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A Study on Impact of TPM in Ajute International Pvt Ltd

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ABSTRACT: Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plants and equipment. One of the main objectives of TPM is to increase the productivity of plant and equipment with a modest investment in maintenance. Total quality management (TQM) and total productive maintenance are considered as the key operational activities of the quality management system. The main objective of TPM is to increase the Overall Equipment Effectiveness of plant equipment. TPM addresses the causes for accelerated deterioration while creating the correct environment between operators and equipment to create ownership. Through this study, the researcher tries to evaluate the effectiveness of the total productive maintenance practice followed in Ajute International Pvt. Ltd . The major objectives are to determine the efficiency of the TPM training programme for new employees, know the effectiveness of maintenance and repair works carried out during the facility downtime condition and to assess the impacts of TPM.

KEYWORDS: Total Productive Maintenance, plants, equipment, effectiveness of maintenance, Total quality management .

I.INTRODUCTION

In industry, total productive maintenance (TPM) is a system of maintaining and improving the integrity of production and quality systems through the machines, equipment, processes, and employees that add business value to an organization. TPM focuses on keeping all equipment in top working condition to avoid breakdowns and delays in manufacturing processes. It can be considered as the medical science of machines. Total Productive Maintenance (TPM) is a maintenance program which involves a newly defined concept for maintaining plants and equipment. The goal of the TPM program is to markedly increase production while, at the same time, increasing employee morale and job satisfaction.

TPM brings maintenance into focus as a necessary and vitally important part of the business. It is no longer regarded as a non-profit activity. Down time for maintenance is scheduled as a part of the manufacturing day and, in some cases, as an integral part of the manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum.

Why TPM ?

TPM was introduced to achieve the following objectives. The important ones are listed below.

- Avoid wastage in a quickly changing economic environment.
- Producing goods without reducing product quality.
- Reduce cost.
- Produce a low batch quantity at the earliest possible time.

Industry Profile

The manufacture of jute fibres into coarse cloth by hand-spinning and hand- weaving was a very old industry in India. "Practically, every homestead in the jute tracts had a few bundles of jute suspended from a beam in the roof of

the verandah. The fibre was spun into twist or yarn, and worked up as required into string or rope, or was woven into gunny cloth or bag.”

The first power loom was established in 1859 at Baranagar near Calcutta. In the beginning, the progress was very slow so much so that between 1854 to 1863—64, only one more mill was built. From 1863—64 onwards, however, growth of the industry was fairly rapid, occasional set-backs notwithstanding jute was the monopoly of India, and in this, the Bengal industry “furnished with the best mechanical appliances moved by steam” had a strong advantage. It naturally led to the industry’s expansion which had the inevitable result of “shutting Dundee out to a great extent from the Asiatic, Australian and even a part of the American markets.” The progress was slowed down during 1890-95 on account of the prevailing famines in India which indirectly hit the export trade and hence the demand for gunny hags in the country. From 1900 onwards, the industry again grew at a fairly rapid pace and by 1913—14, the number of jute mills had risen to 64 with 36,000 looms and employing 2.16 lakh workers. The First world war created a large demand for sand-bags and other jute manufactures. In order to economise on shipping which was scarce at that time, the govt., encouraged the export of jute manufactures in place of the raw-fibre. The shipping difficulties were so acute that between 1917—19, even exports of just manufactures was prohibited except under license. However, the war demand was so great that these restrictions could not seriously hinder the growth of the industry.

In 1919, the industry comprised 76 mills which employed 2.76 lakh workers. In addition, there were 211 jute presses in which 33,316 persons were employed. It is worth noting that the jute growers of Bengal did not share this prosperity of the industry. On the contrary, export markets having been closed by the war and there being acute shipping shortage, the farmer was forced to dispose of his crop at whatever prices the industry chose to pay.

The industry was overtaken by a crisis as soon as the war ended. Production was far in excess of the world’s dislocated trade requirements. Therefore, in order to adjust production to world demand, the mills agreed to work fewer hours a week. Fortunately, the demand picked up again with the revival of international trade and the industry continued to make fair progress till it was overtaken by the World Depression.

The Depression brought about a calamitous fall in agricultural prices. In 1930 — 31, for example, the aggregate value of the Bengal jute crop was “not more than 1/5 of what it had been in 1926. The result was financial paralysis met by voluntary crop restriction.” The mill industry was also severely hit partly due to an actual decline in demand for packing materials and partly due to competition from substitutes which was further aggravated by the depression, and by the intensification of economic nationalism.

The main trouble of the industry, however, lay in its excess capacity. Even during the depression, the number of spindles and looms continued to increase so that the industry came to have an estimated excess capacity to the extent of 30%. A rational solution would have been to scrap the excess capacity and prohibit the establishment of new mills. In practice, the adjustment was made through the notorious device of reducing the number of working days as well as the hours of work and a scaling of a part of the machinery. However, with the recovery in the world trade, the demand for jute manufactures began to increase and from November 1934, jute mills decided to increase production by gradually unsealing the looms. By 1937—38, all restrictions were withdrawn and jute exports, which stood at 6.7 lakh tons in 1933 — 34, exceeded 1 million mark. The second world war brought about a sea-change in the industry. From an era of short working hours, sealed looms, quotas and gentlemen’s agreements in 1938, there was a change in 1939 to working on double shifts, unsealing the looms, rise in wages and increased activity to the extent of seeking exemption from the operation of the Factories Act. The boom, however, proved short-lived.

The stimulus fell-off and the industry took an erratic course due to loss of markets, transport difficulties and fluctuating demands. This is manifest from the volume of jute manufactures which rose to 12.8 lakh tons in 1939 only to fall to 11 lakh tons in 1940—41; it again improved to 12.7 lakh tons in 1941—42 but declined to 10.6 lakh tons in 1943—44. The year 1943 was particularly characterised by an acute shortage of coal so much so that the Indian jute mills Association had to establish its own depots for distribution. On the whole, the war was a period of prosperity for the industry whose profits recorded substantial increase.

India’s monopoly in the world trade of jute manufactures was brought to an end by the Partition of the country. All the jute mills but only 19% of the area under jute cultivation came to India’s share while Pakistan got 81% of the jute area but not mill. This made the supply of raw-jute a major problem for the industry. The problem was further aggravated when Pakistan imposed an extra duty on the jute exports to India and also when she refused to devalue her currency in



tune with the rupee devaluation in 1949. The Govt., met the situation by prohibiting the export of jute on one hand and initiating steps for increasing the home production on the other.

Ownership and Management of Jute Industry:

Since its inception, the industry remained a close preserve of the foreigners who owned, controlled, and managed it. While Indians furnished land and labour for growing jute and labour for manufacturing, Scotland furnished the “**brains and the far sight**”.

Enormous profits made by the industry soon attracted the attention of the Americans as well who promptly invested several million dollars. As late as 1951, the British capital controlled 89% of the jute industry. The reasons for this are not far to seek. The nature of the markets, predominantly foreign, and the development of non-Indian business agencies and financial institutions in Calcutta, were mainly responsible for this state of affairs.

Profits and Wages of Jute Industry:

Jute, from the very beginning, was famous for its high profits. The early mills “**simply coined money.**” That is why many persons, doing prosperous business in tea, coal, turned to jute. The boom was so great “that the shares for a mill could be sold in Calcutta during a morning.” The peak of profits was reached from the I world war until 1930 when, in the words of Buchanan, “it is doubtful if any group of factories in the world paid such handsome profits as the jute industry in India.” It is estimated that during the decade 1915—24, the industry earned 90% per annum on its capital. During the thirties, the industry was so depressed that in spite of hours being reduced to some forty per week, and weeks operated to three per month, profits come down and even disappeared for many mills. The total paid profits in 1931 were under rupees one crore as compared with rupees 2.65 crores in 1930 and rupees 7.23 crores paid in 1926. The industry turned the corner with the start of the second world war. The days of low prices and low profits were left behind and an era of rising prices and high profits started. The index of profits jumped rapidly from 100 in 1939 to 590 in 1940 and 923 in 1943.

Problems of the Jute Industry:

The industry’s major problem was that of foreign competition. The most powerful competitor was Pakistan which had the advantage, being a late comer, of installing more productive modern machines as against India’s old factories crying for modernisation. The industry in Pakistan, assured of ample supply of lower-priced and better quality raw-fibre, enjoying a substantial export subsidy and operating through Bonus vouchers, was able to increase her share in the world jute exports from 7% in the fifties to nearly 30% towards the end of the Third Plan Period. Indian jute goods had also to contend with synthetics such as Polypropylene which had shown promise of being an effective substitute for jute. Continuous improvement in the quality of the product and diversification of production were the two major means by which the industry could hope to sustain its competitiveness both against other countries and against the flood of Polymers.

II.OBJECTIVES OF THE STUDY

One of the main objectives of TPM is to increase the productivity of plant and equipment with a modest investment in maintenance. Total quality management (TQM) and total productive maintenance (TPM) are considered as the key operational activities of the quality management system. In order for TPM to be effective, the full support of the total workforce is required. This should result in accomplishing the goal of TPM: "Enhance the volume of the production, employee morale and job satisfaction."

The main objective of TPM is to increase the Overall Equipment Effectiveness of plant equipment. TPM addresses the causes for accelerated deterioration while creating the correct environment between operators and equipment to create ownership.

Through this study, the researcher tries to evaluate the effectiveness of the total productive maintenance practice followed in Ajute International Pvt Ltd . This will help the management of Ajute International Pvt Ltd to make the TPM successful and increase the business efficiency.

Primary Objective

To evaluate the effectiveness of the total productive maintenance practice followed in Ajute International Pvt Ltd

Secondary Objectives

1. To study the current status of TPM implementation in Ajute International Pvt Ltd
2. To know the effectiveness of maintenance and repair works carried out during th facility downtime condition.
3. To determine the efficiency of the TPM training programme for new employees
4. To identify the biggest hurdles for the effective implementation of TPM in Ajute International Pvt Ltd
5. To assess the impacts of TPM in Ajute International Pvt Ltd
6. To make suggestions to improve the effectiveness of total productive maintenance practice in Ajute International Pvt Ltd

Limitations Of The Study

For anything there should be some limitations like that my project also have certain limitations. The following are some limitations what I faced:

- The information provided by Majority of the respondents could also be biased or inaccurate. No independent verification of the data was possible.
- Time is one major constraint, which limits the effective data collection.
- Non-availability of data collection from all employees of Ajute International Pvt Ltd
- The sample size is only 120 employees of Ajute International Pvt Ltd so the sample may not be truly representative of the total population
- Reliability and accuracy of the analysis depends on the respondents' openness and trueness towards each question in the questionnaire.

III.REVIEW OF LITERATURE

The purpose of this paper is to investigate the impact of total productive maintenance (TPM) and total quality management (TQM) practices on operational performance and their inter-relationship. The study focused on three main constructs, namely, TPM, TQM and operational performance of pharmaceutical industry. Under TPM, four constructs, namely, disciplined maintenance, information tracking, housekeeping and operator involvement has been considered with the help of literature. In TQM, four constructs, namely, quality data and reporting, product innovation, research and development (R&D) management and technology management has been considered. Out of 410 Indian pharmaceutical plants contacted for survey, 254 responses have been used in the study for analysis. The factor analysis, path model and structural equation modeling has been used to analyze the proposed framework. The results for alternate models has been studied, interpreted and reported. Finally the direct and indirect effect of TPM and TQM on operational performance has been tested and checked for proving and disproving the hypotheses.

IV.RESEARCH METHODOLOGY

Fundamental to the success of any formal marketing research project is a sound research design. A good research design has the characteristics of problem definition, specific methods of data collection and analysis, time required for research project and estimate of expenses to be incurred. The function of a research design is to ensure that the require data are collected accurately and economically. A research design is purely and simply the framework or plan for an analysis of data. It is a blue print that is followed in completing a study. It resembles the architect's blue-print (map) for constructing a house. It may be worthwhile to mention here that a research design is nothing more than the framework for the study ensures that the study will be relevant to the problem and the study will employ economical procedures.

Claire seltizetal defines Research Design as "Research design is a catalogue of the phases and facts relating to the formulation of a research effort. It is the arrangement of collection and analysis of data in a manner that aims to combine relevant to the research purpose with economy in procedure".

Three important about research design are

1. The design of investigation should stem from the problem
2. Whether the designs are productive in a given problem setting depends on how imaginatively they are applied. An understanding of the basic design is needed so that they can be modified to suit specific purpose
3. The three basic design are as follows
 - i. Exploratory Research design



- ii. Descriptive Research design
- iii. Casual Research design

The Research design used in the study is descriptive research design

RESEARCH DESIGN

Descriptive research design is also called explanatory design. This is the one that simply describes something such as demographic characteristics. The descriptive study is typically concerned with determining frequency with which something occurs or how two variables vary together.

SAMPLE SIZE

It refers to the number of elements of the population to sample. The sample size chosen for the survey is 120 employees of Ajute International Pvt Ltd

DATA SOURCES

After identifying and defining the research problem and determining specific information required to solve the problem, the researcher's task is to look the type and sources of data which may yield the desired results. Data sources are of two types through which data is collected.

Data sources may be classified as

1. Primary data
2. Secondary data

PRIMARY DATA

Primary data is the original data collected by the researcher first hand. It is collected for the first time through field survey. These are those that are gathered specifically, for the problem at hand. The various sources for collecting primary data are questionnaire, observation, interview etc. The primary source used for the study is questionnaire.

SECONDARY DATA

Secondary data is the information which is already available in published or unpublished form. When the needed information is collected from the census of population available in a library means then it is a secondary data. It is also used for collecting historical data. The various sources of secondary data are books, periodicals, journals, directories, magazines, statistical data sources etc. The secondary source used for this study is company profile, scope, need, review of literature.

V. RESEARCH INSTRUMENTS

Research instrument are the instruments which is used for gathering or collecting information. The instruments used in the study are

1. Direct questions
2. Close end questions
3. Dichotomous questions
4. Multiple choice questions

DIRECT QUESTIONS

Direct questions are just what their names indicate. They explicitly ask for the desired data. However the directness of the question also relates to the way a response is interpreted.

CLOSE END QUESTIONS

Such questions are also called fixed alternative questions they refer to those questions in which the respondent is given a limited number of alternative response frame which he/she is to select one that most closely matches his/her opinion or attitude.

DICHOTOMOUS QUESTIONS

A dichotomous question refers to one which offers the respondent a choice between only two alternatives and reduces the issue to its simple terms. The fixed alternatives are of the type, yes/no, agree/disagree, true/false etc.

MULTIPLE CHOICE QUESTIONS

A multiple choice question refers to one which provides several set alternatives for its answers. Thus, it is a middle ground between free answers and dichotomous question.



SAMPLING

Collecting data about each and every unit of the population is called census method. The approach, where only a few units of population under study are considered for analysis is called sampling method. There are two main categories under which various sampling method can be put.

The two categories are

1. Probability sampling
2. Non-probability sampling

The sampling method adopted for the study is convenience sampling under non-probability sampling.

NON-PROBABILITY SAMPLING

In non-probability sampling, the chance of any particular unit in the population being selected is unknown, since randomness is not involved in the selection process. But this does not mean that the findings obtained from non-probability sampling are of questionable value. If properly conducted their findings can be accurate as those obtained from probability sampling. The three frequencies used non-probability designs are

1. Judgment sampling
2. Convenience sampling
3. Quota sampling

CONVENIENCE SAMPLING:

In this method, the sample units are chosen primarily on the basis of the convenience to the investigator. The units selected may be each person who comes across the investigator.

SAMPLE FRAME:

A Sample frame may be defined as the listing of the general components of the individual units that comprise the defined population.

SAMPLE DESIGN

Sample design is the theoretical basis and the practice means by generalizing from characteristics of relatively few of the comprising population. It is the method by which the sample is chosen.

VI. RESULTS

CHARTS:

Charts are graphic displays of data for easy understanding of relative positions that is not always possible with descriptive words or numbers. Types of charts commonly used in business data presentation are: Bar and pie.

BAR CHARTS:

The bar chart is commonly used for presentation of qualitative data. The data can be continuous or discrete data, which are plotted against discrete data intervals. The vertical bar diagram, also called bar chart where the length or height of bars represent the numerical value of the event or measurement. Width or gap between the bars is of no significance to the bar chart data, but they are uniform in a diagram.

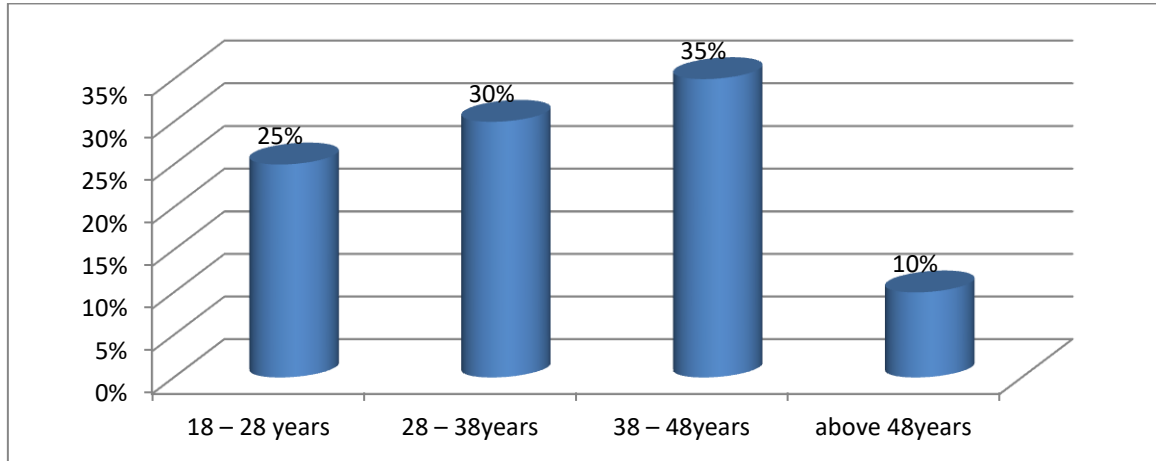
DATA ANALYSIS AND INTERPRETATION

TABLE: 1 AGE

Particulars	No Of Respondents	No Of Percentage
18 – 28 years	30	25%
28 – 38years	36	30%
38 – 48years	42	35%
above 48years	12	10%
Total	120	100%



Chart: 1



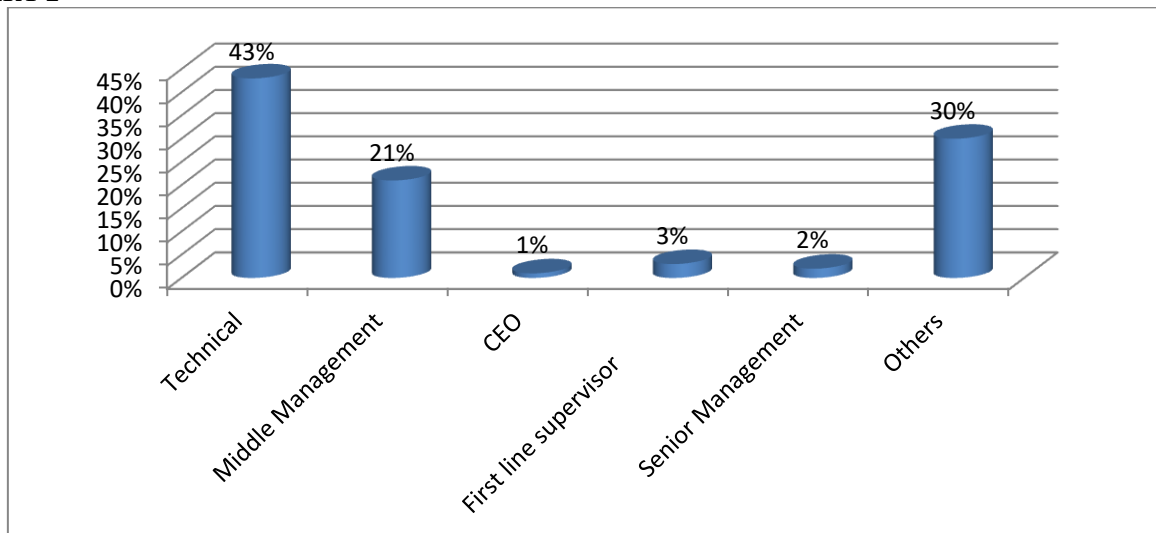
INFERENCE

35% of the respondents are at the age between 38-48 years, 30% of the respondents are at the age between 28-38 years, 25% of the respondents are at the age between 18-28 years, 10% of the respondents are at the age above 48 years. Therefore 35% of the respondents are at the age between 38-48 years.

TABLE: 2 POSITIONS IN ORGANISATION

Particulars	No Of Respondents	No Of Percentage
Technical	52	43%
Middle Management	25	21%
CEO	1	1%
First line supervisor	4	3%
Senior Management	2	2%
Others	36	30%
Total	120	100%

CHART 2





INFERENCE

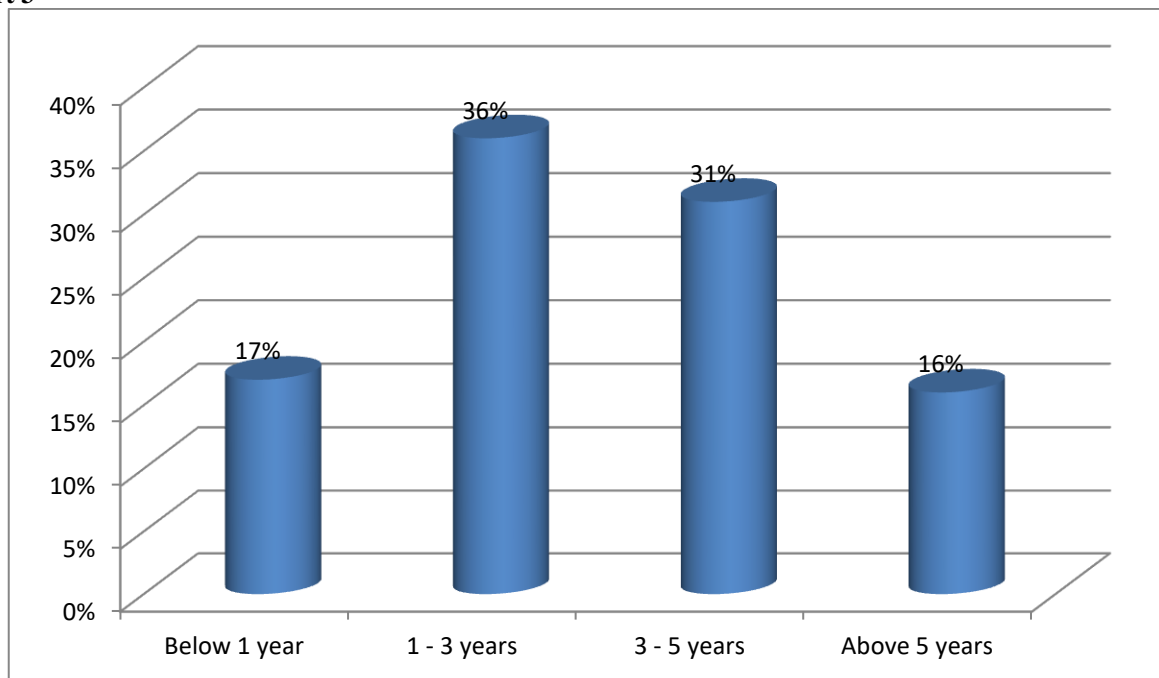
43% of the respondents are in technical position at the organization, 30% of the respondents are in others position at the organization, 21% of the respondents are in middle management position at the organization, 3% of the respondents are in first line supervisor position at the organization, 2% of the respondents are in senior management position at the organization 1% of the respondents are in CEO position at the organization.

Therefore 43% of the respondents are in technical position at the organization.

TABLE: 3 EXPERIENCE

Particulars	No Of Respondents	No Of Percentage
Below 1 year	21	17%
1 - 3 years	43	36%
3 - 5 years	37	31%
Above 5 years	19	16%
Total	120	100%

Chart 3



INFERENCE

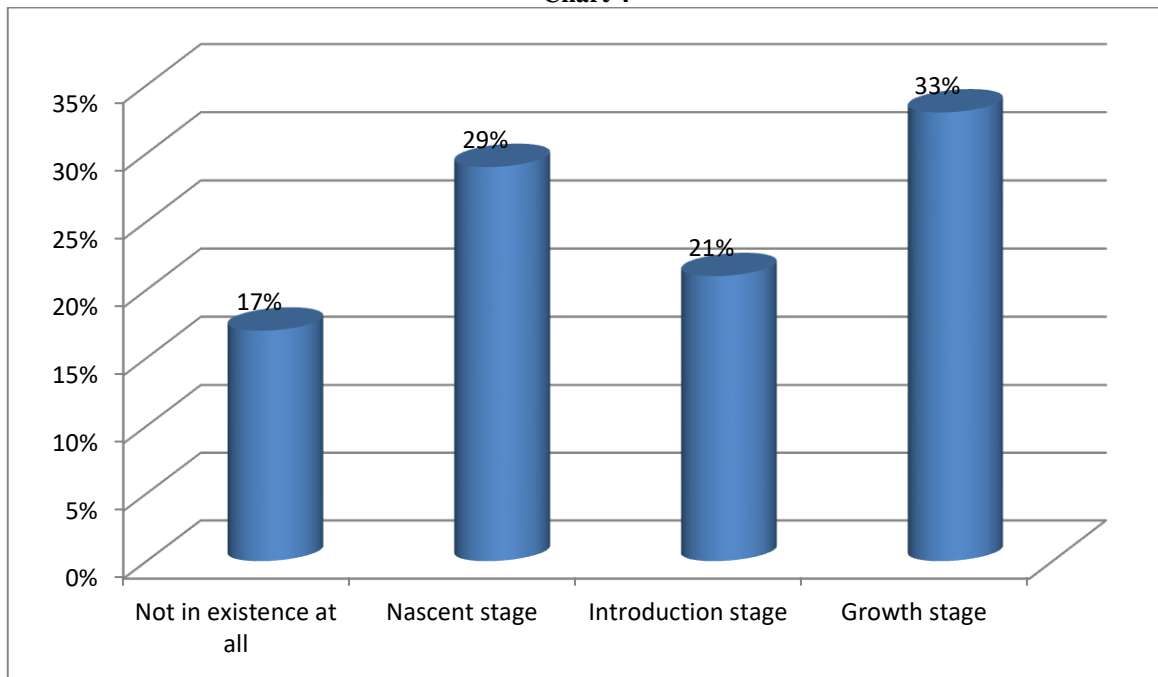
36% of the respondents have 1-3 years of experience, 31% of the respondents have 3-5 years of experience, 17% of the respondents have below 1 year of experience, 16% of the respondents have above 5 years of experience. Therefore 36% of the respondents have 1-3 years of experience.



TABLE: 4 CURRENT STATUS OF TPM IMPLEMENTATION IN AJUTE INTERNATIONAL PVT LTD

Particulars	No Of Respondents	No Of Percentage
Not in existence at all	20	17%
Nascent stage	35	29%
Introduction stage	25	21%
Growth stage	40	33%
Total	120	100%

Chart 4



INFERENCE

33% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at growth stage, 29% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at Nascent stage, 21% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at introduction stage, 17% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are not in existence at all. Therefore 33% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at growth stage.

TABLE: 5 SEGMENTS BEING PRACTICED AT INDUSTRY

Particulars	No Of Respondents	No Of Percentage
5s technique	20	17%
Autonomous maintenance	23	19%
Planned maintenance	17	14%



Quality maintenance	18	15%
Continuous improvement	17	14%
Education and training	25	21%
Total	120	100%

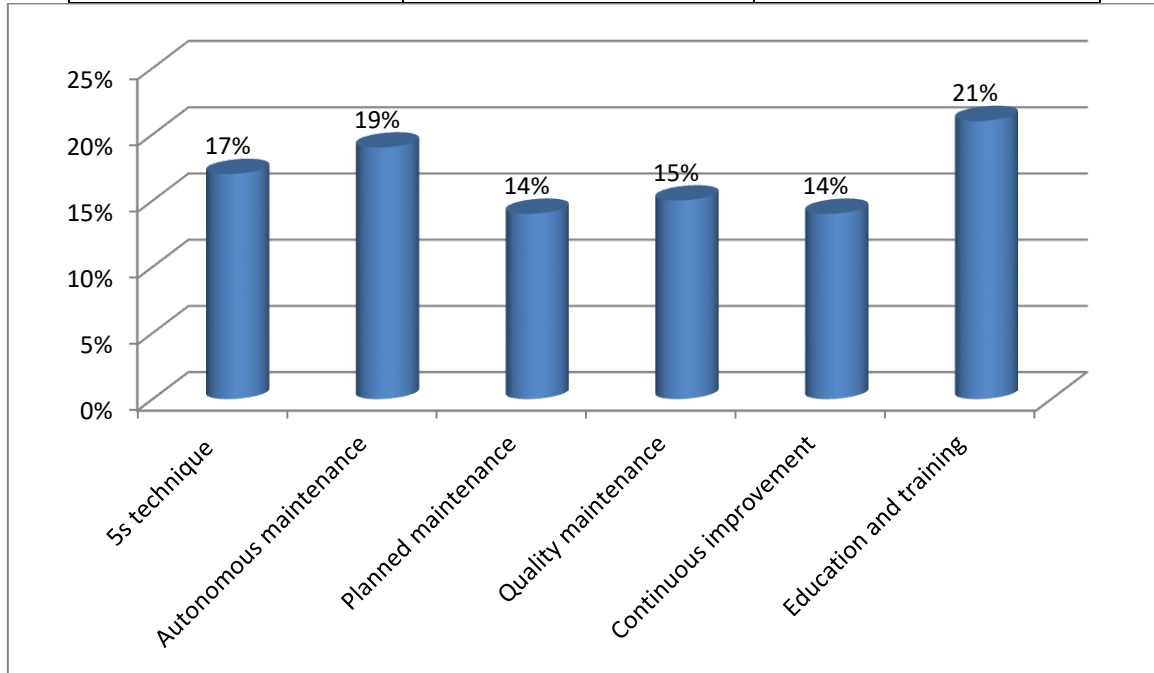


CHART 5

INFERENCE

21% of the respondents are in Education and training segment at industry, 19% of the respondents are in autonomous maintenance segment at industry, 17% of the respondents are in 5s technique segment at industry, 15% of the respondents are in quality maintenance segment at industry, 14% of the respondents are in planned maintenance segment at industry, 14% of the respondents are in continuous improvement segment at industry. Therefore 21% of the respondents are in Education and training segment at industry.

VII.FINDINGS

- 35% of the respondents are at the age between 38-48 years, 30% of the respondents are at the age between 28-38 years, 25% of the respondents are at the age between 18-28 years, 10% of the respondents are at the age above 48 years.
Therefore 35% of the respondents are at the age between 38-48 years
- 43% of the respondents are in technical position at the organization, 30% of the respondents are in others position at the organization, 21% of the respondents are in middle management position at the organization, 3% of the respondents are in first line supervisor position at the organization, 2% of the respondents are in senior management position at the organization 1% of the respondents are in CEO position at the organization.
- 36% of the respondents have 1-3 years of experience, 31% of the respondents have 3-5 years of experience, 17% of the respondents have below 1 year of experience, 16% of the respondents have above 5 years of experience.
- 33% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at growth stage, 29% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are at Nascent stage, 21% of the respondents current status of TPM implementation in Ajute International Pvt Ltd



are at introduction stage, 17% of the respondents current status of TPM implementation in Ajute International Pvt Ltd are not in existence at all.

5. 21% of the respondents are in Education and training segment at industry, 19% of the respondents are in autonomous maintenance segment at industry, 17% of the respondents are in 5s technique segment at industry, 15% of the respondents are in quality maintenance segment at industry, 14% of the respondents are in planned maintenance segment at industry, 14% of the respondents are in continuous improvement segment at industry.

VIII.CONCLUSION

As with the entire body of lean manufacturing systems, Total productive maintenance originated in Japan. An organization called the Japan Institute of Plant Maintenance (JIPM) formed in 1961 under a different moniker and unveiled the TPM concept a decade later. The Japanese automotive supplier Nippondenso is credited with first utilizing the process, and Seiichi Nakajima of JIPM established eight management pillars, for which TPM is well-known today. TPM aims to increase productivity, efficiency and safety by empowering operators and team leaders to play a proactive role in day-to-day lubrication, inspection and cleaning. Management is tasked with creating a “buy-in culture” to support continuous activities through eight pillars of activity. This study has been undertaken to understand the overall effectiveness of the total productive maintenance in Ajute International Pvt Ltd. For this purpose, responses from the employees of Ajute International Pvt Ltd have been collected and analyzed. Advanced technologies can be used to maximize the benefit of total productive maintenance. Automated system to monitor the process and procedure has to be used in Ajute International Pvt Ltd. Based upon the findings out of the research, few valuable suggestions have been given to the management of Ajute International Pvt Ltd to improve the overall effectiveness of the total productive maintenance.

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