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Optimization of Capacity Utilization in a Manufacturing Industry – A Case Study

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Abstract: *In today's competitive market, every organization is striving hard to excel to utilize capacities effectively which determines the position of the organization in the Market. To achieve effective utilization a lot of planning is required with respect to capacity utilization. Capacity Planning and Capacity Management are today's modern organization requirement. The capacity plans needs to be executed flawlessly without unpleasant surprises .To match the capacity with the plans, an attempt has been made to evaluate capacity utilization index in a cement manufacturing industry. Overall equipment effectiveness is calculated with three separate but measurable components availability, performance and quality. Many manufacturing companies benchmark their industry to set challenging target at 85% capacity utilization, even though 100% OEE is possible.*

Keywords: *Capacity Utilization, Capacity Index, Capacity Utilization, Capacity Management, OEE*

I. Introduction

The present work has been aimed to determine capacity index in a cement industry with respect to capacity plan. The following aspects are considered while conducting the study:

1. Utilization of machines in a cement industry.
2. Utilization of labour in a cement industry.
3. Combined utilization of machines as well as labour in a cement industry.
4. Calculation of the overall capacity index of the cement industries.
5. Recommendations and inferences drawn by analyzing the data.

Analysis of this work will be helpful to know the capacity utilization of cement manufacturing industry, since it is going to be helpful for all kinds of economic activities .corporate needs to control the types and quantities of materials they purchase, plan which products are to be produced and what quantities and ensure they are able to meet the current and future demand. Making a bad decision in any of these areas will make the company lose money. Hence capacity planning is a tool to deal these types of problems.

The common steps involved in cement manufacturing are:

1. Procurement of raw materials.
2. Preparation of raw materials for the pyro-processing system.
3. Pyro-processing raw materials to form Portland cement clinker.
4. Cooling of Portland cement clinker.
5. Storage.
6. Packing and loading.

II. Methodology

The methodology adopted in the present work is to study the layout of the industry and collecting suitable data with respect to utilization of machines and man power. The human effort is judged, wastage identified and bottlenecks are identified to eliminate the same .The daily data is collected which is converted to weekly, monthly to calculate capacity indexes, which are charted. To study the comparison the same details are plotted mainly to give recommendations to the issues.

The capacity index is calculated by taking one machine in a cement industry mainly to design index value so that the decision makers can take qualitative decision on capacity. Dumper 1 has been identified for the above purpose. The details of working time, idle time, percentage of utilization calculated for the month of January.

WEEK	WORKING TIME	IDLE TIME	TOTAL TIME	% UTILIZATION	% IDLE TIME
1	2580	4440	7020	58.10	41.90
2	1620	5400	7020	23.07	76.93
3	3660	3360	7020	52.13	47.87
4	2220	4800	7020	31.62	68.38
MONTH	WORKING TIME	IDLE TIME	TOTAL TIME	% UTILIZATION	% IDLE TIME
JAN	10080	18000	28080	35.89	64.11

Similarly the labour details are calculated for the same month and the same are as follows

WEEK	WORKING TIME	IDLE TIME	TOTAL TIME	% UTILIZATION	% IDLE TIME
1	5943	1077	7020	84.65	15.34
2	6054	966	7020	86.23	13.77
3	5982	1038	7020	85.21	14.79
4	5963	1057	7020	84.94	15.06

III. Analysis

As we know in modern day competitive world every organization demands an effective utilization of capacity. In this work the researcher selected cement manufacturing plant to calculate and evaluate capacity index. In simple words Cement manufacturing starts with raw material acquisition to milling of raw materials to pyro processing where raw mix is heated to produce port land cement clinkers to cooling and storage, finally finish milling to packing and storing.

The machines slelected for the above work are dumpers (where 10 dumpers were available), Excavators (where 5 excaveters were available), Drilling Machines (Where 02 were available) and one crusher. The capacity index calculated machine wise, month wise and tabulated as follows.

IV. Average Capacity Index Of Machineries

MACHINE / WEEK	1	2	3	4	AVERAGE MACHINE C.I
DRILLING MACHINE 1	0.2322	0.2200	0.3305	0.2542	0.2592
DRILLING MACHINE 2	0.2596	0.2969	0.2869	0.2801	0.2809
EXCAVATOR 1	0.4730	0.4023	0.3837	0.4195	0.4196
EXCAVATOR 2	0.3640	0.4409	0.5272	0.5849	0.4793
EXCAVATOR 3	0.6420	0.6083	0.6867	0.5993	0.6341
EXCAVATOR 4	0.7681	0.7695	0.7494	0.6809	0.7420
EXCAVATOR 5	0.5285	0.5946	0.4222	0.5349	0.5201
DUMPER 1	0.5196	0.5943	0.5545	0.5338	0.5506
DUMPER 2	0.4923	0.4831	0.4620	0.5339	0.4928
DUMPER 3	0.5386	0.5537	0.5453	0.6727	0.5776
DUMPER 4	0.6433	0.5542	0.6806	0.6512	0.6323
DUMPER 5	0.6439	0.7442	0.7683	0.7144	0.7177
DUMPER 6	0.6802	0.9153	0.8477	0.6917	0.7837
DUMPER 7	0.6420	0.7579	0.6183	0.7232	0.6854
DUMPER 8	0.6228	0.6883	0.6639	0.4544	0.6074
DUMPER 9	0.8358	0.8549	0.8707	0.8757	0.8593
DUMPER 10	0.7572	0.8507	0.8594	0.8787	0.8315
CRUSHER	0.7920	0.7811	0.8493	0.7905	0.8032

V. Conclusion

In this work OEE and Labour Sheet is set to determine C I which will be used to measure and study the capacity planning. Even though every calculation involves variables and accuracy of that calculation is dependent of the choice and number of variables. As we increase the number of relevant variables the accuracy of the CI increases. By creating C I charts of cumulative data by considering only the bottleneck in particular plant.