ABSTRACT: “A study on production Scheduling Techniques at Bharat industries limited, Thiruvallur” as focused on Production Scheduling for production process in the organization. This study shows how every machine as properly scheduling maintaining in the organization and its prevention from the failures and breakdown in the production process. The main objectives of this study is explored the new production planning and control concepts available for practical operations. The main principle has been defined by as to control the lengths of the queues in front of work stations on the shop floor.

Scheduling comprises the definition of starting and finishing times and the assignment of resources to each task of the set, while being restricted by several constraints, which may involve the tasks and/or the resources. The present article analyzes a wide range of approaches used for solving production scheduling problems. These approaches have been classified into two categories, traditional and modern ones. Fields of study have inspired these approaches. The traditional approaches range from simple dispatching rule; to composite dispatching rules, computer simulation, and mathematical programming. Meanwhile recent approaches range from statistical mechanics.

The type of research design used is descriptive in nature and the required data has been generated using a research instrument called the questionnaire, to a sample of 101 employees. Convenience sampling procedure is used in this survey. The structured questionnaire consists of open ended liked multiple choices, close ended etc. The period of the study is for three months. The collected data has been analyzed using various statistical tools like two-way Annova, one sample run test, and chi-square. A methodology and systems to do this at both the job release and the employee enquiry stage have been presented in previous papers. The purpose of this research is to provide a theory for workload control to assist in providing procedures for implementing input and output control. It enables dynamic capacity planning to be carried out at the customer enquiry and order entry stages for versatile manufacturing make-to-order companies.

I. INTRODUCTION

Production scheduling tools greatly outperform older manual scheduling methods. These provide the production scheduler with powerful graphical interfaces which can be used to visually optimize real-time workloads in various stages of production, and pattern recognition allows the software to automatically create scheduling opportunities which might not be apparent without this view into the data. Companies use backward and forward scheduling to allocate plant and machinery resources, plan human resources, plan production processes and purchase materials. Forward scheduling is planning the tasks from the due date or required-by date to determine the start date and/or any changes in capacity required.

Batch production scheduling is the practice of planning and scheduling of batch manufacturing processes. Batch production scheduling shares some concepts and techniques with finite capacity scheduling which has been applied to many manufacturing problems. The specific issues of scheduling batch manufacturing processes have generated considerable industrial and academic interest.

In this study deals how the master production scheduling is carried out a batch process can be described in terms of a recipe which comprises a bill of materials and operating instructions which describe how to make the product the batch process control standard provides a framework for describing a batch process recipe. The standard
provides a procedural hierarchy for a recipe. A recipe may be organized into a series of unit-procedures or major steps. Unit-procedures are organized into operations, and operations may be further organized into phases.

II. OBJECTIVES OF THE STUDY

Primary Objective
- To ascertain the effectiveness of production scheduling Techniques at Bharat industries Limited, Thiruvallur

Secondary Objectives
- To find out the awareness level of production scheduling techniques in the organization.
- To identify the mistakes and achieve zero defects in the production scheduling technique.
- To determine the effectiveness of production scheduling method of production in the organization.
- To find out the challenges of production scheduling technique in production process.
- To identify the satisfaction level of production scheduling methods in the organization.

III. NEED OF THE STUDY

- This study has to find out the various challenges and outcomes of the production scheduling techniques, concepts and methods.
- This study helps to find out the defectiveness in the production scheduling and eliminate the defective products.
- This study helps to rectify the precise production problems from the employees.

IV. SCOPE OF THE STUDY

- This study provides supports to decrease the defects in the production scheduling.
- This study increases the efficiency of production scheduling and eliminates defects in the preproduction process.
- This study shows how the employees are involved in the production process with production scheduling concepts of production methodology.

V. RESEARCH METHODOLOGY

Target respondents
- The results could be skewed because of a small sample size of 100 only.
- The target respondents were only the Bharat Industries ltd, Thiruvallur employees.

Proposed sampling method
Convenience sampling has been used in this study. Convenience sampling is used for selection of homogeneous sample for the study. It refers to selecting a sample of study objects on convenience.

Research Design
Descriptive Research Design used in this project.

Tools for analysis
- Two Way ANOVA Test
- Chi – square test
- One sample run test
- Karl pearson‘s correlation co-efficient

VI. STATISTICAL TOOLS

Test No. 1 TWO WAY ANOVA
AIM:
Perform two ways ANOVA between different experienced respondents towards PRODUCTION SCHEDULING techniques supports to employees.
Table No 1. TWO WAY ANOVA

<table>
<thead>
<tr>
<th>POKE-YOKER TECHNIQUES SUPPORTS EMPLOYEES</th>
<th>Below 5 yrs</th>
<th>6 to 10 yrs</th>
<th>11 to 15 yrs</th>
<th>16 to 20 yrs</th>
<th>Above 20</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify mistakes</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Reduce wastages</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Increase production</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Protect from defects</td>
<td>2</td>
<td>4</td>
<td>15</td>
<td>3</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>None of above</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>20</strong></td>
<td><strong>37</strong></td>
<td><strong>14</strong></td>
<td><strong>17</strong></td>
<td><strong>101</strong></td>
</tr>
</tbody>
</table>

**HYPOTHESIS**

**Null Hypothesis (H₀):** There is no significant difference among the different experienced respondents towards production scheduling techniques supports to employees.

**Alternative Hypothesis (H₁):** There is a significant difference among the different experienced respondents towards production scheduling techniques supports to employees.

**Table no. 2 TWO WAY ANOVA TABLE CALCULATION**

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Degrees of freedom</th>
<th>Sum of square</th>
<th>Mean sum of square</th>
<th>F- Ratio</th>
<th>F-table (4,20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSS</td>
<td>4(k-1)</td>
<td>76.56</td>
<td>19.19(76.56/4)</td>
<td>3.288(19.19/5.8)</td>
<td>2.87</td>
</tr>
<tr>
<td>ESS</td>
<td>20(n-k)</td>
<td>116.4</td>
<td>5.82(116.4/20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSS</td>
<td>24</td>
<td>192.96</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VII. RESULT**

Calculated value < Tabulated value
3.288 < 2.87
Accept the $H_1$

**VIII. CONCLUSION**

There is a significant difference among the different experienced respondents towards production scheduling techniques supports to employees.
Test No.2 ONE SAMPLE RUN TEST

Aim:
Find out that production scheduling supports future innovation in the company.

Hypothsis

Null Hypotheses ($H_0$): production scheduling supports future innovation in the company

Alternative Hypotheses ($H_1$): production scheduling supports future innovation in the company

Sequences:

YYY NNN YY N YYYY N YY N YY YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N YYYY N

$n_1$ (Yes) = 66
$n_2$ (No) = 35
$r$ (No of sequence) = 52

Mean of r-statistic ($\mu_r$) = $\frac{2n_1 n_2}{n_1+n_2}$ + 1

Calculated $|Z|$ = 1.16

Table $|Z|$ @ 5% level of significance = 1.96

Conclusion:
Table $|Z|$ is greater than Calculated $|Z|$ so $H_0$ is accepted and $H_1$ is rejected.

Decision:
Production scheduling always supports future innovation in the company

Test No.3 CHI SQUARE TEST

Aim: Chi square analysis between department’s employees and supports to complete the task

Table No.3 Chi Square Test

<table>
<thead>
<tr>
<th>POKE YOKE SUPPORTS TO COMPLETE THE TASK</th>
<th>Quality</th>
<th>Production</th>
<th>Packing</th>
<th>South</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rewards &amp; awards</td>
<td>5</td>
<td>11</td>
<td>3</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>Setting challenging goals</td>
<td>6</td>
<td>11</td>
<td>6</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>Work culture</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>41</td>
<td>17</td>
<td>22</td>
<td>101</td>
</tr>
</tbody>
</table>

Hypothsis:

Null Hypothesis ($H_0$): There is no association between departments’ employees and supports to complete the task

Alternative Hypothesis ($H_1$): There is an association between departments’ employees and supports to complete the task

Formula:

$\sum \frac{(O_i - E_i)^2}{E_i} = E_1 \sum \frac{(O_i - E_i)^2}{E_i} = 6.5186$

Degree of freedom: $= (C-1) \times (R-1) = (4-1) \times (5-1) = 12$

Level of Significance: $= 5%$

Table value at 5% Level of Significance $= 21.026$
Test No.4 Karl pearson’s correlation co-efficient
AIM: Find out the correlation coefficient between production scheduling increases motivation and reduces workload.

<table>
<thead>
<tr>
<th>POKE YOKE INCREASE MOTIVATION/ REDUCES WORKLOAD</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>15</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
<td>23</td>
<td>17</td>
<td>1</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>0</td>
<td>2</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>39</td>
<td>32</td>
<td>7</td>
<td>4</td>
<td>101</td>
</tr>
</tbody>
</table>

Table No.5 Karl pearson’s correlation co-efficient calculation

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>dx = X - X̄</th>
<th>dy = Y - Ȳ</th>
<th>dₓ²</th>
<th>dᵧ²</th>
<th>dₓᵧ</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>19</td>
<td>9.80</td>
<td>-1.20</td>
<td>96.04</td>
<td>1.44</td>
<td>-11.76</td>
</tr>
<tr>
<td>45</td>
<td>39</td>
<td>24.80</td>
<td>18.80</td>
<td>615.04</td>
<td>353.44</td>
<td>466.24</td>
</tr>
<tr>
<td>21</td>
<td>32</td>
<td>0.80</td>
<td>11.80</td>
<td>0.64</td>
<td>139.24</td>
<td>9.44</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>-18.20</td>
<td>-13.20</td>
<td>331.24</td>
<td>174.24</td>
<td>240.24</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>-17.20</td>
<td>-16.20</td>
<td>295.84</td>
<td>262.44</td>
<td>278.64</td>
</tr>
<tr>
<td>101</td>
<td>101</td>
<td>0</td>
<td>0</td>
<td>1338.80</td>
<td>930.80</td>
<td>982.80</td>
</tr>
</tbody>
</table>

\[ X' = \frac{\sum X}{n} = \frac{101}{5} = 20.20 \]
\[ Y' = \frac{\sum Y}{101} = 20.20 \]

RESULT:
The correlation value is positive (0.88) and it is between 1 and 0.

CONCLUSION:
There is a highly positive correlation between production scheduling increases motivation and reduces workload.
IX. FINDINGS

- 100% respondents are known about the production scheduling Production process.
- 30% respondents are strongly agree, 34% are agree, 20% are neither agree nor disagree, 9% are disagree and 7% are strongly disagree that quality increases after implemented production scheduling.
- 60% are told that Increase production rate, 15% are told that decrease production rate and 25% are told that no changes in production scheduling technique.
- 24% are told increase quality, 25% decrease quality, 26% are supports quality, 20% are told reduce defects.
- 100% are told that the organization is provides production scheduling training to all the employees.
- 48% are agreed, 16% are neither agree nor disagree that production scheduling techniques changes product quality.
- 35% are told that Identify mistakes, 32% are told that reduce wastages, 8% are told that increases productivity, 16% are told that protect from defects and 9% are told that none of above.
- 76% of employees are saying agree, 14% of employees are saying neither agree nor disagree and 1% of employees are saying disagree regarding for poke yoke reduce workload for employees.
- 57% of employees are saying agree, 13% of employees are saying neither agree nor disagree and 1% of employees are saying production scheduling increase motivation.
- 39% of employees are reduced their stress, 30% of employees are increased performance and 9% of employees are increased their confidence level due to production scheduling training program.
- 25% of respondents are told rewards and awards are supports to complete the task, 10% of respondents are told are things are supports to complete the production scheduling to complete the tasks.
- 75% of respondents told poke yoke supports to future innovation. 25 % of the respondents told not support the future innovations.

STATISTICAL FINDINGS

- There is a significant difference among the different experienced respondents towards production scheduling techniques supports to employees.
- Production scheduling always supports future innovation in the company.
- There is no association between departments’ employees and supports to complete the task.
- There is a highly positive correlation between production scheduling increases motivation and reduces workload.

X. SUGGESTIONS AND RECOMMENDATIONS

- Production scheduling is a complex system of information flow, decision-making, and problem-solving. It is not simply an optimization problem. It is hoped that the strategy presented here will help engineers, analysts, and managers recognize and understand this complexity and successfully improve their production scheduling. An analysis of these perspectives suggests that they form a hierarchy. This, in turn, motivates an integrative strategy for improving production scheduling that begins with considering the production scheduling system, then looking at the scheduler’s decision-making process Systems.
- A solid production schedule should help in determining whether delivery dates can be met and can identify predictable downtime for maintenance schedules. A proper production schedule also gives production and other personnel an explicit statement of what is expected and in order that supervisors and managers can measure productivity and performance. The production-scheduling system is more than a schedule-generation process, be it manual or automated. This system should not be a piece of software, but it should interact with all departments and provide information that all managers need for other planning and supervisory functions. After the schedule is generated do the manufacturing operations and processes begin.

XI. CONCLUSION

- A plant’s production-scheduling system continues to develop over the years, evolving through the mistakes and miscalculations recognized and corrected. Remember, common sense is one of the most important aspects of effectively simple production scheduling. The layout of the production-scheduling board traditionally would be in
a calendar-month format. Each delineated section is one day’s worth of production for that specific machine. Each section on the board will be the location of that machine’s daily jobs. Each job will be earmarked with a job card. The job card has all the details of the work to be done and is created at the order-entry stage. Pertinent information for the job is included on the card: customer, design, number of colors, substrate and, most important, due date.

- The production schedule is a work in progress and changes continually. A daily schedule and requisitions for art, receiving, screen and ink is created by each department head, determined by the main scheduling needs. There are numerous advantages to the integration of process planning and production scheduling. It must be incorporated with other systems and interactive with real-time changes and adjustments. The objective is that production scheduling is a part of a complex flow of information and decision making. It is expected that a scheduling system should incorporate all relevant constraints in the printing process and should perform suitable activities for a changeable environment.

REFERENCES

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Journals referred:

Web sites:
11. http://sbinfocanada.about.com/od/Production.html