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SOME BENEFITS OF JIT APPLICATION ON THE ASSEMBLY LINE IN MANUFACTURING INDUSTRY

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***Abstract*:** *In this paper we present the necessity of knowing and applying of Just in Time concept for today Manufacturing. JIT represents a concept, already used whit certain benefit in manufacturing industry. The paper presents a synthesis of the characteristics that define this concept, methods of application and some significant results. One of the goals of this article is to provide to the readers the informational resources for learning about possible implementation of Just in time systems and the benefits derived from these process conversions. Some possibilities of application of JIT concept in an assembly line with one piece flow are analyzed.*
Key words: *JIT, Lean manufacturing, EDI, Kanban, TPM*

1. INTRODUCTION

As it result from numerous papers from literature a major reason for the success of manufacturing industry in Japan is considered to be the implementation of Just-in-time (JIT) systems. JIT production is a manufacturing philosophy which eliminates waste associated with time, storage space, and labor. Basics of the concept are that the company produces only what is needed, when it is needed and in the quantity that is needed. The company produces only what the customer requests, to actual orders, not to forecast. JIT can also be defined as producing the necessary units, with the required quality, in the necessary quantities, at the last safe moment. It means that company can manage with their own resources and allocate them very easily (Hino, 2005).

JIT is also a manufacturing approach that assists companies to efficiently manage and implement cost and time saving methods and techniques. Some of these methods and techniques include: waste elimination, reduction of total processing times, reduction of setup times, lot size reduction, inventory cost minimization, employee flexibility, total preventive maintenance (TPM), total quality control (TQC), a pull/Kanban production system, uniform plant loading, and long-term cooperative relationships with vendors. (Susanto , 2003).

2. JIT CHARACTERISTICS

A product can fully replay to customer demand (characteristic, structure, delivery time, cost) only if the manufacturing system has the capacity to manage this demands. According with this needs the manufacturing companies tried to find strategies to increase their ability to match the customer demand more closely than conventional manufacturing strategies. One of the solution is the implementation of JIT systems, proved they are truly capable of responding to customer demand whatever its level.(Hino, 2005)

A successful JIT system requires a sum of elements and technical requirements to be present in the manufacturing company, as: Continuous Improvement, that refers to the idea that a large number of small improvements in processes are easier to implement than major improvements and have a large cumulative effect.

Eliminating waste from overproduction, waiting time, motion, product defects, processing, transportation, inventory.

The 5S Program defines the steps that are used to make all work spaces efficient and productive, help people share work stations, reduce time looking for needed tools and improve the work environment. The 5S that reduce wasted time & motion at micro level: Sort : Sort out unneeded items; Straighten: Have a place for everything; Shine: Keep the area clean; Standardize: Create rules and standard operating procedures; Sustain: Maintain the system and continue to improve it; Straighten: Have a place for everything;

Set-up time reduction - increases flexibility and allows smaller batches. Ideal batch size is one item. Multi-process handling - a multi-skilled workforce has greater productivity, flexibility and job satisfaction.

Total Productive Maintenance **(**TPM) brings maintenance into focus as a necessary and a key process of the business. It is no longer regarded as a non-profit activity. Down time for maintenance is scheduled as a part of the manufacturing day and, in some cases, as an integral part of the manufacturing process. The goal is to hold emergency and unscheduled maintenance to a minimum.

3. CASE STUDY OF A JIT ASSEMBLY LINE

An assembly line, also called production line, is a manufacturing process where interchangeable parts are added to a product in a sequential manner to create a finished product. It's an arrangement of tools and workers in which a product is assembled by having perform a specific, successive operation on an incomplete unit as it passes by in a series of stages organized in a direct line until is completed.(Muller et al, 2010)

As JIT stated, in a production line (fig. 1) or in a production flow the previous step won't produce more parts then the next step requires in each *n* workstation (Ws_1...Ws_n).

Machines and equipments may be set up from „groups" of identical machines to assembly line (AL) to meet production requirements. Thus it has been created multiprocess production line. In this JIT system, independent units (IU) are linked with conveyor lines (CL) conveting many discreete operations into a lean and continuos linear manufacturig cell. (Chryssolouris et al., 2008)

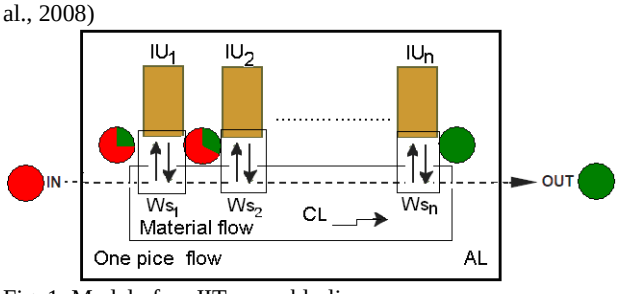

Fig. 1. Model of an JIT assembly line

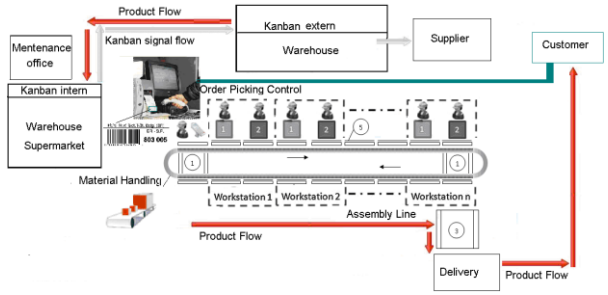

Fig. 2. A complete JIT assembly line

An extension of JIT used in this case is Electronic Data Interchange (EDI). EDI is the movement of business documents in a structured, machine-retrievable data format. This permits data, particularly documents, to be transferred without rekeying from a business application in one location to a business application in another. This offers advantages to both, the buyer and the supplier. The whole cycle from ordering to paying the bill can be generated electronically. Once the order is received by the supplier, an electronic bill can be generated by the supplier's system. This saves a tremendous amount of labor time, and means that no data entry errors are introduced into your system by the staff. Cycle times are reduced, and data entry backlogs are almost completely eliminated. This allows for very quick order processing. A proper system can easily handle receiving an order and shipping that order with its invoice the same day. EDI allows to this company to handle far greater volumes because eliminates: data entry errors from operators, mailing time, filing and other processing of paperwork and reduce labor processing costs and time, lead times, order cycle time and inventory carrying costs.

The complete JIT assembly line (fig. 2) has an effective First in First Out system (FIFO) using bar-coding all the way through the process from raw materials coming in to finished goods. The computerized barcode system is also very useful for controlling non-conforming product.(Krüger et al., 2009)

Is used Pull/Kanban, concept of building products to actual demand and not to forecast. Kanban (Kan=card, Ban= signal) is an simple movement system that minimize storage in the production area. Server only delivers components to client work station as and when needed (called/pulled). Kanban card information contains: accurate data: correct part no., quantities & measure's; visible - chart if material ordered & when; error proof for no stock outs; minimum inventory; clear & complete info. to suppliers; link inventory directly to demand; tie in with POP: issuing orders, receiving & authorizing accounts payable

The AL is designed for flexibility. The line is designed to handle demand fluctuations and mixed model production. There is one-piece flow between manual workstations.

One Piece Flow refers to the concept of moving one work piece at a time between operations within a work cell. This idea has many benefits. It keeps work in process at the lowest possible level. It encourages work balance, better quality and a host of internal improvements.

The processes in this complete JIT assembly line can range from simple manual assembly to technologically complex. Material flow is downstream and information flow is upstream. The line uses the pull system for material control. The AL incorporates inventory and production control trough kanban, quality assurance, continuous improvement, and preventative maintenance functions. Then the workstations are linked by the kanban inventory and production control subsystem to final assembly.

4. CONCLUSION

The JIT concept is only one part in the value chain that brings the satisfaction to the customers. It means that the JIT concept can't solve existing problems in other enterprise processes. Everything in enterprises is needed to be healthy, through the hierarchy of employees and all workflow processes. Synergy is the only thing that can improve (efficient) results. And in the bottom line, the JIT concept is just one link in the whole chain, but very important.

JIT system seeks ways to improve coordination between various departments or functional areas. The practice of JIT links engineering, planning, and purchasing departments and bridges the inter-organization gap between customer and supplier. System integration is achieved because sequential processes are no longer separated by functional or organizational walls.

The paper of this study proves that if the company wants to have a JIT concept it does not mean that everything must be done very fast. The most important thing for the company is to have well organized resource allocation. Also, the management and employees must have on their mind that this concept can help the enterprise to solve many logistics problems.

The assembly line model can be a good example that can be used on a suits of simulation softwares like MATFLOW, WITNESS, Optimizer. The WITNESS simulation package is able to model a variety of discrete and continuous elements, as: Parts, Buffers, Machines, Conveyors, tracks and vehicles, labor, shifts, variables, part attributes.

The next step is to optimizate this model. Based on continuous improvement used in JIT systems, many „what if" scenarios can be analyzed in a short time.

5. ACKNOWLEDGEMENTS

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