose profiles discussed in the paper. The objective of this paper is to identify the type of nose profile and with specific aerodynamic characteristics with minimum pressure coefficient and critical Mach number. Main purpose of this paper is to develop some prototype profiles with outstanding aerodynamic qualities and low cost for use in projects. The designs were made in ANSYS software. Flow observation in numerical simulation was done at Mach 0.8 for different nose profiles, and performance characteristics of selected profiles are presented. Von Karman Ogive nose profile give higher critical Mach number and minimum pressure coefficient which is desirable for the subsonic flow. [5]

Yong-Chao Chen et.al analysed the aerodynamic characteristics of a canard guided rocket. The author used both the mathematical and computational methods. ANSYS FLUENT was used to analyze the various configurations of the canard and its effect on the nose, fin and the canard itself. The results showed that the force in axial direction decreased with positive change in length of the Carmen curve. There was an increase in normal force coefficient, and betterment in the static stability. The change in span length led to increase in axial force. The stability and forces improved with a greater number of fins and reducing the number and increasing the aspect ratio led to better roll characteristics. [6]

Bogdan-Alexandru Belega et.al: analysed the flow inside a convergent-divergent rocket engine nozzle. A nozzle is used for producing kinetic energy from chemical energy. They are used for increasing the flow exhaust speed for greater thrust. The nozzle was design in GAMBIT software using conventional analysis and analysed in fluent using k-e turbulence model. It was observed that the there was an increase in velocity along the flow direction inside the nozzle. It was observed that there was sudden break in velocity due to a shock wave but after that there was normal increase in velocity. The authors concluded that the nozzle design worked as it should. [7]

Sreenath K R et.al: compared and analysed the flow through bell and dual bell nozzles. The nozzles were designed in gambit software and analysed in the fluent software using the SST k-omega model. Simulations were performed for velocity magnitude and static pressure. It was observed that dual bell has better performance at both lower and higher atmospheres and can save a lot of fuel at lower altitudes. Dual bells have better specific impulse too but the author concluded that it can be used for single stage orbital missions. It was also noted that bell shaped nozzle performs best at 1.5 Mach number. [8]

Manish Tripathi et.al: compared and analysed the effect of cross section and cascades on the rocket fins. The analysis was done by CFD. At lower angles of attack there is not much difference in lift from both flat plane cross-section and aerofoil cross section cascades. There is a positive change in lift for increasing the gap as the cascading effect is reduced. The aerofoil cross section has a faster and sharper stall angle. Drag is lesser for aerofoil wings. Aerofoil cascades have better aerodynamic properties and reduced drag. Flow separation is higher in aerofoil shapes at higher angles and pressure gradients. If the gap is reduced the angle for stalling can also be delayed. [9]

Md Nizam Dahalan et.al: Multiple aerodynamics characteristics where tested on a curved fin rocket to analyze how it performs at different speed. Numerical and semi-empirical method is used to study the rocket. USAF DATCOM was used as a reference for semi empirical method and ANSYS fluent gives the data for numerical method. The design of curved fin rocket consists of conical nose cone, 4 curved fins symmetrically attached and a cylindrical body-tube. The study was conducted under subsonic and supersonic speed, Mach number used for subsonic speed were 0.15, 0.4, 0.6 and 0.8 as for supersonic speed 1.2, 1.4 and 2.0 Mach number were used at an angle of attack varying from 0 degree to 25 degree. CFD analysis was used because it is cost effective and fast process then wind tunnel testing and if can also calculate lift and drag coefficient as well. In the results it can be seen by comparing the graphs of CFD and other methods that they show similar pattern. It can be seen that CFD analysis for force and drag coefficient were comparable with wind tunnel testing method. [10]

Leonid Shabliy et.al. This paper shows results of a new design of rocket engine with a thrust of 25N compared to a prototype with chamber burnout defect which was fixed in this new design. Compared to the prototype this new engine has more pressure in the chamber with results in decreasing value of burnout absence. Multiple researches with CFD model of chamber burnout were done to completely remove its possibility. The workability and feature of the new engine were shown and proven with

the numerical simulation done on ANSYS software. It is designed so that this CFD model can also be used for different purposes. [11]

Matteo Poli et.al: This paper describes how sounding rockets are being widely used and how useful they are in the future. However as there are quite expensive and take a lot of time to be made, the author and his team decided to develop reusable as well as cost effective rockets which can carry heavier payload. MATLAB and Simulink software were used to make a numerical model to observe different parameter of the rocket like apogee prediction and simulating the trajectory, in case of crash predicting the impact ellipse, analysis the landing area and many other aerodynamic factors were analysis. The flight simulation data was compared to the real flight data giving satisfactory results. The software helped in better understanding of the flight on rocket in real time. [12]

Blazej Marciniak et.al: Research in microgravity is important in rocket science field as it allows the scientists to do multiple researches on the upper layer of the atmosphere and use of sounding rocket is one such method to do research in easy and effective way. In the paper it is experimented on a rocket named ILR-33 Amber to make a sounding rocket which is recoverable as well as cost effective as sounding rockets are expensive and difficult to manufacture. The design was made from the scratch and then simulation of it was done to find the effect of aerodynamics factors on it. Different technologies were used including solid propellant boosters, separation mechanics, and recovery subsystems. Payload for microgravity experiment was placed bottom of the nose cone having volume of 10litres. The design was successful in staying in microgravity for 150 seconds with an apogee greater than 100km. multiple on ground testing such as wind tunnel research and motor ignition were done. [13]

Ankith Y.S et.al: This paper focusses on the analysis of thermal properties having different fin materials and varying thickness. In automobile components engine cylinder plays a major role so maintaining its efficiency and sustainability is important and removal of heat has to done quickly and very precisely. Material like Aluminium 6061, aluminium 356 and aluminium 204 are used during the heat analysis and observing the characteristics of heat dissipation. Model design is made on SOLIDWORK software and ANSYS workbench is used for meshing of the design. Parameters such as geometry, material, number, and size as well as air velocity of fins are observed during simulation of the fins. After comparing it is observed that heat dissipated through stepped fin is more than rectangular fin model. Fin length of 16mm gives better performance than 13mm. Aluminium alloy

6061 is much better than other materials. Design with 7 fins shows better results than 5 fins. And velocity from 35kmph to 85kmph resulted in more heat dissipation than others. [14]

C.P. Hoult et.al: In the field of sounding rocket roll lock in also known as catastrophic yaw is the trickiest phenomenon. Out of several causes only one is discussed in this paper which is contact between fore body vortices and tail fins which produce non-linear as well as high angle of attack roll moment. Both the roll moments show comparable magnitudes. During the roll lock-in to achieve the condition of steady state and to calculate its probability of happening, rigid body momentum equation is used. It is the method which precisely decrease the probability by adjusting the fin which are openly exposed. And with the help of mathematical calculations it is shown that value of static margin greater than two caliber heuristic rule can cause the difficulty. Analysis on fine taper ratio was also conducted and is have very minimal effect on the fins. If number of fins are kept above four then probability of roll lock-in can be drastically decreased. [15]

Methodology

The vehicle described in this paper is designed to be robust, effective, light in weight and cost effective and it can be safely recovered after use.

The amount of thrust produced by a rocket is given by

$$F = \dot{m} * v_e + (p_e - p_0) * A_e \quad (1)$$

Specific impulse of the rocket is:

$$I_{sp} = \frac{F}{\dot{m} * g_0} \quad (2)$$

The isentropic equations are:

$$\frac{T_0}{T} = [1 + \frac{(\gamma-1)}{2} * M^2]$$

(3)

$$\frac{p_0}{p} = [1 + \frac{(\gamma-1)}{2} * M^2]^{\frac{\gamma}{\gamma-1}}$$

(4)

$$\frac{\rho 0}{\rho} = [1 + \frac{(\gamma-1)}{2} * M^2]^{\frac{1}{\gamma-1}}$$

(5)

The blueprint of rocket is firstly design on "open rocket "software to make it accurate and with required stability for safe and steady flight. A nose cone of 50 cm in length and 15 cm in base diameter was designed, after checking performance of different nose cone shape ogive nose cone is selected. A body tube of 200cm was attached to the nose cone carrying payload, flight computer, recovery system and propellant used. The upper stage was designed with a thickness of 0.5cm and 4 fins of trapezoidal shape having 0.3cm thickness with airfoil shape. A transition was added to the body tube to separate upper and lower stage of rocket having 15 cm and 30 cm as fore and aft diameter respectively. Another body tube of 300cm in length and 30cm in diameter containing booster stage propellant was continuing the rocket body after transition having a thickness of 1cm and 4 fins of trapezoidal airfoil shape of 0.5cm supporting the body of rocket.

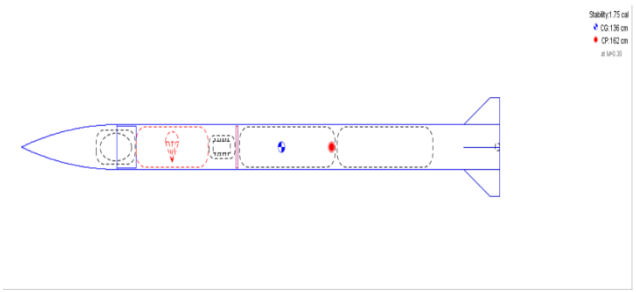


FIGURE 1. OPEN ROCKET DESIGN FOR UPEER STAGE

UPPER ROCKET PARAMETERS	VALUES
TOTAL MASS (KG)	45
PROPELLANT MASS (KG)	21
EMPTY/DRY MASS (KG)	24
PAYLOAD (KG)	10
DIAMETER (CM)	15
TOTAL LENGTH (CM)	250

TABLE 1. UPPER STAGE ROCKET PARAMTERS

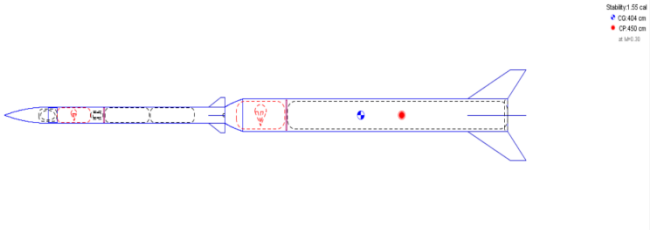


FIGURE 2. OPEN ROCKET DESIGN OF FULL ROCKET

FULL ROCKET PARAMETERS	VALUES
TOTAL MASS (KG)	321
PROPELLANT MASS (KG)	200
EMPTY/DRY MASS (KG)	121
DIAMETER (CM)	30
TOTAL LENGTH (CM)	591

TABLE 2. FULL ROCKET PARAMTERS

Rocket Propulsion Analysis (RPA) software was implemented for theoretical calculation of nozzles design of rocket body. Ammonium perchlorate with aluminum and HTPB was used as lower/booster stage propellant which will lift the rocket from ground providing thrust of 9500N at a chamber pressure of 320psi with area expansion ratio (Ae/At) of 20:1. Whereas, liquid oxygen and liquid methane was used as propellant for upper/sustainer stage to make the rocket achieve lower earth orbit applying thrust of 900N at 80psi chamber pressure with 30:1 area expansion ratio. The values obtained from the software are listed in the table below:

PARAMETERS	SUSTAINER STAGE	BOOSTER STAGE
CHAMBER PRESSURE(PSI)	80	320
THRUST(N)	900	9500
EXIT PRESSURE(PSI)	0.29	1.6679
PROPELLANT	LIQUID OXYGEN+LIQUID METHANE	AP/AL/HTPB
EXPANSION RATIO(Ae/At)	30	20
GAMMA	1.17	1.15
DENSITY	0.4215	2.3911
MACH NUMBER	3.7096	3.6841
O/F RATIO	3.153	4.077
REACTION EFFICIENCY(%)	95.9	97.02
NOZZLE EFFICIENCY(%)	97.75	97.7
OVERALL EFFICIENCY(%)	93.75	94.78
ISP(SEC)	335.27	161.4
MASS FLOW RATE(KG/S)	0.27373	0.81274
CHAMBER TEMPRETURE(K)	3200	2954.4
EXIT TEMPRETURE(k)	1969.45	1390.1
EXIT VELOCITY(M/S)	3306.85	2631.89

TABLE 3. NOZZLE DIMENSTION CALCULATIONS WITHRPA

After proper structural design of rocket body and its nozzles fusion 360 CAD software was used to create 3 dimensional structure of bodies, numerous functions provided by the software make the designing much easier and accurate.

FIGURE 3.CAD DESIGN OF 2 STAGE SOUNDING ROCKET- FUSION 360

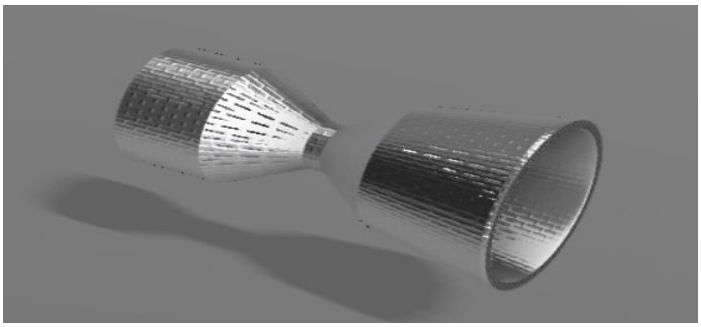


FIGURE 4. SUSTAINER STAGE NOZZLE DESIGN USING FUSION 360

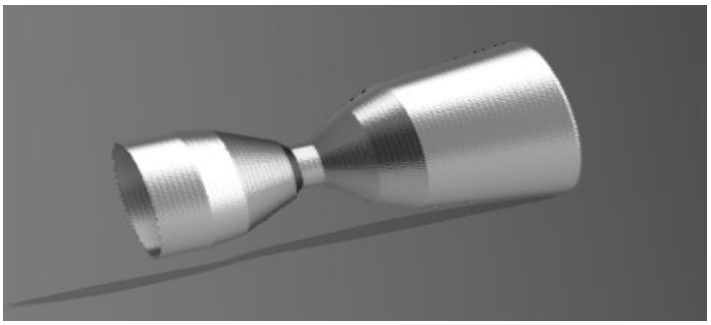


FIGURE 5. BOOSTER STAGE NOZZLE DESIGN USING FUSION360

ANSYS software was used for analysis and simulation of the structural rocket and nozzles of different stage. The analysis was done on the complete rocket and the upper stage to compare and check the performance of vehicle at different situations. The analysis is done at different Mach numbers and operating conditions. Multiple graphs were plotted to compare the results and analyze the performance of the vehicle.

Meshing

The meshing of the nozzles was done on Ansys Meshing software. Face meshing was applied to make a structured mesh and edge sizing was applied with required bias to capture the flow and boundary layers correctly during the simulation. Only half geometry of the nozzle was used due to the symmetry. For the rocket full body and rocket upper stage, proper domains were made in the Space claim software to capture the flow correctly. Since the rocket bodies have quarter symmetry so only

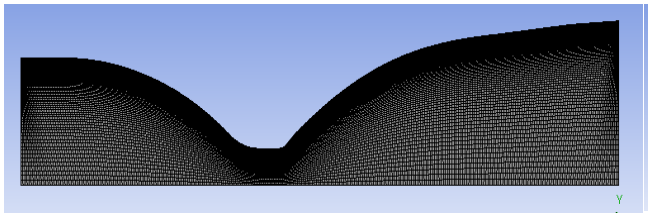
that much of the body was used to save computational time. The meshing was done with fluent meshing software using *watertight* meshing. The polyhexa core type of volume mesh was used to provide the best quality of mesh.

Geometry	Nodes	Elements
Upper nozzle	16362	16080
Lower nozzle	28684	28300

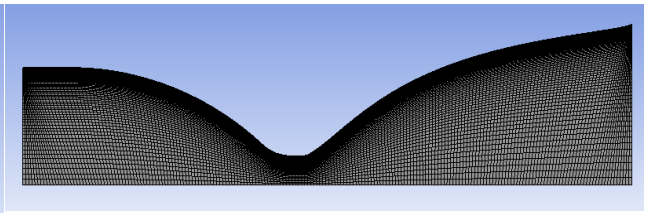
TABLE 5. MESH VALIDATION FOR NOZZLE

Geometry	Cells	Faces	Nodes
Upper Stage	779692	3107542	1634641
Full rocket	1000115	4663377	2846566

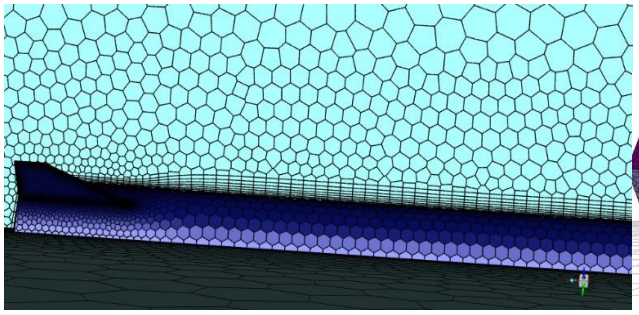
TABLE 6. MESH VALIDATION FOR ROCKET



MESH GENERATION – LOWER NOZZLE
[FIGURE- 6]

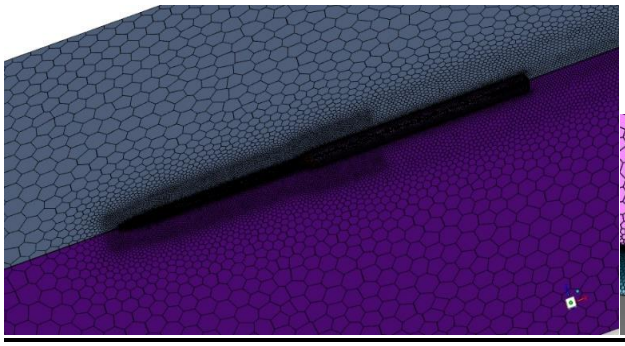


MESH GENERATION – UPPER NOZZLE
[FIGURE- 7]

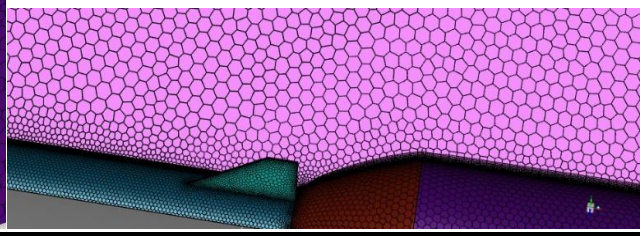


MESH GENERATION – UPPER ROCKET BODY
[FIGURE- 8]

MESH GENERATION – UPPER ROCKET BODY
[FIGURE-8.1]



MESH GENERATION – FULL ROCKET BODY
[FIGURE-8.2]



MESH GENERATION – FULL ROCKET BODY
[FIGURE-8.3]

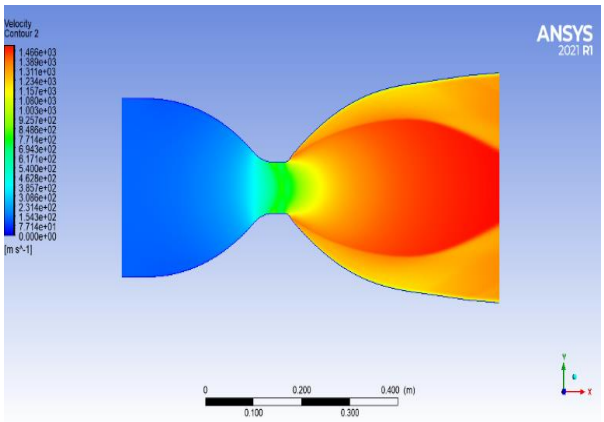
Pre-conditions

For the nozzles the density-based solver is used in Ansys fluent. SST k-omega turbulence model is used and air is kept as ideal gas to capture the change in density. A pressure inlet and outlet are used. After initialization enough iterations are run till the solution converges. For the lower nozzle, at the inlet gauge pressure is 5Mpa and temperature is 1500kelvin and at the outlet, gauge pressure is 0. The sea level operating conditions are used. For the upper nozzle, the gauge pressure at the inlet is 2Mpa and temperature is 1500 k and at the outlet the gauge pressure is 0. The atmospheric conditions at 50km height are used. For the whole rocket and upper stage, the pressure far field condition is used on the domain. The pressure-based solver is used. The turbulence model is SST k-omega as it captures the wall functions accurately and is mostly preferred for cases like these. The air is kept as ideal gas and for accuracy the Sutherland model of viscosity is used. Second order upwind methods are used with high order term relaxation. The full rocket and just the upper stage are simulated at different Mach Numbers and at different heights having respective atmospheric conditions to make the approach a bit realistic. The full rocket is simulated at Mach -> 0.6, 1 and 2 at the height of 5km, 15km and 25km respectively and the upper stage is simulated at Mach -> 3 and 4, at the height of 40km and 50km respectively.

Results

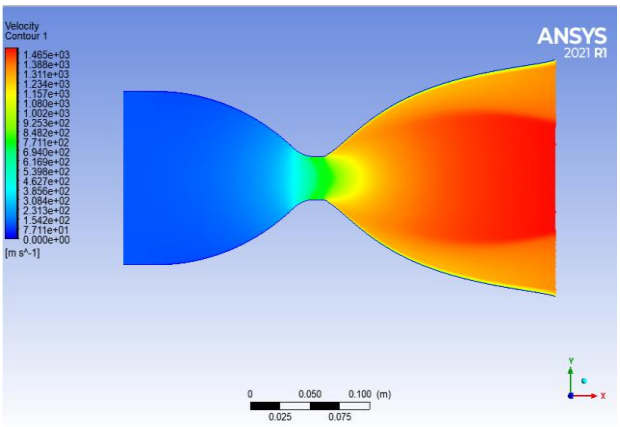
After analysis the following contour plots and graphs of respective nozzles are obtained:

Velocity contour: The velocity is minimum at inlet and keep on increasing as we move forward toward the exit. At the throat of the nozzle Mach is at 1 which is known at choked flow condition.



VELOCITY MAGNITUDE CONTOUR (m/s)

[FIGURE – 9]



VELOCITY MAGNITUDE CONTOUR (m/s)

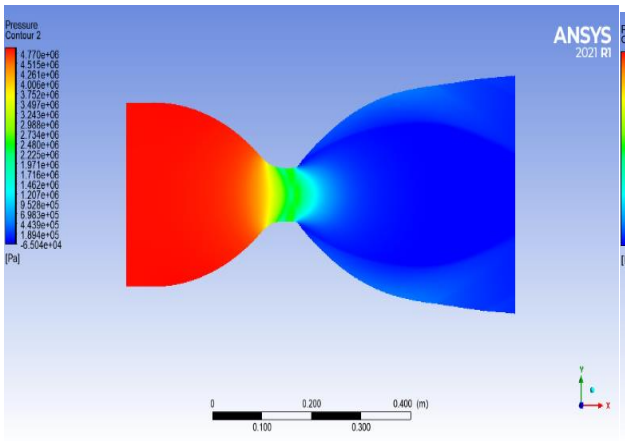
[FIGURE – 9.1]

Velocity at exit of booster stage nozzle is 1383.16m/s at Mach number 3.05

The exit velocity of sustainer stage nozzle is 1427.7 m/s at Mach number 3.34

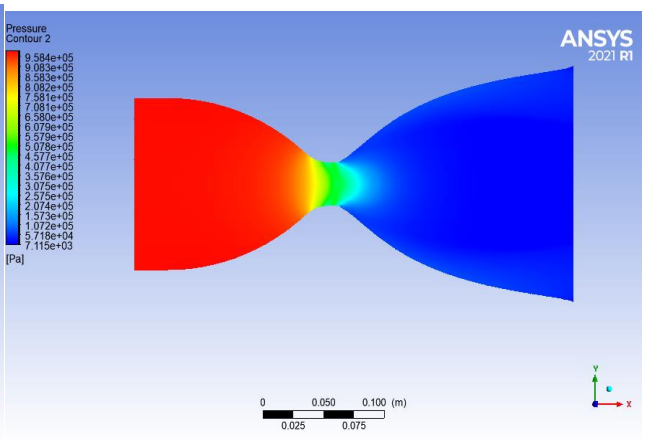
At the walls of the nozzles after the throat a visible boundary layer is also observed.

Pressure contour: The pressure value is maximum at inlet and keeps on decreasing as we move forward to nozzle exit. The pressure will suddenly decrease after throat because of the formation of shock waves.



STATIC PRESSURE CONTOUR (PASCAL)

[FIGURE – 10]



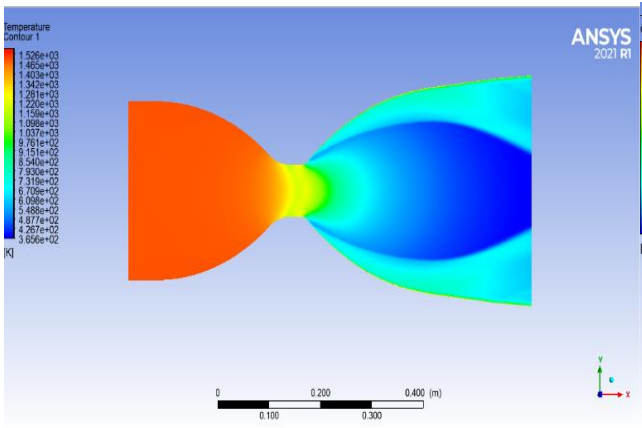
STATIC PRESSURE CONTOUR (PASCAL)

[FIGURE – 10.1]

Static pressure at exit of the booster stage nozzle is 49151 Pa

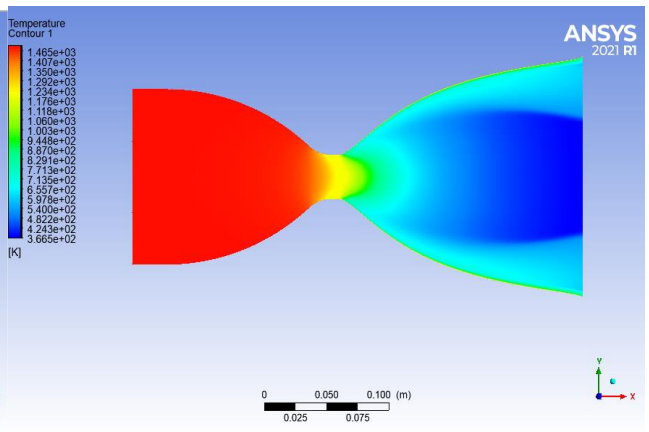
Static pressure at exit of the sustainer stage nozzle is 20730.6 Pa

Temperature contour: The temperature is maximum at the inlet of the nozzle and keep on decreasing towards the exit of nozzle.



STATIC TEMPERATURE CONTOUR (K)

[FIGURE – 11]



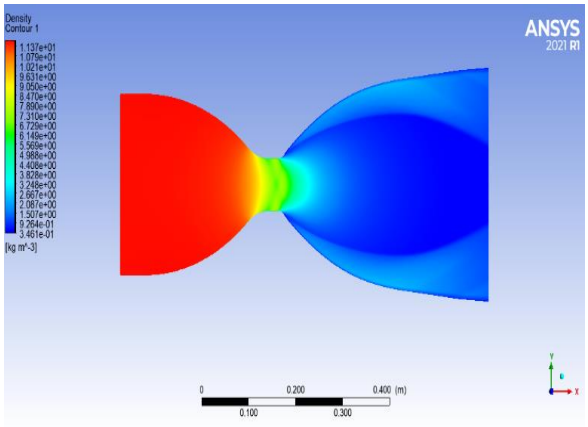
STATIC TEMPERATURE CONTOUR (K)

[FIGURE – 11.1]

Temperature of exit of booster stage nozzle is 547.39K

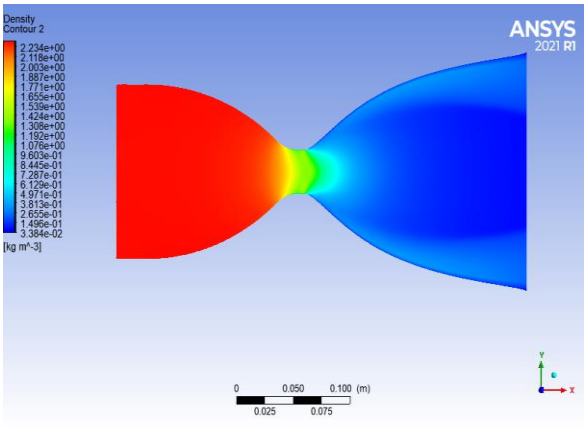
Temperature at the exit of sustainer stage nozzle is 483 K

Density contour: The density is maximum at the inlet of the nozzle and keeps on decreasing as we move forward towards the exit of the nozzle.



DENSITY CONTOUR (kg/m3)

[FIGURE – 12]



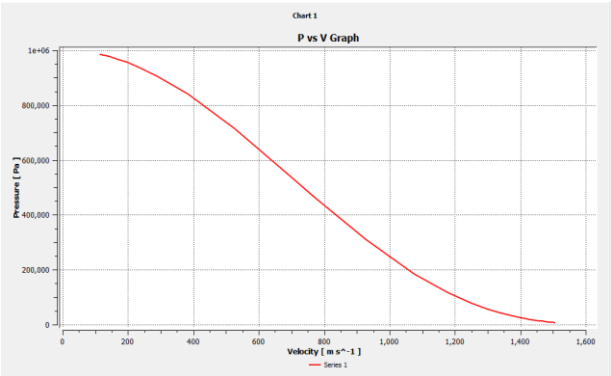
DENSITY CONTOUR (kg/m3)

[FIGURE – 12.1]

Density magnitude at the exit of booster stage nozzle is 0.87 kg/m^3.

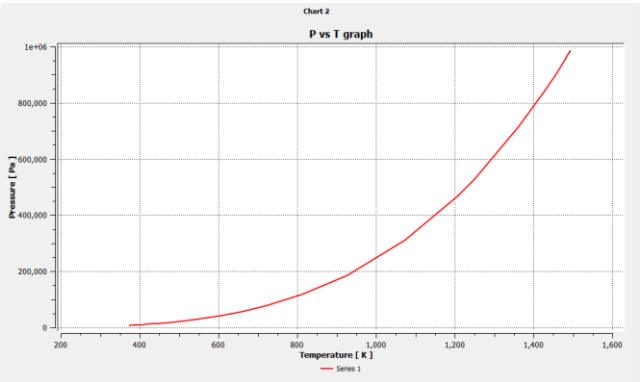
Density magnitude at the exit of sustainer stage nozzle is 0.316 kg/m^3.

Graphical representation of sustainer stage nozzle performance:



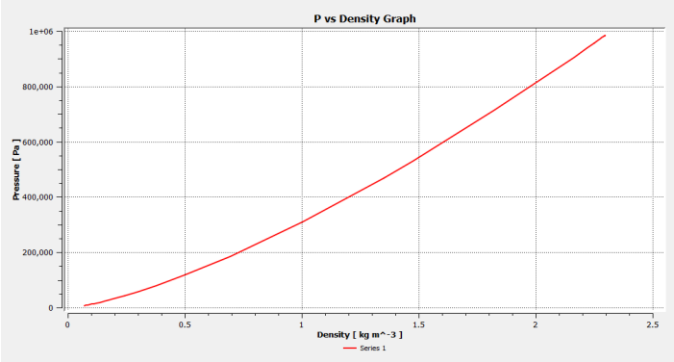
PRESSURE vs VELOCITY

[GRAPH – 1]



PRESSURE vs TEMPERATURE

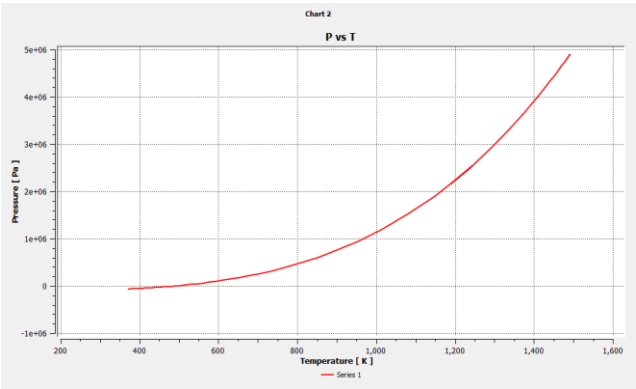
[GRAPH – 2]



PRESSURE VS DENSITY

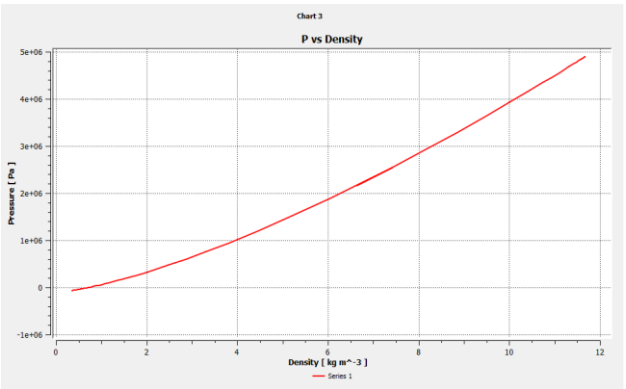
[GRAPH – 3]

Graphical representation of booster stage nozzle performance



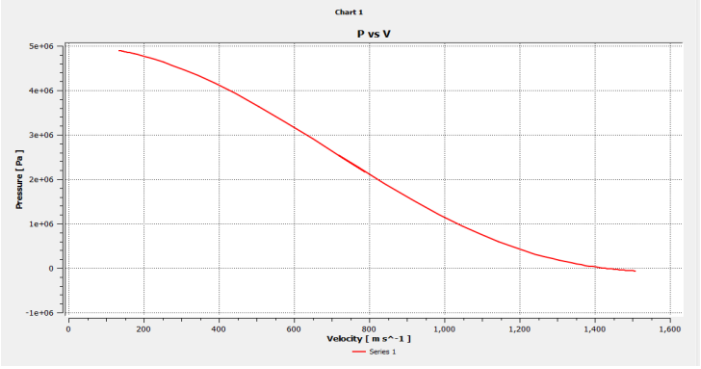
PRESSURE vs TEMPERATURE

[GRAPH – 5]



PRESSURE VS DENSITY

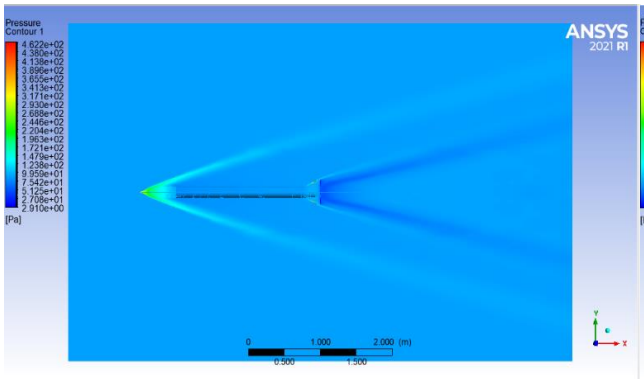
[GRAPH – 6]



PRESSURE vs VELOCITY

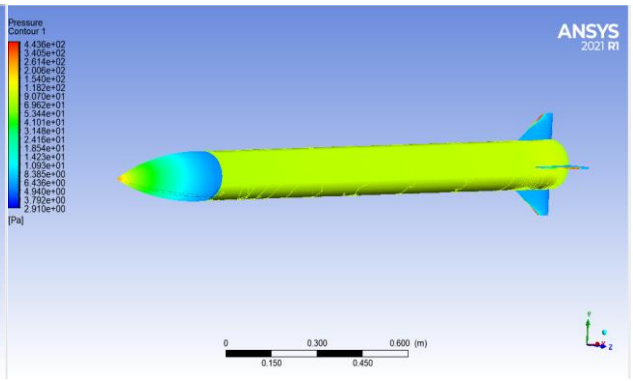
[GRAPH – 4]

CFD Analysis of Rocket Pressure



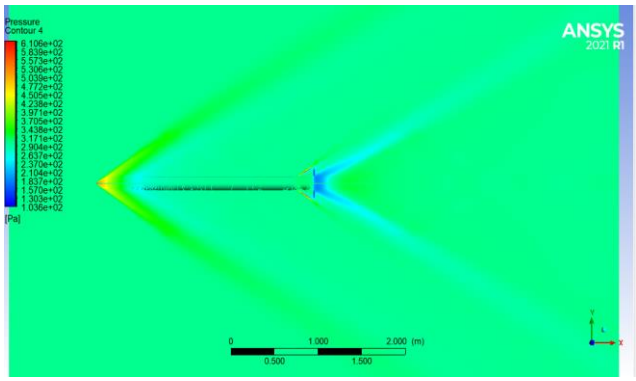
Upper body at Mach 4

[FIGURE-13]



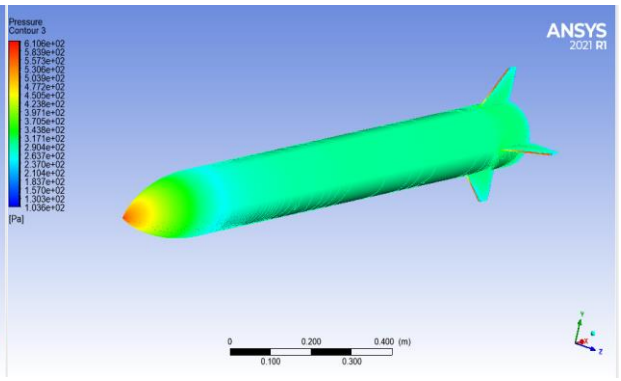
Upper body at Mach 4

[FIGURE-13.1]



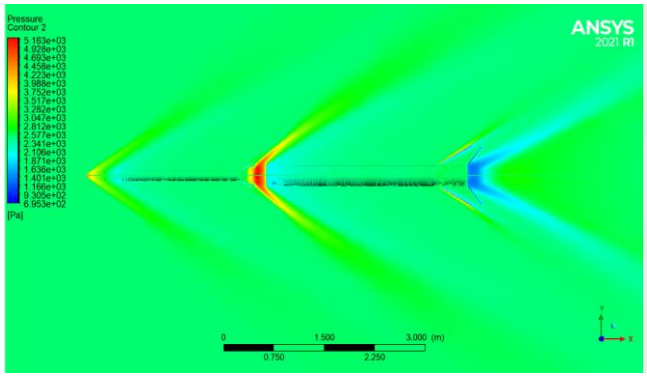
Upper body at Mach 3

[FIGURE-14]



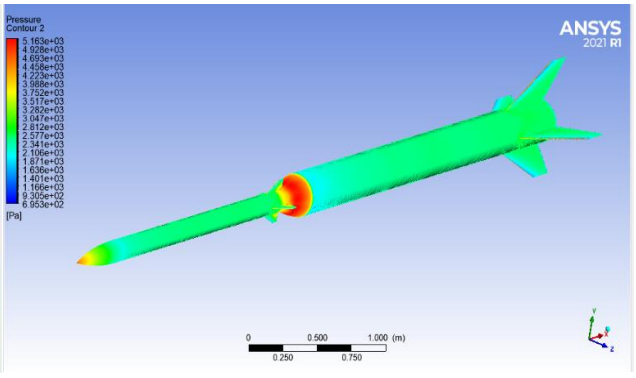
Upper body at Mach 3

[FIGURE-14.1]



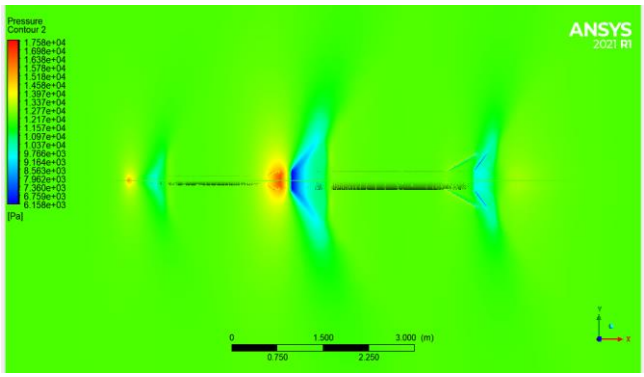
Full body at Mach 2

[FIGURE – 15]



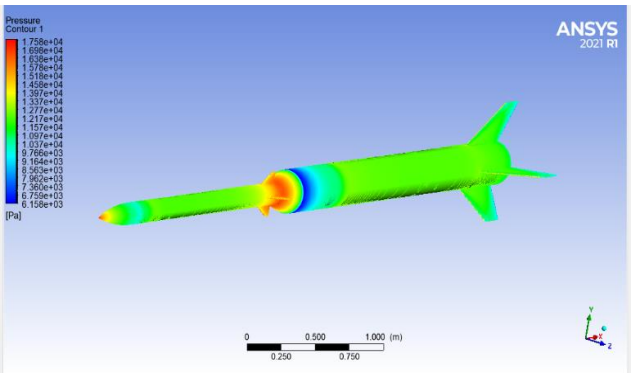
Full body at Mach 2

[FIGURE – 15.1]



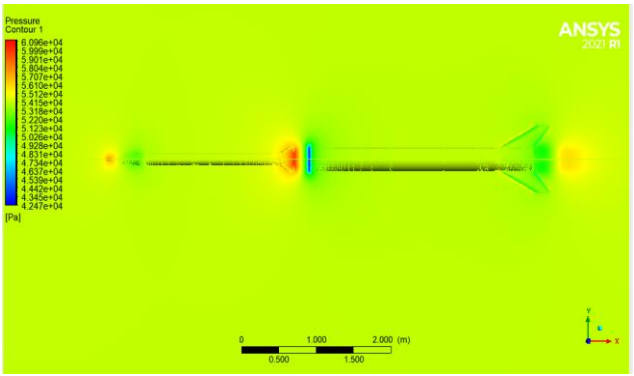
Full body at Mach 1

[FIGURE – 16]



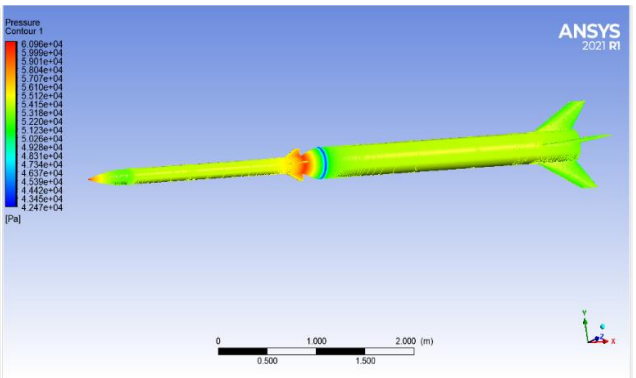
Full body at Mach 1

[FIGURE – 16.1]



Full body at Mach 0.6

[FIGURE – 17]

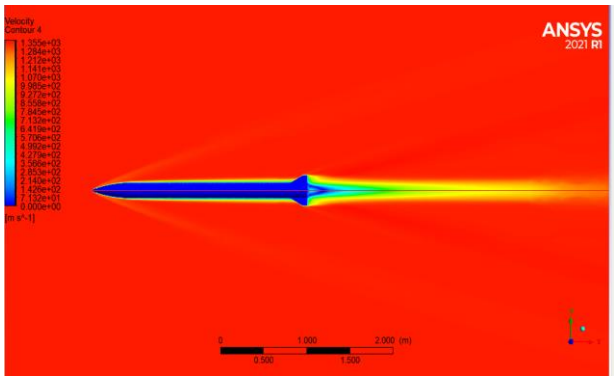


Full body at Mach 0.6

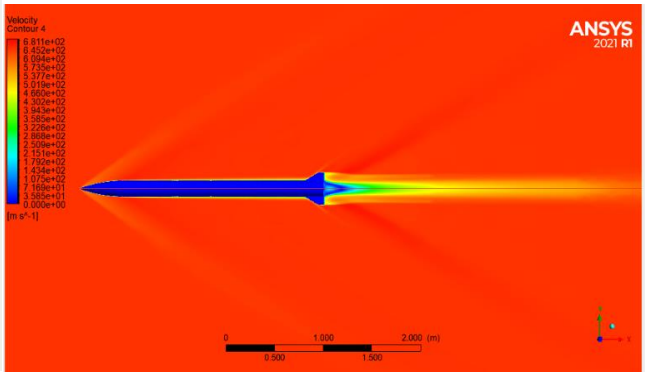
[FIGURE – 17.1]

Various contours of pressure have been shown above. In figure [13] & [14] we observe a bow shock at the front of the rocket and a delayed bow shock at the end. In figure [15] we observe similar bow shock at the front of rocket and the transition a big shock formation can be seen which is clearly due to increase in surface area of the booster stage. In figure [16] & [17] we observe pressure considerations at the tip, transition and back fin.

VELOCITY-

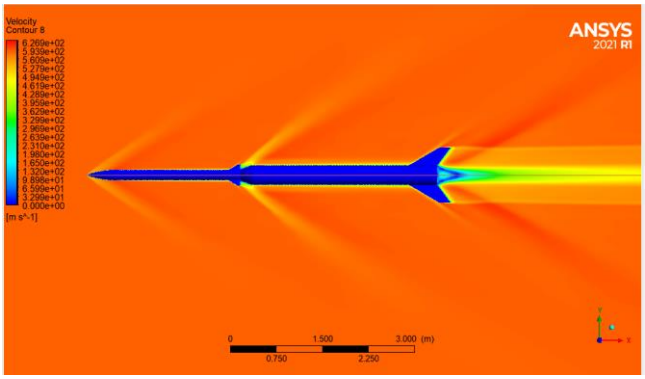


Upper body at Mach 4



Upper body at Mach 3

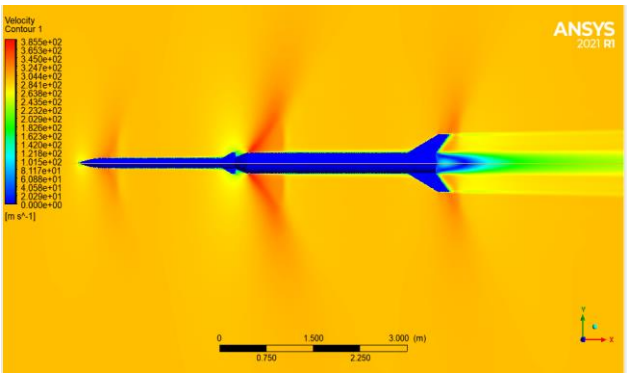
[FIGURE –18]



Full body at Mach 2

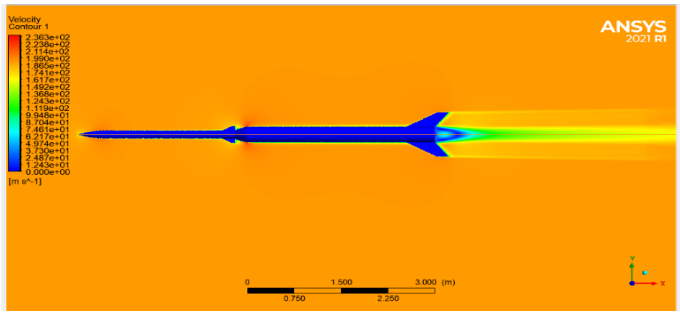
[FIGURE -20]

[FIGURE –19]



Full body at Mach 1

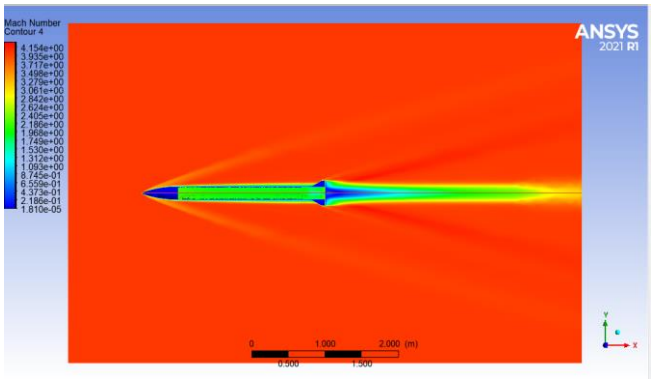
[FIGURE –21]



Full body at Mach 0.6

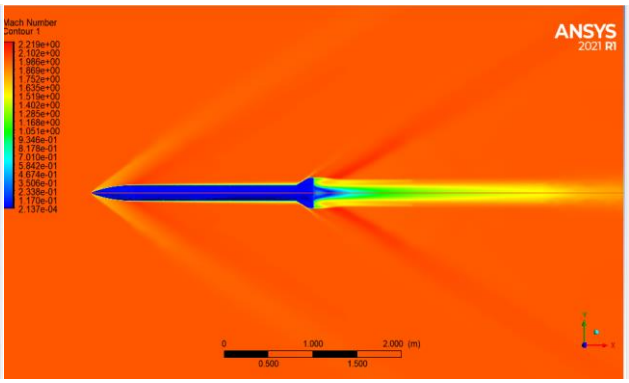
[FIGURE –22]

MACH-



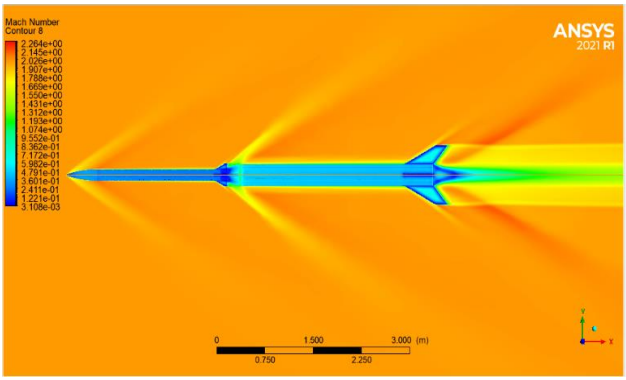
Upper body at Mach 4

[FIGURE –23]



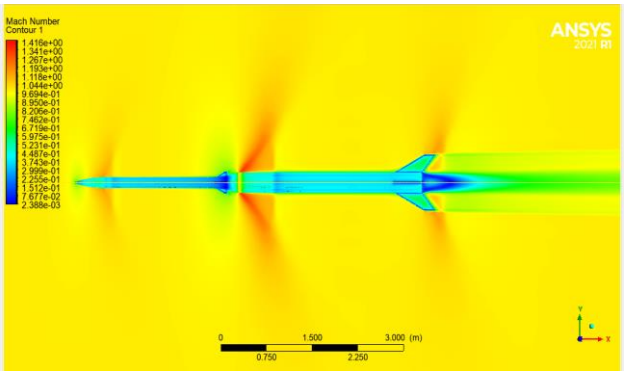
Upper body at Mach 3

[FIGURE –24]



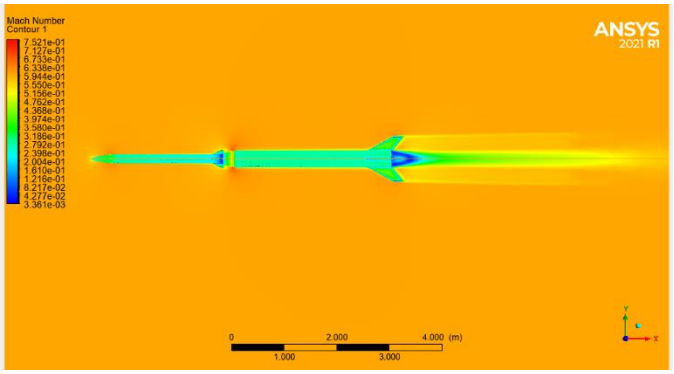
Full body at Mach 2

[FIGURE –25]



Full body at Mach 1

[FIGURE –26]

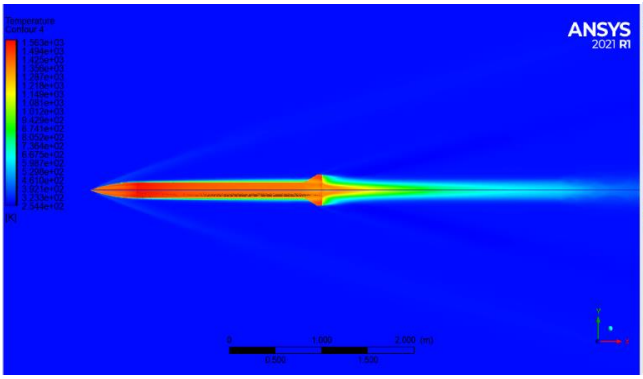


Full body at Mach 0.6

[FIGURE –27]

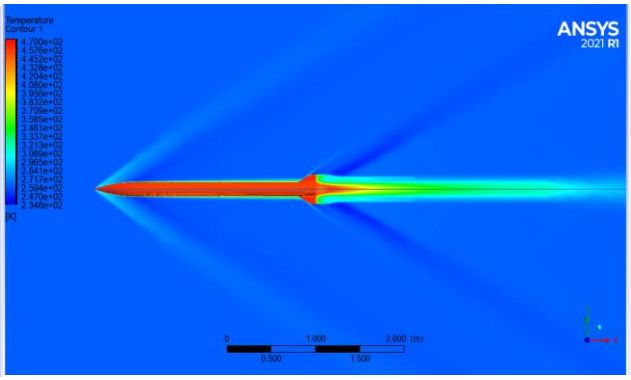
In the Mach number and velocity contours we observe at the boundary wall the speed of air is almost zero, which showcases the correct representation of boundary layer and in the full rocket body contour we observe a drop in velocity between the forward fin and transition which is due to formation of vortices and hence, forming high pressure region.

TEMPERATURE-



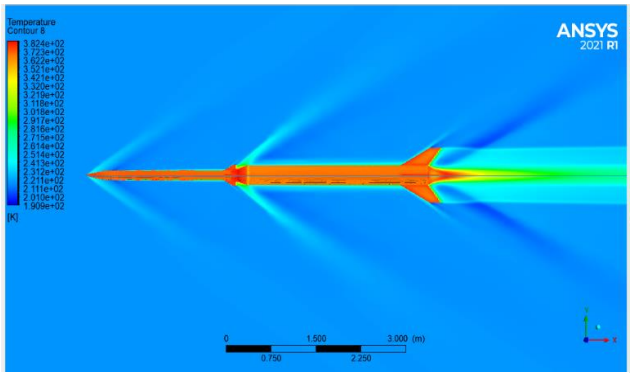
Upper body at Mach 4

[FIGURE-28]



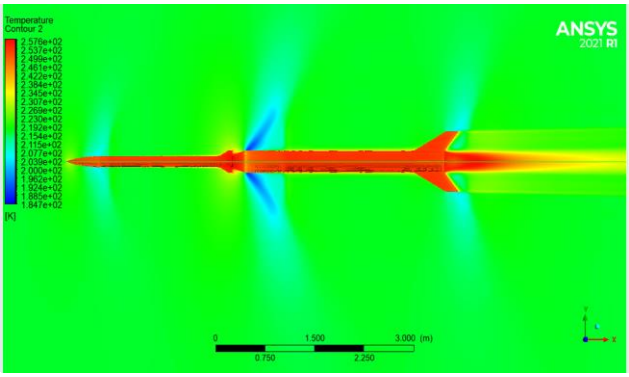
Upper body at Mach 3

[FIGURE-29]



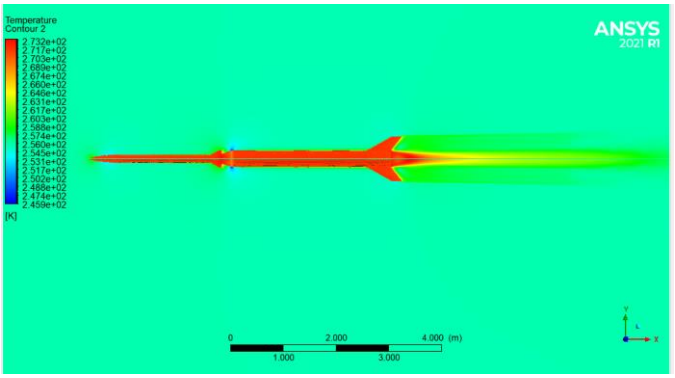
Full body at Mach 2

[FIGURE-30]



Full body at Mach 1

[FIGURE-31]



Full body at Mach 0.6

[FIGURE-32]

In temperature contours we observe temperature over the body is the highest and at the walls of the rocket we observe boundary layers where small change in temperature can be observed.

DRAG-

$D = \frac{1}{2}\rho v^2 C_d A$,

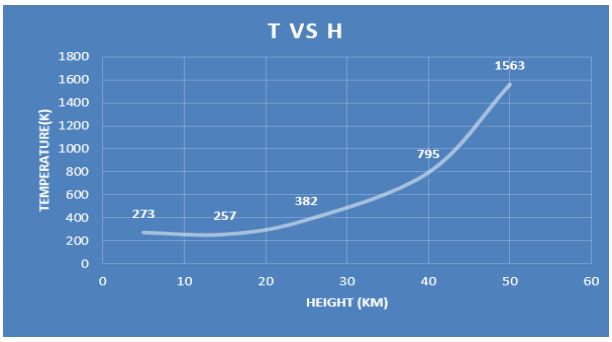
Where, D = drag force (N)

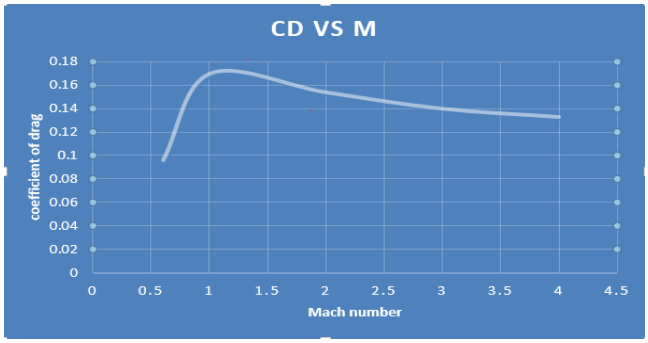
ρ= density (kg/m^3)

v= velocity of object (m/s)

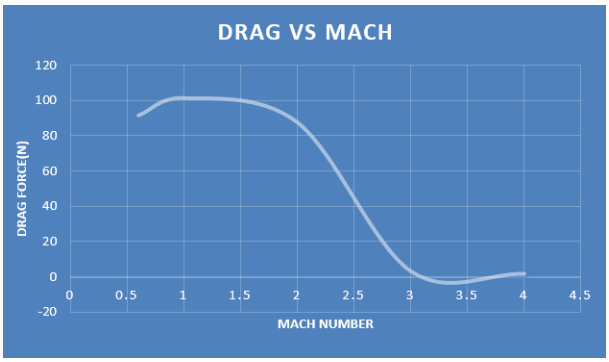
C_d= coefficient of drag

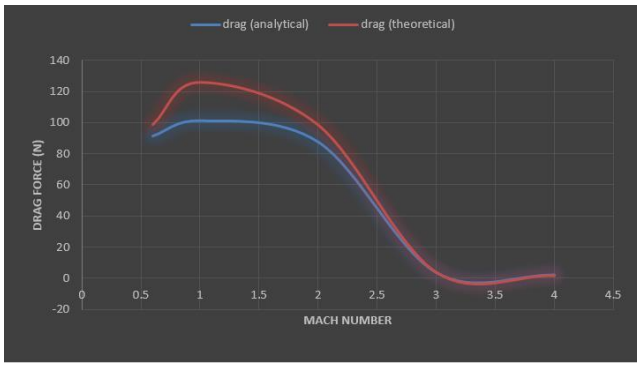
A = cross-sectional area (m^2)





GRAPH-1 **GRAPH- 2**





[GRAPH – 3] **[GRAPH – 4]**

Conclusion

The design is made on open rocket software taking consideration the fineness ratio of rocket body, after observing different nose cone designs, ogive shape is selected. The nozzles are designed using RPA software with inlet conditions of 80 & 320 psi chamber pressure on upper and lower stage nozzle respectively. Both the rocket body and nozzle design are three dimensionally made using fusion 360 software. The nozzles designed in accordance to chamber conditions and ambient conditions have been simulated and they show desirable results. In the full rocket simulations we observe small pressure considerations at the tip, fin and transition at subsonic speed which is within the expected results, whereas, at sonic and supersonic speeds a much larger concentration of pressure is observed that the transition which needs to be further analyzed and worked on. In the upper stage only small

bow shocks are observed which do not hinder the flow of rocket. The temperature over the body of the rocket is observed to be maximum at Mach 4 at a height of 50km. So, we can conclude that we need to use some kind of thermal coating in the upper stage of the rocket to keep the payload and flight computer safe from high temperature. The coefficient of drag value is highest at Mach number 1 which is acceptable as the greatest shocks are formed at that speed, the theoretical and analytical are almost similar which further validate the CFD analysis.

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$CATISIO_5$ CERAMIC NANO OVALS: SYNTHESIS, PHYSICOCHEMICAL CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY WITH WATER REMEDIATION APPLICATION

***M. V. Patil, **S. R. Bamane, #S. M. Khetre**

**Department of Chemistry, Miraj Mahavidyalaya, Miraj,416410 India,*

*** Sushila Shankarrao Gadav eMahavidyalaya, Khandala, Satara,416416 India,*

#Department of Chemistry, Dahiwadi College, Dahiwadi, Satara-416416, India.

Abstract

The most emerging branch of science is Nano science and nanotechnology in which metallic Nano particles plays an important role especially in the field of physics, chemistry, medicine pharmaceuticals etc. Metallic Nano particles have great potential in its applications. Hence it is used in different spectroscopic and microscopic characterization methods. Metallic Nano particles have applications in drug,, protein, tissue engineering, enzymology, biosensors, different diagnostic devices, and production of ceramic membrane. With this idea in the field of ceramic Nano technology, a new class of trio-metal oxide ceramic Nano composite material has been developed i.e.**$CaTiSiO_5$**.

A new oval shaped **$CaTiSiO_5$**Nano particles were synthesized by wet chemical Co-precipitation and muffle ignition method. The oval shapes of Nano material were confirmed using SEM imaging and spinal packing in crystals were determined on the basis of XRD spectrum. The surface functionalities over Nano material was confirmed using FTIR spectrum elucidating hydroxyl and oxide groups over surface for future water wet ability. Furthermore the porous nature and electronic states in Nano material were elaborated on the basis of UV-Vis. and PL spectral transitions along with matching SEM and XRD data. The very high porosity of this ceramic Nano material was confirmed by BET measurements and future water remediation applications were demonstrated using antimicrobial testing on Klebsiella and membrane water purification activity. Overall this novel ceramic porous Nano material has proved probable application in water purification membranes.

Keywords: *Oval ceramic, Nano material, Highly Porous, Water remediation*

SOFT SKILLS: A WAY TO SHAPE YOUTH'S CAREER IN MODERN WORLD

***Mr. P.B. Bhandare, **Mr. A.D. Pachore**

**Department of English, Miraj Mahavidyalaya, Miraj, 416410 India.*

***Department of English, Miraj Mahavidyalaya, Miraj, 416410 India.*

Abstract

The need of soft skills has been recognized as the demand of 21st century. Any language can be mastered only when we learn the soft skills involved it. A learner should realize that four basic skills LSRW (Listening, Speaking, Reading and writing) are the fundamental requirements of learning a language. But in modern world, we fall short in acquiring soft skills without which we suffer from fair communication especially, when we talk about youth. It creates a positive influence on furthering your career. Many people are skilful with some skills while struggle with others. Some people may have excellent communication and leadership quality but lack in management and presentation skill. Here SWAT analysis plays a crucial role. Today most organisations recognize that their employee's professional development or professional ethics plays a major role in maintaining their relationship with customers, colleagues and suppliers. Their professional development helps the organisation to grow rapidly. In this regard, soft skills, referred to as life skills, are essential for employees to play a vital role in the growth of organisation.

Teacher's role is considered very important in developing soft skills. Today, it is the need to train students and employees in soft skills. Teachers and trainers should follow best practices in classroom while teaching soft skills. Teachers have to encourage experimental learning in classroom. They should introduce open-ended questions in class room and follow three common methods in teaching soft skills. i.e. Interactive teaching, to hire a trainer in workplace; focus on soft skills, besides regular curriculum. An unwanted remark from MNC," What Universities and Colleges providing are nothing but only waste material makes us gloomy. So learning soft skills has become a watchword for our better prospect.

Keywords: *content based skills, technical skills, soft skills, personality development etc…*

ICIMR-2021: 23rd & 24th August, 2021

STUDY OF NOZZLE FLOW SEPARATIONS IN DIVERGENT SECTION OF NOZZLE

***Rishi Suhas Karandikar, **Ankit Kumar Mishra, **Janani Kavipriya. S, **Ashutosh Kumar**

**Department of Aerospace Engineering, Hindustan Institute of Technology & Science, Chennai-603103, India*

***Department of Research and Development, Abyom Space tech and Defense Pvt. Ltd, Gorahkpur-274402, India*

Abstract

In this paper study of Nozzle flow Separation is carried out by simulation of Rocket Nozzle Design made through Autodesk Fusion 360 in ANSYS 2021R1 to investigate the Laminar Regime and Turbulent Regime in the divergent section of nozzle. Flow is analysed throughout the nozzle contour from convergent to divergent sections for its separation from nozzle walls due to boundary layer phenomena to visualize it for Laminar and Turbulent regimes. Nozzle design is made for design Mach No of 2.955 and the flow separation simulations are carried out to investigate the flow regimes.

Keywords: *Nozzle Flow Separation, Nozzle Pressure Ratios, Turbulent Regime, Laminar Regime, Axial Flow Direction.*

Introduction

The nozzle flow under certain circumstances generates critical side loads on the walls. This mainly occurs when the flow is separated due to an overexpansion and during the start-up transition processes. Different types of flow separation are possible with the different nozzle types as well within the same nozzle. At largely over-expanded regime boundary-layer is detached from the nozzle wall due to an adverse pressure gradient generating the separation shock. This supersonic and separated flow continues downstream and it may interact with the recompression shocks, asymmetric jet portions and/or possibly present internal shock, which can further lead to the severe lateral loads.

These lateral or side-loads of uncontrolled flow separation are frequently present during the transient processes of engine start-up and shut-down operation. Under expanded nozzle produce more Isp than over expanded nozzles.

Nozzle

A nozzle is a device designed with varying cross- sectional area especially in the form of a tube through which hot gas or liquid flows to generate thrust following Newton's third law of motion. The nozzle is often used to control the characteristics of fluid flow, pressure, and the direction of flow, and to enhance the velocity of a gaseous substance exiting the nozzle to greater velocities. In the area of compressible flow, the nozzles are typically categorized as a convergent nozzle and a Convergent–divergent (CD) nozzle. Both types of nozzles have principled applications in aerospace industry and technology. A Convergent-Divergent nozzle is used to convert chemical energy into kinetic energy in a thermal chamber and vice versa. [11]

Nozzle Flow Separation

In Rocket Engine Design and its optimum performance, it is important to have the knowledge of flow separation in rocket nozzles. Basically, separation of flow is studied under conditions of sea level. However, during the launcher or rocket ascent the change of ambient density is disregarded. In the design of altitude-adaptive dual bell nozzle the important factor of concern is the ambient flow properties. For this reason, within conventional convergent-divergent nozzles influence of ambient density on nozzle flow separation is to be studied. [1]

In a conventional convergent-divergent rocket nozzle the flow can withstand only a certain degree of overexpansion. Beyond this point the separation of boundary layer occurs, nozzle walls are lifted off and the ambient air is sucked into the remaining separated backflow section of the nozzle. For a given geometry of rocket nozzle, the flow separation position is a function of the total pressure, the ambient pressure, and the gas properties. This separation of flow leads to additional undesired loads on side walls of nozzle, stressing the nozzle, structure of launcher, the rocket engine, and the payload. The prediction of the position of flow separation is very important in rocket nozzle design and determines maximum possible area ratio of nozzle, which is engine performance deciding factor. [1]

On basic fluid dynamic phenomena flow separation in supersonic nozzles occurs at a certain pressure ratio of chamber to ambient pressure. This results in formation of shock and turbulent-boundary layer interaction inside the nozzle walls of divergent section. [2]

When the exit pressure to ambient pressure ratio of a nozzle is reduced to about 0.4–0.8, ambient air penetrates through the viscous layer. Thus, due to the adverse pressure gradient, separation of the boundary layer from the nozzle wall will get initiated, and this phenomenon is known as Nozzle flow separation. [3] Due to adverse pressure gradient, Separation of flow in nozzle occurs as the flow expands, making separated flows extended region. The part of the flow that separates the flow recirculating and the flow through the central region of the duct is called the dividing streamline. [4] Due to loss of energy in the flow separation in the boundary layer adjacent to nozzle wall initiates, an alternate method to prevent such separation of boundary layer is to reenergize the air by adding thin high-speed jet to it. [5]

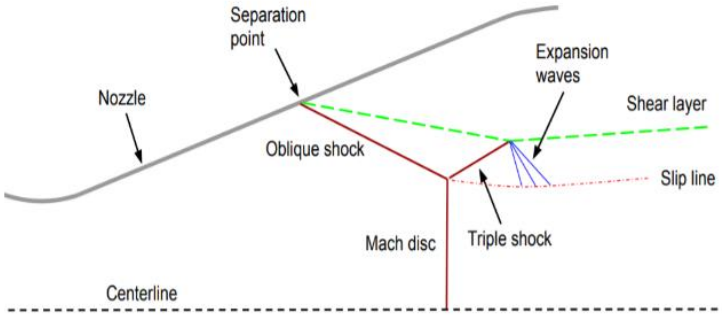

Fig 1.1 Shock Pattern of Supersonic Flow with Free Shock Separation inside an Axisymmetric Convergent- Divergent Nozzle [7]

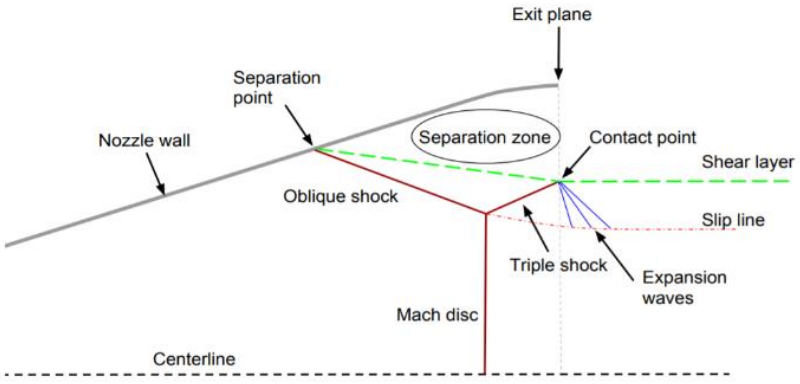

Fig 1.2 Schematic Diagram of Free shock separation [8]

Reflections inside different rocket nozzles with their generation of shock is studied and its impact of mainly two modes of separation, namely Restricted Shock Separation (RSS) and Free Shock Separation (FSS) is explored. [6]

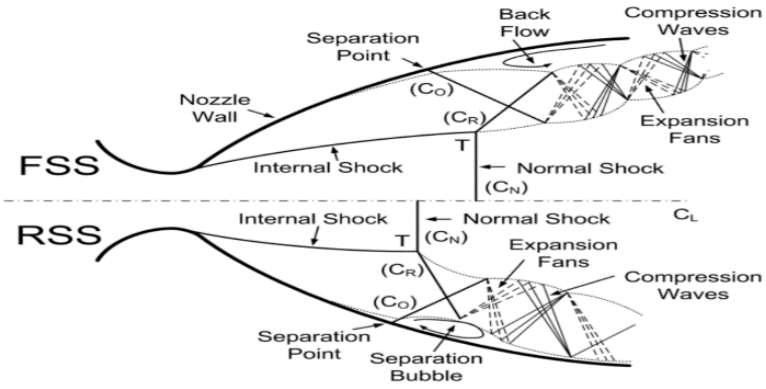

Fig 1.3 Phenomenological sketch of RSS and FSS [9]

Nozzle Design Parameters

Diameter of Convergence, D_c = 75 mm

Diameter of Throat, D_t = 17.40 mm

Diameter of Exit, D_e = 49.21 mm

Length of Convergence, L_c = 40.13 mm

Length of Divergence, L_d = 78.96 mm

Total Length of Nozzle, L = 118.96 mm

Angle of Convergence = 28 ^{o}

Angle of Divergence = 15 ^{0}

Impulse, I = 3602 N-s

Thrust, T = 1669.6 N

Burn Time, t= 2.158 s

Gamma = 1.043

Nozzle Efficiency = 0.95

Exit Mach No, M_e = 2.955

Throat Area, A_t = 237.7 mm^2

Exit Area, A_e = 1902 mm^2

Stagnation Temperature, T_o = 1625 K

A_e / A_t = 8

Po / P = 64.9254

To / T = 1.18774

A / A* = 12.16275

Velocity at Exit, V = 1940 m/s

Mass Flow Rate, $\dot{m}$ = 9.5443 Kg/s

$$\frac{T_o}{T} = 1 + \frac{k-1}{2} M^2$$ [10]

$$\frac{P_o}{P} = \left(1 + \frac{k-1}{2} M^2\right)^{\frac{k}{k-1}}$$ **[10]**

$$\frac{A}{A^*} = \frac{1}{M}\left(\frac{1 + \frac{k-1}{2} M^2}{1 + \frac{k-1}{2}}\right)^{\frac{k+1}{2(k-1)}}$$ **[10]**

$$\dot{m} = p_o M A \sqrt{\frac{k}{RT_o}} \left(1 + \frac{k-1}{2} M^2\right)^{\frac{k+1}{-2(k-1)}}$$ **[10]**

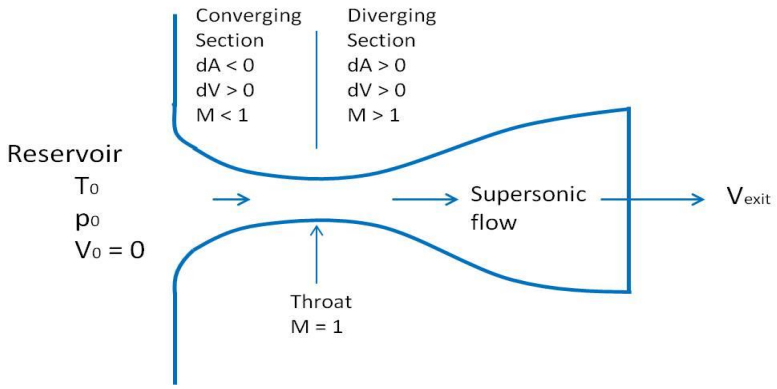

Fig 2.1 Subsonic to Supersonic Flow through Nozzle [12]

Nozzle Fusion 360 Designing Views

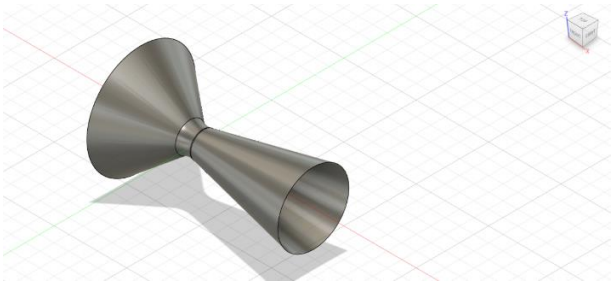

Fig 3.1 Front view of Nozzle Design

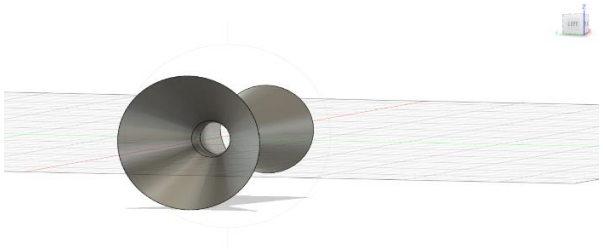

Fig 3.2 Isometric View of Nozzle Design

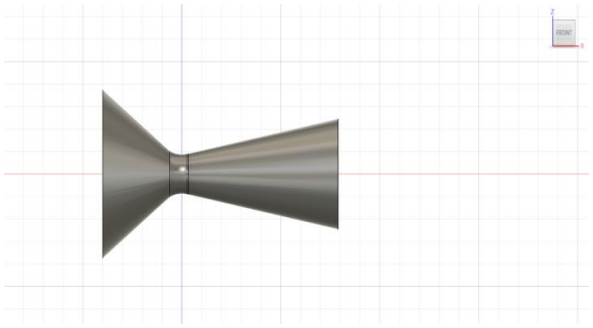

Fig 3.3 Side View of Nozzle Design

Nozzle Simulations Results

Fig 4.1 Nozzle Rendered Design

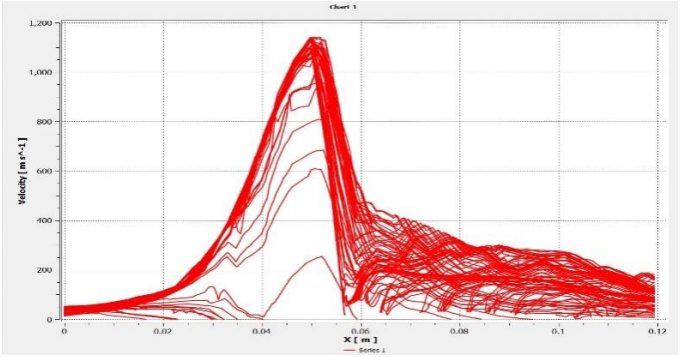

Fig 4.2 Graph of Velocity vs Axial Length of Nozzle

We can see that Velocity at Throat of Nozzle of increased between axial length of 0.4-0.6 m approaching to M=1 as design condition and we can see the Turbulent behaviour of Velocity at Divergent Section with curl of velocity flowing at rear end of nozzle.

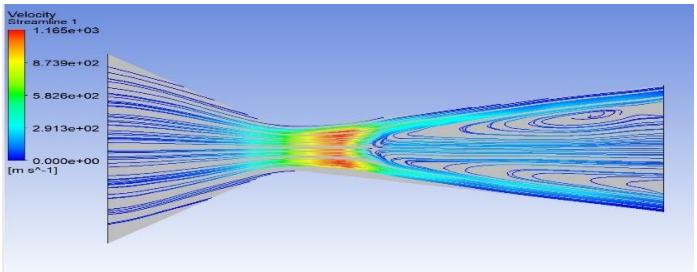

Fig 4.3 Simulation of Velocity flow across Nozzle Axial Length

We can see Velocity Streamlines across the axial direction of the nozzle. Here just after Nozzle Throat Velocity is approaching nearly 1200 m/s and we can visualize the flow turbulence due to Nozzle flow separation at nozzle exit in divergence portion. It can be seen that flow in mean half of nozzle is

laminar and even at nozzle walls the flow is laminar but in between we have curl of flow due to which there is a reduction in flow exit velocity.

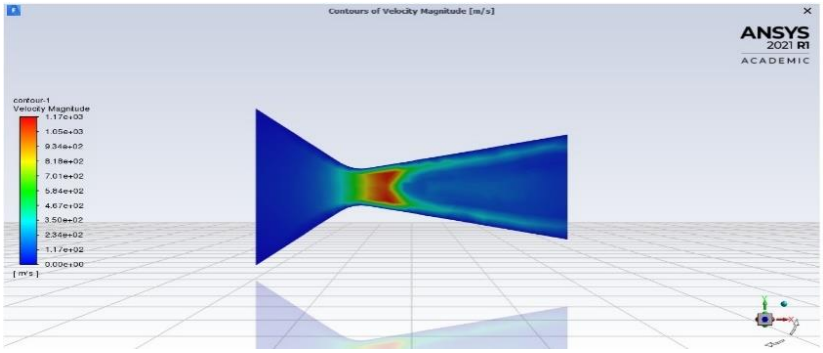

Fig 4.4 Simulation of Velocity Magnitude Contour

We can see the flow of velocity magnitude contour in the above figure. At Throat the magnitude of velocity is increased marking in Red Zone and at Convergent and Divergent portion of nozzle the magnitude is seen to be in laminar regime.

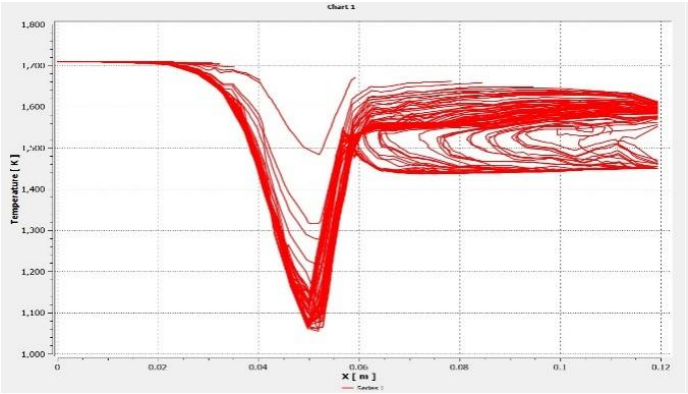

Fig 4.5 Temperature Chart across Nozzle Axial Direction

Plot of Temperature vs Axial Direction of Nozzle is depicted here. The plot is seen exact inverse mirror of velocity profile and therefore proves Basic thermodynamic relation of gases in flow. Temperature is directly proportional to Velocity.

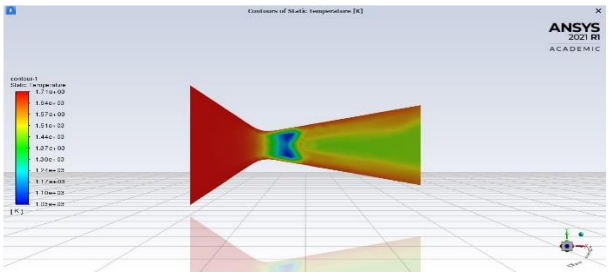

Fig 4.6 Contour of Static Temperature across Nozzle Axial Direction

Static temperature variation with respect to the nozzle axial direction is being depicted in the figure above. We can see static temperature is at its peak of the system in convergent section of nozzle while at the divergent section of nozzle, the dynamic portion increases and to maintain the energy balance of the system the Static contour is seen reduced.

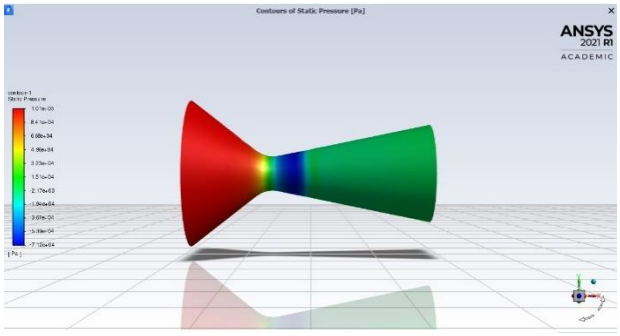

Fig 4.7 Contour of Static Pressure across Nozzle Axial Direction

Static Pressure variation with respect to the nozzle axial direction is being depicted in the figure above. We can see static pressure is at its peak of the system in convergent section of nozzle while at the divergent section of nozzle, the dynamic portion increases and to maintain the energy balance of the system the Static contour is seen reduced of the pressure. At throat we can see the Static pressure is at its minimum values.

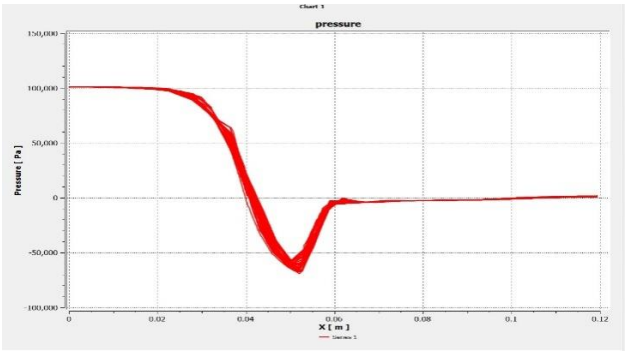

Fig 4.8 Variation of Pressure vs Axial Direction of Nozzle

Above figure shows the variation of Pressure across the nozzle axial direction. At the nozzle convergence we have pressure same as reservoir condition of 1.101325 bar and then with velocity increasing towards Nozzle throat we have drop in pressure to follow Momentum Equation.

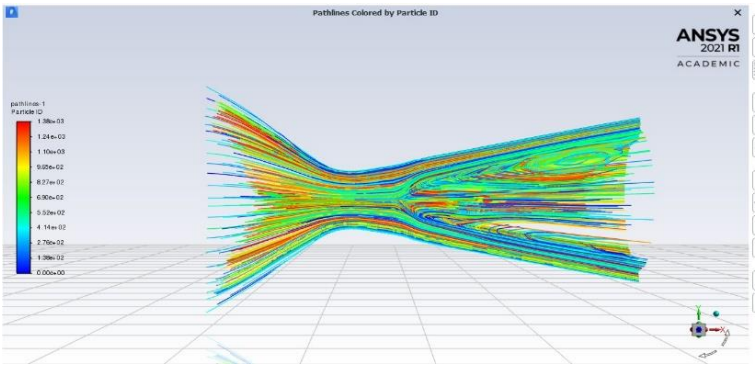

Fig 4.9 Path lines Contour across Nozzle Axial Direction

Across the Nozzle axial flow direction contour of coloured Path lines of particles is depicted for the Nozzle Convergent- Divergent Section. Here coloured path lines are used to make the flow separation across the nozzle be visualized in clear detail.

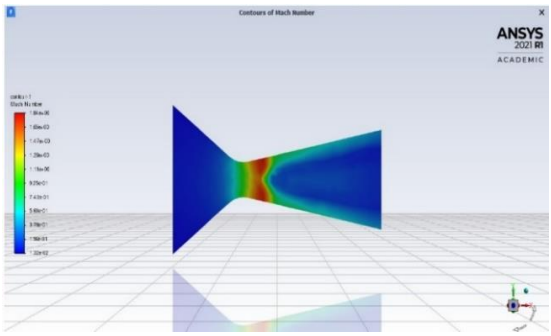

Fig 4.10 Contour of Mach No across Nozzle Axial Direction

In the above simulation figure Contour of Mach No across Nozzle Axial Direction is depicted. I t can be clearly seen that Mach No in convergent section is increasing because it follows continuity equation and after Throat Mach No is seen increasing . At Throat we have Minimum Area with maximum mass flow rate passing and having a Mach no as 1.

Conclusion

Rocket Nozzle with design exit Mach No of 2.955 was designed in Fusion 360 Software and then Simulated in ANSYS 2021R1 with above stated Axial flow Separation achieved. In this paper Nozzle Design was studied to its flow separation after throat section till exit in divergent section of nozzle with slight Turbulent regime achieved in rear exit frame of nozzle and also laminar flow regime was followed in mean axial Half diameter portion. The flow separation is seen from Nozzle wall with flow

being curl making flow in that regime Turbulent and then again coming back to laminar regime at exit. Nozzle Design is successfully verified for Nozzle Flow separation in the Divergent section.

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COMPARATIVE STUDY ON PROPELLANT CHARACTERISTICS FOR REUSABLE LAUNCH VEHICLES

***Ankit Kumar Mishra, *Madhumitha M, *Rama Devi, **Prathiksha G Shetty, #A Naga SaiKiranmai, $Simran T**

**Department of Research and Development, Abyom Space Tech and Defense Pvt. Ltd, Gorakhpur-274402, India.*

***Department of Aerospace Engineering, Defense Institute of Advanced Technology, Pune- 411025, India.*

#Department of Aerospace Engineering, Bharath Institute of Higher Education and Research, Chennai- 600073, India.

$Department of Aerospace Engineering, Sastra University, Tirumalaisamudram, Thanjavur- 613401, India.

Abstract:

Advanced rocket technologies are often based on cryogenic fuels which form a part of liquid propellants. The classification of liquid propellants and comparison between its two types of case studies are explained. Nowadays cryogenic and semi cryogenic technology has been used for propelling a rocket. It is the preferred technology because of its high performance. The growing demand for high energy density fuels, as well as concerns about their safety, has prompted researchers to concentrate on green propellants that are both efficient and long lasting. Collation of four propellants has been carried out for semi cryogenic and cryogenic fuels. The Oxidizer preferred to be used is the same for all fuels which have the best reactivity. Cryogenic propellants taken for comparison are Liquid Hydrogen, Liquefied Methane and for semi cryogenic fuels considered are RP-1 (Kerosene) and UDMH with Liquid Oxygen as the Oxidizer. The scope of this work addresses the comparison among the propellants, on their chemical properties, overall efficiency and fatigue life which is a major criterion for RLVs.

Keywords: *Propellant Characteristics; Semi Cryogenic; Cryogenic; Efficiency; Reusable Launch Vehicles.*

Introduction:

A large amount of rocket fuel is needed to launch a rocket into space by overcoming earth's gravity while delivering a small payload. Hence space tech remains expensive. Reusability of rocket components could have a significant impact on the overall cost of rocket technology by reducing the materials used. This feat is being achieved by various space tech companies launch vehicles like SpaceX's Falcon 9 and Falcon Heavy, Rocket Lab's Electron, and Blue Origin's New Shepard. While the above said models are operational, there are various other companies which are in their developmental stage of RLVs such as Virgin Galactic, NASA, I-space's Hyperbola, Roscosmos's partly reusable Amur, Relativity Space's Terran R, ISRO's RLV-TD and much more, with the use of cryogenic propellants.

Cryogenic propellant is a classification of propellants that need to be stored at extremely low temperatures to maintain them in liquid state and are used in space missions where there is no atmosphere. Some of the advantages include being cleaner, therefore qualifying as a green fuel; reduction of transportation cost due to their abundance in comparison to the fast-depleting fossil fuels; higher mass flow rate, hence more thrust and power and no environmental hazard in case of any spillage. Despite the difficulty to use due to the complex engine architecture such as cryogenic cooling, pumping mechanisms, etc.; the current operational models prefer cryogenic propellants due to their excellent characteristics. The combined benefits of low toxicity and easy handling may shorten ground processing time from weeks to days, simplifying the launching of satellites and spacecraft.

In this paper a detailed comparison is carried out between Cryogenic and semi cryogenic propellants and deducing the important characteristics making them a more sought-after propellant.

Literature Review:

Abishek et.al (2018) compares the flow and combustion characteristics of LOX/methane and LOX/hydrogen propellant combination at single element level using swirl coaxial injector by computational fluid dynamics model at supercritical pressure of 6.8MPa. In combustion simulation, the effect of large swirl velocity and radial expansion results in large LOX core length with hydrogen and it is restricted in radial and axial directions in case of methane for oxygen mass fraction. The high temperature and low swirl velocity properties of methane restricts the inner oxygen core to expand radially when compared with hydrogen for fuel mass fraction. Density varies axially for both

hydrogen and methane. Due to low operating density of hydrogen the swirl velocity is higher than in methane case, which in turn delays mixing with reduced shear layer diffusion and high temperature combustion zone extends up to exit. In case of Lox/methane there is higher diffusion and the high temperature combustion zone ends within the domain.[1]

Dhruv Mehendiratta and M.Ramachandran (2018) explained that liquid Methane is a hydrocarbon. Liquified Methane has more advantages when compared with Kerosene as it has specific impulse of higher values, has incomparable properties of cooling, having higher limits of coking, soot production is very less and the pressure will be reduced in the cooling surfaces. For reusability, coking and soothing properties are very important. Methane cost is about three times lesser when compared to Kerosene, due to its impressive long-haul stability. Due to high expansion of engine mass and an expandable booster capacity with the blend of higher volume leads to high drag penalty and plethora of mass penalty. Methane is a smooth cryogen that can be stored at a lower temperature than kerosene and higher temperature than Hydrogen. There is a formation of carbon soot in the combustion chamber; it acts as a protective layer mainly for kerosene, and tends to oppose the nozzle exhaust flow. Oxygen with any other hydrocarbon produces less performance characteristics when compared to Oxygen/Hydrogen. Liquid Methane is helpful to decrease the flammability whereas liquid Hydrogen has less specific impulse than Methane.[2]

Youhong et.al (2016) experimented on the corrosion damage and SCC (Stress corrosion and cracking) behavior on LD 10 Aluminium alloy structure (pressure vessel for storing the propellants). Double Cantilever Beam (DCB) was taken and subjected to constant amplitude cycle loading with maximum tensile stress and then put into three solutions of 3.5% Nacl, N2O4 and UDMH. The specimen was taken out every 15 days and checked for the crack lengths and this continued until a condition where crack growth doesn't propagate. Finally, the last crack length was recorded, and initial stress intensity factor was calculated. Corrosion pits were found on the one in the NaCl solution, a layer of white corrosion was produced on the one, in the UDMH solution and asymmetric yellow speckles were formed on the one in the N2O4 solution. The corrosion damage degree was severe on the one in Nacl solution. This paper gives us an idea of how the corrosion property of UDMH might impact the storage tank and sometimes the engine as well.[3]

Mohammad et.al (2011) studied the properties of UDMH. It has high vapor pressure at room temperature and forms a stable liquid at lower temperatures. There is good intermolecular interaction due to strong hydrogen bonds. Increasing the boiling properties of UDMH may arise due to colligative

properties. Viscosity of UDMH does not change. It has a low freezing point. It has low density and a high refractive index. It has low heat of vaporization at the boiling point, high molecular weight and has low flash point.[4]

Sakaguchi Hiroyuki et.al (2018) studied the future use of Methane in reusable launch vehicles and performed some experiments and tested for long span, out of earth atmosphere operations. The Methane engine was developed under the IHI Corporation and researched on it. Liquid oxygen as Oxidizer and liquified Methane as fuel are used as Propellant in methane machines for combustion. While compared to Liquid Hydrogen, the value of density multiplied by specific impulse should be higher for liquified methane. Large amount of soot will be deposited at the time of combustion when hydrocarbon fuels like kerosene is used and it may cause clogging trouble at the time of reusable operations of the vehicle. When liquid Methane is used for reusable operations there is no production of soot while combustion and no chance of clogging at the passage of propellant flow. Liquid Methane and liquid Hydrogen don't have the formation of soot but liquid Hydrogen vaporizes quickly and cannot be stored for a long span, while Liquid Methane can be stored for longer duration and the vaporization is comparatively less. Liquified methane is safer and less explosive, leakage is very low due to its higher molecular weight when compared with liquid Hydrogen. Propellant tanks or its valves can be designed and standardized for liquid methane as fuel and Liquid Oxygen as Oxidizer to reduce production cost. For the transportation systems, liquified methane is very efficient as it is cost efficient, reduces the size of propellant tanks, reusable, and can be stored for a long time. Liquified methane can also be used as a regenerative cooling system which is most likely to reduce combustion chamber temperature.[5]

K.A. Zona in their NASA article stated the advantages of using liquid Hydrogen as rocket fuel. Hydrogen is an extremely powerful and light propellant that is being used in rockets. Burns with high intensity due to its lower molecular weight. When liquid hydrogen reacts with liquid oxygen as Oxidizer, it produces a high amount of specific impulse and propellant consumption is very efficient compared to other propellants in rockets. Due to the cryogenic nature of both liquid oxygen and liquid hydrogen, the gases could be liquefied only at very low temperatures hence tends to have more technical challenges. To avoid it from boiling and evaporating, from all the sources of heat where the liquid hydrogen is stored or fueled in the rocket engine, it should be insulated carefully and friction of air molecules in the atmosphere should be avoided. When the vehicle is in space, liquid hydrogen is protected from the radiation and heat of the sun. To avoid tank explosion, vent is a must in the

system due to rapid expansion while the absorption of heat by liquid hydrogen. Liquid hydrogen becomes brittle when the metal is exposed to the extremely cold temperatures. Liquid hydrogen has the tendency to leak even from welded pores. Technical solutions are required to solve all the problems that will be faced by liquid Hydrogen. Large tanks are required because of their low density. It is energetic and gases produced during combustion are very light.[6]

Waxeneggaer et.al (2017) studied the failure mechanisms and the parameters affecting it in liquid rocket engines for reusable launch vehicles. Different combustion cycles, propellant combinations and design parameters like chamber pressure significantly affects fatigue life of the engine. Simulation tools like EcoSimPro and Ansys are used for cycle and thermal analysis. Finite element model for fatigue life prediction. Results showed that the combustion chamber of the gas generator cycle has the highest number of cycles to failure (66) and staged combustion cycle with approximately 50 cycles to failure, this is due to the different pressure present in cooling channels at the throat. When considering fatigue life, LOX/CH4 is found to be better than LOX/LH2 due to the increased number of cycles to failure in the latter combination. The propellant choice affects the requirement to have a minimum number of cycles to failure and reduces the performance of the engine. Also operating regime has a significant influence on the loads which act on the critical subcomponents.[7]

Alan et.al (2019) examined the regulations to be followed when choosing the propellant combination to check for explosion and hazards especially the blast pressure, fragments, and thermal effects. The explosive characteristics depend widely on the degree of mixing of the propellants and other factors such as tank configuration, specific failure mode and time of ignition. The study showed that LOX/hydrogen has high explosive energy (heat of combustion including the moles of oxygen) and high TNT equivalency (ratio of weight of trinitrotoluene and weight of material with same blast effect) compared to LOX/Methane and LOX/RP-1. LOX/LCH4 mixture in vapor phase have a broader detonable range (reaction wave propagating through reactants faster than the local speed of sound) than LOX/hydrogen.[8]

Stappert et.al (2018) evaluates the launch systems with reusable vertical takeoff and vertical landing booster stages by comparing different propellant combinations, staging's and engine cycles. The study shows that LOX/hydrogen launchers are the lightest followed by LOX/RP-1, LOX/LCH4 and LOX/LC3H8. The Gross lift-off mass of hydrocarbons is 2.8 times higher compared to hydrogen launchers. In hydrocarbons LOX/RP-1 has the lowest dry mass followed by LOX/C3H8 and

LOX/CH4. LC3H8 offers significant cooling potential. It is evident that the propellant chosen for the launchers has an effective exhaust velocity and structural index (dry mass/propellant mass).[9]

Zejun et.al (2012) investigated the morphological changes of gelled UDMH droplets during combustion to explore the effects of ambient pressure and oxygen fraction on burning rate and micro explosions. The burning properties of gelled UDMH were studied. Combustion process involves a classical combustion stage with a steady flame envelope around the droplet, then a bubble appears with vigorous micro explosions until most of UDMH fuel is consumed followed by a gellant combustion stage. Increase in the chamber pressure suppresses the bubble formation and delays micro explosion of the droplet due to increase in boiling temperature of UDMH as the pressure increases. This results in the increase in burning rate. Increase in oxygen fraction rises the flame temperature and the droplet heat increases, decreasing the bubble formation time and the micro explosion time with an increase in the burning rate constant.[10]

Results and Discussion:

Various studies on the propellant characteristics of cryogenic and semi cryogenic propellants for reusable launch vehicles have been discussed. Comparison is done between cryogenic propellants (liquid methane and liquid hydrogen) and semi cryogenic propellants (RP-1 Kerosene and UDMH).

Fatigue Life:

When considering fatigue life of LOX/CH4 is found to be better than LOX/LH2 due to the increased number of cycles to failure in the latter combination. The propellant choice affects the requirement to have a minimum number of cycles to failure reducing the performance of the engine. Also, the operating regime has a significant influence on the loads which act on the critical subcomponents [7].

Explosive Characteristics:

The explosive characteristics depend widely on the degree of mixing of the propellants and other factors such as tank configuration, specific failure mode and time of ignition. LOX/hydrogen has high explosive energy (heat of combustion including the moles of oxygen) and high TNT equivalency (ratio of weight of trinitrotoluene and weight of material with same blast effect) compared to LOX/Methane and LOX/RP-1. 1.LOX/LCH4 mixture in vapor phase have a broader detonable range (reaction wave propagating through reactants faster than the local speed of sound) than

LOX/hydrogen. RP-1 presents a lower explosion hazard and also has a fraction of the toxicity and carcinogenic hazards [8].

Maximum Vacuum Thrust:

It is observed that for cryogenic (LOX/hydrogen) propellants, for maximum vacuum thrust 22 chambers can be used with gas generation cycle, for semi cryogenic (LOX/RP-1), 16 chambers with gas generation cycle and for storable propellants (NTO/UDMH) 25 chambers can be used. LOX/hydrogen launchers are the lightest followed by LOX/RP-1, LOX/LCH4 and LOX/LC3H8 [9].

Mass and Density:

Increased density of Hydrogen at liquid state requires large pipe diameters and a large pump for large volume but provides higher specific impulse. RP-1 is far denser than LH2, giving it a higher energy density (though its specific energy is lower). Semi-cryogenic and storable propellants have identical propellant mass density and specific impulse levels. Gross lift-off mass of hydrocarbons is 2.8 times higher compared to hydrogen launchers. In hydrocarbons, LOX/RP-1 has the lowest dry mass followed by LOX/C3H8 and LOX/CH4. Use of kerosene as propellant leads to a lower booster dry mass, making it the preferred choice if no operational benefits of methane can be identified. Kerosene's high density enables a compact design of turbomachinery and minimal stage sizes.[11]

Storability:

Methane is a soft cryogenic propellant with a storage temperature of about 111 K .This temperature is in proximity to LOX and can enable, under favorable circumstances, a simplified architecture. Its density is desirable for easy storage in small tanks, compared to what would be required for liquid hydrogen. While considering the leakage, liquid Hydrogen tends to leak and it's difficult to store for a longer period than the liquid Methane and it tends to react faster and explosively in some cases, than liquefied Methane. UDMH and RP-1 are both storable liquid propellants [11].

Combustion Characteristics:

Combustion stabilization of the methane-oxygen diffusion flame was examined and the study observed a detached flame regime (stable combustion) and a blow off regime where flames were not generated due to uneven mixing. The effect of the mixer ratio of methane and oxygen lowered and chemical reaction rate increased as the stoichiometric ratio approached creating a stable lifted flame

(detached) even in high oxygen Reynolds number. This detached flame can prevent excessive heat transfer due to combustion gas thereby preventing thermal damage and destruction in the injector and propellant supply system.[12]

Boiling Point and Melting Point:

Kerosene has higher kinematic viscosity than methane, freezing point and critical temperature and pressure of kerosene are higher than methane [8]. The boiling point at one atmospheric pressure for hydrogen is -252.8° C, for Methane being 161° C and 150-300° C for RP-1. Liquid Hydrogen has the highest flash point among liquid methane, RP-1 and UDMH.

Specific Impulse:

Hydrogen provides the highest specific impulse and RP-1 provides a lower specific impulse than liquid hydrogen (LH2), but is cheaper and stable at room temperature. Methane has higher impulse than kerosene so it has higher characteristic velocity than kerosene. UDMH with Nitrogen tetroxide being the storable liquid propellant has a specific impulse close to that of RP-1.

Coking and Corrosion:

Coking is the thermal deposition of propellant on channel walls. Every hydrocarbon has a threshold wall temperature after which there is coking deposition stimulated. It is influenced by the wall temperature and the chemical composition of hydrocarbons. Some of the effects of coking are increased pressure drop due to reduced cross section, reduction in heat transfer between chamber wall and cooling channel due to the formation of a layer from coking and composition of fuel changes. Corrosion-degradation of metallic surfaces leading to decreased pressure drop due to loss of wall material, increased heat transfer between chamber wall and cooling channel wall due to reduced wall thickness and change in composition due to reaction for the fuel and metal.[13]

Table 1: Properties of CH4, LH2,UDMH & RP-1

Properties	Methane	Liquid Hydrogen	UDMH	RP-1
Melting point (°C)	-182.456	-259	-57	-43
Boiling point (°C)	161.5	-252	64	150-300
Molar mass (g/mol)	16.043	2.016	60.1	23.30
Density (kg/m^3)	422.8 (liquid at -162°C)	70.85	791 (at 22°C)	0.81
Flash point (°C)	-188	585	10	38
Autoignition temperature (°C)	537	585	248	295
Explosive limits	4-17%	4-74%	2-95%	0.6-4.9%
Combustion Temperature (K)	3550	3070	3415	3670
Oxidizer Fuel Ratio	3.7:1	6:1	2.61	2.7:1
Specific Impulse (seconds)	459	532	333	370

Conclusion:

The research done on propellant characteristics of reusable launch vehicles leads to the preference of Liquid propellant, which is further classified as semi cryogenic and cryogenic propellants. Compared to other fuels, cryogenic has higher efficiency .A detailed comparison on the different properties among the liquid propellants such as liquified Methane, liquid Hydrogen, RP-1 and UDMH had been carried out for Reusable launch vehicles. In many space missions, which have been launched by

organizations across the world, liquid Hydrogen, liquefied Methane, kerosene are used as fuels and liquid Oxygen as Oxidizer, combined to form a propellant. The properties considered for the study are its availability, specific impulse, corrosiveness, coking characteristics, storability, combustion stability, explosive characteristics, fatigue life, mass and density along with its chemical properties, production of thrust, toxicity, handling and maintenance and transportation of the fuels. Each of the propellants have their pros and cons but when looking for a potential green propellant, liquid Methane with liquid oxygen can be considered with a fairly high specific impulse and its density is desirable for easy storage in small tanks, compared to what would be required for liquid Hydrogen.

Liquid Hydrogen when compared with liquefied Methane, both are suitable as rocket propellants, but liquid Hydrogen tends to leak from gaps and it's hard to store for a while due to its evaporation property, transportation should be done with taking extreme measurements whereas, Methane is easy to handle and transport, safe to store for a longer period. Liquefied Methane is preferable for longer range missions and an optimized one due to its properties when compared to Liquid Hydrogen. Still some tests are going on with liquefied Methane, for single stage to orbit missions. It is very efficient in using liquefied Methane rather than liquid Hydrogen and for two stages to orbit, it is efficient in using combined propellants of liquid Hydrogen and liquefied Methane to achieve the most efficient mission. It is better to use Liquid methane in the upper stages and LH2 in the first stage. Liquid Methane has high heat transfer characteristics which can be used for regenerative cooling. It also has high characteristic velocity and good mixture ratio which can produce high thrust. Methane is also abundant in the outer solar system. It can be harvested from Mars, Titan, Jupiter and many other planets and moons. Major disadvantage of other propellant being explosive hazardous and coking property.

From the comparative study of these propellants, it is safe to say that liquefied Methane is efficient to use in long range missions for reusable launch vehicles. Till date, missions have not been launched using liquefied Methane. After conducting tests on various fuels, scientists have discovered the benefits of liquefied Methane.

LOX/LCH4 has been considered as green propellant for future space missions. Since liquid methane has high specific impulse out of all four chosen propellants liquid methane and liquid oxygen can be preferred as a propellant for reusable launch vehicles.

Why choose methane in future rocket engines?

One of the most important factors while considering any of the fuel for rocket engines are cost and maintenance, hence Methane is preferable because it's cheaper and can be maintained with less cost, for storing the Methane in the form of liquid a passive system of cooling is sufficient. When compared to Hydrogen, Methane is denser and it is possible to store over a long period, fuel tank insulation is not needed, doesn't require a complex design of rocket like hydrogen propellant does, doesn't have the property of leak and for lift off the quantity of methane requirement is very less due to its high specific impulse. Methane requires simple and light fuel feed systems. There is a special process known as autogenous pressurization for Methane (self-pressurization in the tanks), so it doesn't require bulky and complex pressurization systems. The first engine to test with Methane is Raptor by SpaceX.

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NANOSTRUCTURED ZNO DOPED Bi_2O_3 BASED E-NOSE FOR H_2S MONITORING

***Snehal D. Patil, *Harshal A. Nikam, *Y. C. Sharma, **Y. B. Patil, **D. R. Patil**

**Dept. of Physics, Vivekananda Global University, Jaipur, India*

***Bulk and Nanomaterials Research Laboratory, Dept. of Physics, R. L. College, Parola, Jalgaon, MHS India, 425111*

Abstract

The nanostructured ZnO and Bi2O3 powders were synthesized by disc type ultrasonicated microwave assisted centrifuge technique. Thick films of pure Bi2O3 and ZnO doped Bi2O3 powders were fabricated by screen printing technique followed by firing at 450oC for 30 min. The surface morphologies, chemical compositions and crystal structures of the pure and doped Bi2O3 powders have been investigated by FESEM, E-DAX, XRD, etc. ZnO doped Bi2O3 (5 wt %) sample exhibits crucial response to 10 ppm H2S gas at 350oC. Electrical behavior and gas sensing performance of thick films of pure and ZnO doped Bi2O3 thick films have been studied and discussed.

Keywords: *Nanostructured ZnO, Bi2O3, Thick films, H2S Sensor*

A BIBLIOMETRIC STUDY OF RESEARCH TREND IN LIBRARY AND INFORMATION SCIENCE IN NORTH-EASTERN REGION OF INDIA, 1989-2018

***TS Paumunmuang Simte, **Dr Bobby Phuritsabam**

**Research Scholar, **Assistant Professor (S-2),*

Department of Library and Information Science,

Manipur University, Canchipur-795 003, Imphal, India.

Abstract

One of the growing areas of research in the discipline of library science that is gaining wide currency in a research study is bibliometric study. The term 'bibliometric' was derived from two Greek words: 'biblion' which means 'book' and 'metron' which means 'measure'. This paper deals with the quantitative study of one hundred (100) doctoral theses awarded in the field of library science by four (4) central universities in North Eastern Region of India during 1989-2018. The study shows that there is a steady growth of research activity in the discipline as shown by a gradual increase in the production of doctoral theses by the research community of the region. Research in the discipline is carried out on various traditional and modern topics concerning library science. Some of the faculty are very dynamic and resourceful in terms of publications and the number of doctoral theses awarded under their supervisions indicates. So, the study of library science as a discipline and as a subject of research interest is very dynamic and holds much scope to explore further.

Keywords*:* *Bibliometric Study, North Eastern Region, Doctoral theses, References.*

ROLE OF MULTIDISCIPLINARY APPROACH IN RESEARCH INNOVATION IN AYURVEDA

***Dr Rashi Sharma, **Dr Sunil Kumar**

**PG Scholar, **Professor, Dept. of Rachna Sharir, NIA Jaipur.*

Abstract

Ayurveda works on true health care rather just providing disease management only. In today's scenario there is massive rise in scenario of antimicrobial body resistance and Ayurveda can provide the best approach of defending ourselves. But the Research in field of Ayurveda is at the level of infancy which can be matured up by multidisciplinary approach in field of Ayurveda. Ayurveda Research will always be at margins but by adopting few measures, it cango beyond the boundaries like new innovative therapeutic approaches which are not earlier mentioned in Samhitas must be worked on along with a joint effort of Ayurveda physicians, scientists from other areas, data managers and engineers for new instrumentation and tools development. The articles and ideas should come out from the published section to incorporative section and a cumulative effort to make that idea worldwide should be worked upon. This can bring out the outcome which is cost effective for public and which is centrally focused on patient centric approach. The nano technology in collaboration with Ayurveda can bring such wonderful outcomes in form of Ayurveda Medicinal products. The Genomics branch of science can help in resolving many hidden genetic concepts of Ayurveda like Matrujadi Shad Bhavas that can be helpful in treating many genetical diseases. This paper highlights the role of multidisciplinary approach in field of Ayurveda Research so that we can gain the future territories of Ayurveda.

Keywords: *Ayurveda, Genomics, Multidisciplinary, Research.*

EXISTENTIAL IMPACT OF COVID-19 ON BUSINESS OPERATIONS IN AFRICA: THE CASE OF DELTA STATE

Kifordu A Anthony, Ogala S. Christian

Business Administration and Marketing Delta State University Abraka ,

Department of Arts and Humanities Delta State Polytechnic

Ogwashi Uku Delta State

Abstract

This study determined the existential impact of covid-19 on the survival of business operations in Nigeria with preventive measures and economic implications as the objectives investigated. The research was a survey research design. The population of the study which was 50was used because of the size. The Source of data was a questionnaire, which was tested for reliability using the Split-Half technique and the value obtained was .863. The analysis was carried out using the Regression Technique at a 5% level of significance was used in the hypothesis test. The findings revealed the extent to which the impacting variables predict the significant outcome. The study was narrowed down only to importers of goods in Delta state. The Nigerian government will by this study know how to encourage businesses to survive after a pandemic such as covid-19. Similarly, small businesses will gain from this study in that they will know from the suggestions made, how to navigate through tough times in their businesses by embracing online platforms to import or supply products.

Keywords: *Covid-19, Business operations, Economic Impact, Preventive measures.*

OCEAN PLASTIC POLLUTION: ITS DISASTROUS IMPACTS ON ECOSYSTEM AND SOLUTIONS

Aastha Arora, Mayank Sehdev

Ryan International School, New Delhi, India, Indian Representative – Conrad Challenge

Abstract

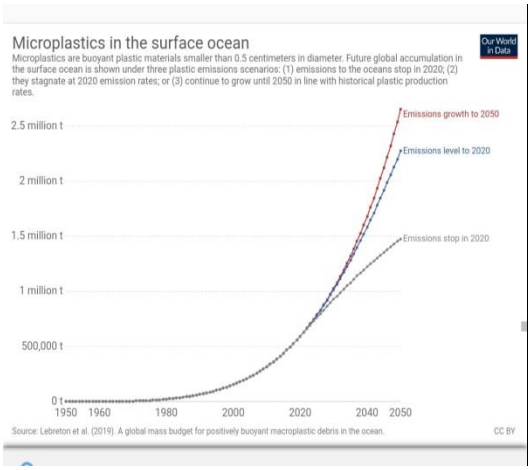
Since its popularization in the 1950s, plastic use has skyrocketed due to its uses in the field of social health, safety and energy. However, due to plastic's longevity and resistance to decomposition, its widespread use has led to an epidemic of mismanaged waste. There is now 5.25 trillion macro and micro pieces of plastic in our ocean and 46000 pieces in every square mile of ocean weighing up to 269000 tonnes. Plastic pollution has a direct and deadly impact on wildlife. Thousands of seabirds and sea turtles, seals and other marine mammals are killed after ingesting plastic or getting entangled in it. Endangered wildlife like the Hawaiian monk seals and pacific loggerhead sea turtles are among nearly 700 species that eat and get caught in plastic litter. Technology can be used to target hotspots of marine plastic pollution. The inventory is a tool to identify plastic pollution and cleanup technologies. However technology alone cannot solve this issue, prevention has to be carried out by reducing, reusing and recycling. As plastic waste accumulates in our oceans at alarming rates, the need for efficient and sustainable remedial solutions is urgent. The paper introduces ocean plastic pollution, elaborates it causes and treacherous hazards, discusses existing technologies working to solve this grave concern and presents potential sustainable solutions of this hot issue. Above all, innovation and prevention have to work hand in hand and they are the only major key to end this menace.

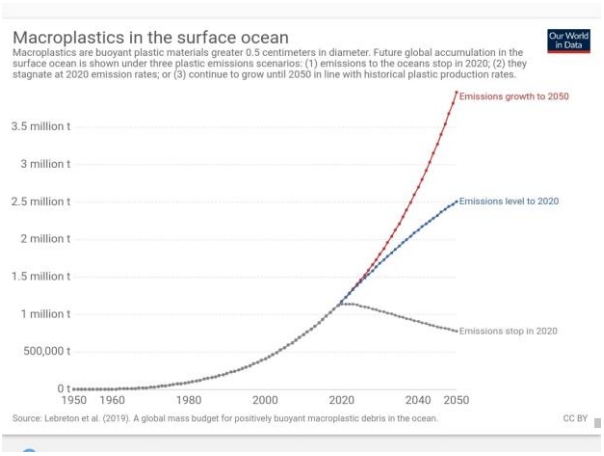
Introduction

Globally, around 300 million tons of plastic waste is generated annually and most of it ends up being discarded in Oceans and landfills. Oceans act as a large reservoir for plastic pollution. It gets concentrated into our oceans through various means like cargo of the ships, fishing nets and garbage thrown in the sea and inflicts catastrophic effects on the aquatic, marine life and human life. Millions

of Marine animals are impacted by the plastic which limits their ability to move, feed etc. Many of them die due to infection and injuries inflicted by plastic consumption.

According to Surfers against Sewage website (sas.org.uk) 1.5 million tons of plastic was produced in 1950, which rose to 320 million tons in 2016. This is set to double by 2034. Everyday approximately 8 million pieces of plastic pollution find their way into our seas. There may be around 5.25 trillion macro and microplastic pieces drifting in the Oceans. Plastic constitute 60-90% of all marine detritus. At this rate, by 2050 plastic waste will outweigh all the fish in the Oceans. It is perceived that 700 species of fish, seabirds and marine mammals could go extinct due to plastic pollution. One estimate suggests that at least 267 species worldwide have been affected, including 84% of seaturtle species, 44% of all seabird species and 43% of all marine mammal species. Even the deepest sea creatures can't escape plastic pollution.



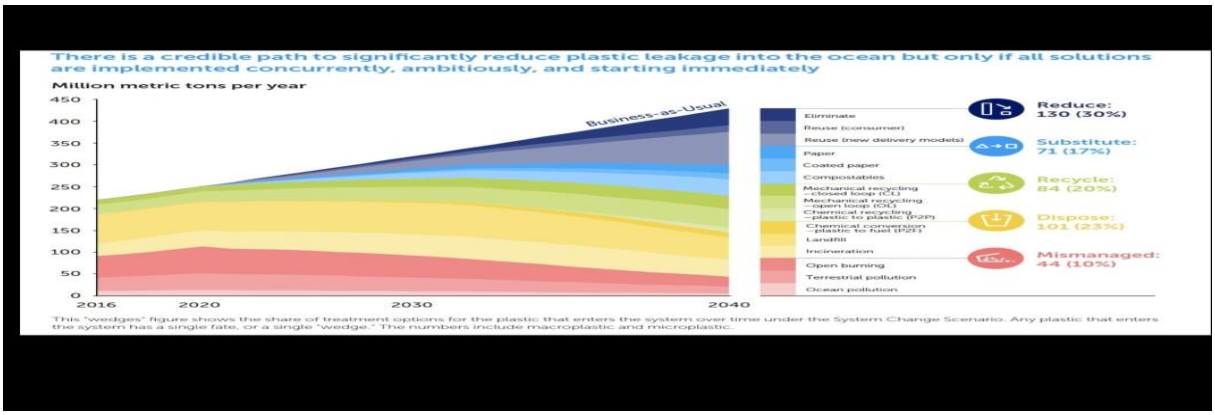


This has become a global crisis and there is an urgent need to come up with sustainable remedial solutions to solve this crisis and prevent further contamination of aquatic environment and its effects on the environment.

Literature Review

As plastic waste is accumulating in the ocean at alarming rate, there is an urgent need for efficient solutions. The best solution is incorporating the 3Rs in our daily lives (reduce, reuse, recycle) and holding worldwide movements and campaigns to spread awareness about its deleterious environmental impacts and completely end its production and replace it by other environment friendly means. Other solutions include development and mobilization of technologies working to combat ocean plastic. Presently, there are very few players in ocean plastic removal and

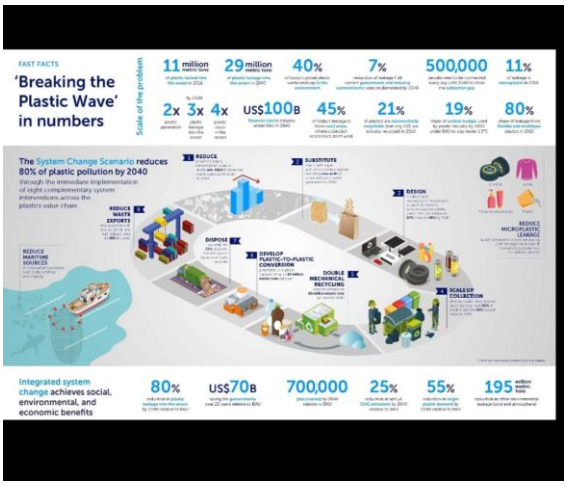
biodegradation and their success rate is very low, around 40-50%. Ocean plastic pollution is a global tragedy for our ocean and sea life. It has a pernicious effect on aquatic life and leads to death of numerous sea creatures. Therefore, it is mandatory to immediately come up with a solution to solve this predicament. Although reducing, reusing and recycling plastic is the best way to tackle this crisis and to prevent further escalation of plastic pollution, it cannot annihilate the already prevailing plastic litter in the ocean which encompasses about 80% of all marine debris from surface water to deep sea sediments. Other efforts have been made at international and regional levels to address further escalation of marine pollution e.g. The London Convention and the 1978 Protocol to the International Convention for the Prevention of Pollution from Ships (MARPOL). Several other technologies and methods are developed to remove the already existing plastic from the oceans like the use of satellite imaging and machine learning to assist in cleaning up 5 trillion pieces of plastic trash found in world's ocean garbage patches and it is estimated that 50% of it could be captured within 5 years e.g. The European space agency uses this method to focus cleanup efforts. There is wide use of AI to solve this issue. The Ocean Cleanup is yet another non-profit organisation working on this global issue. Boyan Slat's "OCEAN CLEANUP PROJECT" aimed to clean the largest garbage patch of the world "the Great Pacific Garbage Patch" located between Hawaii and California, initially used giant fishing net (or scoop) for plastic, but was soon changed to fixed boom due to its massive cost. The fixed boom was later changed to floating boom at the surface of the water and skirt hanging beneath it. The floater provides buoyancy while the skirt prevents debris from circumventing underneath and leads it into the retention system. The technology has achieved very little success and is highly expensive and time consuming with a very low efficiency rate. It only collects the plastic from the ocean and does not degrade it and hence it remains in the environment and leads to carbon emission and by-catch, moreover there is risk of inducing harm to marine life. Norwegian Technology is yet another technology which cleans the oceans from plastic pollution and recycles plastic waste. Clean Sea Solutions, a Norwegian company has developed Clean Sea Robot, an aqua drone which sweeps up the plastic waste from the ocean surface with the help of computer vision and remote sensing. The collected debris is stored on board and emptied in a dedicated docking station. This technology again can be used only on a small area and not cost effective. It also does not degrade the plastic. More methods have been developed but everyone has several detrimental effects on the environment in one way or the other therefore immediate alternatives to end/reduce global ocean plastic is required.

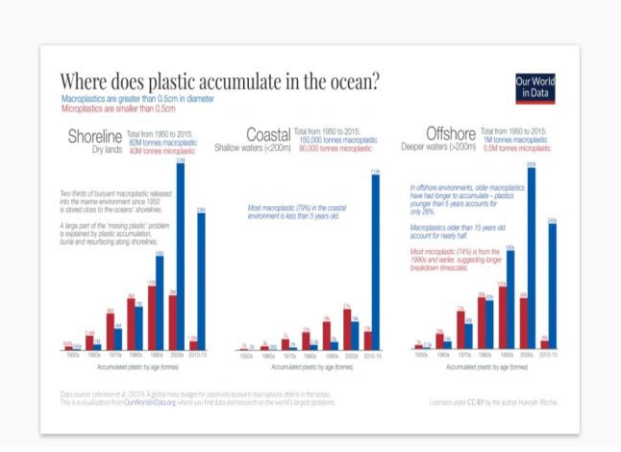


Proposed Further Research

We plan to form a venture which aims to cleanse our oceans of plastic pollution which causes umpteen number of problems to the aquatic and humans life and therefore affecting the environment severally. Our venture aims to use an ingenious concept to solve this global issue by using plastic eating wax worms (Galleria Mellonella) to degrade majority of plastic litter present in oceans across the world. Our team came up with this idea after we read an article (source: nationalgeographic.com) about the accidental discovery of plastic eating insects by Federica Bertocchini, a development biologist at the University of Cantabria in Spain. She first noticed the possibility while cleaning her backyard of beehives when she extracted some vexatious wax worms from the bee hives and placed them in a plastic bag. After an hour she noticed holes in the bag and was quick to realise the special property that these wax worms possessed. It was concluded that since they sustain on wax they might have developed an enzyme that could degrade plastic since wax and polyethylene have chemically similar structure consisting of long carbon chains. After further research it was found out that Galleria Mellonella embodies an enzyme present in its guts was responsible to convert polyethylene into ethylene glycol. Conduction of further experiments revealed that each worm created an average of 2.2 holes per hour in polyethylene plastic overnight. 100 wax worms degraded 92 milligrams of plastic. At this rate it would take the same 100 wax worms approximately 1 month to completely degrade 5.5 grams of an average plastic bag. This rate of degrading plastic was a lot quicker than any other organisms known to execute the same task. Our venture plans to use this property of Galleria Mellonella to solve the global crises of ocean plastic. These wax worms would be extracted from bee keeping facilities where they act as pests and inflict harm to the apiary industry, thus curbing any further damage. The captured wax worms would then be carried to the concentrated regions of ocean garbage patches e.g. The Great Pacific Garbage Patch which consists of more than 1.8 trillion pieces

of plastic weighing around 80000 tons, The North Atlantic garbage Patch which has a density of 200000 pieces of trash per square kilometre etc. The worms would be stored in the different storage facilities near the concentrated regions, from where drones would be utilized to take them to the final destination. A suitable binding agent (e.g. Loctite Vinyl - Plastic Flexible adhesive which is water proof and creates a flexible bond that would not breakdown from sunlight or UV exposure) would be used to bind the loose plastic litter drifting on ocean over an extensive area to convert it into a rock solid mass of garbage. Additionally drones would be used to first spray binding agent and then wax worms on the concentrated regions of the garbage patch. The use of drones makes the project labour and energy inexpensive and also cost effective. This will also save time taken to spray through any other means. There would be no need to extract plastic from the ocean since its bio degradation would take place in the ocean itself over a period of time. Another advantage to the use of wax worms is that they are raised for the sole purpose to be used as fish bait. Therefore serving several purposes of bio degrading the plastic and then acting as fish bait and preventing harm to the bee hives by removing it from them. So the same plastic litter which used to cause death and injury to the marine life would no longer do the same, instead the wax worms used in the project would help in flourishing marine life.





However this is just a theoretical idea and hence practical research has to be carried to answer several questions like what will be the environmental impact of introducing trillions of invasive species (G. MELLONELLA) on oceans and crops? What is the effectiveness of degradation rate compared to amount of plastic in ocean? Will it be efficient? What is the impact of degradation process on water

(toxicity,development of microorganisms etc.)? What is the environmental impact of binding agent? How effective is it? Is it suitable for microplastics? What is the effect of ethylene glycol on marine ecosystem? Therefore we propose to carry further research and development to get answers of several such questions and to prove its feasibility. With further research, we can also plant the enzyme/bacteria strain causing plastic degradation on E.coli bacteria or phytoplankton while keeping in mind the fact that DNA modification doesn't destroy the balance of ecosystem.

Conclusion

Millions of pieces of micro and macro plastic get accumulated into the ocean everyday. Ocean plastic pollution has wide spread and extreme effect on aquatic life and kills thousands of seabirds, fish, turtles etc. Samples taken by scientists at the Scottish Association or Marine Science of the Western Isles found that 48% of the creatures found at a depth of 2000m had plastic in them (source: azocleantech.com). A UN Ocean Conference report from 2017 also stated, "Every year about 1000000 seabirds and 100000 marine mammals die from contact with our plastic waste". Human life also gets affected indirectly when they consume the seafood affected by the plastic pollution. Plastic toxins cause hormonal abnormalities and developmental problems in living organisms. Several emerging technologies and remedial solutions are being worked on to end this menace. However, their success rate is meagre and have severe impacts on environment. Technology alone cannot end ocean plastic. Therefore, we as children of mother earth have to immediately take responsibility to prevent further escalation of this global crisis. This can be done by spreading awareness in our neighbourhood, replacing plastic used in our daily lives by other eco friendly means, using sustainable means like recycling, reusing and reducing. A big difference can only be created by a series of small changes.

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BLACK FUNGUS AND CORONAVIRUS

*Barbara Sawicka, **Krishnan Umachandran, #Estabraq Rashid

[1]Department of Plant Production Technology and Commodities Science, University of Life Science in Lublin, Poland*

***General Manager, Nelcast Ltd., India*

#Head of the English Department, College of Basic Education, Almustansiryah University, Iraq

Abstract

The aim of the study was to determine the influence of the SarsCov2 virus on the spread of the black fungus, a dangerous and even deadly disease that spreads mainly in Asia. The etiology of this disease, symptoms and diagnosis, clinical significance, identification, relationships between this disease and diabetes and coronavirus infection are discussed. In addition, treatment and prevention options were analyzed, especially in patients with chromoblastomycosis, as well as prophylaxis. Patients with diabetic ketoacidosis have been shown to be at a higher risk of developing the black fungus known as Mucormycosis. Patients with a positive coronavirus test are also exposed to black fungus infection. The disease spreads through the respiratory tract, affecting people with weakened immune systems and those treated with steroids. Black fungus symptoms vary depending on where it resides, leading to a variety of facial and cerebral symptoms. It has been established that the fungus does not spread between humans or between humans and animals, but is usually found in people who are immunocompromised or are taking medications that reduce the body's ability to fight germs and diseases. Mucormycosis, in conditions of high humidity and high temperature, can prove fatal as the risk of transmission increases, especially in the event of the SarsCov 2 pandemic. In the near future, this fungus could pose a very real problem to human health worldwide.

Keywords: *black fungus, diabetes mellitus, invasiveness, immunity, prevention, treatment, SarsCov2*

ICIMR-2021: 23rd & 24th August, 2021

Introduction

At a time when India is struggling with an increasing number of deaths caused by SARS-CoV-2 coronavirus infection, doctors warn against a so far rare fungal infection caused by the so-called black fungus. If left untreated, the disease can become dangerous and even lead to death. Mucormycosis, or "black fungus", is increasingly affecting COVID-19 patients. Experts are alarming that half of the patients who develop the infection die. Black fungus cases have been reported in hospitals in Delhi, Pune and Ahmedabad. In the state of Gujarat, about 300 cases have now been reported in four cities. New infections are coming so quickly that the governmental pandemic team in India has issued a special message warning of the disease. India is also not the only country with reported cases of the "black mushroom". Other cases have also been reported in several other countries, including the UK, US, France, Austria, Brazil and Mexico, but the number is much greater in India [Biswas 2021, Parakash & Chakrabarti, 2021]. Rhinocerebral (Sinus and Brain) *Mucormycosis* is an infection in the sinuses that can spread to the brain, commonly affecting people with uncontrolled diabetes and those who had kidney transplant. Pulmonary (Lung) *Mucormycosis* is common among people with cancer and also with organ transplant or a stem cell transplant. Cutaneous (Skin) *Mucormycosis* occurs after the fungi enter the body through a break in the skin, due to surgery, burn injuries or skin trauma, and have a weakened immune system. Gastrointestinal *Mucormycosis* is more visible among young children, especially premature and low birth weight infants less than 1 month of age, who have antibiotics, surgery, or medications that lower the body's ability to fight germs and sickness. Disseminated Mucormycosis happens when the infection spreads through the bloodstream to affect another part of the body, and most commonly affects the brain, spleen, heart, and skin [Petrikkos et al. 2012, Skiada et al. 2013, Binder et al. 2014, Danion et al. 2014, NORD 2018, Kumar 2021, Parakash & Chakrabarti, 2021]. Transmission of black fungus occurs through inhalation, inoculation, or ingestion of spores from the environment affecting the lung or sinus forms of the infection, as someone inhales the spores from the air. Mucormycosis is an uncommon angioinvasive disease, resultant of a fatal fungal infection that usually affects patients with altered immunity, caused by mold fungi of the genus *Rhizopus, Mucor, Rhizomucor, Cunninghamella* and *Absidia* of order- *Mucorales,* Class- *Zygomycetes* [Ibrahim & Kontoyiannis 2013, Parakash & Chakrabarti, 2021]. The facilitating

environment for Mucorales spores to germinate in people with COVID-19 is low oxygen, high glucose, acidic medium, high iron levels and decreased phagocytic activity of white blood cells (WBC) due to immunosuppression coupled with several other shared risk factors including prolonged hospitalization with or without mechanical ventilators [Kumar et al., 2021]. The burden of black fungal diseases are acute, severe, eye infection, and chronic based on population and disease demographics. Black fungus infected patients are those who have had exposures that put them at risk for fungal eye infections, lasting for several days to several weeks after the fungi enter the eye, leading to eye pain, redness, blurred vision, sensitivity to light, excessive tears and discharge. Though surgery is vital to remove dead tissue, the therapy can use antifungal agents posaconazole (oral) and isavuconazole, but are expensive unlike the affordable Intravenous amphotericin B [GAFFI, 2020].

Material and Methods

The following databases: PubMed, ScienceDirect, Google Scholar, ProQuest, Semantic Scholar and Cochrane were searched using the following key terms: "antidiabetic compounds", "bioactive compounds" or "natural compounds", and "carbohydrates" "herbal carbohydrates", "Health" and "type 2 diabetes", "SarsCov2", "pathogenic fungi", black fungus "

Admission Criteria. It included research studies (in silico, in vitro and in vivo) using various research models such as human cell lines and laboratory animals that have reported that carbohydrates have health effects, including type 2 diabetes, also in languages other than English, so as not to limit the scope of work. In addition, a manual search was performed to locate previous research articles based on references to published narrative articles and systematic review articles.

Exclusion criteria. Studies that looked at other types of disease were excluded. Search results were limited to original scientific articles published between 2001 and 2021. Duplicate articles from different databases were searched and only one was kept. Data on the "black fungus", the effects and the place of their occurrence were extracted**.**

Results

Symptoms and Diagnoses

General symptoms are one-sided facial swelling and numbness, headache, nasal or sinus congestion, black lesions on nasal bridge or upper inside of the mouth, fever, abdominal pain, nausea and gastrointestinal bleeding. Disseminated type occurs in those who are already sick from other medical conditions, posing more complications in detection of the symptoms are related to mucormycosis, at times those infections in the brain can lead to mental status changes or coma. Diagnosis and Testing considers medical history, symptoms, physical examinations, and laboratory tests while diagnosing those suspected of the infection [Kameshwaran, et al. 2021]. Collection of a sample of fluid from the respiratory system or may perform a tissue biopsy with a small sample of affected tissue is analysed in a laboratory for evidence of mucormycosis under a microscope or in a fungal culture. Coronavirus damages airway tissue and blood vessels, thereby increasing susceptibility to fungal infection. Immediate initiation of therapy is critical due to the infection nature such as acute, and fulminate. Depending upon the results such as presence of predisposing conditions, signs and symptoms of disease, observation of fungal elements, and smears of material [Branscomb 2002; Biswas et al. 2021]. General cleanliness includes visible dust, dirt, and stains; evidence of fungal growth and damage such as visible mold and mildew, stains, mold odor, fungal growth on drywall surface or underneath wall coverings, fungal growth on building's interior support structures and building materials; and evidence of air intrusion from outdoors or from other adjacent spaces likely that of the status of window seals, seals surrounding plumbing pipe intrusions, and lack of self-closing doors are pertinent patient care areas and locations based on relevance to potential exposures, as per epidemiologic review of initial cases [USDHHS, 2020].

Clinical Significance

In order to understand the pathology of the black fungus that causes brain infections in East Asian patients, it is necessary to understand its natural ecological niche. From the relatively low degree of molecular variability of the black yeast *Exophiala dermatitidis*, a potential factor causing

infections in East Asian patients, it can be concluded that this species is a new pathogen currently undergoing active speciation. It has been found to be an oligotrophic fungus under conditions of a hot, humid environment, such as e.g. in steam rooms. Strains of *Cladophialophora*, *Fonsecaea*, and *Ramichloridium*, known to humans as inducers of chromoblastomycosis, are often found on aggregated, rotten plant material. However, the molecular biodiversity of fungi in the environment is much higher than in humans, so it is difficult to precisely trace the etiological factors of the disease. This approach has been successful for *Cladophialophora carrionii*, whose muriform-like cells, a tissue form of chromoblastomycosis, are found in cactus drying spines. The performed phagocytosis tests can provide methods of distinguishing both pathogens and non-pathogens, since the killing rates of strict saprobes turned out to be significantly higher than in species known to be pathogens. Therapeutic options for patients with chromoblastomycosis were discussed, of which muriform cells, i.e. the tissue form of chromoblastomycosis, are found, for example, in drying spines of cacti [de Hoog et al. 2000, Song et al. 2017, Kameshwaran et al. 2021].

The human body is influenced by physical activity and diet. The latter must be nutritionally balanced, contain the right type and amount of carbohydrates. Increasing or reducing the amount of carbohydrate above the desired amount can affect both physiological and metabolic processes. Increasing the amount of simple carbohydrates can cause obesity, a disease that puts people at even greater risk of disorders such as cardiovascular disease. Carbohydrate consumption also contributes to the growing epidemic of non-insulin dependent diabetes (type 2 diabetes). However, foods high in non-starch polysaccharides and foods with a low glycemic index protect against diabetes. Increased sugar consumption also contributes to the development of tooth decay [Kameshwaranet al. 2021]. Carbohydrate malabsorption can manifest as constipation, diarrhea, gas and stomach pain. It may occur as a result of congenital or acquired defects in the metabolism of enzymes or the intestinal mucosa. Celiac disease and Crohn's disease are examples of secondary malabsorption. Bacterial overgrowth of the small intestine (SIBO) can occur as a result of gastric bypass or gastric bypass disorders (chronic diabetes, scleroderma), causing impairment of the absorption interface and severe absorption disorders. Lactose intolerance, on the other hand, is a primary lactase deficiency. Lactase is an enzyme that breaks down lactose, disaccharide, into glucose, and galactose in the brush border of enterocytes into monosaccharides. Lactase deficiency

is the most common enzyme deficiency in the world [Song et al. 2017, Wang et al. 2020]. The most frequently used method for diagnosing carbohydrate malabsorption is the hydrogen exhalation test. With incomplete absorption, undigested carbohydrates enter the colon, where there are hydrogen-producing bacteria. The hydrogen level (H2) is measured on the first expiration. Unmetabolized carbohydrates have an osmotic effect in the digestive tract and contribute to the symptoms of diarrhea and flatulence. Treatment of most carbohydrate malabsorption disorders involves avoiding the accompanying mono- or disaccharides [Hammer & Hammer 2012, Raithel et al. 2013].

1. Identification

Although Exophiala are environmental fungi, their presence in clinical specimens should not be disregarded as an impurity [Woo et al. 2013]. Black fungi have been known for decades, but they are among the most difficult to identify groups of fungi, therefore diagnostic ambiguities have often occurred in the past [de Hoog et al. 2000]. Due to the advancement of molecular techniques and the availability of the DNA sequences of various gene loci in sequence databases such as GenBank, it was possible to identify Exophial down to the species level. Initially, it was intended to recover Candida species from this patient's samples. However, we did observe the appearance of unusual dark colonies on the SDA plates. The darkness of the color grew as the culture grew old and appeared as a "black mushroom" within a few days. To obtain a pure culture, black fungal colonies were grafted onto the SDA in the second round, which were then Gram stained. In two, two black fungal isolates were found, and the mouthwash samples were named [Binder et al. 2014, Seneviratne et al. 2015, Kumar 2021].

Seneviratne et al. [2015] described the first case of isolation of the species *E. dermatitidis* from the human oral cavity. E. dermatitidis is considered a new systemic pathogen in Southeast Asia [de Hoog et al. 2000]. Fatal brain infections and disseminated black fungi have previously been reported in China, with *E. dermatitidis* being one of the causative agents [Li et al., 2011]. Previously, isolation of this species from the oral cavity in humans has never been reported. These Authors described a case of two strains of *E. dermatitidis* isolated from the obturator of a patient

with NPC during IMRT. They also performed a comprehensive molecular analysis of the isolates and characterized their phenotypic behavior in terms of antifungal susceptibility. They also obtained pioneering data on virulence attributes such as biofilm formation, hemolysin and proteinase determination. One of these *E. dermatitidis* isolates was resistant to caspofungin and amphotericin B, the two best antifungal drugs on the market for systemic fungal infections. This discovery justified further clinical trials on the dangerous fungal pathogen, especially in the growing immunocompromised population, including patients with NPC [Li et al., 2011, Rodrigues & Albuquerque, 2018].

The Relationship between the Disease and Diabetes

Severantes et al. [2015], Kumar [2021] and others [Club Nova et al. 2009, Binder et al. 2014, Wang et al. 2018, Li et al. 2019] believe that mucormycosis may be associated with the use of steroids such as dexamethasone, which are used to treat severe COVID-19. Steroids reduce lung inflammation in the case of SARS-CoV-2 coronavirus infection, but they also lower immunity and raise blood sugar levels in both diabetics and non-diabetic patients. It is believed that this large decline in immunity may put people at risk of developing mucormycosis. People with diabetes, also those who use steroids, take oxygen for a long time, and patients with a severe course of COVID-19 are most at risk of developing the infection. Vigilance should also be maintained in patients after chemotherapy and taking long-term immunosuppressants [Seneviratne et al. 2015, Kumar 2021].

Carbohydrates, and especially oligosaccharides, polysaccharides and glycoconjugates, are the most important part of the bioactive ingredients of natural products used in diagnostics, therapy, food additives, as well as in various biomaterials [DeFronze 1999, Club Nova et al. 2009, Wang et al. 2018]. The greatest endocrine disease related to metabolic disorders and carbohydrate metabolism characterized by elevated fasting blood glucose is diabetes mellitus (DM). While the cause of elevated blood glucose may be related to either too little or too much insulin, the complications of chronically high serum glucose are devastating to humans. Untreated DM can lead to serious complications. The significant morbidity and mortality of diabetes mellitus is due to macrovascular complications [Wang et al. 2018, Bolla et al. 2019]. DM is becoming a

devastating scourge, and despite the increase in the number of new drugs to treat and prevent the disease, its prevalence is increasing. For this purpose, nutritional therapies are being considered, including the use of alternative systems of medicinal plants and herbal foods [Mahomoodally et al. 2012; Wang et al. 2018, Bolla et al. 2019].

Together with dietary raw materials, plant preparations have been and still are the basis of disease management, even after the introduction of insulin [Mahomoodally et al. 2012]. Activities such as: manipulating carbohydrate metabolism through various mechanisms, preventing and restoring β-cell integrity and function, or insulin-releasing activity, improve glucose utilization by medicinal plants and inhibit the activity of digestive enzymes and provide a good opportunity to transform them into therapeutic ingredients nutritional [Sawicka & Gupta 2018,]. Recently, there is more and more work on the potential of medicinal herbs and food plants with antidiabetic activity to inhibit α-amylase and α-glucosidase, which leads to significant progress in understanding the activity of α-amylase and α-glucosidase, and thus to the development of new pharmacological agents [Anonymous 2019, Ratanakiri, et al. 2020]. A-amylase is believed to inhibit the gastrointestinal and metabolic effects, which may help not only in the treatment of postprandial hyperglycemia. Recently, the production and sale of α-amylase and α-glucosidase inhibitors that block digestion and absorption of ingested carbohydrates (mainly starch) have been promoted as a means of rapid weight loss. Patients are demanding new natural dietary supplements known as 'carbohydrate or starch blockers' and suggest that diets may eat carbohydrate-rich foods without experiencing weight gain or increased caloric intake [Bolla et al. 2019, Mahomoodally et al. 2012]. Today, many traditional and exotic species of herbs and foods are used in folk medicine to treat a variety of ailments, including chronic diseases such as DM [Mahomoodally et al. 2012, Sawicka & Gupta 2019]. Many kinds of extracts from various exotic as well as traditional species of herbs and food plants are registered as decoctions or "extracts" and commonly used as nutritional supplements [Anonymous 2019, Li et al. 2019, Rattanakiat et al. 2020]. Nevertheless, there is a need for its constant, constant supplementation or renewal. Carbohydrate analysis is essential to understanding structure-function relationships.

Treatment

Treatment with prescription for antifungal medicine requires surgery to cut away the infected tissue. There is no vaccine to prevent mucormycosis and it is quite difficult to avoid the omnipresent fungi in the environment. Early detection can prevent loss of eyesight, nose or jaw through clinical intervention, while those with weakened immune systems may reduce the chance of developing the infection by avoiding areas with a lot of dust like construction or excavation sites, direct contact with water-damaged buildings, flood water after hurricanes, natural disasters, and activities involving close contact to soil, often associated with decaying organic material such as fruit and vegetables. Upon establishing the diagnosis, immediately correct hypoxia, acidosis, hyperglycemia, and electrolyte imbalance; while discontinuing steroids, anti-metabolites, and immunosuppressive drugs. Surgery should be undertaken, with amphotericin B therapy, continued until remission is achieved with Liposomal amphotericin B [Branscomb, 2002]. Mucormycosis is a highly lethal fungal infection in immunocompromised and a severe one in renal transplant recipients. Surgical debridement combined with antifungals, especially liposomal amphotericin B and posaconazole, can significantly improve a patient's overall survival [Ibrahim & Kontoyiannis 2013, Katragkou et al. 2014, Song et al., 2017].

None can be spared

Thousands of mucormycosis cases have been reported following India's second wave of COVID-19 cases. This fatal, neglected disease has finally been highlighted all over the world [Cornely et al. 2019, Millon et al. 2019, Biswas 2021, Kumar 2021, Parakash & Chakrabarti 2021]. Among physicians, lack of personal protective equipment is the most commonly cited cause of thier death. Exemption of elederly physicians from front-line work can save some lives. Mucormycosis burdens the immunocompromised patients, using drugs that suppress the immune system such as corticosteroids. However the mortality can be delayed with newly developed pathogenesis medications requiring injection of antifungal agents, surgical intervention and timely dosage of antifungal therapy. However, the treatment differs in species and effects on the human body varying widely between developed and developing nations. While it is less common and seen only in patients with haematological malignancies(HM) in developed regions; it is common in patients

with uncontrolled diabetes mellitus or trauma in developing countries [Kumar, 2021]. Fatality rate with mucormycosis is as high as 90%, rapid dissemination of mucormycosis is an extraordinary phenomenon and even a delay of 12 h in the diagnosis could be fatal. 50% of cases of mucormycosis have been diagnosed only in the post-mortem autopsy series, where its temporal associations in relation to comorbidities, association with drugs being used in COVID-19 and overall characteristics of patients had a cumulative outcome [Kumar et al., 2021]. Patients with leukemia or lymphoma suffering from the pulmonary form usually die from the infection due to GI tract infection [Wang et al. 2020]. The overall mortality is high, as death results in 2 weeks if untreated or unsuccessfully treated [Branscomb, 2002]. Fungal diseases are clinically silent in their early stages and can mimic other infections. Hospitals in underdeveloped countries have little or no diagnostic capability for complex test formats, expense, inadequate laboratory infrastructure and a lack of training are all barriers to black fungus diagnostic testing [Song et al. 2017, GAFFI, 2020]. Seneviratne et al. [2015], Bongomin et al. [2017], Rodrigues & Albuquerque [2018] showed that black fungus isolates are resistant to caspofungin, the main antifungal agent in systemic candidiasis. Since little is known about the black fungus in clinical settings, it is important that clinicians stay abreast of new discoveries in this field.

Conclusion

Controlling black fungal infections require more awareness towards better tests to diagnose them at the early stage, focus on controlling diabetes and using corticosteroids wisely. Patients will need access to timely surgery and antifungal treatment. Many biotic and abiotic factors can influence the treatment of mucormycosis, including: underlying health condition related to infection (e.g., diabetes, haematological cancer, etc.), location and extent of infection, time to appropriate diagnosis and treatment initiation, age, general health status and other factors.

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EFFECTIVE USE OF RUBRICS ASSESSMENT TOOL IN DEVELOPING BASIC EDUCATION STUDENTS' ACHIEVEMENT IN BASIC SCIENCE IN JALINGO EDUCATION ZONE, TARABA STATE, NIGERIA

Igoh Sunday Adah
Department of Science Education Taraba State University, Jalingo

Abstract

The study examined the effective use of rubric self-assessment tool in developing basic education students' achievement in basic science. Quasi experimental design was used for the study. The population of the study was 36,000 Basic education students. A sample size of 76 students. 2 intact classes of 42 and 34 Upper basic II students were used as sample of study. Three objectives, three research questions and three hypotheses were raised to guide the study. Basic Science Achievement Test (BSAT) developed by the researcher was used for data collection. Mean and standard deviation were used to answer the research questions while the hypotheses were tested using ANCOVA at 0.05 level of significance. Results obtained among others indicated that students under Rubric self-assessment tool scored higher than those taught using a conventional method. It was therefore concluded that Rubric self-assessment tool empowers students' learning in basic science. It was recommended among others that effective use of Rubric assessment tool should be used to enhance the teaching and learning of Basic Science.

Key words: *Basic Education, Basic Science, Students' Achievement, Rubrics Assessment tool, Gender*

Introduction

The Universal Basic Education (UBE) programme in Nigeria was launched in 1999, with the goal of providing "free, universal and compulsory basic education for every Nigerian child aged 6-15 years", UBE (2018).The onset of basic education programme in Nigeria ushered in Basic Science as one of the core subjects to be studied in order to pave way for the scientific and technological development of the nation. Basic Science is basic training in scientific skills which are required for human survival, sustainable development and societal transformation (Chukwuneke & Chinkwenze, 2012).This implies that effective teaching and learning of the subject could lead to the attainment of the sustainable development Goal of the nation.

Basic Science, as a core subject plays a major role in exposing learners to the world of Science and prepares them for higher education in Science and technology. The teaching of Basic Science enables learners to identify problems that are of scientific nature, analyse such problems, engage in critical thinking and thus develop problem solving skills eventually. Basic Science is of great importance because early experiences in science help students to develop problem-solving skills that empower students to participate in an increasingly scientific and technological world (Guyana, 2009).This shows that acquisition of knowledge in Basic science could enable students to contribute to the development of the nation. Basic science provides students unique training in observation, reasoning and experiment in the different branches of science. It helps students to develop a logical mind (Prakash, 2012). This therefore means that adequate knowledge of the subject could enable the learner to become useful to himself and the society at large as well as prepare the learner for further study in science. It was reported in Baiki, (2010) and Agbo, (2018) that, basic science is the bedrock to advance studies in science, technology and engineering. This submission might have been derived based on the objectives of teaching and learning Basic Science as enshrined in the Basic Science curriculum.

According to FME (2012), the objectives of the Basic Science and Technology (BST) curriculum for the first nine (9) years of school are to enable learners to:

- Develop interest in science and technology, acquire basic knowledge and skills in science and technology,
- apply their scientific and technological knowledge and skills to meet social needs,

- take advantage of the numerous career opportunities offered by science and technology, become prepared for further studies in science and technology,
- Avoid drug abuse and related vices, and be safety and security conscious.

The learner is expected to achieve the set objectives of learning basic science by the end of the basic education programme and be ready for secondary school science.

Achievement is the accomplishment of something noteworthy, especially by superior ability, special effort and great courage. Academic achievement is a construct coined to explain and describes the end process of teacher-students' engagement, that is, the teaching and learning process in a formal class room setting guided by a curriculum.

Educational or academic achievement is the specified level of attainment or proficiency in academic work as evaluated by the teacher in a teacher made test or Standardized test or by a combination of both (Deepa & Chamundeswari, 2014). This implies students' academic achievement entails how well an individual learner has done in his or her cognitive task.

According to Duguryil (2012), recent reports show to the contrary that students do not perform well in basic science. Duguryil's view is obvious as shown in students' poor performance in secondary school certificate examination. The poor performance could be related to teachers' inability to use proper assessment tools such as rubrics in teaching basic science effectively.

Educators use assessment tools to make informed decisions regarding strategies to enhance student learning and performance in various subjects. Assessment tools are techniques used to measure a student's academic abilities, skills, and/or fluency in a given subject or to measure one's progress toward academic proficiency in a specific subject area. This could be one of the reasons behind the emphasis on data-driven decision making in education to hold schools accountable and improve the quality of education students are receiving (Mandinach & Jackson, 2012). The most important assessment tool used in Nigerian schools is Test. However, research has shown that tests alone are not a sufficient way of collecting data and determining if students are meeting standards (Mandinach & Jackson 2012).Tests can be a part of "assessment *for* learning;" yet, multiple types of assessments should be used when making academic decisions (Kortez, 2003). The use of assessment strategies are enhanced by the type of assessment tools utilized by the teacher. There are different types of assessment tools, one of which is the Rubrics assessment tool. It provides

additional information about students' performance (Brookhart & Chen, 2014, Andrade & Du, 2005).

Rubrics are a prevalent grading tool used by teachers to assess and provide feedback to their students. As scoring guides, they serve as a way to guide criteria-based assessment and encourage evidence-based decisions in the classroom. They are used in support of the movement toward "assessment *for* learning" (Mandinach & Jackson, 2012, p. 30). The prevalence of rubric use in both secondary and higher education is increasing. Not many years ago mentioning rubrics to faculty members in many fields may have brought forth looks of confusion, consternation, or disinterest. Today, however, the topic of rubrics can be found as part of regular faculty development programs, as standard expectations from accreditors, and as the focus of major cross-disciplinary higher education projects such as the Association of American Colleges and Universities (AAC&U) VALUE rubrics (Association of American Colleges and Universities, 2014). Rubrics are now seen as a way to bring to the surface and make transparent the criteria that faculty members value from assignments which can then serve as a pre-assignment guide, post assignment assessment, and a feedback tool for students. Nonetheless, critics of rubric use exist, often arguing that rubrics may disrespect a faculty member's evaluative expertise or that the focus on specific criteria, to the exclusion of other criteria, limits or constrains creativity which makes the assignment and feedback inflexible. Bloxham, den-Outer, Hudson, and Price (2016) for example, have argued that with detailed assessment criteria, it "is likely to make marking an overly onerous process, limit independent thought and originality in students and encourage middling grades if individual criteria are scored". Though these voices of dissent continue to grow weaker, they remain a reality in higher education because of the degree of independence often granted to faculty as subject matter experts. Rubrics is a collaborative process that requires discussion leading to evidence-driven consensus; a procedure where examples from students' work are used to justify scores leading to a shared understanding amongst raters. Though resistance remains, it could be argued that the use of rubrics to assess students' learning is becoming mainstream.

Research has shown that students portray a positive attitude and perception on the use of rubrics for its support in learning process (Eshun & Poku, 2013; Kulprasit, 2016; Raposo-Rivas 2016). As important as the benefits of the use of rubrics is to learning, students' gender could have an

influence on basic science students' use of the assessment tool for learning. Gender is the range of physical, biological, mental and behavioural characteristics pertaining to and differentiating between the feminine and masculine (female and male) population (Filgona, 2017). Nwona and Akogun (2015) noted imbalance against girls in science, technology and mathematics. Gender had no effect on academic performance of students (Eravwoke, 2011). Oludipe (2012) investigated the influence of gender on Junior Secondary School Student's academic achievement in basic science Findings of the study revealed that there was no significant difference between the academic achievement of male and female students. However, the results of Odagboyi (2015) showed that there was a significant difference between students' achievement in favour of the males. These findings gave room for inclusion of gender as a moderating variable for this study.

Statement of the Problem

In spite of the relevance of Basic Science as the basis on which scientific and technological studies rest, the achievement of students in the subject has been reported to be poor (Ochu & Haruna, 2015). Basic Science teachers are poorly trained in both content knowledge, assessment techniques and pedagogy (Ibe, 2008 as cite in Datom, 2015).This is possibly one of the factors responsible for poor achievement in secondary school science considering the fact that the subject remains the foundation of science education in Nigeria. Hence, there is a need to attempt other instructional strategies and assessment techniques such as rubrics as a self-assessment tool for enhancing teaching and learning.

Purpose of the Study

This research is aimed at encouraging the effective use of Rubric Self-assessment tool in developing Basic education students' interest in Basic science. Specifically the study intends to;

1. Find out the difference in the mean achievement scores of students assessed using rubric self-assessment and those assessed without the use of rubric self-assessment in Basic Science.

2. Find out the difference in the mean achievement scores of male and female students assessed using rubrics self-assessment in Basic science.
3. Find out the significant interaction effect of treatments and gender on students' achievement in Basic science.

Research Questions

1. Is there any difference between the mean achievement scores of students assessed using rubric self-assessment and those assessed without the use of rubric-referenced self-assessment in Basic Science?
2. Is there any difference between the mean achievement scores of male and female students assessed using rubric self-assessment in Basic Science?
3. Is there any significant interaction effect of treatments and gender on students' achievement in basic science?

Hypotheses

1. There is no significance difference in the mean academic achievement scores of students assessed using rubric self-assessment tool and those assessed without the use of rubric self-assessment tool.
2. There is no significance difference in the mean achievement scores of male and female students assessed using rubric self-assessment.
3. There is no significant interaction effect of treatments and gender on students' achievement in Basic science.

Materials and Method

This study adopted the quasi-experimental design. Specifically, the pre-test post-test non-equivalent control group design. The study was carried out in Jalingo education zone, Taraba State, Nigeria. The sample for the study was drawn using multi stage sampling technique. Out of the three local government areas in the education zone under study, Jalingo local government area was

selected using simple random sampling. Two government owned co-educational schools with three streams of upper basic II classes were purposively selected. This was followed by the sampling of one intact classroom from each of the sampled schools using random sampling making a total of 2 intact classrooms. One of the two intact classes was designated experimental group while the other class was designated control group. A sample of seventy six (76) upper basic II science students drawn from the two intact classes out of which 44 are males and 32 females were involved in the study. From the sample size, 42 students were used for treatment group and 34 students were used for control group. The instrument used for data collection developed by the researcher was a 60-item multiple choice known as Basic Science Achievement Test (BSAT). The instrument covered the three main topics in the basic science curriculum: Work, Energy, and Power and Simple machines. This is because these topics are the basic main topics in the basic science subject. To control for possible pre-existing differences in overall ability between the experimental and control groups, a pretest was administered to both groups before the commencement of the experiment in the respective schools. The experimental group was taught with rubric self-assessment tool while the control group was taught with conventional strategy using the same content outline for four weeks. Research questions were answered using mean and standard deviation while the hypotheses were tested at 0.05 alpha level significance using analysis of Co-variance (ANCOVA)**.**

Results

Research Question 1: Is there any difference between the mean achievement scores of students assessed using rubric-referenced self-assessment and those assessed without the use of rubric-referenced self-assessment in Basic Science?

Table 1

Mean Achievement and Standard Deviations of Pretest and Posttest of Experimental and Control Groups

Group	n	Pretest		Posttest		Mean
		Mean	Std.Dev.	Mean	Std.Dev.	Gain
Treatment	42	18.64	2.93	44.55	5.11	25.91
Control	34	18.79	2.91	41.79	6.08	23.00
Mean Difference		0.15		2.79		

Results of Table 1 show that the posttest mean achievement scores of students taught Basic science with Rubrics assessment tool is 44.55 with standard deviation of 5.11, while that of those taught without Rubrics assessment tool is 11.70 with standard deviation of 6.08. The difference between the pretest and posttest achievement mean scores of Rubrics assessment tool is 25.91.32 and that of without Rubrics assessment tool is 23.00. These differences show what were achieved by the two groups. There is also a difference of 2.76 between the posttest mean scores of the two groups; which is in favour of the Rubrics assessment tool; with mean gain of 2.91. The implication is that the students taught Basic science with the use of Rubrics assessment tool gained in achievement more than their counterparts who were taught without Rubrics assessment tool.

This further suggested that rubric self-assessment could enhance students' learning in basic science.

Research Question 2:

Is there any difference between the mean achievement scores of male and female students assessed using rubrics self-assessment in Basic Science?

Table 2

Mean Achievement and Standard Deviations of Pretest and Posttest based on Gender of Experimental Group

Group	n	Pretest		Posttest		Mean
		Mean	Std.Dev.	Mean	Std.Dev.	Gain
Male	24	18.54	2.95	43.46	4.43	24.92
Female	18	18.78	2.98	46.00	5.71	27.21
Mean Difference		0.24		2.54		

Results of Table 2 show that the posttest mean achievement scores of male students taught Basic science using Rubrics assessment tool is 43.46 with standard deviation of 4.43, while that of the female students is 46.00 with standard deviation of 5.71. The difference between the pretest and posttest mean scores of the male students is 24.92 and that of the female students is 27.21. These differences show what were achieved by the male and female students. The difference between the posttest mean scores of the two sexes is 2.54 and the mean gained in favour of the female students is 2.29. The implication is that the female students taught Basic science using Rubrics assessment tool gained in achievement more than their female counterparts.

Research Question 3:

Is there any significant interaction effect of treatments and gender on students' achievement in basic science?

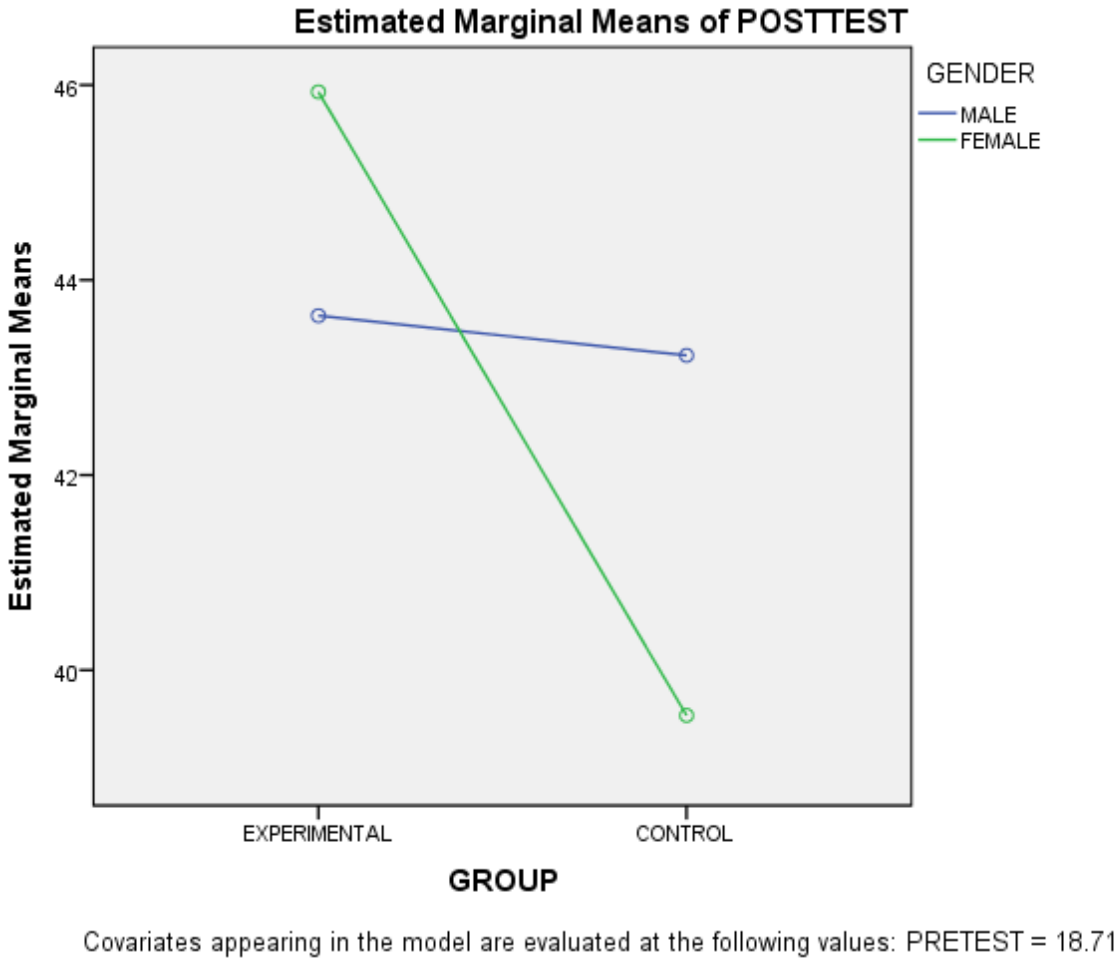

Figure 1: Interaction Effect of Treatments and Gender on Students' Achievement in Basic science

In Figure 1, the profile plot/graph shows the interaction effect of Treatment and gender on students' Achievement in Basic science. The interaction pattern shows that the plots for males and females intersect between Rubrics assessment tool (experimental group) and those without Rubrics assessment tool (control group). This indicates that there is interaction effect between treatments and gender. The interaction is tenable in this case when Rubrics assessment tool is used along with those without Rubrics assessment tool in Basic science class.

Hypotheses

The hypotheses that guided the study were tested at 0.05 level of significance and their results are placed in the tables below:

HO₁: There is no significance difference in the mean academic achievement scores of students assessed using rubric self-assessment tool and those assessed without the use of rubric self-assessment tool.

Table 3
One-way Analysis of Covariance of the Mean Achievement Scores of the Experimental and Control Groups

Sources of Variation	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	949.604[a]	2	474.802	23.343	.000	.390
Intercept	851.787	1	851.787	41.878	.000	.365
Pretest	807.146	1	807.146	39.683	.000	.352
Group	**160.597**	**1**	**160.597**	**7.896**	**.006**	**.098**
Error	1484.597	73	20.340			
Total	145030.000	76				
Corrected Total	2434.421	75				

Table 3 is one-way ANCOVA between groups' analysis of covariance to compare the effect of Rubrics assessment tool and without the use of Rubrics assessment tool in Basic science. The result $F(1, 73) = 7.896$, $P = .000 < 0.05$ shows that the two groups differ significantly. Thus, the null hypothesis is not retained. Therefore, there is a significant difference between the mean achievement scores of students taught Basic science using Rubrics assessment tool and students taught without assessment tool. The effect size (eta square = .098) is very low and it indicates that 9.8% of the difference in the mean score is based on the assessment tool used.

HO₂ : There is no significance difference in the mean achievement scores of male and female students assessed using rubric self-assessment.

Table 4: One-way Analysis of Covariance of the Mean Achievement Scores of Male and Female Students taught Basic science using Rubrics self-Assessment tool

Sources of Variation	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	271.96[a]	2	135.548	6.597	.003	.253
Intercept	914.467	1	914.467	44.507	.000	.533
EXP-Pretest	204.650	1	204.650	9.960	.003	.203
EXP-Gender	**57.262**	**1**	**57.262**	**2.787**	**.103**	**.067**
Error	801.308	39	20.546			
Total	84421.000	42				
Corrected Total	1072.405	41				

Table 4 is one-way ANCOVA between gender analysis of covariance to compare the effect of Rubrics Assessment on male and female students' achievement in Basic science. The result F (1, 39) = 2.787, P = .103 > 0.05 shows that the variation of scores for male and female students of Rubrics Assessment tool group is the same. Thus, the null hypothesis is retained. Therefore, there is no statistically significant difference between the mean achievement scores of male and female students taught Basic science using Rubrics Assessment tool. The effect size (eta square = .067) is very low and it indicates that 6.7% of the difference in the mean score is based on gender.

HO_3 : There is no significant interaction effect of treatments and gender on students' achievement in Basic science.

Table 5: ANCOVA of Interaction Effect of Treatments and Gender on Students' Achievement in Basic science

Sources of Variation	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1111.418[a]	4	277.855	14.811	.000	.457
Intercept	946.747	1	946.747	50.808	.000	.417

Pretest	666.170	1	666.170	35.751	.000	.335
Treatments	**211.641**	**1**	**211.641**	**111.358**	**.001**	**.138**
Gender	**8.808**	**1**	**8.808**	**.473**	**.494**	**.007**
Treatments X Gender	**159.925**	**1**	**159.925**	**8.582**	**.005**	**.108**
Error	1323.003	71	18.634			
Total	145030.000	76				
Corrected Total	2434.421	74				

Table 5 is two-way ANCOVA between groups analysis of covariance to assess the effect of the use of Rubrics Assessment tool and without the use of the tool on male and female students in Basic science. After adjusting the mean for the pre-test scores, the result F (1, 76) = 8.582, P = 0.005< 0.05 shows that there was significant interaction effect of treatment and gender on posttest scores of students in Basic science achievement test. This implies that the null hypothesis is rejected. Also, the effect size (eta square = .108) is low; hence the effect size is insignificant. The effect size indicates that only 10.8% of the difference in the mean score is based on the assessment tool used. However, the main effect for treatment: F (1, 100) = 111.358, p = 0.001 is significant. But for gender effect: F (1, 76) = 8.582, p = 0.494, it is insignificant.

Discussion of Results

The results of this study revealed that the students taught basic science with rubric self-assessment tool (treatment group) performed better than the students taught with conventional method. In other words, the difference between the adjusted mean achievements of the treatment group was significant in favour of the treatment group. This difference was significant as revealed by the analysis of covariance (ANCOVA), F (1, 73) =7.896, P=.000<0.05. This implies that the use of Rubrics assessment tool in teaching Basic science is effective in enhancing students' learning achievement in the subject. This finding of the study is supported by Tshering and Phu-ampai (2018) study which showed that rubrics enhanced students' learning achievement which led to students' positive opinion towards rubric usage in Educational Assessment and Evaluation. Eshun and Poku (2013) also concluded that in terms of studio based learning, 86% of the students had a positive perception on the use of rubrics for its support in learning process. Similarly, in Raposo-

Rivas‟ (2016) study, almost one in three students (72.4%) were satisfied with the use of rubric in their learning. Equally, Kulprasit (2016) also found that students showed a positive attitude toward the writing rubrics when rubrics were used as assessment for learning in English as Foreign Language (EFL). It is worthy to note that Students' involvement in development of rubrics empowers them to be more engaged and active in their own learning.

It is revealed in the study that the female students had a higher gain score (43.46) in achievement than their male (46.00) counterparts. However, the result F (1, 39) = 2.787, P = .103 > 0.05 shows that the variation of scores for male and female students of Rubrics Assessment tool group is the same. The difference was not significant as revealed by the analysis of covariance (ANCOVA).This findings agree with that of Eravwoke (2011) which showed that Gender had no effect on academic performance of students. This is consistent with Oludipe (2012) who investigated the influence of gender on Junior Secondary School Student's academic achievement in basic science. Findings of the study revealed that there was no significant difference between the academic achievement of male and female students. However, the results of Odagboyi (2015) showed that there was a significant difference between students' achievement in favour of the males, contrary to this finding.

Result of the findings also shows that there was significant interaction effect of treatment and gender on posttest scores of students in Basic science achievement test: F (1, 76) = 8.582, P = 0.005< 0.05. However, the main effect for treatment: F (1, 100) = 111.358, p = 0.001 is significant. But for gender effect: F (1, 76) = 8.582, p = 0.494, there is no significant difference. This implies that there is interaction effect of Rubrics assessment tool (treatment) and gender as revealed in the result. This equally agrees with the findings of Raposo-Rivas‟ (2016) study, which showed that almost one in three students (72.4%) were satisfied with the use of rubric in their learning, and that of Oludipe (2012) which revealed that there was no significant difference between the academic achievement of male and female students.

Rubrics self-assessment seemed to have provided an environment free from stress and boredom in which male and female students have achieved some level of equilibrium in basic science. This could be another tool for reducing gender gap in science education because rubrics self-assessment tool is innovative and have the potential to motivate learners towards learning Science.

Recommendations

i. Rubric assessment strategy should be used to enhance effective teaching and learning of Basic Science.
ii. Students should be encouraged to participate in the creation of rubric for Basic science learning.
iii. Teachers should be trained in routine based workshop to enhanced their skills for assessing learners

Conclusion

These findings have strong implications for the teaching and learning of Basic Science in Nigerian secondary schools. It therefore implies that effective use of Rubric self-assessment strategy have a positive effect on the students' achievement in basic science thereby encouraging students' interest in learning in basic science as a subject

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FACTS AND FEATURES OF ARTIFICIAL INTELLIGENCE FOR FUTURE GENERATION

Dr Swarup Sarkar

Associate Professor, Dept. of Electronics & Communication Engineering, Sikkim Manipal University, Sikkim, India

Abstract

Visualize a forthcoming days when intelligence is not controlled by people and machines can contemplate as well as humans being and their task with them to make an even more exhilarating in the world. While this forthcoming days are still far away and Artificial Intelligence has still created a lot of advancement, In this scenario, there is a huge amount of research being required executed in almost all fields of Artificial Intelligence like medical science, Automobile, **Quantum Computing, Neural network, expert system , Internet of Things, Robotics**, etc. Few of important field of research areas are Large-scale machine learning, Deep learning, Reinforcement learning, Robotics, Computer vision, Natural Language Processing, Recommender Systems, Collaborative systems, Computation of Crowdsourcing and Game theory and intelligent social excellent and many more. The area of modern trained are not restricted to above mention field , it requires high end research another associated field of Artificial intelligence like Internet of Things (IoT), Neuromorphic Computing and many more. There is a long list for expected future trends like Artificial Intelligence for different IT solution, Collaboration with cloud and Artificial Intelligence, Different AI based operating system , Security and Ethical issues related to AI required to be focused. But in the dark side six potential threats to society posed by AI and related technology are identified. The most alarming threats are possible people might lose their jobs due to the huge application of robotics and automation and accountability may be loss due to the use of huge AI systems and the human race might be end due to unlimited success of

AI. Finally we can conclude that the Artificial Intelligence is gift for human society but we must aware its securities & ethical issues and a huge research activities are required to be performed for exploring its optimum possibilities.

THE QUALITY OF LESSON PLANNING AND DELIVERY IN COLLABORATIVE TEAM MEETINGS FOR THE DEVELOPMENT OF FUTURE EFL TEACHERS

Aoda Kadhim Abid

Associate Professor, English Department, University of Al-Muthanna, College of Education for Human Sciences, Iraq

Abstract

The goal of the current study was to determine how a suggested collaborative team meeting method (CTMS) affected the quality of lesson planning and delivery among potential EFL teachers. Participants in the study were the third-year English Department (n=18) at Thi-Qar University in Iraq's College of Education for Human Sciences. Two complete EFL fourth-year practicum groups made up the recruited participants. A pre-post-test one group design was employed in the investigation. A pre-post lesson planning quality evaluation checklist and a lesson delivery quality observation checklist were created and put into use to gather the study's data. The intervention training was a suggested method for team meetings that were collaborative (CTMS). The participants' lesson planning and delivery quality were procedurally pre-assessed before to the intervention. The CTMS was taught to the participants. Lesson design and delivery quality of intervention participants were pre-assessed before, during, and after the intervention. Results showed that the quality of class planning and delivery for aspiring EFL teachers has increased.

Additionally, there was a tepidly favorable link between the caliber of lesson planning and lesson delivery among the potential EFL teachers. Finally, the collaborative team meeting approach (CTMS) proved successful in improving the caliber of lesson planning and lesson delivery among potential EFL teachers

RENDERING THE POETIC BEAUTY INHERENT IN THE SANSKRIT EPICS

Dr Neeraj Kumari

Associate Professor, Sanskrit Department

Thakur Biri Singh Degree College Tundla, Firozabad, India

संस्कृत महाकाव्यों में निहित काव्य सौंदर्य का अनुपादन

डॉ नीरज कुमारी

सह . आचार्य, संस्कृत विभाग, ठाकुर बीरी सिंह महाविद्यालय, टूंडला, फिरोजाबाद, भारत

ABSTRACT

Sanskrit poetry is an important part of Indian literature. This study takes place in relation to various aspects of Sanskrit poetry, including composition, style, rasa, alankara and chhanda. This study is generally distinguished from other forms of Sanskrit literature such as Dharmashastra, Phalitshastra and Itihas. The history of Sanskrit poetry begins from Vedic times. It is found in Vedic poetry such as the Rigveda, the Yajurveda, the Samaveda and the Atharvaveda. The influence of poetry was immense in the world of those days and it played an important role in the development of Sanskrit literature.

सारांश

संस्कृत काव्यशास्त्र भारतीय साहित्य का एक अहम अंग है। यह अध्ययन संस्कृत काव्य के विभिन्न पहलुओं के संबंध में होता है, जिनमें रचना, विधा, रस, अलंकार और छन्द शामिल हैं। यह अध्ययन सामान्यतया

संस्कृत साहित्य के अन्य रूपों जैसे कि धर्मशास्त्र, फलित शास्त्र और इतिहास से अलग होता है। संस्कृत काव्यशास्त्र का इतिहास वैदिक समय से शुरू होता है। वैदिक काव्य जैसे कि ऋग्वेद, यजुर्वेद, सामवेद और अथर्ववेद में पाया जाता है। उन दिनों के जगत में काव्य का प्रभाव बहुत अधिक था और यह संस्कृत साहित्य के विकास के लिए एक महत्वपूर्ण दायित्व निभाता था।

परिचय

संस्कृत काव्यशास्त्र का प्रारंभ वेदों के समय से हुआ था, जब कुछ वेदों के सामान्य अर्थ को संगीत या छंद के माध्यम से अभिव्यक्त किया जाता था। संस्कृत काव्यशास्त्र की उत्पत्ति का अधिकांश श्रेय अनुष्टुभ छंद के विकास को जाता है, जो मुख्य रूप से रामायण और महाभारत के उल्लेखित हैं। इसके बाद भारतीय साहित्य और काव्यशास्त्र का विकास दो विशेष युगों में हुआ: संस्कृत काल और प्राकृत काल। संस्कृत काल में महाभारत, रामायण, मणि कदंबरी, विक्रमोर्वशीयम्, कालिदास के रघुवंश, कुमारसंभव और मेघदूत, जैसी अनेक प्रसिद्ध काव्य रचनाएँ लिखी गईं। वेदों के बाद भारतीय संस्कृति ने महाभारत, रामायण, पुराणों, काव्य, नाटक और तंत्रों जैसी अनेक विधाओं में काव्य लिखना शुरू किया। इनमें से कुछ प्रसिद्ध कविताएं थीं, जैसे तुलसीदास की रामचरितमानस, कालिदास की मेघदूत, विक्रमोर्वशीय और अभिज्ञानशाकुन्तलम्। इन काव्यों में कवि ने विभिन्न चरित्रों को विवरणपूर्ण ढंग से वर्णन किया और उनके विभिन्न भावों को व्यक्त किया। इसके साथ ही उन्होंने छंद, अलंकार, रस, गुण आदि के बारे में भी विस्तृत रूप से विचार किया।

भरतमुनि

भरतमुनि का नाट्यशास्त्र संस्कृत काव्यशास्त्र का प्राचीनतम उपलब्ध ग्रन्थ है। इसमें पाठान्तर इतने हो गये हैं कि विभिन्न स्थानों से प्रकाशित संस्करणों में पद्यों की संख्या तथा अध्यायों में भी भेद है। डॉ. मनमोहन घोष ने अपनी विस्तृत भूमिका सहित सम्पूर्ण नाट्यशास्त्र का अंग्रेजी अनुवाद रॉयल एशियाटिक सोसाइटि कलकत्ता से 1950 ई. में प्रकाशित कराया। नाट्यशास्त्र पर इधर शोधकार्य भी प्राप्त हुए हैं। डॉ. सुरेन्द्रनाथ दीक्षित का ग्रन्थ 'भरत और भारतीय नाट्यकला (राजकमल प्रकाशन, दिल्ली) इस दिशा में महत्वपूर्ण ग्रन्थ है। भरतमुनि को काल्पनिक या वास्तविक माना जाये - इस विषय में भी विवाद चले हैं किन्तु संस्कृत नाट्य - परम्परा में भरत एक आदरणीय आचार्य थे जिनके नाम पर भरत - वाक्य का प्रयोग प्रत्येक नाटक में हुआ है।

'नाट्यशास्त्र' एक विशाल ग्रन्थ है जिसमें नाट्य और काव्य से सम्बद्ध नियमों का विस्तृत विवेचन है। इसके चौखम्बा संस्करण (सं. – बटुक नाथ शर्मा तथा बलदेव उपाध्याय) में 36 अध्याय हैं, जबकि काव्यमाला संस्करण में 37 अध्याय हैं। अभिनवगुप्त इसमें 36 अध्याय ही मानते हैं पद्यों की संख्या 5000 से अधिक है जो मुख्यतः अनुष्टुप छन्द में हैं। गद्यभाग भी इसमें बहुत है । वर्तमान काल में उपलब्ध नाट्यशास्त्र विकास के विभिन्न लक्षणों से युक्त है अर्थात् इसमें समय - समय पर संवर्धन और संशोधन होता रहा था। इसका

रचनाकाल इसीलिए विवादास्पद है। 100 ई. पू. से लेकर 300 ई. तक के काल में इसे वर्तमान रूप मिला होगा- ऐसा बहुमत है। इसकी विषयवस्तु व्यापक है– नाट्य की उत्पत्ति, प्रेक्षाग्रह की प्रस्तुति, रूपक के अभिनय की प्रस्तुति, पूर्वरङ्ग, संगीत, रस-विवेचन, अभिनय के भेद (अष्टम अध्याय), चारी - विधान, मण्डल, गति, प्रवृत्तियों का विवेचन, वाचिक अभिनय के अन्तर्गत भाषाओं तथा छन्दों पर विचार (अध्याय 15 तथा 16) काव्य - विवेचन (17), पात्रों के लिए भाषा - विधान (18), रूपक-भेद (20), कथानक - रचना, वेश-भूषा, स्त्री - पात्रों पर विचार, चित्राभिनय, वाद्य, ताल, लय, पात्र (प्रकृति) भेद तथा नाट्यशास्त्र का महत्व - ये बहुविध विषय इसमें प्रतिपादित हैं ।

नाट्यशास्त्र पर कालान्तर में अनेक टीकाएँ लिखी गयी थीं जिनमें केवल अभिनवगुप्त-रचित 'अभिनवभारती' छिन्न विच्छन्न रूप में उपलब्ध (तथा प्रकाशित) है। इसमें अन्य तीन पूर्ववर्ती टीकाकारों (भट्टोद्भट, शंकुक तथा भट्टनायक) के रस-निष्पत्ति-विषयक सिद्धान्त दिये गये हैं । अभिनवगुप्त ने अपने रस - सिद्धान्त की भी स्थापना की जो अनुवर्ती विद्वानों के द्वारा स्वीकृत है।

अग्निपुराण अनेक विषयों से सम्पूर्ण पुराण है जिसके ग्यारह अध्यायों में (337-47) काव्यशास्त्रीय सामग्री है। इस पुराण के रचनाकाल पर काव्यशास्त्र के विद्वानों में मत भेद है। कुछ लोग इसे पाँचवीं शताब्दी ई. में रखने के पक्षधर हैं तो कुछ इसका काल 12 वीं शताब्दी ई. तक ले आने की अनुशंसा करते हैं क्योंकि भामह, दण्डी, आनन्दवर्धन और भोज तक के सिद्धान्त इसमें हैं। इनमें किसी ने इस पुराण का उद्धरण नहीं दिया है। वस्तुतः पुराणों का जब-जब कोई हस्तलेख बनता था तब-तब उसमें जोड़-घटाव होता रहता था । इसलिए पूरे पुराण को बाद में सिद्ध करना ठीक नहीं । इसके साहित्यिक अंश में काव्यभेद, नाट्य- विचार, रस, रीति, वृत्ति, अभिनय के चार अङ्, अलंकार तथा दोष का विवेचन है। इसी विवेचन पर भामह आदि के सिद्धान्त आश्रित हैं

भामह

भामह का स्थान भरत के अनन्तर प्रथम आचार्य के रूप में समादृत है। इन्होंने 'काव्यालङ्कार' नामक ग्रन्थ की रचना करके 'अलङ्कार - प्रस्थान का प्रवर्तन किया था। यह ग्रन्थ शुद्ध काव्यशास्त्रीय है (क्योंकि नाट्यशास्त्र तो मुख्यतः दृश्यकाव्य- विषयक है) । काव्य का प्रथम लक्षण भामह ने ही दिया । इन्होंने 38 अलंकारों का विवेचन किया। भामह कश्मीर के निवासी थे। इनका समय 550 ई. के आसपास माना गया है । 'काव्यालंकार' में परिच्छेद हैं जिनमें पाँच विषयों का विवेचन है काव्यशरीर, अलंकार, दोष, न्याय तथा शब्दशुद्धि | पूरे ग्रन्थ में 400 श्लोक हैं । इस ग्रन्थ पर उद्भट ने 'भामहविवरण' नामक टीका लिखी थी जो खण्डित रूप से उपलब्ध हुई है । दण्डी

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संस्कृत गद्यकाव्य के इतिहास में सरल - प्राञ्जल - भावपूर्ण गद्य के लेखक के रूप में दण्डी का नाम अमरण है। दण्डी के विषय में अनेक प्रशस्तियाँ सुभाषितों के संग्रह-ग्रन्थों में उपलब्ध हैं । एक प्रशस्ति में वाल्मीकी और व्यास के बाद तीसरा स्थान दण्डी को ही दिया गया है-

जाते जगति वाल्मीकौ कविरित्यभिधाभवत् ।

कवि इतो ततो व्यासे कवयस्तवयि दण्डिनी । ।

अर्थात् वाल्मीकी के आने पर 'कविः' यह शब्द बना, व्यास के आने पर द्विवचन में 'कवि' रूप हुआ और दण्डी का आविर्भाव होने पर ही बहुवचन रूप 'कवयः' हो सका । ऐसे महान् कवि के कृतित्व तथा रचनाओं के विषय में विद्वानों में ऐकमत्य नहीं है

दण्डी का काल

दण्डी के काल के विषय में विद्वानों का एक दल छठी शताब्दी ई० के आसपास रखता है। दोनों दल अन्तरङ्ग और बहिरङ्ग प्रमाणों को इस विषय में सामने रखते हैं अन्तरङ्ग प्रमाणों के अन्तर्गत उनकी तीन रचनाओं (दशकुमारचरित, काव्यादर्श तथा अवन्तिसुन्दरीकथा) की सहायता ली जाती है । बहिरङ्ग प्रमाणों में दण्डी के विषय में अन्य कवियों की चर्चाएँ मुख्य आधार हैं । बीसवीं शताब्दी के आरम्भ्स में कुछ विद्वानों ने दशकुमारचरित में निर्दिष्ट समाज और भूगोल का अध्ययन करके यह निष्कर्ष निकाला था कि हर्षवर्धन के पूर्व गुप्त - साम्राज्य के ह्रासोन्मुखकाल का समाज दण्डी ने देखा था जिसका चित्रण उन्होंने इस गद्यकाव्य में किया। अतः उनका समय छठी शताब्दी ई० के मध्य (550 ई० के आसपास) होना चाहिए । शैली के आधार पर भी दण्डी को सुबन्धु और बाण से पूर्व रखने के प्रयास से प्राप्त हुए हैं । बाण का काल प्रायः निश् चित है कि वे हर्षवर्धन (राज्यकाल 606-48 ई०) के समकालिक थे । बाण के परवर्ती सभी लेखकों पर उनकी शैली का प्रभाव है । दण्डी पर यह प्रभाव नहीं है, अतः दण्डी बाण के पूर्व थे। कॉलिन्स ने अपने ग्रन्थ में संकेत दिया है कि दशकुमारचरित में उपलब्ध भौगोलिक एवं राजनीतिक चित्रण हर्षवर्धन के पूर्व का ही उपपादक है, अतः दण्डी का काल 600 ई० के पूर्व ही होना चाहिए । एम्० आर० काले का भी यही मत है।

दण्डी के काल पर, नये तथ्यों की प्राप्ति से, बहुत प्रकाश पङा है । 1924 ई० में दण्डी की तृतीय कृति 'अवन्तिसुन्दरी' कथा की प्राप्ति हुई । दशकुमारचरित से इसकी शैली का अन्तर है किन्तु कथानक में अद्भुत साम्य हैं। विद्वानों का कहना है कि दण्डी ने युवावस्था में सरल शैली में 'दशकुमारचरित' लिखा था और प्रौढ़ावस्था में आकर उसी कथानक पर परिमार्जित अलंकृत शैली में 'अवन्तिसुन्दरीकथा' की रचना की होगी। कई विद्वानों ने 'अवन्तिसुन्दरीकथा' को सर्वथा अप्रमाणिक ही कहा है किन्तु अनेक विद्वान् इसे प्रामाणिक मानकर दण्डी के काल और वंश का निर्णय करते हैं। इस 'कथा' का सार भी पद्यरूप में प्रकाशित है जिसमें दण्डी के वंश का भी वर्णन है। इस कथा में दण्डी के द्वारा बाण और मयूर की प्रशंसा किये जाने का निर्देश

है। इसमें दण्डी को भारवी (या उनके मित्र दामोदर) का प्रपोत्र एवं काञ्चीनरेश नरसिंहवर्मा (प्रथम) का समकालिक कहा गया है। इसके आधार पर नये विद्वान् दण्डी को 700 ई० के निकट मानने के पक्षधर हैं ।

'काव्यादर्श' के आधार पर भी दो तथ्य प्रस्तुत किये गये हैं-राजा सेन - कृत (846 ई0-866 ई०) सिंहलीभाषा में रचित 'सिय-बस-लकर' (स्वभाषालंकार) नामक काव्यशास्त्रीय ग्रन्थ तथा अमोघवर्ष-रचित (815 ई०) कन्नङ भाषा का अलंकार - ग्रन्थ 'कविराजमार्ग' ये दोनों 'काव्यदर्श' को ही आदर्श बनाकर लिखे गये है। इससे उपर्युक्त 700 ई० वाले मत का विरोध नहीं है ।

पीटरसन तथा याकोबी ने प्राण - कृत ' कादम्बरी' के शुकनासोपदेश में आये हुए एक गद्यांश (केवलं चनिसर्गत एवाभानुभेद्यमरवालोकोच्छेद्यमप्रदीपप्रभापनेयमतिगहनं तमो यौवनप्रभवम्) की तुलना 'काव्यादर्श' के निम्नलिखीत पद से करते हुए दण्डी को बाण का परवर्ती सिद्ध किया गया है-

अर्थालोकसंहार्यमवार्य सूर्यरश्मिभिः ।

दुष्टिरोधकरं यूनां यौवनप्रभवं तमः ।।

इस प्रकार दण्डी का काल 550 ई० से 600 ई० के बीच और 700 ई० के निकट माननेवाले विद्वानों के दो दल हैं। इस विषम स्थिती में उनकी तीन रचनाओं के आधार पर उनके समय की पूर्व तथा उत्तर सीमा का निर्णय आवश्यक है ।

दण्डी ने शाकुन्तलम् नाटक के एक श्लोकांश 'लक्ष्म लक्ष्मीं तनोति' (1/20) का निर्देश काव्यादर्श (1/45) में किया है- लक्ष्म लक्ष्मीं तनोतीति प्रतीतिसुभगं वचः । (2) काव्यादर्श (2/226, 362) में 'चारुदत्त' और 'मृच्छकटिक' से 'लिम्पतीव तमोऽङ्गानि' पद्य दिया गया है। (3) काव्यादर्श (1 / 34) में 'सेतुबन्ध' नामक प्राकृत काव्य का उल्लेख है जो प्रवरसेन (400 - 450 ई०) की रचना है। बाण ने 'हर्षचरित' (1/14) में सेतुबन्ध का लेखक प्रवरसेन को बताया गया है । वह चन्द्रगुप्त द्वितीय (375 -413 ई०) की पुत्री प्रभावति गुप्ता के पति वाकाटकनरेश रुद्रसेन (द्वितीय) का पुत्र था। इस प्रकार दण्डी 450 ई० के परवर्ती हैं।

काव्यादर्श के आधार पर सिंहली भाषा का ग्रन्थ ' स्वभाषालंकार' प्रायः 850 ई० में राजा सेन द्वारा लिखा गया था । कन्नङ का अलंकार - ग्रन्थ 'कविराजमार्ग' इसी काव्यादर्श पर आश्रित है जो अमोघवर्ष के द्वारा 815 ई० में रचा गया। अतः दण्डी आठवीं शताब्दी ई० के बाद नहीं हो सकते । (2) काव्यादर्श (2 / 279) में दण्डी ने राजवर्मा की शिवभक्ति की चर्चा की है, इस राजा को काञ्चीनरेश नरसिंहवर्मा (द्वितीय 7वीं शताब्दी का अन्तिम चरण) से अभिन्न माना गया है । (3) काव्यादर्श के मङ्गलश्लोक में आये 'सर्वशुक्ला सरस्वती' इस वाक्यांश पर विज्जका (या विजया) की टिप्पणी प्रसिद्ध है । यह विज्जका पुलिकेशिन् (द्वितीय, 634 ई०) की पुत्रवधू थी, पी० वी० काणे इस आधार पर दण्डी को 600 ई० में सिद्ध करते हैं । (4) वामन ने अपने 'काव्यालंकारसूत्र' में दण्डि के सिद्धान्तों का परिवर्धन किया है । वामन का समय जयापीड के राज्यकाल

(779-813 ई०) में माना जाता है । (5) कुछ विद्वानों ने बाण और माघ के ग्रन्थों की छाया काव्यादर्श में दिखाकर इन दोनों कवियों के अनुवर्ती दण्डी को 700 ई० में सिद्ध किया गया है । (6) अवन्तिसुन्दरीकथा में दिये गये दण्डी के पूर्वजों के वृत्तान्त से यह निष्कर्ष निकाला गया है कि भारवी के मित्र दामोदर के प्रपौत्र दण्डी को भारवी के 100 एक सौ वर्ष बाद (600+100+700 ई०) रखा जा सकता है ।

इन प्रमाणों से मुख्यतः दण्डी को 700 ई० के आसपास रखने का आग्रह नये विद्वानों ने किया है। इनके सभी तर्क काव्यादर्श और अवन्तिसुन्दरी कथा पर आश्रित हैं। दशकुमारचरित में केवल अराजकता की स्थिती देखकर प्राचीन विद्वानों ने हर्षवर्धन के पूर्व दण्डी को माना था । वस्तुतः यह अराजक स्थिती कभी भी हो सकती थी । किन्तु दण्डी का चित्रण उपर्युक्त कालसीमाओं के अन्तर्गत (450-700 ई०) ही माना जा सकता है, वह 550 ई० से 600 ई० का ही संकेत देता है । दण्डी की भाषा बाण आदि कवियों से सर्वथा अप्रभावित है किन्तु यह निर्णायक तथ्य नहीं है। बाण के बाद भी प्रसादगुण-युक्त वैदर्भी शैली का प्रयोग हुआ है । दण्डी की 'अवन्तिसुन्दरीकथा' में तो बाण का स्पष्ट प्रभाव प्रतीत होता है । इसीलिए दण्डी के काल का महत्त्वपूर्ण आधार यह 'अवन्तिसुन्दरीकथा' ही है जिसे प्रामाणिक न मानने की स्थिति में 600 ई० तक ही दण्डी को रखा जा सकता है; और यदि यह प्रामाणिक रचना हो तो दण्डी को 675 ई० एएवं 725 ई० के बीच रख सकते हैं।

दशकुमारचरित

यह दण्ड-रचित गद्यकाव्य है जिसमें कथा और आख्यायिका नामक दोनों गद्य-भेदों के लक्षण उपन्यस्त हैं। इसके दण्डि - रचित होने में तो विवाद नहीं है किन्तु सम्पूर्ण ग्रन्थ को उनकी कृति मानने में आपत्ति उठी है। वर्तमान ग्रन्थ तीन भागों में उपलब्ध है- (1) पाँच उच्छ्वासों की पूर्वपीठीका, (2) आठ उच्छ्वासों का दशकुमारचरित एवम् (3) उपसंहार। इनमें कुछ विद्वानों का अभिमत है कि पूर्वपीठिका और उपसंहार - भाग बाद में जोड़े गये हैं। दण्डि की मौलिक कृति में केवल मध्य भाग ही शेष है। कथा को अविच्छिन्न तथा पूर्ण करने के लिए आगे-पीछे कुछ अंश प्रक्षिप्त हुए । इस मत को ईगलिंग (eggeling), अगाशे, विल्सन तथा कीथ ने प्रवृत्त किया। अपने मत के समर्थन में इन्होंने युक्तियाँ दी हैं कि कुछ पाण्डुलिपियों में पूर्वपीठीका और उपसंहार (उत्तरपीठिका) नहीं हैं, पूर्वपीठिका में दी गई वंशावली दशकुमारचरित की नामावली से कहीं-कहीं भिन्न है, प्रक्षिप्त भागों में व्याकरण - सम्बन्धी अनियमितताएँ हैं, इन भागों की पाण्डुलिपियों में पाठ-भेद बहुत है तथा शैली की दृष्टि से भी ये भाग मूल ग्रन्थ की अपेक्षा शिथिल हैं ।

दशकुमारचरित को साकल्य रूप से दण्डी - रचित न मानने वाले विद्वानों की युक्तियाँ विचारणीय हैं । पाण्डुलिपियों में पूर्व और अन्तिम भाग न मिलना कई कारणों से सम्भव है जैसे- असुरक्षा, जीर्णता इत्यादि । ऐसी अनेक पाण्डुलिपियाँ हैं (जैसे - बुद्धचरित की) जिनमें पूर्वापर भाग सुरक्षित नहीं रह सके। कभी-कभी पूर्वापर भाग में ताल-मेल न रहने या प्रतिलिपि करने में भूल के कारण भी कुछ नामों में सामञ्जस्य नहीं है । जैसे - मूलग्रन्थ में सुमन्त्र (पूर्वपीठिका में मन्त्रगुप्त), राजपुत्र (मन्त्रिपुत्र), प्रमति (कामपाल राजता का पुत्र सुमति मन्त्री का पुत्र) । यह सब पाठ की अस्पष्टता का फल है।

व्याकरण की शिथिलताएँ भी लिपिकारों के दोष हैं। सम्पूर्ण दशकुमारचरित की शैली समान रूप से सरल, प्रवाहपूर्ण, अल्प वर्णनों से युक्त तथा कथानक की रोचकता बनाये रखने वाली है । पाण्डुलिपियों की प्रतिलिपि करते हुए कुछ संशोधकों ने अवश्य ही अपनी बुद्धि से कुछ परिवर्तन किये होंगे । अतः पूरी कृति दण्डी की है।

इस विषय में एम्० आर० कवि ने एक अन्य कारण बताया है कि 1250 ई० के आसपास दशकुमारचरित (सम्पूर्ण) का तेलुगु - अनुवाद हुआ था । जब समग्र दशकुमारचरित किसी कारण से पूर्ण और अन्त के अंशों से रहित हो गया तब किसी कुशल लेखक ने नष्ट भागों का तेलेगु से पुनः संस्कृत रूपान्तर कर दिया । दशकुमारचरित की तीन टीकाएँ प्रसिद्ध हैं- भूषण (शिवरामपण्डिकृत), पदचन्द्रिका (कविन्द्राचार्यकृत) तथा लघुदीपिका (भानुचन्द्रकृत) । ये केवल मध्यभाग पर ही हैं, पूर्व और उत्तरपीठिकाओं पर नहीं । अर्थात् इनकी दृष्टि मध्यभाग ही दण्डि - कृत है ।

सम्पूर्ण उपलब्ध ग्रन्थ को दण्डिकृत मानने के कई तर्क हैं- (1) 'दशकुमारचरित' शीर्षक की सार्थकता पूरे ग्रन्थ से होती है, मध्यभाग में तो सात कुमारों का पूरा और एक कुमार का अधूरा वर्णन है । नायक (राजवाहन) का आधा वर्णन तो पूर्वपीठिका में ही है, शेष दो कुमारों का भी वर्णन वहीं है । उत्तरपीठिका परिणाम या कार्यावस्था का परिचय देती है। अतः कथानक की दृष्टि से और शीर्षक के विचार से पूरा ग्रन्थ एकात्मक है। ऐसा न होने से इसका शीर्षक कुछ भिन्न ही होता । (2) भाव, भाषा शैली तथा विचार-तत्त्व (जीवनदर्शता) की एकरूपता पूरे ग्रन्थ को एकात्मक सिद्ध करती है ।(3) पूर्वपीठिका के मङ्गलश्लोक में आठ बार तथा गद्यभाग में अनेक बार 'दण्ड' शब्द का प्रयोग करने के कारण कवि का उननाम 'दण्डी' पडा था - यह भी इस रचना के साकल्य - रूप से दण्डि-कृत होने का प्रमाण है ।

ऐसा माना जाता है कि दण्डी ने इसकी रचना युवावस्था में की थी। सम्भव है, उन्हें इसका पूर्व और अन्तिम भाग बाद में अच्छा नहीं लगा हो तो, उन्होंने इसका संशोधित रूप बनाया हो जिससे यह विवाद उत्पन्न हुआ अथवा किसी परवर्ती लेखक ने ही इस अंश का संशोधन किया । किन्तु यह स्पष्ट है कि केवल मध्यभाग को दण्डिकृत मानने से कृति अपूर्ण और विकलांग होगी। इसके कथानक तथा अन्य पक्षों पर पृथक् विचार करेगें।

अवन्तिसुन्दरीकथा

दशकुमारचरित की पूर्वपीठिका में मालव - नरेश की पुत्री अवन्तिसुन्दरी का प्रणय- वृत्त संक्षेप में वर्णित है, उसीका स्वीस्तर निरूपण इस 'अवन्तिसुन्दरीकथा' में किया गया है। इस ग्रन्थ का आंशिक प्रकाशन 1924 ई० में दक्षिणभारती ग्रन्थमाला में श्री एम्० आर० कवि के सम्पादन में हुआ था । पुनः तिरुअन्नतपुरम् की अनन्तशयन-संस्कृत- ग्रन्थावली में 1954 ई० में इसका पूरा रूप प्रकाशित हुआ । विद्वानों का अनुसार हस्तलेख की अपूर्णता के कारण यह संस्करण भी अपूर्ण ही है। कुछ लोगों का विचार है कि यह दण्डी के नाम से किसी अन्य कवि के द्वारा की गयी रचना है। दूसरी और कुछ विद्वान हैं कि 'अवन्तिसुन्दरीकथा' ही

दण्डी की मुख्य रचना है, इसीका सार दशकुमारचरित की पूर्वपीठिका के रूप में किसी ने प्रस्तुत किया होग।

प्राचीन साहित्य में दशकुमारचरित की अपेक्षा इसी गद्यकाव्य को दण्डी की रचना के रूप में अधिक ख्याति मिली थी। 'नामसंग्रहमाला' में अप्पयदिक्षीत ने कहा है- इत्यवन्तिसुन्दरीये दण्डिप्रयोगाः । इसमें सुबन्धु, मयूर और बाण की प्रशंसा की गयी है, जिसके आधार पर दण्डी का काल इनके अनन्तर 700 ई० में माना गया है। आचार्य बलदेव उपाध्याय का मत है कि 'अवन्तिसुन्दरीकथा' के शैली - सौन्दर्य के आधार पर पण्डितों में यह प्रशस्ति चली थी- दण्डिनः पदलालित्यम् । जो लोग इस गद्यकाव्य को दण्डी की कृति नहीं मानते, उनका कथन है कि इसके कवि ने दण्डि और बाण की प्रमुख विशिष्टताओं को लेकर इसका प्रणयन किया था । तदनुसार 'दशकुमारचरित' से पूर्वपीठिका का कथानक एवं भाषा में पदलालित्य का ग्रहण किया है तो 'हर्षचरित' से प्राचीन कवियों का गुणानुवाद एवं कविवंशवर्णन की प्रक्रिया अपनायी गयी है। इस पर 'कादम्बरी' का भी प्रचुर प्रभाव है जैसे अवन्तिसुन्दरीकथा (पृ० 47) में जो लक्ष्मी का वर्णन मिलता है, वह शुकनासोपदेश (कादम्बरी का भाग) के लक्ष्मी - वर्णन से अनुप्राणित है। इस गद्यकाव्य का पद्यात्मकक संक्षिप्त रूप (अवन्तिसुन्दरीकथासार) भी उपलब्ध है। इसके लेखक का नाम अज्ञात है। यह सप्तम सर्ग में समाप्त होता है।

दशकुमारचरित का कथन

'दशकुमारचरित' के तीन खण्डों में पूर्वपीठिका में कथा की पृष्टभूमि के साथ दो कुमारों की पूरी किन्तु नायक राजवाहन की अधूरी कथा दी गयी है। मूल भाग में राजवाहन की कथा पूर्ण करके शेष सात कुमारों की कथा वर्णित है । उपसंहार में कथा की सुन्दर समाप्ति की गयी है। अतः कथानक की दृष्टि से पूरी रचना एक सम्बद्ध सुघटित कृत है। ग्यारहवीं शताब्दी ई० में पूरी रचना को दण्डि - कृत मानते थे। इसकी पूर्वपीठिका का प्रथम उच्छास ग्रन्थ की भूमिका देता है कि मगध- नरेश राजहंस (जिनकी रानी वसुमति थी) को मालव - नरेश मानसार ने पराजित करके विन्ध्याटवी में रहने को विवश कर दिया। वहीं वसुमति ने राजवाहन नामक पुत्र को जन्म दिया । राजवाहन के संरक्षण में नौ अन्य कुमार भी आये। उनमें सात तो मन्त्रियों के पुत्र थे और दो मिथिलानरेश प्रहारवर्मा के पुत्र थे । दासों कुमारों की शिक्षा साथ - साथ हुई तथा वे बड़े होने पर दिग्विजय के लिए निकल पड़े। अभियान के क्रम में ही वे पृथक् हो गये । क्रमशः वे इस कथा के नायक राजवाहन से मिलते गये और अपनी अद्भुत कथाएँ सुनाते गये। पूर्वपीठिका के तृतीय और चतुर्थ उच्छासों में क्रमशः सोमदत्त और पुष्पोद्भव अपनी रोमांचक कथाएँ राजवाहन को उज्जयिनी में सुनाते हैं । पञ्चम उच्छास में राजवाहन और मालवनरेश मानसार (मगधनरेश के शत्रु) की पुत्री अवन्तिसुन्दरी का प्रणय और अद्भुत परिणय वर्णित है, यह कथा मूलदशकुमारचरित (मध्यभाग) के प्रथम उच्छास तक चली गयी है जहाँ नायक राजवाहन को बन्धन में डालकर चम्पा पर आक्रमण के लिए अवन्तिसुन्दरी का भाई (चण्डवर्मा) ले जाता है।

चम्पा - विजय के उत्सव में ही राजवाहन के मित्र अपहारवर्मा ने ऐसा आक्रमण किया कि चण्डवर्मा मारा गया, राजवाहन छुट गया। अब चम्पा में ही बिछडे हुए मित्रों की एक-एक कर भेंट होती है तथा वे सब राजवाहन को अपनी-अपनी रोमांचक कथाएँ सुनाते हैं। सबकी कथाओं में किसी न किसी राज्य की प्राप्ति और राजकुमारी का परिणय भी रहता है अर्थात् अब सभी राजा बन गये हैं । क्रमशः अपहारवर्मा (उ० 2), उपहारवर्मा (उ० 3), अर्थपाल (उ० 4), प्रमति (उ० 5), मित्रगुप्त (उ० 6), और विश्रुत (उ० 8) अपने - अपने इतिवृत्त नायक को चम्पा में ही सुनाते हैं। उत्तरपीठिका में ये सभी मिलकर राजहंस के पास जाते हैं जो इन कुमारों को स्वविजीत राज्यों को समर्पित कर स्वयं वानप्रस्थ स्वीकार करते हैं। सभी कुमार नीतिपूर्वक प्रजा का पालन करते हैं।

मित्रगुप्त के इतिवृत्त में अवान्तर कथाओं के रूप में धूमिनी, गोमिनी, निम्बवती और नितम्बवती की कथाएँ भी हैं । मन्त्रगुप्त के वृत्तान्त की विशिष्टता है कि उसमें ओष्ठ्यवर्ण (पवर्ग) का बिल्कुल प्रयेग नहीं है, यहाँ तक कि पदान्त 'म्' भी अनुस्वार रूप में परिवर्तित है । इसका विलक्षण कारण कवि ने कहा है कि उसकी प्रीयतमा के दाँतों द्वारा अधरक्षत होने से वह करों से ओठों को छिपाये हुए था (करकमलेन किंचत्संवृताननो ललितवल्लभारभस - दत्तदन्तक्षत - व्यसनविह्वलाधरमणिः)। उनकी कथा में (सप्तम उच्छास) लालित्य का अनुपम सन्निवेश है ।

उपर्युक्त दस कुमारों की कथाओं से सम्बद्ध इस ग्रन्थ के दस उच्छास हैं (पू० वी० 3, 4, उ० पी० 1 राजवाहनचरित, 2, 3, 4, 5, 6, 7, 8) । इन सबके शीर्षक 'चरित' के रूप में हैं जैसे– सोमदत्तचरित, पुष्पोद्भवचरित इत्यादि । अन्य उच्छासों के शीर्षक हैं- कुमरोत्पत्ति (पू० पी० 1), द्विजोपकृति (पू० पी० 2, इसमें राजवाहन एक ब्राह्मण उपकारार्थ रात में निकला और उसकी खोज में ही सभी पृथक् हो गये) तथा अवन्तिसुन्दरीपरिणय (पू० पी० 5) । इस प्रकार कथानक को ऐसा संघटित किया गया है किक रोचचकता बनी रहे तथा कहीं भी कथावस्तु शिथिल न हो ।

वामन

वामनभी कश्मीर- नरेश जयापीड की राजसभा के मन्त्री थे, अतः इनका काल भी 800 ई. के निकट है। उद्भट और वामन ने एक-दूसरे के विषय में कुछ नहीं लिखा यद्यपि दोनों एक ही स्थान पर एक ही काल में थे। वामन का निर्देश ध्वन्यालोक तथा काव्यमीमांसा में मिलता है जिससे इनके काल का समर्थन होता है। इनका 'काव्यालंकारसूत्र' नामक ग्रन्थ प्रसिद्ध है । इसपर स्वयं वामन ने वृत्ति भी लिखी थी । इसका विभाजन पाँच अधिकरणों में है जिनमें क्रमशः काव्यशरीर, दोष, गुण, अलंकार तथा प्राचीन प्रयोगों पर विचार है । प्रथम और चतुर्थ अधिकरणों में तीन-तीन अध्याय हैं, शेष में दो-दो हैं । वामन ने 'रीतिरात्मा काव्यस्य' कहकर रीति - प्रस्थान का प्रवर्तन किया था; काव्यगुणों को रीति से जोड़कर उन्हें काव्य में नित्य कहते हुए शब्दार्थ के धर्म के रूप में समझाया । काव्यालंकारसूत्र पर तीन प्रचीन टीकाएँ प्राप्त हुई हैं जिनमें गोपेन्द्र भूपाल की 'कामधेनु' प्रसिद्ध है ।

रुद्रट

रुद्रट सम्भवतः आनन्दवर्धन के समकालिक (850 ई.) कश्मीर के शैवमतावलम्बी सामवेदी ब्राह्मण थे। समकालिक होने से वे एक-दूसरे के विषय में कोई चर्चा नहीं करते। राजशेखर (900 ई.) ने इनका उल्लेख किया है (काकुवक्रोक्तिर्नाम शब्दालंकारोऽयमिति रुद्रटः, काव्यमीमांसा, अध्याय-7)। रुद्रट की एकमात्र कृति है- काव्यालंकार। आर्या छन्द के 734 पद्य इसमें है जो सोलह अध्यायों में वितीर्ण हैं। इस ग्रन्थ में काव्यस्वरूप, चार प्रकार की रीतिया, अनुप्रास, यमक, श्लेष, चित्र, दोष, अर्थालंकार, दस प्रकार के रस तथा प्रबन्धकाव्यों के भेदों का क्रमशः विवेचन किया गया है। अपने पूर्ववर्ती ग्रन्थों से इसमें व्यापकता है । अलंकारों का तार्किक वर्गीकरण, रस-निरूपण, नायक-नायिका - भेद इत्यादि का विवेचन रुद्रट की विशिष्टता है । इस ग्रन्थ पर नमिसाधु व्याख्या मिलती है। ये श्वेताम्बर जैन थे जिनकी टीका का काल 1069 ई. दिया गया है ।।

उद्भट

उद्भट (भट्टोद्भट्ट) का एक ग्रन्थ 'अलंकारसारसंग्रह' (निर्णयसागर प्रेस से 1915 ई. में प्रकाशित) केवल अलंकारों पर लिखा गया ग्रन्थ है। इसमें छह वर्ग, 79 कारिकाएँ तथा 41 अलंकारों विवेचन है । उद्भट ने अपने 'कुमारसम्भव' नामक महाकाव्य के प्रायः 100 पद्य इन अलंकारों के उदाहरण के रूप में दिये हैं । उद्भट राजतरङ्गिणी के अनुसार (4 / 495) राजा जयापीड (राज्यकाल 779-813 ई.) की राजसभा के अध्यक्ष थे । अतः इनका काल 800 ई. के आसपास रखा जाता है । अलंकारसारसंग्रह पर प्रतिहारेन्दुराज (10 वीं शताब्दी का आरम्भ) ने 'लघुविवृत्ति' तथा राजानक तिलक (1100-1125 ई.) ने 'उदभटविवेक' नामक टीका लिखी थी ।

उपसंहार

संस्कृत के काव्य शास्त्र के सर्वेक्षण में साहित्य शास्त्र में सामाजिक तथा सांस्कृतिक महत्त्व के विषय में कवियों के जीवन के विशेष रूप से वर्णन किया गया है भरतमुनिके नाट्यशास्त्र संस्कृत काव्यशास्त्र का प्राचीनतम उपलब्ध ग्रन्थ है। किन्तु संस्कृत नाट्य - परम्परा में भरत एक आदरणीय आचार्य थे जिनके नाम पर भरत-वाक्य का प्रयोग प्रत्येक नाटक में हुआ है । नाट्यशास्त्र' एक विशाल ग्रन्थ है जिसमें नाट्य और काव्य से सम्बद्ध नियमों का विस्तृत विवेचन है । इस इकाई में अग्निपुराण के अनेक विषयों से सम्पूर्ण पुराण है जिसके ग्यारह अध्यायों में (337-47) काव्यशास्त्रीय सामग्री है। इस पुराण के रचनाकाल पर काव्यशास्त्र के विद्वानों में मत भेद है। भामह स्थान भरत के अनन्तर प्रथम आचार्य के रूप में समादत है। इन्होंने 'काव्यालङ्कार' नामक ग्रन्थ की रचना करके 'अलङ्कार - प्रस्थान' का प्रवर्तन किया था। संस्कृत गद्यकाव्य के इतिहास में सरल - प्राञ्जल - भावपूर्ण गद्य के लेखक के रूप में दण्डी का नाम अमरण है । दण्डी के विषय में अनेक प्रशस्तियाँ सुभाषितों के संग्रह -ग्रन्थों में उपलब्ध हैं । एक प्रशस्ति में वाल्मीकि और व्यास के बाद तीसरा स्थान दण्डी को ही दिया गया है। इन सवके विषय में वर्णन किया गया।

सन्दर्भ

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THE EFFECT OF BEHAVIORAL MODELING IN TEACHING SOME TABLE TENNIS SKILLS TO STUDENTS OF AL-AMAL INSTITUTE FOR THE HEARING IMPAIRED

*Dr. Ahmed Allawi Saadoun, **Dr. Haydar Kadhum Issa

**University of Al Qadisiyah, Iraq **Ministry of Education, Iraq*

ABSTRACT

Preparing an educational curriculum using the behavioral modeling method in teaching some table tennis skills to students of Al-Amal Institute for the deaf and dumb, as well as identifying the

impact of using the behavioral modeling method in developing the level of performance of some table tennis skills (serving and receiving). The study also showed a comparison between the use of the behavioral modeling method and traditional education in developing the level of performance of some table tennis skills (serving, receiving and serving) and retaining them, assuming that there are no statistically significant differences between the pre and posttests of the experimental group that learns using the behavioral modeling method in developing the level of the performance of some table tennis skills, as well as there were no statistically significant differences between the post-tests between the experimental group and the control group in developing the level of performance of some table tennis skills. The research sample was determined, and they are the students of Al-Amal Institute for the Deaf and Mute in the academic year 2019-2019, whose number is 16 students distributed into two groups, the experimental group, if their number reached 8, and the control group, whose number reached 8 students, after conducting equivalence between them in some of the selected variables, applying the educational curriculum and analyzing the results using statistical methods The researcher concluded that the method of behavior modeling is an effective method in developing the level of performance in table tennis. The method of behavior modeling is an effective method in developing the level of performance in table tennis. Moreover, the use of the behavior modeling method led to the development of the level of performance of my skills (serving and receiving the serve) and the scoring) in table tennis greater than the usual method.

Keywords: Behavior Modeling Style, Hope Institute, Table Tennis.

INTRODUCTION

Interest in educational technology has increased in the Arab world, and the great role it plays in developing the education process and facilitating learning in the shortest possible time. Hence, this development undoubtedly included all areas of life, and the sports field as one of these important fields has also witnessed in recent years a great development and progress in the field of education and training. From this, it is necessary to develop and use modern educational means that keep pace with developments and the current era, and the educational process in its entirety has become

the preoccupation of many researchers and those interested in the educational process. From this we see that the learner is the main axis in the educational process by trying to provide him with information, sources and modern technologies (supported by programmed educational presentation tools), and this in turn is positively reflected when learning basic skills in sports in general, and among those games is table tennis as one of the games Individuality, which consists of a number of basic skills, which in turn require a high level of mental abilities. These skills are the starting point for learning beginners in the game, which enables them to earn the largest number of points and then win the match. Hence, many workers in the field of education and training try to take advantage of modern technology in the learning process. Skills, especially with beginners, and the capabilities offered by these modern scientific techniques aimed at raising the efficiency of learning and performance. Behavioral modeling is one of the technological innovations that appeared in educational institutions that are used to develop the educational process and raise the efficiency of performance and increase its effectiveness. Absorption of the learned skill, so the researchers resorted to designing an educational curriculum with behavioral modeling and the use of computer software to learn some basic skills in table tennis (table), and the importance of research lies in laying the foundations for building a public base for learning and practicing sports skills by going towards people with special needs to create a generation or abilities Skillful, physical and dynamic that opens the horizon for a promising future.

Research Problem

The researchers summarized the research problem with the following questions:

- Does the behavioral model develop some table tennis skills?
- Which of the traditional learning methods or the behavioral modeling method is better in the education process?
- Which of the two methods of traditional learning or the method of behavioral modeling preference in retaining skills for long periods?

The research problem also lies in the fact that it is an attempt to add a new method of education for people with special needs who are deaf and dumb and may contribute to giving the teacher of

physical education a practical method applied scientifically that can benefit from it in his implementation of the physical education lesson plan.

Research Objectives

1. Preparing an educational curriculum using the behavioral modeling method in teaching some table tennis skills to students of Al-Amal Institute for the Deaf and Dumb.
2. Identifying the effect of using the behavioral modeling method in developing the level of performance of some table tennis skills (serving and receiving).
3. Comparing between the use of behavioral modeling and traditional education in developing and retaining the level of performance of some table tennis skills (serving and receiving).

Research Hypotheses

1. There are no statistically significant differences between the pre and posttests of the experimental group that learns using the behavioral modeling method in developing the level of performance of some table tennis skills.
2. There are no statistically significant differences between the pre and posttests of the control group that learns in the traditional way in developing the level of performance of some table tennis skills.
3. There are no statistically significant differences between the post-tests between the experimental group and the control group in developing the level of performance of some table tennis skills.

Research Scopes

1. The human field: students from Al-Amal Institute for the Deaf and Dumb, Al-Qadisiyah Governorate Center.
2. Time frame: for the period from 5/11/2019 to 16/12/2019.
3. Spatial field: the yard and playground of the Housing Youth Center, Al-Qadisiyah Governorate Center.

DEFINING TERMS

Behavioral Modeling

It is to provide a direct behavioral model to the individual, where the goal is to communicate information about the behavioral model shown to the child with the intention of bringing about a change in his behavior or acquiring a new behavior[1] (Jordan, 2009, 350).

RESEARCH METHODOLOGY AND FIELD PROCEDURES

Research Methodology

The choice of the method is one of the priorities of the research procedures, so the researcher used the experimental method due to its suitability to the nature of the research. 217).

The Research Community and Its Sample

The research community was identified and they are students of the Al Amel Institute for the Deaf and Dumb, Al-Qadisiyah Governorate Center for the academic year 2019-2020 (Diwaniyah Center). After that, the research sample was deliberately chosen, and they are the average first-grade students, whose number is (16 students). They were distributed into two groups A and B. By lottery, group B was chosen to be the experimental, and their number reached 8 students, group A, the control, and their number reached 8 students, as shown in the table (1).

Table (1) Shows the number of members of the search groups

Section	Research Groups	Total Number	Sample Excluded	The final sample number
A	17	1	8	17
B	17	-	8	17
	17	1	16	17

[1] Michael I. Jordan. Computational aspects of motor learning, Motor Skills. New York: Academic Press, 2009. P. 350-420.

Equivalence and homogeneity of the research sample

One of the conditions of experimental research is that there are equal groups and its homogeneity so that the work is on a starting line and so that the researcher can refer the differences between the results of the research to the independent factors. The researcher resorted to verifying the equivalence of the research groups. It is related to research (Vandalen, 1977, p. 398). The sample was equalized with the variables: chronological age measured in months, height measured in centimeters, and weight measured in kilograms, as shown in Tables (2) and (3).

Table (2) The Homogeneity of The Research Groups in The Variables of Age, Height and Weight

Statistical Parameters / Variables	No.	Mean	Std Dev.	Torsion Modulus	Sig.
Age / Month	16	14.5	4.472	-0.565	Homogeneous
Height / Cm	16	145.8	5.236	0.578	Homogeneous
Weight / Kg	16	48.63	3.48	0.609	Homogeneous

Table (3) Equivalence of The Two Research Samples with The Chosen Variables

Statistical Parameters / Variables	Groups	No.	Mean	Std Dev.	Torsion Modulus	Sig.	Statistical Parameters
Age / Month	**Experimental**	8	14.47	4.542	8	1.433	equivalent
	Controlled	8	13.95	5.923	8		
Weight / Kg	**Experimental**	8	141.48	5.655	8	2.121	equivalent
	Controlled	8	143.55	5.344	8		
Height / Cm	**Experimental**	8	46.86	4.732	8	1.533	equivalent
	Controlled	8	50.80	5.136	8		

DETERMINE

THE APPROPRIATE TESTS

Basic skills tests with table tennis

1. ***Transmitter: It was measured by sending a test about 40 cm x 40 cm squares (Salam Jwaida, 2009, 28).***
2. ***Receiving the serve: repelling balls from the level of the belt from stability (10 repetitions) (Salam Jwaida, 2009, 49).***

The First Pilot Experiment

The researchers conducted a first exploratory experiment on 10/6/2021 by applying the educational program prepared in its initial form on a sample of (16) students. The aim of this experiment was to set the performance time for each exercise according to behavioral modeling methods, determining the rest time in each exercise, and the students' response to the exercises, as well as the possibility of application by the subject teacher.

Educational Curriculum

One of the elements of preparing the educational curricula is to identify the category to which the curriculum is to be applied, and they are students of 13-14 years of age, and after defining it and defining the main objective of the curriculum, which is teaching some basic skills on the table. Sports is a set of planned experiences practiced by the participants through sporting events (Saleh, 1981, 199). Through personal interview with professors specialized in the subjects of teaching methods and motor learning and table tennis coaches during lectures, educational exercises were developed for the skills in question according to the method of behavior modeling (Appendix 2) and in a manner consistent with the students' abilities and in line with their tendencies. The programs were presented to a group of specialists in the fields of teaching methods, motor learning and saliva training for the purpose of expressing their opinions and observations about the programs and approving their suitability for application. The preparatory program includes:

- The introduction.
- General warm-up.

And the main part which includes:

- Educational Section
- Explanation of the method of performance
- The applied section includes exercises on modeling presentation.

And the last part includes the closing activity and leaving. The researcher used the command method to implement the program for the purpose of controlling repetitions and controlling work in groups.

The Main Experiment

The researcher implemented (6) an educational unit to develop the level of performance of two table reel skills, which are (transmitting, receiving, transmitting). And by three educational units for each skill. And in the period from 5/11/2019 to 16/12/2019.

The educational units were given at the rate of an educational unit per week for each group, according to the specificity of the class schedule in the school, and on Mondays for the experimental group and Thursdays for the control group.

Post-tests

Post-tests were conducted for the research sample after completing the implementation of the educational program on 20-21/12/2019, and the researcher followed the method he used in the pre-tests under the same conditions and under almost the same spatial and temporal conditions and with the same tools.

Presentation and Discussion of Results

1. Presenting the results of the first hypothesis, which states: "There are no statistically significant differences between the pre and posttests of the experimental group that learn by behavior modeling method in developing the level of performance of some table tennis skills." After

collecting the data, unpacking it and processing it statistically, the results appeared for us, as shown in Table (4).

Table (4) Comparing the level of students' performance in the skills tests of the research topic Behavior modeling method (pre and posttests)

Skills	Measuring Unit	Posttests		Pretests		T-Calculated Value
		+P	S-	+P	S-	
transmitter towards boxes (points)	**Point**	3.58	2.36	6.34	3.43	3.61
transmitter receiver	**Frequency**	5.53	4.27	8.65	5.62	5.69

The tabular value of t is (2.7) at an error rate of (0.05) and a degree of freedom (7).

The table above shows that the results of the application of the pre and post tests for the experimental group that learns according to the method of behavior modeling. The value of (T) calculated for the skill of transmitting was (3.61), while the value of (T) calculated for the skill of receiving transmission was (5.69), which is also indicative when compared with The tabular value of (2.7) at the level of significance (0.05) and the degree of freedom (7) all show significant differences. That is, there is a significant improvement in the results of the post-tests of the experimental research sample. That is, we reject the null hypothesis and accept the alternative hypothesis, which states that there are statistically significant differences between the pre and posttests of the experimental group that learns by behavior modeling in developing the level of performance of some table tennis skills.

2. Presenting the results of the second hypothesis, which states that there are no statistically significant differences between the pre and posttests of the experimental group that learns in the traditional way in developing the level of performance of some table tennis skills.

Table (5) Comparing the level of students' performance in the skills tests of the research topic in table tennis in the traditional way (pre and posttests)

Skills	Measuring Unit	Posttests		Pretests		T-Calculated Value
		+P	S-	+P	S-	
transmitter towards boxes	**Point**	4.47	3.11	5.53	3.08	3.47
transmitter receiver	**Frequency**	3.39	4.68	4.82	2.64	2.77

The tabular value of t is (2.7) at an error rate of (0.05) and a degree of freedom (7).

The table above shows that the results of the application of the pre and posttests for the experimental group that learns according to the method of behavior modeling. The value of (T) calculated for the skill of transmitting was (3.47), while the value of (T) calculated for the skill of receiving transmission was (2.77), which is also indicative when compared with the tabular value of (2.7) at the level of significance (0.05) and the degree of freedom (7) all show significant differences, meaning that there is a significant improvement in the results of the post-tests of the control sample. That is, we reject the null hypothesis and accept the alternative hypothesis, which states that there are statistically significant differences between the pre and posttests of the control group that learns in a traditional way in developing the level of performance of some table tennis skills.

3. Presenting the results of the third hypothesis, which states that "there are no statistically significant differences between the post-tests between the experimental group and the control group in developing the level of performance of some table tennis skills".

Table (6) Comparing the level of students' performance in the post-skills tests of the research topic in table tennis, using the modeling method and the traditional method

Skills	Measuring Unit	Posttests		Pretests		T-Calculated Value
		+P	S-	+P	S-	
transmitter towards boxes	**Point**	6.34	3.43	5.53	3.08	2.82
transmitter receiver	**Frequency**	8.65	5.62	4.82	2.64	4.14

The tabular value of t is (2.6) at an error rate of (0.05) and degrees of freedom (14).

The table above shows that the results of the application of the posttests for the experimental group that learns according to the behavior modeling method and the control group that learns in the traditional way. Significant also, and when compared with the tabular value of (2.7) at the level of significance (0.05) and the degree of freedom (7), all of them show significant differences, meaning that there is a noticeable improvement in the results of the post-tests for the experimental research sample, better than the control sample with the specified tests. That is, we reject the null hypothesis and accept the alternative hypothesis, which states that there are statistically significant differences between the post-tests between the experimental group and the control group in developing the level of performance of some table tennis skills.

Interpretation Of the Results

From the results of table (4.5.6), the researcher attributes this to the effectiveness of the behavior modeling method used in this research. Performance practices for a period of a month and a half, during which the students practiced a new method that was not familiar to them in the usual learning, which prompted the students to implement the paragraphs and parts of the educational unit and apply its skills well. The researcher also attributes this common and different development in relation to this age stage that the students go through in this class, as it is characterized by the student's desire to satisfy his group and strengthen his position.

As he mentions (Azmy, 1996): “This stage is characterized by the youth’s work to satisfy his group and strengthen his position in it by increasing his participation in the different (physical) activities (Azmy, 1996, 38).

Also, the image of behavioral modeling represented an increase in motivation to achieve responses to implement skillful performance. He states (Hill and Spencer) in the behavioral theory, "The increase in motivation causes an increase in the strength of all responses in a situation. It is also assumed that competitive situations in sports produce higher rates of motivation and special responses are stronger intensity." in competitive situations than in similar situations that do not have competitive effects” (Mutawa, 1977,104).

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. The method of behavior modeling is an effective method in developing the level of performance in table tennis, but in proportions
4. different.
2. The use of the behavior modeling method led to the development of the level of performance of my skills (serving and receiving the serve) and scoring) with a table ball, which is greater than the usual method.
3. The use of the behavior modeling method led to the development of the performance level of the (serving reception) skill in table tennis to a better degree than the usual method.
4. The use of the traditional method led to a remarkable development of table tennis skills.

Recommendations

In light of the results of the study, the researcher recommends the following:

1. The use of competitive behavior modeling in developing the level of performance of other table tennis skills.
2. The need for teachers of physical education in institutes for people with special needs to use the method of behavior modeling in the development and retention of basic skills when teaching some games
3. Using different types of sensory, audio and visual modeling method in developing and maintaining the level of performance of basic table tennis skills.

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Appendix (2) A Model of a Training Unit Using the Method of Behavior Modeling

A Model for An Educational Unit for The Lesson in The Style of Modeling

Grade: middle school ***Date:***

Number of students: 8 ***Time : 45 min.***

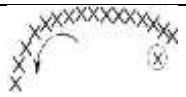
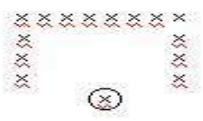
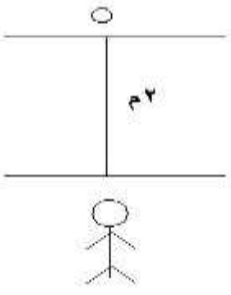
Competition style: Developing the transmission skill.

Behavioral objectives: that the student performs the skill of serving in table tennis well

Tools: (1) Table balls, number (20), are located inside the goal.

(2) a stopwatch.

(3) Net and colored ribbons (20).

Activity	**Time**	**Activity/ Skill**	**Formulations**
Preparatory Part The Introduction	45 Min. 4 Min.	Students standing with notes about the teacher	
Warm-Up and Exercises The Feeling of The Ball	5 Min. 5 Min.	General warm-up for all parts of the body (walking → jogging → jogging with rotating arms → jogging with alternating feet lifting → jogging → walking) Ball sense exercises (holding the racket, tapping the ball and walking a distance of 10 m)	
The Main Part	6 Min.		
Educational Activity	5 Min.	Explanation of the method of performing the transmission skill with the presentation of a visual behavioral model for it by the teacher and one of the students, then the teacher corrects the errors.	
Activity	**Time**	**Activity/ Skill**	**Formulations**
Applied Activity			
Exercise 1 Exercise 2 Exercise 3	7 Min 7 Min. 7 Min.	The student sends a ball towards a square drawn on the table and from a distance of (60 m) from the net, trying to record the largest number of correct passes inside the square during the specified time. Upon completion, the student records the number of passes he accomplished in his registration card (5 repetitions). The student performs the same exercise, but from a distance of (80 cm) from the net, for a period of	

		(30 seconds), taking into account the same performance conditions (5 repetitions). - Invest time between one repetition and another for the purpose of recording results and giving feedback	
Closing Activity	5 Min.	Refer to the students and explain the new exercise. The student performs the same exercise, but for a distance of (60 m), with a run in the place of the square, for a period of (25 seconds), taking into account the same performance conditions mentioned previously. (5 repetitions) Cool down exercises and then leave.	

Small scale processing unit for improving economic status of tribal farmers of Chhattisgarh

V. Verma* and S. Patel

**Lecturer, Govt. Polytechnic, Mahasamund, Chhattisgarh, India*

Abstract

India is largest producer of fruits and vegetables in the world, next to china. Its share in the world's production is 11% and 7% in case of fruits and vegetables, respectively. Chhattisgarh is one the tribal dominated state and their livelihood mostly depend on agriculture. Wheat, paddy and pulses are traditional crops of tribal farmers of Chhattisgarh. Due to lack of adequate processing facilities, farmers are bound to sell their produce at low price. If these produce are processed by effectively and economic ways, they will be able to get proper price and get encouraged to maximize production. Growing interest healthy eating has projected a new range of food and products in the market. So, in this research paper, we discuss the scope of training, developing skill and new technologies demonstrate to farmers for promoting cultivation of more profitable crops. Processing of the more profitable crop using traditional as well as modern techniques for the development of value added and convenient food products would be the possible solution for its promotion and enhancement of consumption, nutritional status and thereby increasing profitability and better livelihood to the tribal community.

Keywords: *Livelihood; processing; value addition; traditional food*

Published By :

IRA PUBLICATIONS

ISBN 978-81-953272-9-4

info@irapublication.com
www.irapublication.com