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Preface

We would like to present, with great pleasure, the inaugural volume-5, Issue-5, May 2019, of a scholarly journal, *International Journal of Engineering Research & Science*. This journal is part of the AD Publications series *in the field of Engineering, Mathematics, Physics, Chemistry and science Research Development*, and is devoted to the gamut of Engineering and Science issues, from theoretical aspects to application-dependent studies and the validation of emerging technologies.

This journal was envisioned and founded to represent the growing needs of Engineering and Science as an emerging and increasingly vital field, now widely recognized as an integral part of scientific and technical investigations. Its mission is to become a voice of the Engineering and Science community, addressing researchers and practitioners in below areas

Chemical Engineering	
Biomolecular Engineering	Materials Engineering
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Textile Engineering	Nano Engineering
Algorithm and Computational Complexity	Artificial Intelligence
Electronics & Communication Engineering	Image Processing
Information Retrieval	Low Power VLSI Design
Neural Networks	Plastic Engineering

Each article in this issue provides an example of a concrete industrial application or a case study of the presented methodology to amplify the impact of the contribution. We are very thankful to everybody within that community who supported the idea of creating a new Research with IJOER. We are certain that this issue will be followed by many others, reporting new developments in the Engineering and Science field. This issue would not have been possible without the great support of the Reviewer, Editorial Board members and also with our Advisory Board Members, and we would like to express our sincere thanks to all of them. We would also like to express our gratitude to the editorial staff of AD Publications, who supported us at every stage of the project. It is our hope that this fine collection of articles will be a valuable resource for *IJOER* readers and will stimulate further research into the vibrant area of Engineering and Science Research.

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Characterization of Biogas Production from Anaerobic Digestion of Animal & Plant Wastes

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Abstract— *The negative impact of the increased use of fossil fuels for energy generation and consumption has reached a global dimension and can no longer be over looked. All efforts are now being geared towards an alternative source of energy, renewable in nature and more environmental friendly in use. This study investigates the production of biogas – a renewable energy from the anaerobic digestion of three different types of biodegradable wastes (Cassava peelings and poultry droppings, Beans waste and poultry droppings, Cassava peelings and beans wastes) as an alternative to fossil fuels for energy consumption. The study was carried out using a 0.1m^3 capacity biogas digester constructed to investigate the anaerobic digestion in generating biogas. The experiment was batch operated and daily gas yield from the plant was monitored for 24 days. During this period, many operation factors were monitored to determine the effect each of them has on the biogas generation. These factors monitored are temperature changes, Pressure changes, pH changes, changes in alkality, Cassava peelings and poultry dropping generated the highest maximum biogas of 0.035m^2/kg/day at a PH value of 7.35 on the 19th day. This was followed by poultry droppings and beans mixture. Cassava peelings and beans waste had the least volume of biogas. This treatise assets that biogas is not only a renewable energy source but has a dual function of waste management in the course of its production.*

Keywords— Biogas, Renewable energy, Anaerobic Digestion, Waste, Fossil.

I. INTRODUCTION

Three major challenges to any nation and the world in general today are rise in energy need of the citizens, waste management and problems arising from environmental degradation such as green house effect, deforestation, desertification, flooding, global warming etc. These aforementioned problems are directly or indirectly linked to the use of energy sourced from fossils. The singular solution to these problems is seeking alternative sources of renewable and environmental friendly energy like biogas.

Biogas is a mixture of colourless, flammable gas obtained by the anaerobic digestion of plant based organic waste material [1]. Biogas is typically composed of 50-70% Methane, 30-40% carbon dioxide and traces of other gases [2]. In Nigeria, there are abundant of wastes arising from the domestic and agricultural sources of which the potential has not been tapped [3,4]. A look around every city in Nigeria shows enormous dumps every here and there of wastes lining up everywhere and polluting the environment. These could be re-cycled and used in biogas production.

Anaerobic biodegradation of cellulose materials is a biological process, the end product of which are a methane-rich gas called biogas and spent slurry of fertilizer vale. It is a process by which organic materials such as straw, weeds, human or animal excrements, garbage, sludge, domestic sewage and organic liquid wastes from factories etc are degraded by huge amount of various microbes of different functions under anaerobic conditions to yield methane in the end [5]. Biogas technology has advantages which include amongst others; treated digested sludge mixed with molasses and grains is said to have high nutritional value equivalent to cowpea meal with which birds can be fed [6]. It is a process having the potential for sterilization which can reduce public health hazards from faecal pathogens and if applied to agricultural residues, a reduction in the transfer of fungal and plant pathogens from one year's crop to the next [7]. The earlier problems mentioned infesting nations could be easily solved by the adoption and implementation of biogas technology. This has been the goal of this research work.

II. MATERIALS AND METHODS

2.1 Sample collection

The wastes used in the testing of the digester were poultry droppings mixed with Cassava peelings, poultry droppings mixed with beans waste (these included the beans coats removed during the preparation of 'akara', infested beans removed during picking, etc). Thirdly, cassava peelings mixed with beans waste. The poultry droppings were procured from poultry farmers

along Ugwogo-Nike road. They were dried and bagged dry. The cassava peelings was procured from local garri producers at Ugbo Odogwu while the beans waste was procured from 'moimoi' and 'akara' producers at eke Obinagu market. These three groupings of wastes were used in feeding the digester in the experimental anaerobic batch digestion runs.

2.2 B: Slurry Preparation

In the setup, an expected biogas production per day was fixed at 100litres. Batch operation was selected which entailed one of the procured waste mixtures at each run time. Different analysis were carried out on the feedstock to determine Carbon-Nitrogen ratio, moisture content, Carbon content, Nitrogen content, total solids, volatile solids etc. It is also pertinent to mention here that the water to waste ratio used was 2:1.

2.3 C: Digester charging

After measuring and mixing of the wastes, the digester was charged with wastes, the inoculums and then the calculated volume of water. Part of the waste mixture goes in first, followed by about half of the inoculums and the remaining wastes. The entire content was vigorously shaken to allow for homogeneity. The inlet pipe which has been hitherto open was closed and locked. The digester content is then allowed to undergo digestion for a retention period of 30 days with daily measurement of gas yield.

III. RESULTS AND DISCUSSIONS

The digester performance evaluation was carried out using the following operational parameters.

- Daily gas production measurement by downward displacement of water in the gas collector.
- Temperature changes during biogas production

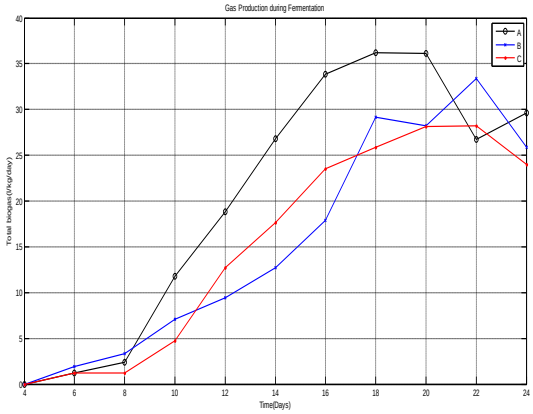

FIGURE 1: Gas generation during fermentation: A-Poultry Droppings + Cassava Peelings +Water, B-Poultry Droppings+Beans waste + water, C-Cassava Peelings + Beans waste +water

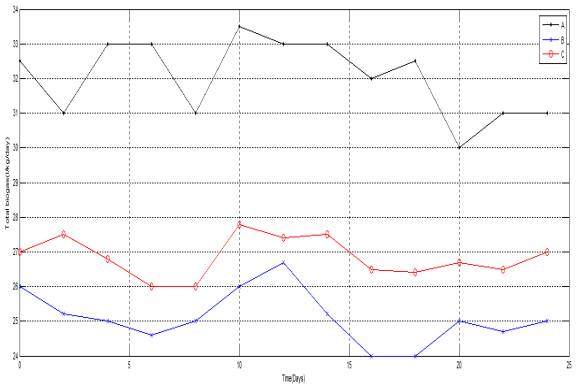

FIGURE 2: Temperature changes during Fermentation, A-Poultry Droppings + Cassava Peelings +Water, B-Poultry Droppings +Beans waste + water, C-Cassava Peelings + Beans waste +water

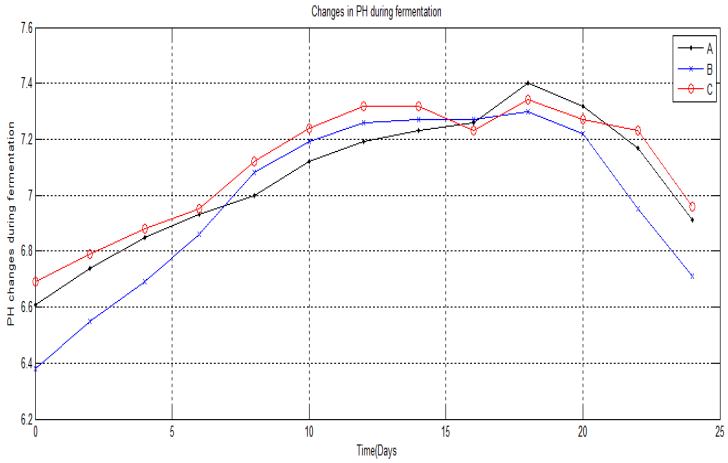

FIGURE 3: PH changes during Fermentation, A-Poultry Droppings + Cassava Peelings +Water, B-Poultry Droppings +Beans waste + water, C-Cassava Peelings + Beans waste +water.

3.1 A: Volume of biogas produced by each waste.

Figure1 above shows the volume of biogas produced by each of the constituents of A(poultry droppings and cassava peelings), B(poultry droppings and beans waste) and C(cassava peelings and beans waste) within the retention period of 24 days. It could be seen that there was no biogas production in the first 5 days. This is because biogas production rate in batch condition is a function of methanogenic bacteria [8]. Maximum production of biogas was 35.2l\kg\day on the 18th day of biodegradation in the poultry and cassava mixture. The temperature at which this maximum gas yield was attained is 32.4°C as seen in figure 2. In beans waste and poultry mixture, a maximum of 33l\kg\day was attained while that of the mixture of cassava peelings and beans wastes yielded 28.4l\kg\day during the same period of time.

3.2 Effect of Temperature on gas yield by wastes

Temperature has been observed by most biogas researchers to be quite critical for anaerobic digester since methane producing bacteria operate most effectively at temperature of 30°C -40°C or 50°C -60°C [9]. In this study, a temperature range of 26 – 32.5 was operated. The effect of temperature on the gas yield is shown in figure 2. Generally, a temperature run of 25°C-45°C is regarded as the mesophilic fermentation temperature while that of 45°C – 50°C is regarded as thermophilic. From the gas yield of the three different constituents' mixtures, it could be seen that the quality and quantity of biogas production using farm or agricultural materials are function of nature and composition of the digester feedstock. This is similar to the report of[9].

3.3 Effect of PH changes on gas yield by wastes.

PH changes in the course of this experiment are shown in figure 3. The PH of any medium affects microbial population and action. In the fermentation process, it affects the rate of biogas production. From figure 3, it is seen that the PH was low at the first 6 days, dropping to below 7.0. This is sequel to the breaking down of organic matter and production of volatile fatty acids by acid forming bacteria. After the first 8 days, the acid forming bacteria were possibly dislodged by the methane forming bacteria. This informed the breaking down of acids by the methanogens to methane and the gradual rise of the PH. From figure 3, beans waste and cassava gave a maximum PH of 7.4, followed by poultry droppings and beans waste with 7.37 and lastly,

7.32 by poultry droppings and cassava. It could also be observed that between the 18th and 20th days of the fermentation, maximum PH was obtained. After this, a gradual drop in PH is seen till the end indicating once again that the methane producing bacteria has dislodged the acid forming bacteria thus inhibiting gas production.

The changes in PH are probably due to temperature variation or pressure of toxicants or inhibitors or both. From the result shown, biogas production continued even at PH of 6.7 in conformity with reports of earlier researchers. Biogas production proceeds quite well as long as the PH is maintained between 7.0 and 7.4 [10] At PH values below 6.2 and above 7.6, toxicity is acute and can impair gas production [11]. Also, PH of less than 6.0 or greater than 8.0 rapidly inhibits methanogenesis under most operating conditions [12].

It is important to maintain the PH of an anaerobic digester between 6 and 8, otherwise, methanogenesis growth would be seriously inhibited[13].

IV. CONCLUSIONS

The study on the production of biogas from the digestion of mixtures of poultry droppings and cassava peelings, poultry droppings and beans waste, cassava peelings and beans waste has shown that biogas can be produced from these wastes through anaerobic digestion for biogas generation.

These wastes are readily available in our environment and can be used as source of fuel if managed well. The biogas generated contains up to 65% methane which supports combustion. It was found out that temperature fluctuations and PH are among the factors that affect biogas production and temperature ranges of 25°C–45°C also purvey mesophile thermal stage for biogas production. It has also been shown that for maximum gas generation, experimentation with various mixes is very important. Results show that mixing of nitrogen rich and carbon rich wastes at a presumed ratio produce more gas than nitrogen – nitrogen or carbon – carbon rich wastes.

Finally, embarking on anaerobic biodegradation process on environmental pollutants for biogas production will not only lead to clean and safer environment but also reduce the use and much dependence on fossil fuels whose by-products are deforestation, desertification, erosion, global warming and flooding.

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FMEA Methodology Capabilities in Environmental Risk Management

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Abstract— *The paper asserts convincingly the appropriateness of the Failure Mode and Effects Analysis (FMEA) methodology for risk identification and minimization activities based on the analysis of potential process inconsistencies disclosed through a quantitative analysis of cause-and-effect discrepancies. Advanced in the paper is also an in-depth analysis of FMEA methodology applicability for the development of new projects and technologies, for production process and product quality planning analyses and takes a closer look of FMEA methodology capabilities in environmental risk management.*

Keywords— FMEA, methodology, analysis, process, environmental risk.

I. INTRODUCTION

In alignment with today's best management practices, companies committed to achieving sustainable development are more determined to implement risk and opportunity management strategies following the general principles of hazard prevention and control programmes. In 2009 the International Organisation ISO adopted three fundamental documents with regard to the basic concepts, principles and basic methods for risk management, namely: ISO Guide 73:2009 „Risk Management. Vocabulary"; ISO/IEC ISO 31000:2009 „Principles and Guidelines on Implementation "and ISO/IEC ISO 31010:2009 „Risk Management. Risk Assessment Techniques". Almost all of the recommended risk management techniques have been successfully applied in the last few years for the purposes of risk identification, analysis, assessment and management. Of all the 31 methods included in the Standard, 4 refer to the project cycle management and the major life cycle phases - identification, analysis, assessment, ranking (prioritization) and proposal ideas for improvement. The methods that meet the requirements for building the analysis object model are [1]:

- Hazard Analysis and Critical Control Points (HACCP) - Analysis of the hazards and identification of critical control points;
- HAZard and OPerability Study (HAZOP)-Investigation of possible hazards in a work process;
- Probability-impact matrix;
- Failure Mode and Effects Analysis (FMEA)-Analysis of failure modes and the consequences of those failures.

Analysis of modern literature shows the applicability of the methodologies discussed so far:

- Hazard Analysis and Critical Control Points (HACCP) The hazard analysis and critical control points can be used to identify and manage hazards and risks in reference to physical, chemical and biological hazards (including microbiological contamination of food products). The method is based on tracking, monitoring and managing potential hazards by identifying the appropriate critical control points, that can be monitored, managed and eliminated, as well as taking corrective actions if critical limits deviations are detected, establishing system verification as well as keeping, maintaining and storing documentation at each stage to verify that the processes are carried out in conformity with the normative documents ensuring the safety and high quality of the products. The results of the method provide detailed information about the risk management by maintain critical point control at every phase of the process life cycle [2];
- HAZOP HAZard and OPerability Study is a qualitative risk assessment method applicable at all stages of the product life cycle. HAZOP is a structured and systematized method of testing, where a team of specialists has a major role in identifying possible hazards not only in the operation of the existing but also in designing new products, technological processes, procedures and systems. The methodology is used to detect potential risks related to the human factor, technological equipment and the environment in which certain activities are performed. The method was originally developed to analyse systems in the chemical industry. HAZOP method is appropriate for the design of products, mechanical and electronic processes and systems, general purpose machines for different types of activities, procedures and systems. The method of testing is most relevant in identifying potential deviations from the project's pre-defined

objectives, specifying reasons for its occurrence, the respective consequences and the necessary precautions that should be taken [2];

- Failure Mode and Effects Analysis (FMEA) is a contemporary method applicable in various modern practice areas. Being one of the most widespread universal risk management concepts, FMEA focuses on product quality management and is prevalent in a wide range of human activities. FMEA can be applied to the product as a whole, a single part or structural component of the product as well as to the overall technological processor operation, making it a universal risk assessment method [3].

According to the object of analysis the methods under consideration can be:

- product-oriented – FMEA and HCCP methods;
- process-oriented – FMEA, HCCP, HAZOP;

phenomenon-oriented – FMEA.

TABLE 1
COMPARATIVE ANALYSIS OF THE METHODS [2]

Risk assessment methods and tools	Risk assessment process				
	Risk identification	Risk analysis			Risk evaluation
		Consequence	Probability	Risk level	
HACCP	❖	❖	♦	♦	❖
HAZOP	❖	❖	•	•	•
FMEA	❖	❖	❖	❖	❖

❖ ***Recommended – RE;***
♦ ***Not Applicable – N;***
• ***Applicable - A***

FMEA is a complex method, both product- and process-oriented, applicable at all stages of the product life cycle and all technological or business processes.

II. ANALYSIS OF FMEA CAPABILITIES

FMEA is a universal assessment method dealing with risk identification and minimization activities based on the analysis of potential process inconsistencies disclosed through a quantitative analysis of cause-and-effect discrepancies.

The analysis of the types and consequences of potential discrepancies is widely used by many global organizations, both for the development of new projects and technologies and for production process and product quality planning analyses. FMEA methodology facilitates risk assessment and evaluation of possible damaging effects caused by potential design or technological processes inconsistencies perceived at the earliest stages of the product design process, the creation of the final product or its components. The purpose of the method is to ensure that all the product quality requirements and the manufacturing and assembly planning processes are implemented through changes in the relevant high-risk technology related operational plan.

The methodology also enables error identification and minimisation in early stages of the product and process creation. This, in turn, shortens the length of time for the creation of competitive products and reduces significantly the organizations' costs due to errors made during the initial preparatory stages.

FMEA methodology acts upon the quality and safety of the objects while in design stage by efficiently identifying potential failures with high precision. This is done by specialists from different fields of study and areas of competency in the process of analysis, making it easier to address the problem thoroughly and improves the exchange of information between enterprise departments. The use of FMEA in the early stages of product design prevents the development of catastrophic failures and identifies possible ways of occurrence of performance shortfalls. The most important effect of the application of the method is the reduction of quality-related or prevention-appraisal-failure costs associated with activities designed to prevent poor quality in products.

FMEA is used for a gradual transition from official statistical and probabilistic methods for analysing object reliability to engineering reliability approaches. The results obtained are characterised by simplicity and clarity, besides being more plausible for the enterprise-provider administration compared to the complex mathematical models for calculating reliability,

especially when they are based on unreliable sources.

III. APPLICATION PHASES OF THE FAILURE MODE AND EFFECTS ANALYSIS PROCESS

Failure Mode and Effects Analysis concept is applicable at different stages of the product/process life cycle. The individual stages include: design; marketing; selection of materials; design of the production process; manufacturing; control and testing; sale; maintenance and operation; destruction. The purpose is to identify the causes for the inconsistencies, their adverse effects, to determine the means of reducing the discrepancies in order to improve the quality of the products and specify the costs of their elimination. FMEA should be applied either before the occurrence of inconsistency or immediately after its detection, or upon uncovering the reasons behind its occurrence in order to prevent or mitigate the impact of possible risk.

It is assumed that there are generally five basic types of FMEA that are used in different of the product life cycle. The four main types are: System/Concept FMEA; Design FMEA; Process FMEA, Application FMEA and Service FMEA [5]. FMEA adopts three criteria to assess the problem: 1) the severity of the effect on the client, 2) how often the problem is likely to occur and 3) how easily the problem can be detected. The degree of severity, the rate of occurrence and detection for each of the failure modes can be set to 1 and 10 (1 = low, 10 = high).

S/CFMEA is performed to analyse product systems and subsystems at a relatively early conceptual design stage. CFMEA focuses on potential defects caused by the system faults on the functions of the product's system. This takes into account the interactions between the systems and/or the system elements. DFMEA is suitable for analysing the product itself prior to its production phase. DFMEA focuses on the defects caused by faults in design [6].

PFMEA is convenient for analysis when implementing processes for creating product. PFMEA focuses on the defects caused by imperfections in performance processes (manufacturing) or assembly processes [7].

AFMEA is used to analyse the application process before the product reaches the customer. AFMEA has two aspects of application: in terms of the supply and customer's perspective.

System/Concept FMEA focuses on system faults, such as:

- system safety and system integration;
- interfaces between subsystems or with other systems, interactions between subsystems or components of the environment;
- single failures (where a single failure can lead to complete malfunction of the system as a whole);
- links and relationships that are unique to the system as a whole (i.e. they do not exist at lower levels) and may cause the entire system not to function as intended;
- human interactions;
- service.

Design FMEA is applied to determine the effects of possible technological process inconsistencies. DFMEA can be carried out both for the projected design and for the existing one. The purpose of such an analysis is to identify potential design discrepancies that pose the greatest risk to the user and to introduce changes to the product design in order to reduce this risk. The outcomes of DFMEA are the input information for the next PFMEA. PFMEA is normally conducted in the production and process planning with the active participation of representatives of interested departments, and if necessary, with representatives of the consumers. PFMEA starts at the stage of technical preparation of production and ends during the time prior to installation of production equipment.

FMEA design analysis can be performed both for the projected design and for the existing one. Design FMEA is carried out by representatives of the development departments, production planning, sales, quality assurance and/in the presence of pilot manufacturing departmental representatives. The purpose of the analysis is to identify potential product defects that pose the greatest risk to the user and introduce such changes to the product design that would decrease the level of the risk.

Process FMEA is usually performed in the same composition as design FMEA. The purpose of this analysis is to establish product design requirements, to ensure safety and customer satisfaction, i.e. to prepare the initial data both for the process of design development and for the subsequent design FMEA.

Design FMEA facilitates the process of development by reducing the risk of failures due to:

- assistance in the objective assessment of design requirements and alternatives;
- assistance in the initial development of manufacturing and assembly process requirements;
- increase in the likelihood of the types of potential failures and their effects on the operation of the system to be addressed during the design / development phase;
- provision of additional information to assist in the planning for thorough and effective testing of design and development programmes;
- compiling a list of the types of potential failures, classified according to their impact upon the "user ", which defines the priority system for design and test programmes improvement;
- creating open recommendation forms and tracking risk-mitigating activities;
- providing recommendations for the future, facilitating the analysis of a set of requirements, assessing design changes and developing promising projects.

Process FMEA covers production-related failures with a focus on:

- improved production process so as to ensure that the product is constructed in line with the design;
- safe working conditions with minimum downtime reduction, scrap and subsequent processing;
- manufacturing and assembly operations, shipping, incoming parts, transport of materials, storage, conveyors, maintenance of tools and labelling.

Production process FMEA begins at the stage of technical preparation of production and ends during the time prior to installation of production equipment. The objective of process FMEA is to ensure that all the requirements for the quality of manufacturing and assembly processes are met by introducing changes in the relevant high-risk technology related planning activities.

The advantages of FMEA concept can be summarised as follows:

- adapts to the types of failures related to personnel, equipment and systems as well as to material components, software and procedures.
- identifies the types of component failures, their causes and effects on the system and presents them in an easily readable format;
- Avoids the need for expensive equipment changes in the process of operation by early problem detection in the process of design;
- Detects the types of failures caused by malfunction of a single element and the requirements for data security and backup systems;
- Provides input data for the process monitoring programs by drawing attention to the most important features that need to be monitored.

The limitations are:

- These methods can be used to detect individual types of failures but not for combinations of types of failures;
- Research studies could be costly and time-consuming if they are not managed efficiently and directed properly;
- May be difficult and lengthy for complex multi-layered systems.

IV. METHODOLOGY FOR THE CONSTRUCTION AND ANALYSIS OF THE ENVIRONMENTAL RISK

According to M. Roszak, M. Spilka, A. Kaniarisk assessment typically includes identification of initiating events, identification of probable sequences of incidents, assessment of the likelihood of occurrence of sequences of accidents and performance appraisal. Then, on the basis of the relevant criteria for the particular situation, the risk m acceptable and evaluated accordingly. Risk assessment takes into account the likelihood of occurrence of probabilities to initiating hazardous events and the severity of the potential consequences. On the basis of the risk assessment and in order to achieve

an acceptable level of risk, appropriate risk reduction measures should be consideredwhere necessary. Such recommendations may be based on the analysts' probability judgments or on the basis of criteria chosen by the company to guide the process of decision-making in risk reduction [9].

The first step in the process of risk assessment and management is to analyse the level of risk and its effects. Once the risk has been assessed a decision needs to be made on what preventive measures or remedial strategies to be introduced in order to avoid/eliminate or reduce residual risk. These principles of prevention and control underpin recent discussions about the role of environmental impact assessment in organization's plans and programmes. One of the most important issues in this area is the environmental risk assessment which can be used as an appropriate tool for studying the impact of human activity on the environment [8].

Environmental risk assessment will include a quantitative and qualitative analysis of the potential risks and the coefficient to be applied to potential risks in the design, as well as the sensitivity or vulnerability of the peripheral environment. The different stages of the environmental risk assessment process include risk identification and analysis, exposure assessment, risk assessment and risk management. Most of the studies, conducted so far, have focused more on the project safety aspects less focused on their environmental aspects. Environmental risk assessment can be used as an integral part of the environmental impact assessment [7].

Risk assessment is performed to determine the severity of exposure to hazards. Of primary importance are issues addressing the adverse effects of such events, whether they should be completely eliminated or could be managed through proper control and preventive measures.Risk assessment will identify existing risks and identify them as a priority in the risk management process and determine how they should be treated.

FMEA is a systematic method for analysing and classifying hazards associated with different products or processes and prioritising risks in order to propose appropriate corrective action and to achieve the desired situation [5]. The main purpose of using FMEA method is to identify the potential states (modes) of the failure system, to assess the causes and effects of the system, to provide a solution to eliminate or reduce the likelihood of occurrence and severity of the effect [8].

According to M. Roszak, M. Spilka, A. Kania [9] the identified environmental aspects are assessed using FMEA risk assessment methodology by environmental degradation factor assessment. Thus, the proper checklist will include variables such as process identification, potential failure mode (environmental aspects), potential effects of failure (consequences), potential causes of failure, initial environmental impact assessment (severity, occurrence, degree of contamination, RPN or level of risk (control action) and secondary environmental impact assessment (severity, occurrence, degree of contamination, RPN or level of risk) as environmental aspects. Since checklists have a content validation, environmental impact checklists, in particular, are normally created with the active involvement of professional healthcare specialists, environmentalists and other experts, employed in the respective organizational unit. Once the necessary information has been collected, the environmental degradation factories to be assessed by analysing the modes of failure and its effects upon the deterioration of the environment (EFMEA). To calculate failure rates FMEA uses the so-called RPN (Risk Priority Number) derived from three components: risk severity (S), risk probability (P) and risk detection (D). RPN gives priority to product or system failure modes, so the larger the RPN, the more serious are the problems associated with the resources allocated in terms of time, cost and quality. The risk parameters P, S and D, therefore, are obtained on the Likert scale [13]:

$$RPN = \text{O xS x D} \tag{1}$$

where O (Occurrence) is the "occurrence of failure", indicating the probability that the failure mode will occur as a result of a specific cause; S (Significance of "severity", the assessment of the severity of the effect of the potential failure mode of the process at the time it occurred; and D the probability of a potential failure detection.

Sai X. Zeng, Chun M. Tam, Vivian W. Y. Tam E-FMEA(Environmental FMEA) is one of the eco design tools used in the process of product design. Taking into account the effects of technology upon the environment incurred by technical problems, deficiencies, errors or process irregularities, the analysis under consideration can be used for constructive, technological and system improvements. E-FMEA methodology allows for a systematic review of potential product or process-related environmental problems to be conducted prior to occurrence of their effects .The concept of "environmental impact" is "free assessment", while the concept of "environmental severity" describes the negative effects of these impacts and can be used to assess the significance of severity or the effect of the environmental impact (S). The second criterion refers to potential technical causes and is applied to assess the likelihood orprobability of occurrence of an impact that affects the environment (O). The probabilities and consequences of risk events upon the environment can be accessed through the

values of the severity of the environmental impact (S), the probability of cause occurrence (O) and the effects (D), with the values of the variables ranging from 1 (low risk) to 10 (high risk). Obtained, in this manner, is the end product or the RPN (Risk Priority Number) [10].

The methodology for risk analysis is applicable for the environmental impact of manufacturing processes. Established in E-FMEA are the index values of occurrence probability and that of environmental risk significance and detection. E-FMEA analysis draws on the assessment of the three most important criteria the production processes should follow:

- compliance with the legal requirements as regards the environmental impact assessment;
- alignment with the requirements for the environmental impact of the technological processes;
- accordance with the requirements for the environmentally-friendly production processes – as regards machinery, assets and equipment in manufacturing units.

The analysis under discussion assumes that the existing failures have a severe impact upon the environment - this is related to the second treatment or elimination of the failure that affects the assessment of the environmental efficiency of the process.

E-FMEA results in the provision of process-related environmental risk assessment. The result takes the form of numerical values constituting the product of the three accepted values as mentioned above.

Murat OZKOK1 states that the Failure Mode and Effects Analysis enables failure risks to be quantified through a risk priority number, which, in turn, is a product of severity, occurrence, and detection. The risk priority number in FMEA is traditionally calculated by multiplying the degree of severity (S) x probability of occurrence (O) x detection (D). McCain [11] argues that FMEA process can be modified to suit its unique applications. Conventional FMEA in his research study and calculates the risk priority number by multiplying degree of severity (S) x Occurrence (O) x Frequency (F). Frequency is here an estimate of how often the activity is performed. The risk priority number is calculated as: Significance (S) x Occurrence (O) x Duration (D). Here, the duration stands for the length of time the activity will last. The reason why the risk priority number involves the period of duration is that that the duration of the activity plays an important role in determining the risk. For example, let us compare a person who performed welding operations for 2 hours and a second one –for 4 hours. In this case, the higher risk was observed for the second person due to prolonged risk exposure [13].

Murat OZKOK defines several phases for determining the risk in the ship's hull structure. The first phase of the methodology is to obtain failure statistics. In this phase, the shipyard's previous failures have been achieved. The more statistics data is obtained, the better. Once the previous failure statistics data is obtained, the failures are grouped to be later applied in determining the obligatory failure probability and failure severity. Calculated, thus, in the fifth phase is the duration of the activity. Identified, for the purposes of the required detailed process analysis, are the work stations that make up the production line of the hull structure as well as the core work activities and their duration. Calculated in the sixth phase are the risk priority numbers (RPN) to be finally contrasted more closely [11].

V. CONCLUSION

FMEA methodology allows prioritisation of failures according to their severity, frequency and detection. The severity describes the significance of the effects of failure. Frequency describes how often failures can occur. Detection refers to a degree of difficulty in detecting damages. FMEA also includes documenting or recording the current knowledge of the risks of failure. FMEA reduces risk at all levels by taking actions that prevent failures or at least reduce their probability of occurrence. It also decides conclusively and assists in the selection of corrective actions that mitigate the impact and consequences of failures. FMEA is applicable in the earliest design and conceptual stages and, through development and testing processes, could be further employed in controlling the process of ongoing operations throughout the entire product or system life cycle.

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Motion of A Rocket in Three-Dimension with Constant Thrust Over A Spherical Rotating Earth Holding Constant Heading and Constant Path Inclination

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Abstract— *In this paper we have determined the velocity and altitude of a spacecraft and then equation of its trajectory with constant thrust, constant heading and constant path-inclination by regulating the bank angle and angle of attack.*

Keywords— Path inclination, constant, relative, rotating, spherical, Bessel's equation, angular velocity, thrust, rocket.

I. INTRODUCTION

Angelo Miele[1] derived differential equations of three- dimensional motion of a spacecraft relative to a spherical rotating Earth. In fact analytical solutions to these complicated equations are not possible.He[1] made no attempt to solve them with some simplified assumptions or introducing some constraints. In this feature are first determined the velocity and altitude of the space vehicle and the equation of its trajectory with constant thrust, constant heading and constant path-inclination by manipulating the bank angle and the angle of attack.

Three-dimensional equations of motion[1] of the space vehicle relative to the spherical rotating Earth are rewritten in a modified form considering the thrust along the flight path and neglecting the variation of gravity with altitude:

$$\dot{X} = \frac{VR\cos\gamma\cos\chi}{(h+R)\cos(\frac{Y}{R})}\ ,\ \dot{Y} = \frac{\boldsymbol{VR}\cos\gamma\boldsymbol{\sin\chi}}{(\boldsymbol{h}+\boldsymbol{R})}$$

$$\dot{h}=V\sin\gamma,\ \dot{V} = \frac{-D}{m}+\frac{T}{m} - g\sin\gamma\ ,\ T = \beta V_E\ ,\ \dot{m} + \beta = 0 \tag{1}$$

$$\dot{\gamma}=(\frac{L}{mV})\cos\emptyset - \frac{g}{V}\cos\gamma + \frac{V\cos\gamma}{h+R}+2\omega cos\chi\cos\frac{Y}{R}$$

$$\dot{\chi} = (\frac{L}{mv\cos\gamma})\sin\emptyset - \frac{V\cos\gamma\cos\chi\tan Y/R}{h+R} + 2\omega(\tan\gamma\sin\chi\cos\frac{Y}{R} - \sin\frac{Y}{R})$$

$$D=\frac{1}{2}C_D\rho SV^2\ ,\ L=\frac{1}{2}C_L\rho SV^2$$

II. NOMENCLATURE

D=drag ,L=lift, h=altitude, m=mass of the space craft, R= radius of the Earth, t =time, V= velocity at time t, V_E=exhaust velocity, $\emptyset$ =bank angle,X= longitudinal range over the Earth's surface, Y =latitudinal range over the Earth's surface, γ = flight − path angle, χ = heading angle, ω = Earth's rotational angular velocity, C_D=drag coefficient ,C_L=lift coefficient, ρ = atmospheric density, S = reference surface area of the spacecraft, g = acceleration due to gravity,T= thrust of the spacecraft, β = constant propellant mass flow ,ie, rate of propellant consumption, prime sign=’=derivative with respect to mass m. $\frac{\frac{1}{2}C_D\rho S}{\beta}$ =K_D= drag factor.

III. FORMATION OF EQUATIONS OF MOTION

Combining two relevant equations of set(1), we obtain

$$\frac{dV}{dm} = \frac{K_D V^2}{m} - \frac{V_E}{m} + c \tag{2}$$

where c=$\frac{g\sin\gamma}{\beta}$ =constant (3)

Equation (2) can be converted into Bessel's equation by substituting,

$$V = -\frac{1}{K_D}\frac{m}{u}\frac{du}{dm} \tag{4}$$

$$m^2\frac{d^2u}{dm^2} + m\frac{du}{dm} + (cm - V_E)K_D u = 0 \tag{5}$$

Comparing equation (5) with equation (2), we get

$$x^2\frac{d^2y}{dx^2} + nx\frac{dy}{dx} + (b + c_1x^{2m_1})y = 0$$

IV. SOLUTION TO THE EQUATIONS

Solution[2] to the above equation is stated as

$$y = x^{\frac{-(n-1)}{2}}\left[A j_{\mu}\left(\frac{c_1^{\frac{1}{2}}x^{m_1}}{m_1}\right) + B j_{-\mu}\left(\frac{c_1^{\frac{1}{2}}x^{m_1}}{m_1}\right)\right]$$

where $\mu^2 m_1^2 = \frac{1}{4}(n-1)^2 - b$ and 2μ is of non integral value in general. *But* $j_{-\mu}$ is replaced by Y_{μ}.However in this situation with n=1, x=m, y=u, $c_1 = cK_D$, $b = -V_E K_D$ *and* $m_1 = \frac{1}{2}$, the required solution to equation (5) with $\mu = 2\sqrt{V_E K_D}$ is given by 'as usual' Bessel function[2]:

$$u = A j_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m}) - B Y_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m}) \tag{5.1}$$

and hence because of (4) the velocity is given by

$$V = \frac{-\sqrt{\frac{cm}{K_D}}\left[j'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m}) - \lambda Y'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})\right]}{j_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m}) - \lambda Y_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})} \tag{6}$$

where constant $\lambda = \frac{B}{A}$ is determined by use of the initial conditions at t=0,

$$m = m_0, h = 0, V = 0 \tag{7}$$

$$\lambda = \frac{j'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})}{Y'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})} \tag{8}$$

Now maneuvering of two control parameters bank angle ϕ and lift coefficient C_L is to bring about constant heading χ_0 and constant flight − path angle γ_0 from (1)

$$\text{with } \dot{\chi} = 0 \text{ and } \dot{\gamma} = 0 \Rightarrow \chi = \chi_0 \text{ and } \gamma = \gamma_0 \tag{9}$$

With this aspect two equations involving ϕ from (1) yield

$$\tan\phi = \frac{\frac{V\cos\gamma_0\cos\chi_0}{h+R}\tan\frac{Y}{R} - 2\omega(\tan\gamma_0 \sin\chi_0\cos\frac{Y}{R} - \sin\frac{Y}{R})}{\frac{g}{V} - \frac{V}{h+R} - 2\omega\cos\chi_0\frac{\cos\frac{Y}{R}}{\cos\gamma_0}} \tag{10}$$

Similarly,

$$C_L=\frac{2m}{\rho SV}\left[\sqrt{\left(\frac{g}{V}-\frac{V}{h+R}-2\omega\cos\frac{Y}{R}\right)^2+\left\{\frac{V\cos\chi_0}{h+R}\tan\frac{Y}{R}-2\omega\left(\tan\gamma_0 sin\chi_0\cos\frac{Y}{R}-\sin\frac{Y}{R}\right)\right\}^2}\right]\cos\gamma_0 \quad (11)$$

In order to execute time-varying $\emptyset$ *and*

C_L, equations (9)and (11) need to be expressed as functions of time t or mass m .With the initial conditions (7),from (1)and (4) one gets

$$h(m)=\int_0^t V(t)\,sin\gamma_0\,dt$$

$$=\frac{\sin\gamma_0}{\beta}\sqrt{\frac{c}{K_D}}\int_m^{m_0}\frac{\left[j'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})-\lambda Y'_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})\right]}{j_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})-\lambda Y_{2\sqrt{V_E K_D}}(2\sqrt{cK_D m})}\sqrt{m}dm \quad (12)$$

which needs to be evaluated numerically.

Considering $\gamma\ and\ \chi$ constants equal to γ_0 and χ_0 respectively as mentioned earlier by regulating / varying C_L and ϕ with time and now combining the first two of set(1),

$$\frac{dY}{dX}=\tan\chi_0\cos\frac{Y}{R} \quad (13)$$

Since initially at t=0,X=0,Y=0,h=0, (14)

the equation of the trajectory of the rocket is obtained from (13) as

$$\sec\frac{Y}{R}+\tan\frac{Y}{R}=e^{X\left(\frac{\tan\chi_0}{R}\right)} \quad (15)$$

$$\text{Now, } sec^2\frac{Y}{R}-tan^2\frac{Y}{R}=1 \quad (15.1)$$

Combining these two equations and simplifying we get

$$Y=Rtan^{-1}[\sin\ hyperbolic\ (X\frac{tan\chi_0}{R})] \quad (16)$$

$$\text{Similarly, } \frac{dY}{dh}=\frac{R\cot\gamma_0\sin\chi_0}{R+h} \quad (17)$$

$$\text{Or, } Y=R\cot\gamma_0\sin\chi_0\log(1+\frac{h}{R})$$

$$\text{Or, } h=R[e^{\frac{(Y\tan\gamma_0)}{R\sin\chi_0}}-1] \quad (18)$$

Owing to the initial conditions (7), from equation (1)

$$m=m_0-\beta t \quad (19)$$

V. CONCLUSION

Hence knowing the velocity- mass distribution(6),altitude-mass distribution (12), equation of the trajectory, ie, longitudinal-latitudinal range distribution (16),altitude-latitudinal range distribution (18) and finally simple mass variation law (19) with respect to time t, the bank angle (10) and the lift coefficient (11) can be made time- varying control parameters so as to accomplish such type of rocket motion.

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Study of association between pre-test knowledge and selected demographic variables of Primary School Teachers regarding selected emotional and behavioural disorders of children.

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Abstract— *The early years of a child's life are very important for his or her health and development. Healthy development means that children of all abilities, including those with special health care needs, are able to grow up where their social, emotional and educational needs are met. Having a safe and loving home and spending time with family—playing, singing, reading, and talking—are very important. Proper nutrition, exercise, and sleep also can make a big difference.*

Children's emotional and behavioural disorders are disorders that affect not only children's behaviour, emotions, moods, or thoughts, but can also affect the entire family as well. The established pattern of emotional or behavioral responses might adversely affect educational or developmental performance including intrapersonal, academic, vocational or social skills.

Keywords— children early age growth, children behavior, health care of children.

I. INTRODUCTION

Children are the real wealth of the nation. They are the builders of India and tomorrow provided their mind and intellect are harnessed in proper channels, they could prove to be worthy custodian of the big heritage (**Singhal P.K.,1991).**

The early years of a child's life are very important for his or her health and development. Healthy development means that children of all abilities, including those with special health care needs, are able to grow up where their social, emotional and educational needs are met. Having a safe and loving home and spending time with family—playing, singing, reading, and talking—are very important. Proper nutrition, exercise, and sleep also can make a big difference.

In fact, a child's difficulty can be just the starting point for teachers worry and concern. Primary School Teachers might not know what to do to help their child or where to go for a help. Possibly, Primary School Teachers may worry because they don't even know if their child's problem is something they should be concerned about in the first place.

Childhood emotional and behavioral disorders should be assessed to help worried Primary School Teachers to better understand various ways that mental illness can affect children; what it looks like and how it can be helped.

Children's emotional and behavioural disorders are disorders that affect not only children's behaviour, emotions, moods, or thoughts, but can also affect the entire family as well. The established pattern of emotional or behavioral responses might adversely affect educational or developmental performance including intrapersonal, academic, vocational or social skills.

II. EMOTIONAL AND BEHAVIOR DISORDERS (EBD)

Emotional and Behavioral Disorders (EBD) are typically referred to when a child is experiencing emotional Disorders having behavioral issues. Emotional and Behavior Disorders, is also referred to as Emotional and Behavioral Disorders, Behavioral and Emotional Disorders, Mental and Behavioral Disorders, and Emotional Behavioral Disability, also abbreviated EBD. These terms are most often used in education and in reference to children. It is a category that is not precisely defined and about which specialists disagree. In the criteria for special education for children aged 3 to 12 years, "emotional disturbance" is one of the eligible disabilities.

Emotional and Behavioral Disorder (EBD) refers to a condition in which behavioral or emotional responses of an individual in school are so different from his/her generally accepted age appropriate, ethnic or cultural norms that it adversely affects performance in such areas as self care, social relationships, personal adjustment, academic progress and classroom behavior or work adjustment **(Forness & Knitzer.,1992)**[7].

Federal government has defined the term emotionally disturbed. It is "a condition exhibiting one or more of the following characteristics over a long period of time and to a marked extent, which adversely affects educational performance:

- Inability to learn that cannot be explained by intellectual, sensory, or health factors
- Inability to build or maintain relationships with teachers and peers
- Inappropriate types of behaviors or feelings under normal circumstances
- A general pervasive mood of unhappiness or depression
- A tendency to develop physical symptoms or fears associated with personal or school Disorders (Hallahan, 2009)

There is no heading "Emotional and Behavior Disorders" in the DSM-IVR (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Revised), but there are a number of diagnoses in each that may often be considered to fit the Emotional and Behavior Disorders category. The International Classification of Diseases (currently ICD-10), on the other hand, has a section (F90-F98) called “Emotional and Behavioural Disorders” with onset usually occurring in childhood and adolescence."

2.1 EBD and ICD

Section F90-F98 of the ICD-10, which has the title mentioned above tying it to our topic, contains seven categories of disorders. Here they are, with clarifying examples of the subtopics:

- Hyperkinetic disorders, including Attention-deficit hyperactivity disorder (ADHD)
- Conduct disorders, including those confined to the family, those not so confined, and Oppositional Defiant Disorder (ODD)
- Mixed disorders of conduct and emotions, including Depressive Conduct Disorder
- Emotional disorders with onset specific to childhood, including separation anxiety disorder, sibling rivalry disorder, and social anxiety disorder
- Disorders of social functioning with onset specific to childhood and adolescence, including elective or selective mutism
- Tic disorders, including Tourette's Disorder
- Other behavioral and emotional disorders with onset usually occurring in childhood and adolescence, including stuttering, pica, cluttering, thumb-sucking, and Attention Deficit Disorder without hyperactivity (ADD).

2.2 EBD and DSM-IVR

The DSM-IVR has a different organizational system for the most closely corresponding section, which it calls "Disorders usually first diagnosed in infancy, childhood, or adolescence." First, it includes learning disabilities that are clearly not emotional or behavioral disorders or disabilities, like autism and mental retardation. In addition, EBD disorders are not sorted out from other disabilities and placed in separate categories, as you will see in this summary of the seven categories that contain EBD disorders:

- Communication disorders including not only stuttering, but also expressive language disorder (which the ICD categorizes as a disorder of psychological development)
- Attention-deficit and disruptive behavior disorders, including ADHD, Conduct Disorder, and Oppositional Defiant Disorder (ODD)
- Feeding and eating disorders of infancy or early childhood, including pica
- Tic disorders, including Tourette's Disorder
- Elimination disorders
- Other disorders of infancy, childhood, or adolescence, including separation anxiety disorder and selective Mutism.

2.3 Causes of EBD

The common causes of emotional behavior disorder tend to be biological disorders and diseases, which are usually caused by genetics, neurological, or biochemical factors, pathological family relationships, undesirable experiences at school, and negative cultural influences, like televised violence, terrorism, and drug and alcohol abuse.

2.4 Characteristics of EBD

E.B.D. can be classified by two broad categories: externalizing and internalizing behaviors. Externalizing behaviors are observable outwardly behaviors, such as hitting and yelling. These behaviors are usually negatively directed towards others. Alternatively, internalizing behaviors are the internal mental or emotional Disorders. Some indicators of internal Disorders are depression, anxiety, withdrawal, and fearfulness. Most E.B.D. children have an I.Q. that usually fall in the slow to mid intellectual range. Every few score fall in the above normal range.

2.5 Types of E.B.D

2.5.1 Attention Deficit Disorder (ADD)

Attention Deficit Disorder, abbreviated ADD, is a term that was formerly quite common. However, the disorder that it refers to has been reconceived as a subcategory of Attention-Deficit/Hyperactivity Disorder, abbreviated ADD.

The slash in the name *Attention-Deficit/Hyperactivity Disorder* is meant to convey that there are multiple types, either more characterized by the loss of attention or characterized by hyperactivity. One reason that people may be continuing to use the ADD tag is that without the slash, Attention-Deficit Hyperactivity Disorder makes it seem that hyperactivity is a central and essential component. So the use of the slash is important in showing a proper understanding of the disorder, acknowledging that hyperactivity is not a symptom of all of the manifestations.

Attention Deficit/Hyperactivity Disorder is now conceived of as comprising at least three distinguishable types referred to in the DSM-IV TR (*Diagnostic and Statistics Manual of Mental Disorders*, 4th Edition, Text Revision). They are:

- Combined subtype
- Predominantly hyperactive-impulsive subtype
- Predominantly inattentive subtype
- Attention-Deficit Hyperactivity Disorder NOS (Not Otherwise Specified)

To understand where ADD fits it, it is important to know that AD/HD has three key classes of symptoms: symptoms of inattention; symptoms of hyperactivity; and symptoms of impulsivity.

The combined subtype is the diagnosis given to people who have symptoms that fit into all three categories: hyperactive, impulsive, and inattentive. The predominantly hyperactive-impulsive subtype is the diagnosis given to people who have symptoms that fit in the hyperactivity and impulsivity categories. And the predominantly inattentive subtype is the diagnosis given to people who used to be diagnosed as having Attention Deficit Disorder, and they only exhibit symptoms in the area of inattention,

2.5.2 ADD Symptoms

Diagnosis of ADD can only be made by a health care professional, but it can be useful to have an idea of the symptoms in order to help tell whether behavior is developmentally appropriate or not. To diagnose ADD, a person must exhibit six of a set of 9 inattention symptoms for at least six months, and to an extent that is not developmentally appropriate and to a degree that functioning is impaired. The symptoms are (in paraphrased version):

1. Frequently fails to pay close attention to details or makes careless mistakes.
2. Frequently has trouble maintaining attention, whether doing tasks or playing.
3. Frequently seems not to listen when being directly addressed in speech.
4. Frequently fails to follow through, whether in completing schoolwork, finishing chores, or working, but not due to an attitude of defiance or a lack of understanding of what was required.
5. Frequently has trouble organizing undertakings.

6. When faced with tasks that require ongoing mental effort, either avoids them or shows dislike for them.
7. Frequently loses important items necessary to carry out assignments, tasks, etc.
8. Frequently is easily distracted.
9. Frequently forgetful in activities that occur every day.

III. ANXIETY DISORDER

Anxiety is one of the most common mental health concerns for children and adults, affecting upwards of 20% of children and adolescents over the lifespan. Anxious youth are often quiet and well behaved, and thus frequently go unnoticed by their parents, teachers, and coaches. Alternatively others can be disruptive and act out, being labeled as having attention deficit disorder or being a "bad" kid. Both scenarios result in youth failing to receive the help they desperately need. Sadly, untreated anxiety can lead to depression, missed opportunities in career and relationships, increased substance use, and a decreased quality of life.

Parents often say that from a very young age, they knew there was something different about their child, but did not immediately recognize it as an anxiety problem. Some waited for their child to "grow out of it", never expecting their child to become even more debilitated over time. Other parents viewed the anxious behaviours as normal as, they, too behaved in a similar way. As a result, parents of anxious children and teens are often confused about what to do, as well as frustrated, and overwhelmed.

those children who experience a specific list of anxious symptoms, more frequently and intensely than peers, are more likely to also experience significant disruption in their lives. This disruption can interrupt or even stop him or her from participating in a variety of typical childhood experiences such as:

- Attending school
- Joining social, athletic or recreational clubs
- Meeting age expected demands such as sleeping through the night, doing homework, and making friends.

It is normal to feel fearful, apprehensive, and/or anxious when facing particularly challenging, dangerous, or stressful situations. Groups of disorders referred to as anxiety disorders, and other disorders with anxiety in their name refer to conditions in which people feel fearful, apprehensive, physically tense, and/or anxious in a way that is out of proportion to what they are dealing with or in a way that is not helpful in coping with danger and stress, but disabling. Symptoms may include sweating, elevated blood pressure, palpitations, and headaches. The anxiety that is experienced may be continuous or occur in episodes, sometimes only upon the presence of some stimulus or some other onset trigger. in panic disorders, there may also be hyperventilation. Anxiety disorders cause extreme fear and worry, and changes in a child's behavior, sleep, eating, or mood.

Different anxiety disorders can affect kids and teens. They include:

3.1 Generalized anxiety disorder (GAD)

GAD causes kids to worry almost every day and over lots of things. Kids with GAD worry over things that most kids worry about, like homework, tests, or making mistakes.

3.2 Separation anxiety disorder (SAD)

It's normal for babies and very young kids to feel anxious the first times they are apart from their parent. When kids don't outgrow the fear of being apart from a parent, it's called separation anxiety disorder. Even as they get older, kids with SAD feel very anxious about being away from their parent or away from home.

3.3 Social phobia (social anxiety disorder)

With social phobia, kids to feel too afraid of what others will think or say. They are always afraid they might do or say something embarrassing. They worry they might sound or look weird. They don't like to be the center of attention. They don't want others to notice them, so they might avoid raising their hand in class. If they get called on in class, they may freeze or panic and can't answer. With social phobia, a class presentation or a group activity with classmates can cause extreme fear.

3.4 Selective Mutism (SM)

This extreme form of social phobia causes kids to be so afraid they don't talk. Kids and teens with SM *can* talk. And they do talk at home or with their closest people. But they refuse to talk at all at school, with friends, or in other places where they have this fear.

3.5 Specific phobia

It's normal for young kids to feel scared of the dark, monsters, big animals, or loud noises like thunder or fireworks. Most of the time, when kids feel afraid, adults can help them feel safe and calm again. But a phobia is a more intense, more extreme, and longer lasting fear of a specific thing. With a phobia, a child dreads the thing they fear and tries to avoid it. If they are near what they fear, they feel terrified and are hard to comfort.

3.5.1 Signs & Symptoms of Anxiety

A parent or teacher may see signs that a child or teen is anxious. For example, a kid might cling, miss school, or cry. They might act scared or upset, or refuse to talk or do things. Kids and teens with anxiety also feel symptoms that others can't see. It can make them feel afraid, worried, or nervous. It can affect their body too. They might feel shaky, jittery, or short of breath. They may feel "butterflies" in their stomach, a hot face, clammy hands, dry mouth, or a racing heart.

3.5.2 Causes of Anxiety Disorders

Several things play a role in causing the overactive "fight or flight" that happens with anxiety disorders. They include:

- **Genetics.** A child who has a family member with an anxiety disorder is more likely to have one too. Kids may inherit genes that make them prone to anxiety.
- **Brain chemistry.** Genes help direct the way brain chemicals (called neurotransmitters) work. If specific brain chemicals are in short supply, or not working well, it can cause anxiety.
- **Life situations.** Things that happen in a child's life can be stressful and difficult to cope with. Loss, serious illness, death of a loved one, violence, or abuse can lead some kids to become anxious.
- **Learned behaviors.** Growing up in a family where others are fearful or anxious also can "teach" a child to be afraid too.

3.5.3 Diagnosis of Anxiety Disorders

Anxiety disorders can be diagnosed by a trained therapist. They talk with you and your child, ask questions, and listen carefully. They'll ask how and when the child's anxiety and fears happen most. That helps them diagnose the specific anxiety disorder the child has. A child or teen with symptoms of anxiety should also have a regular health checkup. This helps make sure no other health problem is causing the symptoms.

3.5.4 Treatment of Anxiety Disorders

Most often, anxiety disorders are treated with **cognitive behavioral therapy (CBT)**. This is a type of talk therapy that helps families, kids, and teens learn to manage worry, fear, and anxiety. CBT teaches kids that what they think and do affects how they feel. In CBT, kids learn that when they avoid what they fear, the fear stays strong. They learn that when they face a fear, the fear gets weak and goes away. The types of treatment used vary with the specific type of anxiety disorder involved. In general, psychotherapy, including cognitive-behavioral therapy (CBT) and interpersonal therapy, as well as medications, including antidepressants are used as many as 60 percent of people with an anxiety disorder are also depressed, often in combination. When substance abuse is the cause of the anxiety, treatment for the abuse or addiction that leads to anxiety is, obviously, a key element of the treatment.

3.5.5 In CBT

- Parents learn how to best respond when a child is anxious. They learn how to help kids face fears.
- Kids learn coping skills so they can face fear and worry less.

  The therapist helps kids practice, and gives support and praise as they try. Over time, kids learn to face fears and feel better. They learn to get used to situations they're afraid of. They feel proud of what they've learned. And without so many worries, they can focus on other things — like school, activities, and fun. Sometimes, medicines are also used to help treat anxiety.

If your child has an anxiety disorder, here are some ways you can help:

- Find a trained therapist and take your child to all the therapy appointments.
- Talk often with the therapist, and ask how you can best help your child.
- Help your child face fears. Ask the therapist how you can help your child practice at home. Praise your child for efforts to cope with fears and worry.
- Help kids talk about feelings. Listen, and let them know you understand, love, and accept them. A caring relationship with you helps your child build inner strengths.
- Encourage your child to take small steps forward. Don't let your child give up or avoid what they're afraid of. Help them take small positive steps forward.
- Be patient. It takes a while for therapy to work and for kids to feel better.

IV. CONDUCT DISORDER

Conduct disorder is a serious behavioral and emotional disorder that can occur in children and teens. A child with this disorder may display a pattern of disruptive and violent behavior and have problems following rules.

It is not uncommon for children and teens to have behavior-related problems at some time during their development. However, the behavior is considered to be a conduct disorder when it is long-lasting and when it violates the rights of others, goes against accepted norms of behavior and disrupts the child's or family's everyday life.

4.1 Causes of Conduct Disorder

The exact cause of conduct disorder is not known, but it is believed that a combination of biological, genetic, environmental, psychological, and social factors play a role.

- **Biological:** Some studies suggest that defects or injuries to certain areas of the brain can lead to behavior disorders. Conduct disorder has been linked to particular brain regions involved in regulating behavior, impulse control, and emotion. Conduct disorder symptoms may occur if nerve cell circuits along these brain regions do not work properly. Further, many children and teens with conduct disorder also have other mental illnesses, such as attention-deficit/hyperactivity disorder (ADHD), learning disorders, depression, substance abuse, or an anxiety disorder, which may contribute to the symptoms of conduct disorder.
- **Genetics:** Many children and teens with conduct disorder have close family members with mental illnesses, including mood disorders, anxiety disorders, substance use disorders and personality disorders. This suggests that a vulnerability to conduct disorder may be at least partially inherited.
- **Environmental:** Factors such as a dysfunctional family life, childhood abuse, traumatic experiences, a family history of substance abuse, and inconsistent discipline by parents may contribute to the development of conduct disorder.
- **Psychological**: Some experts believe that conduct disorders can reflect problems with moral awareness (notably, lack of guilt and remorse) and deficits in cognitive processing.
- **Social:** Low socioeconomic status and not being accepted by their peers appear to be risk factors for the development of conduct disorder.

4.2 Symptoms of Conduct Disorder

Symptoms of conduct disorder vary depending on the age of the child and whether the disorder is mild, moderate, or severe. In general, symptoms of conduct disorder fall into four general categories:

- **Aggressive behavior:** These are behaviors that threaten or cause physical harm and may include fighting, bullying, being cruel to others or animals, using weapons, and forcing another into sexual activity.
- **Destructive behavior:** This involves intentional destruction of property such as arson (deliberate fire-setting) and vandalism (harming another person's property).

- **Deceitful behavior:** This may include repeated lying, shoplifting, or breaking into homes or cars in order to steal.
- **Violation of rules:** This involves going against accepted rules of society or engaging in behavior that is not appropriate for the person's age. These behaviors may include running away, skipping school, playing pranks, or being sexually active at a very young age.

In addition, many children with conduct disorder are irritable, have low self-esteem, and tend to throw frequent temper tantrums. Some may abuse drugs and alcohol. Children with conduct disorder often are unable to appreciate how their behavior can hurt others and generally have little guilt or remorse about hurting others.

4.3 Prevalence of Conduct Disorder

It is estimated that 2%-16% of children in the U.S. have conduct disorder. It is more common in boys than in girls and most often occurs in late childhood or the early teen years.

4.4 Diagnosis of Conduct Disorder

As with adults, mental illnesses in children are diagnosed based on signs and symptoms that suggest a particular problem. If symptoms of conduct disorder are present, the doctor may begin an evaluation by performing complete medical and psychiatric histories. A physical exam and laboratory tests (for example, neuroimaging studies, blood tests) may be appropriate if there is concern that a physical illness might be causing the symptoms. The doctor will also look for signs of other disorders that often occur along with conduct disorder, such as ADHD and depression.

If the doctor cannot find a physical cause for the symptoms, he or she will likely refer the child to a child and adolescent psychiatrist or psychologist, mental health professionals who are specially trained to diagnose and treat mental illnesses in children and teens. Psychiatrists and psychologists use specially designed interview and assessment tools to evaluate a child for a mental disorder. The doctor bases his or her diagnosis on reports of the child's symptoms and his or her observation of the child's attitudes and behavior. The doctor will often rely on reports from the child's parents, teachers, and other adults because children may withhold information or otherwise have trouble explaining their problems or understanding their symptoms.

4.5 Treatment of Conduct Disorder

Treatment for conduct disorder is based on many factors, including the child's age, the severity of symptoms, as well as the child's ability to participate in and tolerate specific therapies. Treatment usually consists of a combination of the following:

- **Psychotherapy:** Psychotherapy (a type of counseling) is aimed at helping the child learn to express and control anger in more appropriate ways. A type of therapy called cognitive-behavioral therapy aims to reshape the child's thinking (cognition) to improve problem solving skills, anger management, moral reasoning skills, and impulse control. Family therapy may be used to help improve family interactions and communication among family members. A specialized therapy technique called parent management training (PMT) teaches parents ways to positively alter their child's behavior in the home.
- **Medication** : Although there is no medication formally approved to treat conduct disorder, various drugs may be used (off label) to treat some of its distressing symptoms (impulsivity, aggression), as well as any other mental illnesses that may be present, such as ADHD or major depression.

4.6 Outlook for Children with Conduct Disorder

If your child is displaying symptoms of conduct disorder, it is very important that you seek help from a qualified doctor. A child or teen with conduct disorder is at risk for developing other mental disorders as an adult if left untreated. These include antisocial and other personality disorders, mood or anxiety disorders, and substance use disorders.

Children with conduct disorder are also at risk for school-related problems, such as failing or dropping out, substance abuse, legal problems, injuries to self or others due to violent behavior, sexually transmitted diseases, and suicide. Treatment outcomes can vary greatly, but early intervention may help to reduce the risk for incarcerations, mood disorders, and the development of other comorbidities such as substance abuse.

4.7 Prevention of Conduct Disorder

Although it may not be possible to prevent conduct disorder, recognizing and acting on symptoms when they appear can minimize distress to the child and family, and prevent many of the problems associated with the condition. In addition,

providing a nurturing, supportive, and consistent home environment with a balance of love and discipline may help reduce symptoms and prevent episodes of disturbing behavior.

V. CONCLUSION

The main aim of the study was to evaluate the knowledge regarding the selected Emotional and Behavioral Disorder of children among their Primary School Teachers. 158 Primary School Teachers were selected by convenient sampling techniques. A Plan Teaching Programme was made which included all information about selected Emotional and Behavioral Disorder of children. This helped the Primary School Teachers to gain more knowledge about identifying and management of Emotional and Behavioral Disorder of children.

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