
MANUFACTURING EXCELLENCE THROUGH TPM IMPLEMENTATION: A PRACTICAL ANALYSIS

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Abstract

To compete effectively in the global marketplace of the twenty-first century, manufacturing companies are trying to maintain a high level of flexibility and responsiveness to achieve agility and to remain competitive. Manufacturers are under tremendous pressure to improve productivity and quality while reducing costs. The new competition is in terms of reduced cost, improved quality products with higher performance, a wider range of products and better services all delivered simultaneously to enhance value to customers. In such environment providing good quality product at low cost for a medium scale industry has become very tough. To provide good quality product at low cost, small industries need a formulation of some manufacturing approaches like agile manufacturing to manufacture defect free products within their materials cost limit. Medium scale steel manufacturing industries like Magnum steel limited (MSL), banmore are facing problems of higher rejections in form of wastes so as to increase their cost. This thesis aims to analyze the application of agile manufacturing in magnum steel limited in order to reduce wastages through implementing lean tools and techniques. An agility audit questionnaire is used for assessing the agility level of the company to identify the current level of performance within the company with respect to the key elements of agility. MSL's agile experience is reported including a list of recommendation for improving its competitiveness to offer solution alternatives not only to the current problems but also to the ones that may be encountered in the future.

INTRODUCTION

Businesses are restructuring and re-engineering themselves in response to the challenges and demands of 21st century. The 21st century businesses will have to overcome the challenges of demanding customers seeking high quality, low cost products, responsive to their specific and rapidly changing. In the past, economies of scale ruled the manufacturing world and everybody knew that mass production and full utilization of plant capacity was the way to make money. This style of manufacturing resulted in inflexible plants that could not be easily reconfigured, and were associated with swollen raw materials, work-in-process and finished goods inventories. Since the early 1980s, in pursuit of greater flexibility, elimination of excess in inventory, shortened lead-times, and advanced levels of quality in both products and customer service, industry analysts have popularized the terms "world-class manufacturing" and "lean production" (Sheridan 1993). Customer Demand Uncertainty is a big obstacle for companies to sustain their competitiveness in the market that responding customer requirements becomes essential. Besides companies need to consider also their cost structures which should have in high consistency to survive as well. In highly competitive environment, the companies need to try some responsibilities to continue their sustainability in the market. Satisfaction of customer requirements within agreed time, high quality and service levels are essential point to keep firms positions. On the other hand reduction of cost in the system is another perspective to survive hence those characteristics; customer responsiveness following cost reduction in the system conducts the firms to take some decisions and responsibilities in the changeable market conditions

LITERATURE REVIEW

Literature search can be consisted of many resources such as books, articles and journals. In this research, many books and articles are reviewed, read and analyzed. After election of those sources; numbers of literatures are used for this research which is put on the reference list as well.

A. Gunasekaran (2002) et.al [1] presents a case study conducted on agile manufacturing in the GEC Marconi Aerospace (GECMAe) company. The study provides the reader with an insight into the company and its agility level. An agility audit questionnaire is used for assessing the agility level of the company. GECMAe's agile manufacturing experience is reported, including a list of recommendations for improving its competitiveness. In addition, a framework has been formulated to highlight some important areas and to offer solution alternatives not only to the current problems but also to the ones that may be encountered in the future.

Nitin Upadhye, S. G. Deshmukh and Suresh Garg (2010) et.al [2] discusses the issues of MSMEs and presents a case to demonstrate the improvements achieved in an Indian mid size auto component's manufacturing unit after the implementation of LMS.

Fawaz Abdullah (2003) et.al [3] addresses the application of lean manufacturing concepts to the continuous production/ process sector with a focus on steel industry. The goal is to investigate how lean manufacturing tools can be adapted from the discrete to the continuous manufacturing environment.

A. Gunasekaran (1999) et.al [4] review the literature available on agile manufacturing with the objective to: (i) identify key strategies and techniques of AM, (ii) suggest some future research directions and (iii) develop a framework for the development of agile manufacturing systems (AMSS) along four key dimensions which include strategies, technologies, systems and people.

RESEARCH METHODOLOGY

FISH BONE DIAGRAM OR CAUSE AND EFFECT DIAGRAM:

The Fishbone Diagram is an easy to use and effective cause and effect technique developed by Kauoru Ishikawa (1982). It is also referred to as an “Ishikawa diagram” or a “characteristics diagram” referring to its use in identifying the causes of various quality characteristics, including problem (Ozeki & Asaka, 1990)

The late Dr. Ishikawa was quality expert who used this diagramming strategy to her Japanese business personnel in organizing those factors that influence a business or manufacturing process. The diagram has a cause side and an effect problem or opportunity side. It graphical represents the causes of a related need or problem.

On the effect side of the diagram, the effect under analysis can be either a current world problem that needs to be corrected or a desired quality characteristic. On the cause side of the diagram are the factors that influence the stated effect or characteristic. Categorical examples of some of the cause factors are equipment, people, environment, materials, and procedures. The strength of the technique lies in using a diagram analyze causal relationships in structured ways focusing attention beyond symptoms to root, or primary, causes (Swanson, 1995).

Purpose of fishbone Diagram

The Fishbone Diagram technique was originally developed for analyzing the factors that influence the process of developing quality products. However, it can be used as a tool for analyzing information related to a needs analysis and selecting alternative interventions for performance improvement. Used in these ways, the Fishbone Diagram will help to generate ideas about the possible causes of problems and identify the components in the process that are responsible for the existing problems. It can also be used to plan new processes to meet quality improvement initiative or new business opportunities.

Typically you will see a Fishbone Diagram used in the following ways:

☑ To identify major or minor reasons for a specific problem of performance. ☑ To identify root causes, or key drivers, contributing to some effect or measurable outcome (performance indicator). ☑ To identify key causes for which additional data are required (Swanson, 1995).

Advantages of Fishbone Diagram

☑ Fishbone Diagramming is adaptable to analyzing causes of problems in a variety of settings has been used successfully in business and industry. ☑ Groups find the method enjoyable. They

can usually complete the work in a session lasting to 2 hours. ☑ There is a strong sense of involvement in resolving problems and in ownership of results. ☑ Facilitators need little training to implement the procedure. ☑ No special equipment is needed. ☑ The technique results in a graphic representation of the relationships that exist between affected and their causes.

Limitations of Fishbone Diagram

☑ Although groups can quickly determine potential causes, Fishbone Diagramming does not usually clarify sequences of causes. ☑ The magnitude and probability of a cause contributing to a need are not established a part of the technique. ☑ The causes identified require verification of some kind.

RESULT AND EXPERIMENTATION

Before analyzing the application of agile manufacturing in magnum steel limited (MSL), it is found that there is no satisfactory waste reduction tool and technique is used in the company and there is almost 14% rejection from each mill. So for MSL, the first priority is to become a lean organization. Without the prerequisite of leanness, the jump to agility is not only not required, but also difficult to accomplish. So first of all lean philosophy is implemented in MSL in order to minimize the wastages.

So after implementing lean tools and techniques on selected rolling mill (16"/10"), there is a reduction in rejected pieces from 13.94 % to 11.26 % in the month of January and February 2016. This results in saving of Rs. 891000 (per piece cost Rs 2700 at that time) due to reduction of defects in February month (368 more pieces were produced in February 2016).

For the established products at MSL, the life cycle is quite long; hence full agility is not required. This is not to say that agile manufacturing is totally inapplicable. Quite the opposite, various enablers of agile manufacturing such as Lean manufacturing, Maintenance management, Supply chain management, Integrated production, Information systems and Cellular manufacturing are quite useful to employ in a company like MSL.

FUTURE SCOPE

Agile manufacturing is about changing the pattern of traditional operation and casting off those old ways of doing things that are no longer appropriate. In a constantly changing competitive environment, there is a need to develop organizations and facilities that are significantly more flexible and responsive than the currently existing ones.

So for MSL, A recommendation has been made to apply a „lean mindset’ to the long established products that are within the maturity stage of the product life cycle in order to reduce unit costs,

while new products could lend themselves to a more agile approach. The lean philosophy should be implemented to all other section of the MSL in order to become a lean organization.

CONCLUSION

In this research work, an attempt has been made to give a real world account of agile manufacturing, the latest manufacturing technique in the context of a case study from the real world of business. Its enablers were identified and a list of suggestions was offered to illustrate them along with five key areas of organizational agility.

The data collected from the questionnaire have led to the conclusion that cost is a key parameter for both production (the company) and more importantly, the customer. As cost is the primary issue, one should be in the mode of „thinking lean’. To reduce costs, along with cellular manufacturing, adoption of other valuable concepts and technologies should also be considered.

The market for Magnum steel limited (MSL) is by no means as turbulent, e.g. the mobile phone industry where there is a definite requirement to be agile and to remain so. This is not to say that agility is only applicable to new products and the leanness should be purely applied to older products. Quite the opposite, various enablers of agile manufacturing such as Lean manufacturing, Maintenance management, Supply chain management, Integrated production, Information systems and concurrent engineering are quite useful to employ in a company like MSL.

Changes are being made in light of overall business perspective and market, not necessarily to become more agile, but simply because it make sense to change!

We have made a number of recommendations to MSL with the objective of improving its overall business competitiveness. Not all of them, however, need to be incorporated, or be implemented at the same time. Some of the recommendation have been reviewed at MSL, bearing in mind the future opportunities and threats to the business.

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