Implementation Issue of JIT (Just in Time) in Indian Steel Industries

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Abstract

This research reveals attributes of just-in-time ('JIT') as practiced by Toyota and its affiliates. Though many researchers have studied JIT in different industry but implementation of JIT in Indian steel industry context is not explored yet. The ultimate goal of any managers is to reduce cost and maximize shareholder's wealth. Over the last decade, steel industries in India are facing increasing pressures to attain and sustain their competitive position and performance. To survive in today's dynamic and competitive markets; firms need to come up with strategies consistent with its environmental demands for efficiency, effectiveness and customer responsiveness. In view of the escalating threats from global players, especially those from China, companies are compelled to continuously review their strategies and devise plans to improve their operations if they were to survive and prosper. One of the strategies to improve manufacturing performance is adoption of world-class, lean and integrated manufacturing strategies such as just-in-time (JIT) system. Some of the benefits of JIT would allow companies to reduce costs, meet customer's demands, stay ahead of competitors and minimize slack resources which are critical for survival in the increasingly competitive market. The focus of JIT is cost reduction and excellence through continuous improvements in the business process by redefining the structural and procedural activities performed within an organization. Therefore in this paper we have tried to study the significance of JIT for increasing company's financial and non financial performance and pertaining issues of its implementation in Indian Steel industries context.

Keywords: *supply chain, Just In Time (JIT), production planning, strategic resource finding.*

1. Introduction

In the past two decades, Japanese manufacturing practices in general and Just-In-Time production in particular have received a great attention from western researchers and manufacturing firms in trial to catch-up Japan in terms of quality, productivity, and low cost. The JIT advocates the elimination of waste by simplifying production processes, reductions in set up times, controlling material flows, and emphasizing preventive maintenance are seen as ways by which excess

inventories can be reduced or eliminated, and resources utilized more efficiently. Supply chain is composed of all activities required for delivering a product to a customer, from product design to getting orders, making materials ready, marketing, manufacturing, logistics, customer services, cash payment and so on. Among all these activities, everybody, everything, and everywhere, putting an effect on the product's quality, price, info exchange, and its receiving and delivering to the market are considered as a part of the supply chain.

Just In Time (JIT) production system has been investigated as a significant efficiency-increasing out come in the production processes and as an approach to an optimized supply chain. In addition, the role of JIT in the supply chain and the proper way of making use of it are discussed. From there, this method is widespread especially in developed countries and noticeable effects of its usage in obtaining productivity and high quality in production have been proved in these countries, it is necessary to study different factors of its acceptability. For perusing useful effects of this system, a comparison has been done in planning systems of production/demand, resource finding/shipping and transportation/logistics with JIT and without it. JIT production systems, process flexibility improvement, strategic resource finding to support JIT are major subjects discussed in this paper.

Effective control of materials and components flow in producing and assembling lines is a key for effective production. In an optimal supply chain, all materials and components are received in time to lead to a precise production. Precise production means producing a safe efficient product in a proper place and time with the least costs. In recent years, several achievements have been got to increase production operation outcome and to get an optimal supply chain, among which "Just In Time Production" system has been the kernel of the newest phenomena in industry management and engineering, "just in time production" system has got much more attentions in last decade in the world industrial societies while it is still considered a new idea in this field. Although this view dates back to several last years and many organizations in the world especially auto producing companies and the like have accepted this system and have successfully applied its rules and techniques in all activities of their organization such as dealing, producing and so on, However, implementation of JIT has posed many setbacks to the firms who are actually following this philosophy. For example, Japanese faced several problems while implementing this philosophy such as suppliers have been blamed for inconsistency in the delivery process due to traffic problems. Some experts also blamed that JIT philosophy switches the responsibility of this inefficiency from more powerful and large manufacturing companies to

smaller, lesser powerful vendors. JIT is also vulnerable in the management of natural catastrophes such as earthquakes, floods, storms etc. as evidenced by the Great Hanshin Earthquake in Japan when deliveries were stopped to the facilities of Toyota although the factories were not damaged at all. Beyond these above mentioned barriers to the successful implementation of JIT approach, companies may also find problems due to gaps between the communication facilities available to manufactures and suppliers. Proper training of the employees as well as the top management involvement is the important factors for the successful implementation of JIT. Presence of accurate data including the accurate and reliable forecast of demand is a key for JIT to operate smoothly. Given the potentials of the JIT, implementation of this philosophy will be of great help to Indian Steel companies in this current economic downturn.

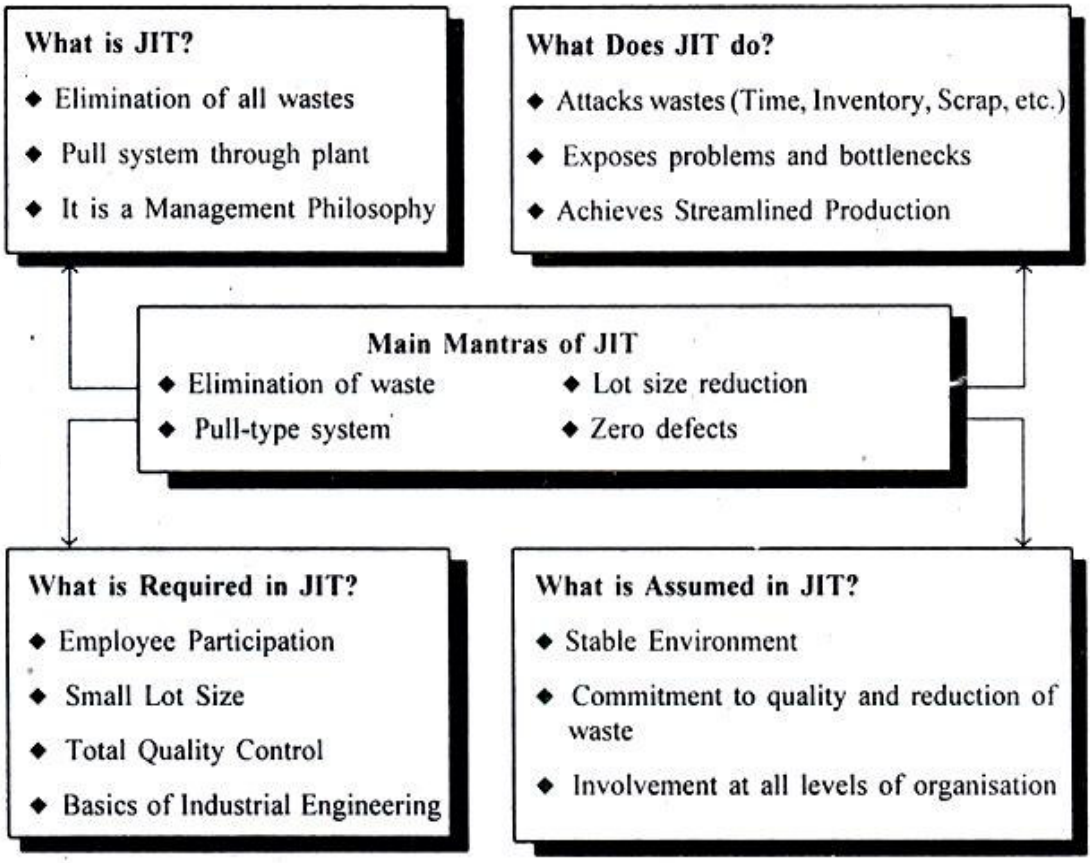

Figure -1 JIT Overview

In this paper we try to examine empirically the factors causing hurdles in implementation of JIT and try to provide solutions to overcome this hurdles. In addition to that, the impact of manufacturing strategy on JIT performance will be examined. The findings of this study are

discussed to shed more light requirement of infrastructure and manufacturing strategy as a necessary tools for successful JIT implementation in Indian steel industries.

2. Literature review

The notion of JIT production was described by Taiichi Ohno, the godfather of Toyota production system, as " All we are doing at the time line from the moment the customer gives us an order to the point when we collect the cash, and we are reducing that time line by removing the non-value-added wastes" (Liker, 2004). One motivating reason for developing JIT and other better production techniques was that after World War II, Japanese people had a very strong incentive to develop good manufacturing techniques to help them rebuild the economy (Cheng, 1996). There are seven forms of waste were identified by Toyota engineers: Waste of overproduction, Waste of inventory, Waste of repair/defects, Waste of motion (unnecessary movement), Waste of processing, Waste of waiting, and Waste of transport (Womack and Roos, 1990; Imai, 1997; Taylor and Brunt, 2001; Liker, 2004).

There is no agreement on a clear definition of JIT. The complex subject is usually summarized in a very brief statement, this result in information being omitted and causes confusion (Hallihan et al., 1997). Voss and Robinson (1987) defined JIT as:

> "JIT may be viewed as a production methodology which aims to improve overall productivity through the elimination of waste and which leads to improved quality. In the manufacturing/assembly process JIT provides the cost-effective production and delivery of only the necessary quality parts, in the right quantity, at the right time and place, while using a minimum of facilities, equipment, materials and human resources. JIT is dependent on the balance between the stability of the user's scheduled requirements and the supplier's manufacturing flexibility. It is accompanied through the application of specific techniques which require total employee involvement and team work".

Many researchers have tried to identify the main elements of JIT. However, there is little consensus among researchers regarding the relative importance of these elements in the JIT implementation process (Ramarapu et al., 1995).However, the potential synergic benefits are not fully realized until all elements of a JIT system are integrated (Goyal and Deshmukh , 1992). . JIT tries to give a quick service to the customers, while it minimizes the inventory. JIT philosophy is

based on wastages deletion via simplification of the production process, declining preparation time, controlling thematerials flow with emphasis on preventive maintenance in order to delete or decrease extra inventories and efficient use of stocks.`

3. Objectives of JIT

The objectives of JIT are achieved through several physical systems or projects. Some of JIT objectives are as follows:

- To reduce the set-up times and lot sizes.
- To achieve 'zero defects' goal in manufacturing.
- To focus on continuous improvement.
- To concentrate on involving workers and using their knowledge to a greater extent.
- Layout of equipments in such a way so as to minimizes both travel distances and inventories between the machines.
- To reduce inventories and thus economize on inventory carrying costs.
- To eliminate waste (such as long set-up times, zig-zag material flow, scrap, machine breakdown, higher stocks, rework, inspection etc.).
- To identify any problem related to waste and solve that through total employees involvement.
- To eliminate all non- value adding activities by systematically identifying these.
- To cross –train the workers in multi-functions to maintain and enable them to run several machines at a time.
- Improved equipment efficiency
- Improved worker efficiency & Improved worker motivation
- Increased administrative efficiency
- Increased equipment utilization
- Increased flexibility
- Increased inventory turns
- Increased profit margin
- Increased team work
- Less scrap & Improved quality
- Lower overheads & Reduced product cost
- Reduced production lead time & Reduced purchasing lot size
- Reduced raw materials/parts & Reduced space requirements

4. Discussion and conclusion

The JIT system is not new to the present scenario of industrialization. This technique is not limited to any particular industry but due to its large potential of benefit it has a widespread application throughout the all industries. Many industries have adopted it and others are going to implement it for their survival in the fast competition at each stage in each area. Implementing JIT requires organizational changes as well as physical plant changes. Cultural transition barriers such as performance measures, organization structure and pay systems, often make organizational changes a tougher and longer process than the physical changes necessary for JIT. While solution to physical problems exists, JIT implementation often waits for organizational changes to catch up. Sustaining the continuous improvement philosophy of JIT is critically dependent on this organization transition. Implementing JIT requires a plan along with commitment from all stake holders.

The current study examines those issues which have positive relationship with the implementation of JIT in steel industries of India. This study focuses issue rated to the product design, total quality control, inventory management, supply chain integration, production plan and their relationship with the JIT implementation.

4.1 Inventory Management

Inventory management is an important factor to consider for implementation of JIT management philosophy. It was measure through three variables; 'Economic Order Quantity (*EOQ*)' which determines optimal order quantity which will reduce the total cost of inventory. EOQ is a basic and essential model and the models that are developed further are based on this very basic model like production quantity model and quantity discount model. **Continuous order** works on the basis of fixed order quantity where trigger is released for fixed quantity replenishment every time the inventory level reaches to the level of predetermined safety and triggers re ordering. **Periodic ordering** works on placing order after a fixed period of time. Study finds that there is a direct relation between JIT and Inventory management and planning (Banerjee and Kim 1995). With the effective management of inventory unnecessary inventory piles and work in progress inventory could be reduced. So manufacturer must focus on inventory management systems to implement JIT and reduce the unnecessary inventory.

4.1.1 Uncertainty in Managing Raw Materials.

Raw materials are crucial in determining the competitive growth of any industry. This is more so for an input-intensive extractive industry like steel. The changing government policy about allocation of iron mine and frauds in allocation raised alarm to steel makers to safeguards adequate material stock to continue run their plants. This major area of concern for implementing JIT in steel industry. Requirement of major raw materials in the steel industry is determined not only by the rate of growth in output but also by the technology adopted for making the required steel. Choice of technology, in its turn, is influenced by the relative costs of raw materials, energy, labour, capital and more specifically by the entire logistics of movement of raw materials and finished products. But at another level, for obtaining access to basic raw material linkages, especially of iron ore and coal, the industry also has to depend on potential intervention by the state and consensus building within the larger social space. The steel industry is also highly material intensive. Generally, 1 tons of steel output requires handling and transportation of around 4 tons of bulk raw materials.

Iron Ore

Iron ore remains the most crucial driving force for the steel industry in India and the industry‘s growth so far can largely be attributed to the domestic availability of low cost and high quality iron ore. Iron Ore is the basic raw material used in steel making. Though iron ore is abundantly available in the country, large scale exports of iron ore have raised serious concerns about future availability of iron ore resources to meet fast rising domestic steel demand. One of the major reasons for export of large quantities of fines has been the mismatch between domestic production and consumption of iron ore fines. The sintering and pelletisation capacity in the country is not adequate to make full use of fines. Another area of concern has been the gradual depletion of high grade ore deposits and lack of domestic technological capabilities to process low-grade iron ores. As per working committee of steel mentioned one of the major challenges is to beneficiate these low grade ores to improve their iron content and to achieve this goal with reasonably high yields. Estimates of total and additional requirement of raw materials have been worked out Based on the projected production of crude steel according to process routes and average norms of consumption. However, in view of the fact that there exists large scope of improvement in operational efficiencies and also due to the fact that there are possibilities of changes in technology adopted, the estimates of input requirements are only indicative.

Coking coal

The domestic availability of Coking coal, a critical raw material required by steel industry is limited and therefore the Indian Steel industry has to depend heavily on imported coking coal to meet its needs. Currently, domestic steel makers meet 70% of their coking coal requirement through imports. The quantum of imports may go up significantly in the 12th plan as steel production in a large number of new projects is likely to be through the BF-BOF route. To ensure raw material security and minimize the impact of volatility in coal prices, the major players in steel sector bound to making buffer stock for running of plants. Non-coking coal used for production of sponge iron is also increasingly becoming scarce in the country. With the demand for non-coking coal from priority sectors like power, Fertilizers etc going up further, its availability for steel making is likely to be limited during the 12th plan. While sponge iron producers may opt for import of coal, the economic viability of this sector may be under pressure due to higher prices of imported coal. Moreover, the gas based DRI units face restricted supply of CNG, largely due to priority allocation of gas to power and fertilizer sectors. Supply of CNG to this sector is a major concern for its growth and these units may have to depend more on imported source of fuel supply. Many existing and new producers propose to create additional capacity manifold under gas based route.

Ferro Alloys

Bulk Ferro Alloys (viz. ferro manganese, ferro silico manganese, ferro silicon, ferro chrome, etc.) manufactured in submerged arc furnaces, and Noble Ferro Alloys (viz. ferro molybdenum, ferro vanadium, ferro tungsten, ferro silico magnesium, ferro titanium, ferro boron, etc.) manufactured through the alumino thermic process, are used in the production of steel as deoxidants and alloying agents to impart particular physical properties to finished steel products. Growth in the steel industry, therefore, drives the demand/consumption for Ferro-alloys. Depending upon the process of steel making and the type of steel being made, the requirement of different Ferro alloys varies within a wide range. Ferro alloy units initially came up in the four states of Andhra Pradesh, Karnataka, Maharashtra and Odisha, mainly due to proximity to raw material resources. The Indian Ferro Alloys industry is operating at below 70% of its capacity. So there is always scarcity of material and the steel producers always prefer to maintain buffer stock to overcome for contingency situation.

4.1.2 Issues In Managing Inventory of WIP Materials.

Overproduction Over Production means manufacturing of the products in excessive quantity i-e a huge wastage of time more than demand which results in the wastage of a huge amount of money, space and time as well. Second is important factor is waiting time which reflects the ineffective and inefficient process and the unnecessary time utilization when in an ongoing process one has to wait for the completion of one process in order to start other. In ideal circumstances, the operations flow must be continuous and smooth.

Internal Movement of Material which means moving a product between different processes of manufacturing that do not add any value. Which in fact is very costly or expensive for any manufacturing plant and it may result in product deterioration or damage.

Inappropriate processing which denotes excessively elaborate and luxurious equipment is extravagant if simpler machinery would work as well,

Unnecessary motion that shows unusual resources are consumed when workers have to bend, walk or reach distances in order to do their jobs. Workplace ergonomics assessment must be conducted in order to create more proficient environment.

Defects which means quarantining and inspecting inventory that takes time and overheads money .

4.1.3 Issues in Managing Inventory of Finished Goods.

Finished good is a completed part that is ready for a customer order. Therefore, finished goods inventory is the stock of completed products. These goods have been inspected and have passed final inspection requirements so that they can be transferred out of work-in-process and into finished goods inventory. From this point, finished goods can be sold directly to their final user, sold to retailers, sold o wholesalers, sent to distribution centers, or held in anticipation of a customer order.

Fig. 2 Finished goods stock

The major area of concern is handling of finished goods, as due to over production, transportation uncertainty inventory of material increased, Which causing rustiness, distortion and defectiveness in material. There is enormous shortage of transport facility like vehicles, rail rakes for transportation of finished steel material causing of finished materials laying at plants levels. Specially long distance delivery of finished products is area of concern due to increased fuel and operation cost in transport sector.

4.2 Insufficient Logistics Infrastructure:

Development and growth of Infrastructure sector is critical for rapid growth of domestic steel industry in the country. Steel industry is a major user of infrastructural facilities especially of Railways, roads, power, and ports. Besides, the competitiveness of domestic steel industry depends heavily on the expansion and provision of efficient infrastructural facilities. The ships are keep waiting in clearances of port due to traffic conjunctions, due to non availability of freight corridor the rake availability is less and speed restriction causing delay in deliveries of material. The producers have to maintain adequate and buffer stock unavailability of logistics infrastructure.

As per the steel working group projections, the steel production in the country will nearly double within the next five years. This requires rapid growth of railways, roads, ports and power facilities. The existing infrastructural facilities are not adequate. The domestic steel industry meets 70% of its coking coal requirement from imported sources and if the same trend is maintained, nearly 50 million tonnes of coking coal will have to be imported by 2016-17. There is urgent need for expansion of port capacity to handle the raw materials and finished goods of steel sector. The steel plants which are likely to come on stream in Twelfth plan period will need to transport 85 to 90 million tonnes of iron ore from the mines and also deliver 45 to 50 million

tonnes of finished steel from steel plants to distribution centres. Therefore, there is immediate need for substantial up gradation of infrastructural facilities to meet the increasing steel requirements of the steel industry.

4.3.1. Total Quality Control (TQC)

The Factor Total Quality control is also measured through three indicators. First is the '*process quality*', which focuses overall quality of the process through which product is to be manufactured. Secondly '*product quality*' which indicates the primary characteristics of the product and value addition of the product and third customer satisfaction which relates with the customer perception of the product or fitness for use (Flynn et al. 1995). The study indicates the existence of a direct relationship of TQC with implementation of Just in Time management. TQC can help steel industry in to reduced defects which lead to effective implementation of JIT management

4.4 Supply chain integration

Supply chain integration is another important factor that can influence JIT implementation in steel industry. Supply chain integration is measured through Distribution Network Configuration that is number, facilities of production, location and network suppliers mission, warehouses, distribution centers, cross docks and customers, 2nd Distribution Strategy means operating control questions like if it is centralized, decentralized or shared; delivery scheme for example direct shipment, cross docking, pool point shipping, direct store delivery (DSD), closed loop shipping; transportation mode for example motor carrier, containing truckload, LTL (Less than truckload) parcel; railroad; intermodal, ocean freight; replenishment strategy and transportation control (for example owner operated, common carrier, private carrier, contract carrier, or 3rd-party logistics.) and 3rd Information shows an integration of processes by supply chain in order to share information that is more valuable, involving forecasts, demand signals, transportation, inventory and potential collaboration. Study finds a positive relationship with JIT implementation (Cook 1996). Supply chain integration could resolve the inventory problems, can reduce unnecessary motion and defects due to raw materials. Supply chain strategy could be vital to success for implementing JIT.

4.5 Production Planning & Control

Production Plan is measure through three indicators, first, '*resource utilization*' i.e., how effectively and efficiently resource has been utilized, second, '*coordinated activities*' represents how much work activities are coordinated with each other to minimize the wastage and third, '*Labor productivity*' which leads to the productivity of labor. Product planning has a positive relation with JIT implementation which recommend manufacturers to perform careful product planning in order to reduce the wastage and to improve labor productivity which could lead to effective implementation of Just- in- Time management Philosophy. In the current situation of India, it is really a challenge for all production managers to implement the JIT in their production process which leads to zero inventory and make to order production planning. It is also tricky in the prevailing situation and uncertain economic environment of the India which makes it really impossible in reality and practice. The current study proposed that the integration of product design, quality control, effective inventory management, and production plan and supply chain could overcome these challenge. Production planning is a complex process because it should consider customer specific requirements, grade, thickness, width, processing, packing type, and weight range, dlivery time, plants constraints, which are related to the nature of the process, cost of production & Plants' capacities

5. Conclusion and Recommendations

JIT has the potential to increases the operational efficiency, quality and organisational effectiveness of Indian Steel Industry while its some basic elements are slightly difficult to implement in existing production system of steel industries. To gain benefits of JIT Indian steel industry must be willing to modify their procedures and operations. The training to employees in order to create organisational culture, establishment of new procedures for dealing with suppliers, analysis of operations to identify the area of standardisation, simplification ,and automation and reengineering of operational processes and procedures are some important issues which should be examined prior to implementation of JIT.

Following are some recommendations in the form of prerequisites for implementation of JIT in Indian Steel industries.

1. Allocation of iron ore mines is carried out as per the provisions of the Mines & Minerals (Development & Regulations) Act 1957 and the Mineral Concession Rules 1960. Under the law, a user can operate a mine under a valid mining lease for the period of lease. So that for specific period uncertainty will overcome and there will be no buffer stock because of uncertainty.
2. Phased Deregulation of the Indian Coal Sector: It is important to deregulate coal sector and allow commercial mining of coal, to bring in competition and thereby improve efficiency of the sector. Focused attention is needed to ensure higher rate of recovery of manganese and improve the quality of the ores by engaging beneficiation and sintering processes.
3. Infrastructure development, such as railways, roads and ports, linking the mining areas to the consumption areas and export markets may be taken on priority basis so that the overall transit period and logistics bottlenecks will be minimised.
4. In order to achieve a precise production, i.e. an efficient product in a proper place and time and with the least costs steel industry must adopt JIT in supply chain. Using JIT in supply chain will increase flexibility and productivity of products and can meet customers' needs.

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