A Study On Production Process And Operating System Of South -India
Paper Mill (SIPM), Thandavpura, Nanjangud.

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ABSTRACT:

This paper empirically indicates the production process and operating system of South India Paper Mill, Nanjangud (SIPM). The study indicates that the organization must be aware of some dependent and independent variables which influence the organization’s production process and operating system, which might affect the efficiency of the company. The study was conducted on the quantitative research methodology by collecting the secondary data from the organization. Descriptive statistics and correlation has been used for selecting statistical techniques. The study includes various literature reviews to decide the right component to improve the production and operation of the company. The study has come up with a result showing that the dependent and independent variables influence the production process and might also affect the operating system of the company. This paper mainly considers the four factors for analysing the company’s production process and its operating system, the factors are productivity, labour efficiency, employees age and employees efficiency. These four factors are further divided into independent variable (labour efficiency and employees age) and dependent variable (productivity and employee’s efficiency). Z-Test and Karl Pearson’s Correlation analysis is done to find out the relation between the variables and to draw conclusions. The study includes various literature reviews to decide the relation between the components and to understand the process of production.

KEYWORDS: production process, operating system, SIPM, dependent variables, independent variables.

INTRODUCTION:

Production process is mainly concerned with transforming a range of inputs into those outputs that are required by the market or requested by the consumers. This production process involves two major sets of resources – transforming resources (which include buildings, computers, machinery and people that carry out the transforming processes) and transformed resources (which include raw materials and components that are transformed into end products). Any production process involves a series of links in a production chain.

The manufacturing process of SIPM is based entirely on recycling of waste paper. The basic raw material for manufacture of paper is waste paper, both imported and local. Broadly the operations of production are Stock Making & Paper Making.
Conventionally, paper is manufactured out of wood or bamboo. A tree suitable for papermaking should be at least 12-year-old and to make one metric tons of paper, 17 trees are required. This means deforestation, which would result in soil erosion and formation of wastelands. Hence, the production & availability of paper is crucial to our National Development. The main objective is to strike the delicate balance between the need for production of a vital commodity and the need for conservation of the environment. In the least, to exist in the Eco System in a nondestructive manner and to Endeavour at the most, to improve our Eco System.

LITERATURE REVIEW:

1) **N DinAli and Ibrahim Dincer (2019)**, has conducted a research “performance assessment of a new solar energy based cogeneration system for dimethyl-ether and electricity production”, renewable energy based integrated system for dimethyl-ether (DME) production and electricity generation, analyzed thermodynamically and evaluated energetically and exegetically. The present system is modeled and simulated using both Aspen plus process simulation software and Engineering Equation Solver (EES).

2) **B B Orazbayev, T S Kenzhebaeva, V L Goncharov and K N Orazbayeva (2019)**, has conducted a research on “systematic approach to the elaboration of a structured model of a Sulphur production unit under uncertainty”, this paper proposes a systematic approach of chemical and technological systems under uncertainty exemplified by a sulfur production unit. the method was implemented successfully to construct a system of models for major units of the catalytic reforming plant.

3) **Sofie Bech, Thomas Ditlev Brunoe and Kjeld Nielsen (2019)**, has conducted a research on “Process for enhancing the production systems robustness with sensor data- a food manufacturer case study”, the research illustrates how production system can be enhanced using sensor data from the existing production setup. The challenge of continuously maintaining the data and the analysis is presented.

4) **Andreas D Landmark, Emrah Arica, Birgit Klove, Pal Furu Kamsvag, Eva Amdahl Seim and Manuel Oliveira (2019)**, has conducted a study on “Situation awareness for effective production control”, the study reveals that workers need to be ware of the situation that consist of multiple factors such as production status and internal and external demand requirements to make effective production control decisions.

5) **Nooshin Salari and Villiam Makis (2019)**, has conducted a research on “joint maintenance and just-in-time spare parts provisioning policy for a multi-unit production system”, this study revealed that the production rates of the units depend on their operating states. The main contribution of this paper is an analytical modeling of a multi-unit production system and the development of effective joint maintenance and spare parts ordering policies for the system.

6) **Ning Liu, Youngjoo Kim and Hark Hwang (2009)**, has conducted a research on “an optimal operating policy for the production system with rework”, this paper studies a production inventory system with rework where a stationery demand is satisfied either
by production setup with new raw materials or by rework setup with defective items coming from production process.

7) Peter Nyhuis and Hans-peter Wiendahl (2006), has conducted a research on logistic production operating curves- basic model of the theory of logistic operating curves, this study has revealed that the interdependencies of these logistic performance measures can be simulated by the logistic production operating curves in quantitative and qualitative terms. These curves therefore enable the logistical positioning of work systems.

8) Hirohisa Sakai and Kakuro Amasaka (2006), has conducted a research on “strategic HI-POS, intelligence production operating system: Applying Advanced TPS to Toyota’s global production strategy, this study improves production operational technology abilities in regard to high-level equipment, which improves levels of mastered skills and which shares intellectual information to maintain or improve the line equipment.

9) Rahul A Sarkar & Lutfar R Khan (1994), has conducted the research on “an optimal batch size for a production system operating under periodic delivery policy, this study proposes two stage batch environment model which takes finite rate of production in order to determine the batch size for a product with associated raw materials. They have considered inventory carrying cost of raw materials and finished goods and also ordering cost of raw materials and set-up cost of manufacturing.

10) Morris A Cohen & Hau L Lee (1988), has conducted the study on “strategic analysis of integrated production and distribution systems”, this study deals on the development of a model which can be used to predict the performance of a firm based on the cost of the product, service given to customers and flexibility of the production and distribution system in a competitive environment within which the firm operates in order to regain its competitive advantage.

OBJECTIVE OF THE STUDY:

1. To access the factors connected to production process in particular to productivity and labour efficiency.
2. To evaluate and find the relationship between employees age and their efficiency.

RESEARCH METHODOLOGY:

Research method is a plan or technique of varied strategies used for collection of data and analyzing the new information for conducting a research an individual plan before starting a research. The study of course of action of an investigator is known as research plan. Methodology includes sampling design, research plan and speculations for data research and analysis. The secondary data from the company has been used to analyze the relation between productivity and labour efficiency and employees age and employee’s efficiency.

Statistical tools used:

- Z – Test
GIS Business

- Karl Pearson’s Co-efficient of Correlation

DATA ANALYSIS AND INTERPRETATION:

a) Z-TEST

Hypothesis:

H₀ – There is a significant difference between productivity and labour efficiency

H₁ - There is no significant difference between productivity and labour efficiency.

Table 1: Evaluation of factors connected to production process in particular to productivity and labour efficiency.

<table>
<thead>
<tr>
<th>Actual production (X)</th>
<th>(X - mean)^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>11.09</td>
</tr>
<tr>
<td>51</td>
<td>1.77</td>
</tr>
<tr>
<td>50</td>
<td>0.11</td>
</tr>
<tr>
<td>54</td>
<td>18.75</td>
</tr>
<tr>
<td>47</td>
<td>7.13</td>
</tr>
<tr>
<td>43</td>
<td>44.49</td>
</tr>
<tr>
<td>298</td>
<td>83.34</td>
</tr>
</tbody>
</table>

- μ = 75 (standard population)
- Mean = 298/6 = 49.67
- Standard deviation = 3.72

\[
SD = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}
\]

- Standard error = 1.52

\[
SE = \frac{\sigma}{\sqrt{n}}
\]

- Z – test = -16.66

\[
Z = \frac{X - M}{\frac{\sigma}{\sqrt{n}}}
\]
According to the calculation done above on the basis of goodness of it, where the observed factor is considered to be labour efficiency and productivity as expected value. The above table shows the calculation of goodness of it and the summation of calculated chi-square is -16.66. since the frequency of calculation of these factors are not done so frequently, one-tailed test is considered with a significance level alpha is equal to 0.05 and degree of freedom in this case is 5. The Z critical taken from the appendix is 11.07. therefore -16.66 false well within the range of acceptance and hence null hypothesis is accepted, that is there is a significant difference between productivity and labour efficiency.

b) KARL PEARSON’S CORRELATION:

Hypothesis:

H₀ – There is a significant relation between employees age and their efficiency.

H₁ – There is no significant relation between employees age and their efficiency.

Table 2: Finding the relationship between employees age and their efficiency.

<table>
<thead>
<tr>
<th>C.I (age)</th>
<th>X (no. of Employees)</th>
<th>Y (efficiency In %)</th>
<th>XY</th>
<th>X²</th>
<th>Y²</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-30</td>
<td>14</td>
<td>60</td>
<td>840</td>
<td>196</td>
<td>3600</td>
</tr>
<tr>
<td>30-35</td>
<td>43</td>
<td>71</td>
<td>3053</td>
<td>1849</td>
<td>5041</td>
</tr>
<tr>
<td>35-40</td>
<td>28</td>
<td>87</td>
<td>2436</td>
<td>784</td>
<td>7569</td>
</tr>
<tr>
<td>40-45</td>
<td>34</td>
<td>85</td>
<td>2890</td>
<td>1156</td>
<td>7225</td>
</tr>
<tr>
<td>45-50</td>
<td>32</td>
<td>86</td>
<td>2752</td>
<td>1024</td>
<td>7396</td>
</tr>
<tr>
<td>50-55</td>
<td>32</td>
<td>75</td>
<td>2400</td>
<td>1024</td>
<td>5625</td>
</tr>
<tr>
<td>55-60</td>
<td>12</td>
<td>67</td>
<td>804</td>
<td>144</td>
<td>4489</td>
</tr>
<tr>
<td>TOTAL</td>
<td>195</td>
<td>531</td>
<td>15175</td>
<td>6177</td>
<td>40945</td>
</tr>
</tbody>
</table>

\[
r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}
\]

\[
r = \frac{7*15175 - 195*531}{(7*6177 - 595^2)(7*40945 - 531^2)}
\]

\[
r = 0.54
\]

According to Karl Pearson’s coefficient correlation the interpreted factor is considered to be the number of employees in different categories of class interval and the efficiency of those employees is a dependent factor. According to the calculation correlation coefficient is 0.54 and therefore there is a significant relationship between employees age and their efficiencies. It is evidently seen from the table that most of the employees are given training program before they are asked to operate on the machineries. From the table we can observe that the employees who are given the training program during sensitization program are on an average 60% efficient. As and when they become complacent
the expertise also increases and therefore such of those employee’s efficiency on an average is about 85%, as and when they become to complacent when the process of operations due to age factor naturally, the efficiency slightly drops down as such there is a significant correlation showing between the independent and dependent factor and hence null hypothesis is accepted.

CONCLUSION:

Production process in the conversion of raw materials into a finished goods and services as demanded by the consumers. It is also a process of converting inputs into outputs as required by the market. Keeping all the factors involved in the production process of the company which is very much essential for on time production of the product with the available resources with the company.

The South India Paper Mills Limited (SIPM) was originally known as Cauvery Valley Paper Mills Pvt. Ltd. The erstwhile company was started in 1948 and was closed in 1954, when the company became sick.

The management of SIPM took over the sick company from the liquidators in 1958, carried necessary renovation and modernization and resumed operations during June 1959. The installed capacity was 5 Metric tons per day. The company is the oldest unit in Mysore District.

The management has been modernizing the mill continuously to ensure survival and progress. The current capacity is 47,450 Metric tons per annum. The manufacturing process is based entirely on recycling of waste paper.

The company provides employment to 300 persons directly and created employment to around 150 persons indirectly. Most of the workmen are from villages in the vicinity. The economy of the villages is dependent upon employment in the company and many workmen are second & third generation of the erstwhile workmen. They generate 10.5 MW of power by Cogeneration out of which around 4 MW is exported to KPTCL. The manufacturing process is based entirely on recycling of waste paper. The basic raw material for manufacture of paper is waste paper, both imported and local. Broadly the operations of production are Stock Making & Paper Making.

According to the hypothesis conducted on two factors, productivity and labour efficiency and employees age and their efficiency, it is predominantly seen that there is a significant relation between the variables and hence null hypothesis gets accepted. When there is increase in the labour efficiency it directly increases the productivity of the company, so the efficiency of the labors plays a major role in the production process and it is proved by conducting Z-test. Where as in the second test done using Karl Pearson’s coefficient of correlation, it can be seen that the efficiency of the employees is depending on the age of the employees, that is when the age increases their efficiency becomes slightly down and vice versa.

Therefore, the management helps the employees to increase their efficiency by providing various training facility for operating the machines which also increases the production efficiency of the company and improve the sales of the company.
REFERENCES:


INTERNET SOURCES:

Wikipedia, Google scholar.