REDUCTION OF THE MANUFACTURING COST IN CHALLENGING TIMES:
A CASE STUDY FROM MOTOR CAR INDUSTRY

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ABSTRACT

Economic slowdowns can result in huge losses and may force a company to go out of business in no time. More specifically so in Indian auto sector, where in there is always a cut throat competition & huge demand from the customers “highest value for money”. This case discusses on how manufacturing cost were further reduced during crisis period using ‘Difficulty and Impact Analysis’. This helped identify the parameter where maximum effect could be brought in terms of cost cutting. It was found that energy costs could be saved significantly. Statistical tools were used to identify the optimum production level so as to save the maximum energy. Using this production levels, the money saved by the company was then calculated and further used for competitive advantage by the company.

Keywords: Manufacturing Cost, Impact & Difficulty Analysis, Energy Cost, Trend Analysis, Cost Optimization

INTRODUCTION

Manufacturing systems encompasses in themselves set of systems. These systems in themselves are complete and demonstrate patterns and trend which when studied well can help in gaining better understanding of these systems. This understanding helps to make better and timely decisions. The case demonstrated here is an example of how understanding of complete anatomy of the system lead to timely decision by an organization that helped to enhance the profitability of the organization and there by maintaining the competitiveness in a challenging situation.

This case is from a manufacturing unit, which produces small and mid-size passenger vehicles. The understanding of the cost structure and a deep dive into patterns helped in the organization not only to enhance the efficiency but also to increase the profits by reducing the costs. As such, there is enough complexity of cost structure exists due to various product lines being made in a single manufacturing lines and plants. (Refer H. Schleich, J. Schaffer, L. F. Scavarda, Managing complexity in Automobile Production)

BACKGROUND

Year 08-09 was a year when the rapidly growing pace of economy took a U-turn. The market was full of economic uncertainties; commodity prices were volatile, market sentiments were dampening and world over auto giants were grappling with growing costs at one end and reduced demand at the other. This global phenomenon did not take long to spread to India and Indian companies too were staring at a bleak future. The situation in 11-12 is not too much different
than that existed in 2008-09 in Indian auto industry. The production was slashed by 30% from its normal levels and indications made clear that the facilities may have to run at only 50% in the coming months.

And as the nature of manufacturing goes, operating at lower capacities implies an increased fixed cost per unit. The increase in manufacturing cost and falling demand implied diminishing profits in already unfavorable scenario and also maintaining cost competitiveness and retaining the cost leadership required special efforts and a concentrated attempt to beat these unfavorable conditions.

Thus, in an inside out fashion an initiative of developing means and measures to utilize the available resources optimally & cost effectively was taken.

For a typical automobile sector if we see, the manufacturing cost primarily constitutes of steel cost, followed by manpower and energy, paint and other consumables costs.

**Difficulty and Impact Analysis**

In order to yield maximum benefit in the least possible time, it’s important to pinpoint the right area where one can focus. Here, it is important and crucial to identify the right set of systems that needs to be improved and enhanced making use of the available data combining with the understanding of each component effectively. The distribution of manufacturing cost is given in Figure 1.

‘**Difficulty & Impact Analysis**’ is a tool that effectively aspect of decision making and helps to make an optimi
Using this tool, the contributors of costs were ranked based on the:

1. **Increasing impact on the manufacturing costs.**
   (The scale used was Likert scale on a rating of 1 to 6, where 1 stands for lowest contributor and 6 stands for the highest contributor)

2. **Level of difficulty in controlling them at our end.**
   (The scale used was Likert scale on a rating of 1 to 6, where 1 stands for easiest to control and 6 stands for most difficult to control)

![Difficulty and Impact Analysis Chart](image)

Figure 2:
**Difficulty and Impact Analysis Chart**

The immediate focus on the systems contributing to the costs that lie in high impact and less difficulty zone lead to maximum benefit with minimum efforts. Details are shown in Figure 2.

Ranking the contributors of the cost and weighing them on the scale of impact and difficulty helped to clearly establish the focus areas of improvement. As per the analysis, the key cost which poses the opportunity of improvement is the Energy Cost. One needs to study all the systems in depth in order to bring about the systematic improvements in the same. When taken an example of energy itself, definitely in this modern and sophistication set up, all the manufacturing facilities consume the energy be it electricity, water, compressed air, steam, etc.

The focus area hence established if worked upon has potential to give maximum results in minimum time to clearly establish the goals. Once focus is clear, it’s important to than understand the focus area clearly so that it becomes easy to maneuver with the components that when aggregate leads to that cost.
TREND ANALYSIS

Data analysis is the most supreme way by which one can establish the trends and patterns the cost bears with the production and understanding of which could be leveraged to gain superior levels. Moving ahead on the similar lines and gain insights on the energy the cost consumption head, the study on establishing the impact on cost with the production volumes fluctuations was established. The same was done by dwelling into the data to establish the quantified relation.

This required:

A) Clear cut estimations of the MWH required for the production of n no. of vehicles

The volume per day and total MW units produced by the turbines were simulated on MATLAB to establish a relation between the two. The result obtained was as follows:

\[ Y = ax^2 + bx + c \]  

(1)

Where \( x \) = Average vehicle produced.

\( Y \) = Total Megawatt units required. The results thus obtained were checked and verified. The obtained relation was checked for the accuracy and was found to be in accuracy range of +/- 5%.

<table>
<thead>
<tr>
<th>Linear Correlation Without subtracting fixed</th>
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<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>-Y.228E-06</td>
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Table 1: Linear Correlation

B) To estimate with accuracy the gas consumption at a particular level of production.

The total fuel consumption as is known = SCM*No. of Megawatts required

SCM is the Specific Cubic meters of gas required to produce a single energy unit (MWH). SCM on other hand was also showing sensitivity to the total no. of MWH units being produced. With this understanding, relation was established between SCM of gas required to produce each megawatt of unit at a particular vehicle production.

Having established the relationship that the vehicle production bears on the energy consumption now was the time to use the understanding to derive the optimal point of the volumes to run the plant at the most efficient level.

Total Energy Consumption for the month = Total Energy required for working days + Energy requirement on off days.
From the above finding,

Total Energy Consumption for the month was estimated as

\[ = \text{SCM (at N avg. Volumes)} \times \text{MWH (for N Prod Volumes)} \times \text{no. of working days} + \text{MWH consumption with no production} \times \text{No. of holidays}. \]

(2)

<table>
<thead>
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<th>A</th>
<th>B</th>
<th>C</th>
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<td>for gas consumption</td>
<td>Z.44E-08</td>
<td>-0.0004</td>
<td>0.977</td>
</tr>
</tbody>
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Table 2: Relationship values

Thus the key here was to select the optimal combination.

The solution obtained above, gives options of various vehicle operating levels and the cost for each decision. But, at a macro level, high production volumes per day have various other manufacturing costs (energy cost) associated to it, and the holidays have their associated cost benefits.

To see the picture holistically and to take a wise decision, all the factors affecting the costs were identified and quantified and incorporated into a decision support system (an IT based system using internal linkages between spread sheets of Microsoft Excel) that helps the management to quickly reach to the optimal level of volume production during the lean periods.
RESULT

Making use of the understanding, an optimal level of production was then selected and the understanding of the systems was leveraged to reduce the costs.

The understanding of the energy and the processes helped the organization to estimate the behavior of the cost much in advance and hence use the understanding in planning the production well so well the production could be made at the best possible levels.

CONCLUSION

In tough times during last year where the industry was reeling under pressure of downward sentiments, the organization could optimize its operations which created a positive impact on the overall environment. The data analysis is a great tool to leverage on the opportunities that the manufacturing systems offer to improve there by leading to the cost competitiveness with lower manufacturing cost, which is the core strength.

The in-depth understanding in the management was able to take faster decisions with the holistic picture through innovative tool of “Manufacturing Decision Support System”. Also, optimized planning based on capacities and cost can be done in a short span of time. This has also resulted in saving of close to 30 M INR for the organization in the span of 6 months.
This has further made way to stream of opportunities to use the same techniques in optimizing the product / model mixes and interplant transfer of semi processed vehicles.

Abbreviations used

SCM: - Standard cubic meter

MWH: - Megawatt hour

M INR: Million Indian Rupees

REFERENCES

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