MB0044 – Production & Operations Management

Assignment Set- 1

Q1. Explain in brief the origins of Just In Time. Explain the different types of wastes that can be eliminated using JIT.

Answer: JIT can be considered to be a philosophy of manufacturing founded on the principles of elimination of all waste and thereby increasing productivity. When the philosophy is applied at workplace, the approach results in providing parts in just right quantities at the right time. This results in economy of material and time thus lowering the costs and increasing productivity. Since no extra parts are available, production of only good parts is forced on the system. JIT has been extended to mean continuous improvement. These principles are being applied to engineering, purchasing, accounting and data processing also. We will see how JIT helps in implementing Lean Production systems. In these days when technology is able to provide us with highly accurate equipments which have high capacities and the business has become global meaning that both suppliers and customers are widely accessible. To remain competitive, cost efficiencies have become compulsory. JIT helps in this process. It is extended to the shop floor and inventory systems of the vendors also. One of the main challenges for JIT is frequent changes in production schedules owing to the changes in demand. This causes the procurements plans to change. In the present day scenario where most manufacturing concerns depend upon a number of suppliers, who in turn may outsource parts and services, disruptions have a cascading effect.
However, there is a limit to the agility that a company can build into the system. Communication right through the supply chain helps in reducing inventories and keeps the flow lines smooth. Success of JIT depends upon a lot of preparation and committed implementation.

JIT considers elimination of waste as fundamental to any processes. Shigeo Shingo an authority on JIT at Toyota classifies them as under :

1. Over Production, The extra parts or products may not be needed or may not be available when needed. So, it is a waste.

2. Waiting Time The operator, the machine or the part will not be either working or worked upon.
The duration of waiting is unproductive and may create more serious consequences.

3. Movement Any unnecessary movement is a waste of energy; causes blockages disrupting movements and delaying the flow of other items creating delays.

4. Process Some steps in the process may not be necessary to arrive at the required stage. It is waste of all the inputs that go into the process.

5. Inventory Excess procurement or production builds up stock of materials which are not immediately used, thus locking space, funds carrying heavy costs.

6. Effort and movement The people who work do not make a study as to how these are utilized in realizing the purpose for which they are made. Both, again use up resources which are not available when needed.

7. Defective Products these are produced using the same equipments, workmen and the time that would be used to make good products. Thus defective products use up resources and result in losses.
Since these wastes have to be eliminated, a thorough study how they occur and what steps would result in their elimination is of paramount importance.

Kanban for material flow Kanban means a 'Visible Card' and also 'Signal' in Japanese language. These cards are used for communicating the quantities required at the 'customers' point for his use. This means that by the card the operator next in line, who is the customer decides how many units he needs and asks for them. The operator who receives the card should make only that many and supply. Similarly he makes a demand on his predecessor by a 'kanban' and receives only the required quantity. This is called the pull system. The containers are designed to hold specific components in certain numbers. Kanban system is a physical control system which uses cards and containers materials must not be removed without posting a card at the receiving post.

2 High Quality Production JIT Production is meant for products which are repetitive in nature. The system has its genesis in providing solution for manufacturing process where the finished product has a number of parts that get assembled. The problems in such situations will be to keep the arrival of parts, components and subassemblies so that no shortages occur holding up production. So, it becomes very vital that all parts that form the flow in many streams are of high quality so that assembly does not get held up. For JIT to be successful, where inventories are kept to the minimum every component has the highest quality. It is relevant to mention Taguchi's insistence on achieving the target value to realize quality. The permitted tolerances do not ensure high quality. Controlling variability by strict adherence to best processes with builtin robustness to achieve six sigma standards, ensures high quality. These help in realizing JIT, which has economy in focus and provide an additional factor for competitiveness.

3 Small and Uniform Workloads Manufacturing facilities have to produce a number of parts to meet the requirements of a number of products. Offering variety in terms of products is a strategy that most businesses practice. Manufacturing all the products in large volumes and maintaining stocks at various distribution centres is highly

uneconomical and no organisation would contemplate such a plan. If we move up the supply chain and see, the input resources raw materials, bought out items, transportation, storage, funds lay a heavy burden on the system. Add to that the operations involved in the transformation process, the costs involved become unthinkable.

The solution is to be able to produce the products in their variety in small numbers and plan the production schedules in such a way that the production facilities become agile to cater to market demands. The aim is to reduce inventories, but at the same time not lose business. So, a small load on the various work centers, both at in-house facilities as well as those of subcontractors is the answer. Achieving uniformity of loading is important to avoid up piling up of work in process.

Software specially developed to tackle these problems helps in achieving the desired result. However, any decision will have a trade off. The sacrifices made will be lost utilization because of frequent changes in set ups, increased transportation, production hold ups owing to mismatch of the production of different parts and perhaps, even a few unsatisfied customers. The costs involved on both counts have to be weighed and decisions taken.

4 Suppliers as Partners Suppliers are those companies which undertake to make supplies of products they manufacture, or they are dealers for or conduct some transformation activity on the materials delivered by us to them. In all cases, since we do business with them, they will have a profit for the service rendered by them. If the technology they have is superior, if their equipments they use are optimal and the workforce efficient, the benefits would increase for them at a cost to our company. If there are a number of suppliers, we would exploit the situation and decrease our cost by choosing the one supplier who charges the least. In this exploitative environment, commitment to meet our needs, giving us the benefit of their learning or transferring our knowledge for improved service would be absent. There is a likelihood of quality suffering. As explained earlier to be able to implement JIT, we need to change schedules quite often either delaying or hastening the production of some items almost on a daily basis, if not hourly. The main concern in such situations will be a build up of inventory or stock out positions. Problems of communication add to the difficulties. Treating suppliers as a part of our business and sharing information, providing technical and financial assistance, seeking their help in improving process, building up rapport between the employees of the supplier organisation and assuring business will ensure cooperation and ensures timely delivery of supplies with good quality. Many times, the supplier, owing to his specialized operations may contribute to our organisation's productivity.

Quality enhancement programmes can be implemented simultaneously for faster and better results.

5 Flexible Workforce and Training: Flexible workforce consists of workmen who are capable of performing many tasks. It may be at their specified workstations or at other workstations that the skills required may be quite different from those which they use regularly. The operational managers can look for personnel who have an attitude for learning other skills and give them training so that when shortages occur they can be utilized for advantage to get over stoppages of work and disruption in workflow. This flexibility ensures reliable customer service and overcome bottlenecks.
Part time and temporary employees also enable the company to overcome surges in demand. In such cases specially trained regular workers can be asked to take over tasks which require high skills and the non regular employees can be given jobs which are simple and can be handled by them without causing any disturbance in the production.

6 Total Productive Maintenance: Maintenance of equipment is a fundamental requirement that planned capacities are realisable only when parts are manufactured in required quantities with high quality. The presumption that machines deliver these is basic to JIT philosophy.

Generally, periodic and preventive maintenance is conducted by the operator and sometimes with the help of the supervisor. These activities help them to understand the machine better and give an opportunity to sense when the equipment may need major repair or reconditioning, to bring back the machine to give the required quantities and not have any impermissible variations. Break downs generally occur as the symptoms are neglected. In TPM, the worker is trained to maintain the machine, keep record of the parts to be replaced on periodic basis, make arrangements to procure them or make them. This will help him to maintain his machine in perfect order without breakdown.

The responsibility to maintain the machine will be his and all assistance by others should be available. With this responsibility, he also has the autonomy to undertake measures to ensure productivity and quality.

Q2.What is Value Engineering or Value Analysis? Elucidate five companies which have incorporated VE with brief explanation.

Answer: Value Engineering / Value Analysis basically it is a methodology by which we try to find substitutes for a product or an operation. It can be conducted both internally and externally. The concept took shape during the Second World War. The thinking process calls for a deep study of a product – the purpose for which it is used, the raw materials used, the processes of transformation, the equipment needed etc. and question whether what is being used is the most appropriate and economical. This applies to all aspects of the product. For example, let us consider a component needs a

round brass rod as raw material in size 21.5 mm. Diameter. It has seven operations – cutting, drilling, and chamfering boring. Milling, plating, and polishing, Value analysis considers all aspects of each of these and investigates whether any of them can substituted by another material, a different size, a different tool, a different machine, a different cot sequence, a different tool for an operation, a different chemical, a different concentration, a different voltage, shorter time or processing. Studies can be conducted to verify whether any operation can be eliminated.

Simplification of processes reduces the cost of manufacture. Every piece of material and the process should add value to the product so as to render the best performance. Thus there is an opportunity at every stage of the manufacturing and delivery process to find alternatives which will increase the functionality or reduce cost in terms of material, process and time. It should be remembered that we are not seeking a cost reduction sacrificing quality. It has been found that there will be an improvement in quality when systematic value engineering principles are employed.

GEC started Value Engineering in 1947 when a substitute for asbestos for flooring had to be found. Specialized dealers could provide an equally good 'material' at a lesser price. Initially the practitioners were the people in charge of purchasing who tried to locate substitute material which would be equally good, if not better, at a lower price. This is the first and basic approach to value engineering. As the concept percolated to the manufacturing departments, engineers applied the same principles and found that they could use alternate materials which were cheaper giving the same performance. It was also found that dimensions and tolerances could be altered without affecting the performance of the part or the product. The investigations took them on the path of eliminating some operations. The focus was on the value of each bit of material, each operation. This approach led to the design stage. Nowadays, the principles of Value Engineering starts at the product concept and design and is carried down the 'value chain'. The aim of value engineering is to effect economies by investigating every opportunity and discovering new materials, methods to achieve high quality performance. The aims of Value Engineering can be listed as under

1. Product Simplification

2. Better and less costly materials

3. Improved product design.

4. High efficiency in the processes

5. Economy in all activities

Q3. Explain different types of Quantitative models. Differentiate between work study and motion study.

Answer:

The different models are as under:

1. Linear Programming: This technique is often used for optimizing a given objective like profit or revenue maximization or cost or outgo minimization. When there are limited resources and they have to meet competing demands, distribution of the resources is the critical issue.

2. Transportation Model: This is concerned goods with from manufacturing centers or warehouses which have to be supplied to depots or retail outlets. The demand and supply position of the places where they are required or produced and the cost of transportation is considered in the model. To economize we use this model.

3. Assignment Model: Allocating jobs or persons to machines, awarding different projects to contractors, so that maximum returns occur or less expenses are incurred calls for the use of this model.

4. Inventory Control Model: Inventory models consider the frequency of placing orders, the quantities per order considering the cost of placing an order, the number of pieces that are to be kept in reserve, the rate of consumption, the lead time required for the supplier, costs involved in storage. Depending upon the probabilities of patterns of consumption and supply, we have different models which give solutions to optimize.

5. Waiting Line Models Queues are formed when the rate of service is at variance with the rate of arrival. They are formed when rate of production is less at particular points compared to the previous ones. Some times we see multiple service points and a single queue are formed for feeding them. Number of items – including people, to be serviced. the rate of service and the type of queue discipline that is intended to be followed, policy of priority, tolerable amounts of waiting etc. are studied with some special techniques.

6. Simulation Models: These models are used when we will not be able to formulate mathematical models. So, we develop a model which resembles a real life situation. And based on the pattern, we predict and plan our procurement, production, delivery etc.

7. PERT and CPM Models : When projects are undertaken with a number of activities some happening in sequence, with gaps of weeks or months and some happening