**Futuristic Approach for efficiency improvement, productivity and quality enhancement using JIT techniques for Indian Manufacturing sectors .**

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***Dr .Kanchan D. Ganvir1***

***Asst.Prof.Priyadarshini Bhagwati College Of Engg.***

***Email: [kanchan.ganvir100@gmail.com](mailto:kanchan.ganvir100@gmail.com)***

***Prof. Jayashri V. Chopade***

***Department of Mechanical Engineering***

***Pimpri Chinchwad college of Engineering and***

***Research, Ravet. Pune, India***

***email : [Chopadejv91@gmail.com](mailto:Chopadejv91@gmail.com)***

***Prof Mayuri Wandhare***

***Mechanical Engineering Department***

***Suryodaya College of Engineering.&Technology***

***Vihirgaov,Umred Road Nagpur 441204 Bhande plot Square, Ngapur 440024***

***email : [mayuriwandhare25@gmail.com](mailto:mayuriwandhare25@gmail.com)***

***Abstract* - Just‐in‐time (JIT) manufacturing systems have attracted huge amount of attention of industries all over the world. The perceptible impact of JIT lies in attaining the far‐reaching productivity and quality standards. Attempts have been made to examine JIT, its benefits and elements for their feasibility in Indian industries. Despite the profound interest of prospective managers and researchers, the extent of JIT implementation in Indian industries so far is not satisfactory. The real challenge before Indian managers is to establish priorities among potential JIT techniques to achieve best possible advantage of JIT implementation in Indian industries .The present work analyses the factors influencing the implementation of JIT Practices in the India manufacturing industry and to devise an overall maintenance strategy for overcoming obstacle to successful implementation.**

***Keywords – JIT,Manufacturing Industries,Japanese philosophy***

1. **INTRODUCTION**

With rapid advancement in technology and availability of workforce at reasonable wages, India is becoming a preferred location for manufacturing companies from all over the world. The manufacturing sector in India has witnessed a growth of about 15 percent during the year 2007. According to a study recently conducted by global management consulting firm Mc-Kinsey and Company, the Indian manufacturing industry is expected to touch US$ 1 trillion by 2025. Industry experts accredit the increasing demand of manufacturing units and the penchant for setting up low-cost plants in India by multinational firms for this possible development.

Improving customer service, making operation faster, more operation and reduction in costs are challenges faced by manufacturers today. To meet these challenges many companies in India searching to improve their ability to compete globaly. Wastage during production process is rapidly growing day by day in industries. This is because of

change in taste of the customer. Which will lead to increase in production costs. A Japanese technique JIT is found to be very effective to overcome these problem by many manufacturing organizations all over the world.

Just in time is a manufacturing philosophy involving an integrated set of procedures or activities designed to achieve the volume of production using minimal inventories. This philosophy believes in delivering right quantity of material in right quality, at right time, right place, whenever required or demanded. Just-in-time (JIT) also is an inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs. This method requires producers to forecast demand accurately.

1. **BACKGROUND**

JIT is a Japanese management philosophy which has been applied in practice since the early 1970s in many Japanese manufacturing organizations. It was first developed and perfected within the Toyota manufacturing plants by Taiichi Ohno as a means of meeting consumer demands with minimum delays.

Taiichi Ohno is frequently referred to as the father of JIT. Toyota was able to meet the increasing challenges for survival through an approach that focused on people, plants and systems. Toyota realized that JIT would only be successful if every individual within the organization was involved and committed to it, if the plant and processes were arranged for maximum output and efficiency, and if quality and production programs were scheduled to meet demands exactly.

The Toyota production plants were the first to introduction JIT. It gained extended support during the 1973 oil embargo and was later adopted by many other organizations. The oil embargo and the increasing shortage of other natural resources were seen as a major impetus for the widespread adoption of JIT.

Toyota was able to meet the increasing challenges for survival through an approach to management different from what was characteristic of the time. This approach focused on people, plants and system. Toyota realized that JIT would only be successful if every individual within the organization was involved and committed to it, if the plant and processes were arranged for maximum output and efficiency, and if quality and production programs were scheduled to meet demands exactly. JIT had its beginnings as a method of reducing inventory levels within Japanese shipyards. Today, JIT has evolved into a management philosophy containing a body of knowledge and encompassing a comprehensive set of manufacturing principles and techniques. JIT manufacturing has the capacity, when properly adapted to the organization, to strengthen the organization’s competitiveness in the marketplace substantially by reducing wastes and improving product quality and efficiency of production. There are strong culture aspects associated with the emergence of JIT in Japan. The development of JIT within the Toyota production plants did not occur independently of these strong cultural influences. The Japanese work ethic is one of these factors. The work ethic emerged shortly after World War II and was seen as an integral part of the Japanese economic success. It is the prime motivating factor behind the development of superior management techniques that are becoming the best in the world. The Japanese work ethic involves the following concepts:

* Workers are highly motivated to seek constant improvement upon that which already exists. Although high standards are currently being met, there exist even higher standards to achieve.
* Companies focus on group effort which involves the combining of talents and sharing knowledge, problem solving skills, ideas and the achievement of a common goal.
* Work itself takes precedence over leisure. It is not unusual for a Japanese employee to work 14­hour days. This contrasts greatly when compared to the Western emphasis on time available for leisure activities.
* Employees tend to remain one company throughout the course of their career span. This allows the opportunity for

them to hone their skills and abilities at a constant rate while offering numerous benefits to the company. These benefits manifest themselves in employee loyalty, low turnover costs and fulfillment of company goals.

* There exists a high degree of group consciousness and sense of quality among the Japanese. The Japanese are a homogeneous race where individual differences are not exploited or celebrated.

In addition, JIT also emerged as a means of obtaining the highest levels of usage out of limited resources available. Faced with constraints, the Japanese worked toward attainment of the optimal cost/quality relationship in their manufacturing processes. This involves reducing waste and using materials and resources in the most efficient manner possible. The input of sustained effort over a long period of time within the framework of continuous improvement is key. This is achieved by a focus on continuous stream of small improvements known in Japan as ‘kaizen’ and has been recognized as one of the most significant elements of the JIT philosophy. Furthermore, Japanese firms tend to focus on enhancing the long run competitiveness rather than emphasizing the realization of short-term profits. They are willing to experience opportunity costs by introducing and implementing innovative ideas within their firms. Stockholders and owners of Japanese companies also encourage the maximization of term benefits. This enables them to experience the rewarding long-term profits as a result of their efforts.

1. **ELEMENTS OF JIT**

* TOP management commitment
* Eliminating waste/reducing inventories
* Enforce problem solving and continuous improvement
* People make JIT work- Employee Empowerment

Total Quality Management (TQM)

* Parallel processing
* Kanban production control
* JIT purchasing
* Working toward repetitive manufacturing
* Cellular Layouts

1. **LITERATURE REVIEW**

There is reasonable consensus among researchers that Just in Time (JIT) is a philosophy of continuous improvement in which non-value adding activities are identified and removed in order to reduce costs, improve product quality, improve performance, improve delivery, add manufacturing flexibility and stimulate innovation in the workplace [1,2,3-7]. Numerous organizations have reported cost cutting and improved quality due to JIT practices [12]. JIT was a technology that permitted many firms to compete successfully in the face of growing competition [33]. Wallace defined JIT as an approach to achieving excellence in a manufacturing company based on continuing elimination of waste and consistent improvement in productivity. Continuous monitoring of production processes with the goal of eliminating all forms of waste is a key point in understanding JIT. American Production and Inventory Control Society (APICS) defined JIT as a philosophy of manufacturing based on a management plan that identifies and then eliminates all waste and emphasizes continuous improvement in plant productivity

Advocates of JIT view inventory as a waste and a source of all evil because inventory build­ups tend to hide production problems rather than solve them [18, 23, 26]. JIT provides authorization for single parts that arrive just in time to be consumed, resulting in stockless production and significant cost savings. Research has shown that JIT organizational philosophy has the potential to increase organizational efficiency and effectiveness [2, 4,8,12]. On the other hand, if JIT is not properly implemented, desirable benefits are not realized [33]. In theory, it is easy to understand the concepts of JIT in terms of eliminating waste and improving productivity. But, in reality, the concepts are difficult to implement because of the need for fundamental organizational changes. Operationally, JIT production requires that waste be identified and eliminated in the following areas: waste from overproduction, waste created by waiting or idle time, waste of motion, transportation waste, inventory waste, processing waste and waste from product defects [11]. The essentials required for a successful JIT production facility are, first, the minimization of inventory in supply chains. Efficiencies are gained from frequent deliveries of small quantities to meet immediate demand [1, 5]. Second is the application of Kanban­a ‘pull’ system of production and materials control [7,8], and, third there must be an employee participation and involvement strategy in place to encourage worker input, which aids in the elimination of waste [1]. In addition, the immediate awareness of quality causes workers to generate ideas for controlling defects and ideas for improving JIT delivery (i.e. more convenient workspaces). Perhaps more importantly, workers hold the authority to stop the line when problems are identified, and so it is critical for the success of JIT to train and motivate the workforce. When JIT principles are implemented successfully across many parts of an organization, a significant competitive advantage can be enjoyed. Enhanced efficiency from waste reductions in order taking, purchasing, operations, distribution, sales and accounting, [9]. Some other benefits of JIT as cited in the literature;

Elimination of waste in production and materials

1. Improving communication internally (within organization) and externally (between the organization and its customers and vendors).
2. Reducing purchasing costs which is a major cost to most organizations [3].
3. Reducing lead time, decreasing throughput time, improving production quality, increasing productivity and enhancing customer responsiveness [4]
4. Foster organizational discipline and managerial involvement
5. Integration of the different functional areas in the organization.
6. It especially bridges the gap between production and accounting.

The JIT benefits do not just happen. Before an organization enjoys the fruits of JIT, it must accept JIT as an organizational philosophy. This requires the organization to change or modify its operating procedures, production system and organizational Researchers have documented some factors that break or make the implementation process of JIT. Top management involvement and proper employee training are essential factors for successful implementation of JIT. The importance of the presence of a logistical planning system was noted by Vickery , Prasad, and Lee. Zhu et al. advocated education and training administrative as well as production workers to facilitate the success of JIT. Francis [18] stressed the importance of accurate data, especially demand forecasts, for JIT to operate smoothly.

Gunasekaran & Lyu analyzed the case of JIT implementation in a small company in Taiwan that produces different kinds of automobile lamps such as rear combination lamps and front turn signal lamps. Continuous improvement, involvement of all people in the organization, reductions in throughput time and elimination of non­value adding activities and

simplification of essential activities were the elements of JIT on which the company placed emphasis. The company proved that with JIT system, the company could survive with lower manufacturing costs and higher quality. Education of workers about JIT concepts and top management commitment were proved essential to ensure the effectiveness and success of implementing JIT Kochan (1997) explain that with the new developed JIT system supported with sophisticated aerial tunnels connecting Ford with its suppliers, production lead times can be minimized, product quality can be improved, responsiveness towards customer demands can me boosted and the most important thing is inventory, space requirements, handling and transportation cost can be dramatically reduced.

Vrat et al. (1997) have conducted a Delphi Study for the applicability of JIT element in Indian context. This study indicated that JIT implementation in India is not an impossible task.Garg et al. [13] have found ‘work culture’ a critical element if a company wants to implement JIT. Adopting JIT culture in India is not an impossible task. According to them, dimensions of work culture in JIT include multifunctional workers, long term employment, motivation and trust, top management attitude and commitment, support from union leaders, effective communication,poka yoke inspection method, and incentive scheme. It is felt that JIT could be a great opportunity for India in the context of recent reforms in economy and trade towards opening of economy and globalization. Some benefits attained in quantified form were also presented when some elements (quality circles, suggestion schemes, kaizan etc.) were applied in an Indian automobile company.

1. **IMPLEMENTATION OF JIT IN INDIAN MANUFACTURING COMPANY**

From previous literatures it is found that philosophy has great potential in the Indian industry. However, a study by Boone and Why bark [22] has shown that there are greater performance differences between countries than between industries. There is also more difference in manufacturing practices affecting performance than between industries. Thus sometimes a different set of practices are useful for improving the same dimension of competitiveness. Hence to evaluate the basic factors, hurdles and management initiatives required in implementation of JIT approach, a survey was conducted in Plastic Pipe Manufacturing Company in Nagpur.

Implementation of JIT is not new to the present scenario of industrialization. This technology is not limited to any particular country but due to its large potential of benefit it

has a widespread application through the world? 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. The implementation of the JIT in companies will depend on many factor The implementation of JIT needs to be done in interaction with all departments.

* Top management must accept idea of the JIT Employees should understand significance of the JITconcept.
* The third step is set up of the ERP (Enterprise Resource Planning). ERP is a system, which integrates all data and processes of an organization into a single unified system.
* The next step is test the system after implementing JIT
* The last step is testing and control for successful existence and developing of the JIT system there must be continuous control. Without control, things can away from the right direction.
* The feedback loops also exist and they are very important for the whole process.

1. **CASE STUDY**

To analyze the effect of implementing JIT Techniques we have conducted a case study on a Plastic Pipes Manufacturing Company situated in Buttibori Nagpur. Details about the company and JIT implementation is discussed in following part of the literature:

## Company Background

The XYZ company is located in Butibori Nagpur, Maharashtra in India. The major product of the company is PVC & HDPE pipes used for water sprinkling & electric fitting purpose. This company is mainly focused on manufacturing as per customer ‘s specification & requirement. The company currently has a capacity of about 150tonn per month (inclusive of all varieties), total annual sales volume is 5crores (in Indian rupees) and total employees are 12. The company is working in 2 shift & 24 hours. Out of 13 workers 7 workers are working in first shift & remaining on second shift. For implementation of technique we first need to identify that what the management people actually want and after identifying all the requirement the work will be started. So, we started our work in some prescribed manner.

## Problem Statement:

As XYZ company is manufacturing variety of product, the company sometime facing difficulties in sales order processing specially in summer as there is large number of customer with verities of specifications for forthcoming seasons. The company is facing with processing these varieties of order and hence not able to satisfy on time delivery of order. The niche for improvement in the lagging condition is the management people who are interested in applying the philosophies as well as they are very much concern about the implementation of these ideas.

The project work basically focuses on improving the productivity of the XYZ company by using JIT as a problem solving approach, reducing the time losses in sales order processing which indirectly satisfy the target customer and introduces win-win situation between customer & the company. Opportunities for productivity improvement through reduced time loss are critical to organizational survival and these efforts can be driven through JIT initiative such as standard operating procedure or reflow the procedure of sales order processing which will be expose in this work.

## Recognition of need:

Before starting the work, we have discussed the requirement of the company in future & following are the need recognized from the manager of the company:

1. The top managerial person need improvement in productivity.
2. The employees of the company need to be involved & concern about organization achievement.
3. Need of reduction in accidental hazards while cutting the required length pipe manually.
4. There should not be too much of capital investment in productivity improvement as the company is batch type & small scale.

While we had tried to solve the problem of the company, following findings has been observed which applies the constraint over use of JIT as a problem solving tool in the company.

It is easy to understand the concepts of JIT in terms of eliminating waste and improving productivity. But, in reality, the concepts are difficult to implement because of the need for fundamental organizational changes. The factors that hinder the implementation of JIT in manufacturing environment have been grouped into four categories. These four categories are:

* + Management
* Workers
* Process
* Suppliers

## Management

1. Lack of training program for management.
2. Extentof management support to JIT implementation
3. Lack of communicationbetween workers and management.

## Workers

1. Lack of formal training programmes for workers
2. Reduction in labour turnover rate
3. Increase in workforce morale
4. Extent of cross training workers
5. Extent of workers' resistance to cross training
6. Extent of the use of unionized workers

## Process

1. Reduction of rejects of finished goods
2. Improvement of finished goods inventory
3. Reduction in lead times
4. Reduction in setup times
5. Reduction in the levels of work load variability
6. Cut down setup time through machine modification or replacement of existing equipment
7. Cut down maintenance time through machine modification or replacement of existing equipment

## Suppliers

1. Lack of cooperation of suppliers in communication and information exchange
2. Lack of cooperation of suppliers in correctly supplied materials
3. Lack of cooperation of suppliers in timing of supplied materials
4. Extent of use of sole suppliers

Following are some misconception in the mind of top managerial persons which leads to failure of implementation of JIT in the selected company & justifications over the misconceptions:

## JIT being restricted to high technology systems.

Being a philosophy, JIT doesn't restrict itself to high technology manufacturing environments, which make extensive use of modern technologies like FMS, CIM etc. JIT philosophy is valid in any manufacturing environment, regardless of the level of advancement in the technology hardware.

## JIT being restricted to any specific type of industry or size of the industry.

Organizations of different sizes, in a variety of industries, have successfully implemented JIT. Indeed, some applications have shown that JIT is eminently suited to nonmanufacturing situations as well, such as in service and administrative work

situations.

**JIT is highly cultural specific**. Being of Japanese origin, there could be a tendency to believe that success of JIT is highly culture specific. But there are ample and conclusive evidence that culture doesn't stand in the way of JIT implementation. However, cultural differences play a role in the adaptation of JIT and in the determination of relative priorities for implementing specific components of JIT.

1. **CONCLUSION**

Indian Industries are going through tough competition and have to improve in order to become competitive globally. JIT like techniques can be very helpful in improving the performance of Indian industries and it has also been demonstrated in literature that JIT approach can be applied in Indian conditions also. Shifting from traditional system to JIT system may not be possible at once but Indian industries can start with applying some JIT elements that may be easy to implement. Proper training can be very helpful in implementation aspects. Some survey and case studies must be conducted in Indian industries to expand the base of JIT applications in Indian Industries.

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