MB0044 – Production and Operations Management

Assignment Set - 1

Q1. Explain briefly the Computer Integrated Manufacturing.

Answer: Computer Integrated Manufacturing

Integration occurs when a broad range of manufacturing and supporting activities are linked. Activities include engineering design, production planning, shop control, order processing, material control, distribution etc. Information flow across all functions takes place with the help of computers. Transmission, processing, distribution and feed back happen almost in real time so that intended activities are conducted rapidly. This process helps in rapid production and also reduce indirect costs. As response times decrease, customer satisfaction increases resulting in better business. CIM helps in avoiding accumulation of materials resulting in better throughput and better utilization of space. Bar coded labels that accompany materials contain instructions for processing them which are read by sensing devices and display the status on monitors. This information is available to all concerned personnel responsible in planning, marketing etc. so that they will be aware of the status of any order and if expediting is needed to meet deadlines, they will be able to seek intervention. Identifying shortages, ensuring faster deliveries becomes easy with CIM.

One of the keys to success in the manufacturing business is to lessen errors and to enhance productivity. The more one can produce with fewer flaws, the more one can make at the bottom line. Over a period of time factory owners have integrated computer systems in order to streamline the production process. CAD, or computer aided design, has been able to aid the operators in the formulation and blueprints of more sophisticated products and technology.

CAM, or computer aided manufacturing, has offered the means by which to produce the more sophisticated items. CAM also enhances the productivity of the factory's output. Together the CAD and CAM systems reduce cycle times, enhance productivity, and aid in the streamlining of the overall production process.

Since the 1980's CAD and CAM have worked together to move from the idea phase to the application phase. This process has not ceased because of the implication. The factory sector has slowly been phasing in computer integrated manufacturing, or CIM over the years. This integration will allow for the digital information and computer control of the production process to be intertwined throughout and within the factory.

In the CIM system some processes will be different. Data entry will now be stored in hard drives. This will allow for the manipulation and the retrieval of the data with a simple keystroke. The means by which the processing of data into the production of products will also be streamlined within hardware and software. This will allow operators to alter and enhance programs in order to improve products. The CIM system will also provide the necessary algorithms to bring all the data together. The data will then be able to intermingle with the sensor and modification components of the system.

While the CIM system is the optimal choice to aid in the manufacturing process, it does come with a unique set of challenges. The greatest challenge is to get all the different machines within the factory to work on the same system. In the typical factory, there are a variety of machines that perform different tasks, that are made by a variety of suppliers. The issue is to get every one of these machines to accept the programming, and tasks from one mainframe computer.

The second challenge of the CIM system is encapsulated within the data itself. While many operators may be lost on the actual production floor, there will be a need for operators to maintain the integrity of the data that is transmitted to the machines. The challenge is in acquiring competent individuals who can assure that all the data within the system is at its optimum operating integrity.

The third, and final challenge that has been encountered in the use of the CIM system is process control. This entails assuring that the whole process runs smoothly. This particular challenge ties the data entry people, the programmers, and the production operators together. The factory will need to assure that the individuals working with the system throughout the factory are competent and knowledgeable. These individuals will need to be well trained, and probably need to update their training periodically.

The goal of the CIM system is to eliminate the waste within the manufacturing process. This is done by taking the design, analysis, planning, purchasing, cost accounting, inventory control and distribution departments and interlink them with the factory floor, material handling, and management departments. The CIM system will have an impact on every system within the factory.

The CIM system, which is sometimes referred to as the integrated computer aided manufacturing system, operates on both hard and software. Simply put, the software is what runs the factory, or the brains. The hardware is what makes the machines run, or the muscles. The CIM system runs on an efficient output process. This means that the whole factory works together, not as separate parts. As a unified unit, it operates for the peak benefit of the whole factory.

Simply put, the CIM system does not backload or store up work. It does not warehouse products. The CIM system keeps work flowing through computer integration in order to keep all the parts of the system constantly functioning. It registers all the raw material received by the factory. It then walks the material through the factory and the production process.

The CIM system fractions every individual "center" of the factory into work cells. As work cells, they are then divided into individual stations. The stations are then broke down to the individual processes, and the processes are what metamorphosizes the raw materials into actual products. This may seem complicated, but it streamlines the whole manufacturing process. With each division of the factory broken down in such a manner, it allows operators to make any necessary changes to the system without shutting down the whole system.

Cim is a very interactive, hands on system. If it is applied correctly, it will enhance the productivity of the whole factory. It will link several departments and functions together. It is simple to install. It usually is installed through a LAN, or local area network, connection.

Q2. What is automation? What are the kinds of automation?

Answer: For services, automation usually means labour saving devices In education, long distance learning technology helps in supplementing class room instruction. The facilitating goods that are used are web site and videos. Automation in the banking sector has resulted in ATMs which save the banks a huge amount of labour and it is found to have given greater customer satisfaction. Automation is ideal when the service provided or the product manufactured is highly standardized. Some extent of automation can be designed even with customization i.e. product or service s meant to produce or deliver low volumes specific to a requirement. The advantage of automation is it has low variability and will be more consistent on a repetitive basis. On the shop floor variability causes loss of quality.

There are three kinds of automation fixed, programmable and flexible. By its very nature, fixed automation is rigid. They are designed for high volume production and their rigidity ensures less variability. They are not amenable to change in product or process. They need minimal human intervention. The machines have sensing and control devices that enable them to operate automatically. The simplest of them – called machine attachments – they replace human effort.

They guide, locate, move and achieve relative positions by means of cams, optical sensing, load sensing mechanisms and activate the controls to remove human intervention. Numerically controlled machines read instructions and convert them to machine operations. Computer/s are used for controlling one machine or a number of them and they have programme written into them for operations. They are Computer Numerically Controlled or, for short, CNC machines. Robots are higher in the order of automation as they perform a variety of tasks.
They are designed to move materials by holding them in their arms and make precise movements according to programmers written into the computers that reside in them. They simulate human actions. They can grip and hold tools and with the help of sensors which are sensitive to touch and force to ‘ know’ that the material is to be held with the requisite pressure for the conduct of operations. Vision sensors are used for inspection, identification and guidance. They use optics based instruments to gather data and feed them to the computers for activating the other parts of the robot. With the help of automation, inspection of components can be done 100% which ensures highest quality Identification and movement of materials are helped by bar codes which are read and fed into the system for monitoring quantity, location, movement etc. They help the automated systems to sort information and provide information for effecting any changes necessary. To make effective use of automated machines, we need to have the movement of materials from and to different stations as also stores, automated. Automated Storage and Retrieval Systems –

ASRS – receive orders for materials from anywhere in the production area, collect materials and deliver materials to the workstations.
Computers and information systems are used for placing orders for materials, give commands, adjusts inventory records – which show the location and quantity of materials available/needed. Continuous updation gives a clear picture for all concerned to enable them initiate action to keep the throughput smooth. Automated Guided Vehicle Systems – AGVS – are pallet trucks and unit load carriers follow embedded guide wires or paint strips to reach destinations as programmed.

Q3. What are the factors that influence the plant location?

Answer: Factors influencing Plant Location can be broadly divided into two types namely: general factors and special factors *(See Figure below Factors influencing plant location).*

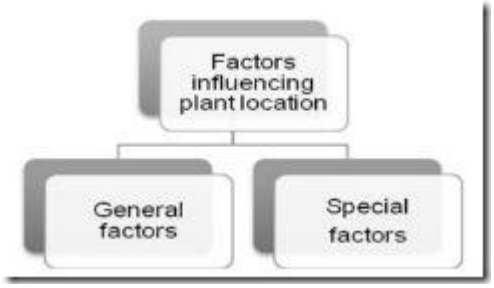

Figure 1: Factors influencing plant location

The factors influencing plant location.
1General factors
The general factors that influence the plant location are listed below *(See Figure General factors influencing plant location)*.

1. ***Availability of land***: Availability of land plays an important role in determining the plant location. Many-a-time, our plans, calculations and forecasts suggest a particular area as the best to start an organisation. However, availability of land may be in question. In such cases, we will have to choose the second best location.

2. ***Availability of inputs:*** While choosing a plant location, it is very important for the organisation to get the labour at the right time and raw materials at good qualities. The plant should be located:
· Near to the raw material source when there is no loss of weight
· At the market place when there is a loss of weight in the material
· Close to the market when universally available, so as to minimise the transportation cost

3. ***Closeness to market places***: Organisations can choose to locate the plant near to the customers' market or far from them, depending upon the product they produce. It is advisable to locate the plant near to the market place, when:

- The projection life of the product is low
- The transportation cost is high
- The products are delicate and susceptible to spoilage

- After sales services are promptly required very often
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The advantages of locating the plant near to the market place are:

- Consistent supply of goods to the customers
- Reduction of the cost of transportation

4. ***Communication facilities***: Communication facility is also an important factor which influences the location of a plant. Regions with good communication facilities viz. Postal and Tele communication links should be given priority for the selection of sites.

5. ***Infrastructure***: Infrastructure plays a prominent role in deciding the location. The basic infrastructure needed in any organisation are:

- Power: For example, industries which run day and night require continuous power supply. So they should be located near to the power stations and should ensure continuous power supply throughout the year.
- Water: For example, process industries such as, paper, chemical, and cement, requires continuous water supply in large amount. So, such process industries need to be located near to the water.
- Waste disposal: For example, for process industries such as, paper and sugarcane industries facility for disposal of waste is the key factor.

6. ***Transport***: Transport facility is a must for facility location and layout of location of the plant. Timely supply of raw materials to the company and supply of finished goods to the customers is an important factor. The basic modes of transportation are by Air, Road, Rail, Water, and Pipeline. The choice of location should be made depending on these basic modes. Cost of transportation is also an important criterion for plant location.

7. ***Government support***: The factors that demand additional attention for plant location are the policies of the state governments and local bodies concerning labour laws, building codes, and safety.

8. ***Housing and recreation***: Housing and recreation factors also influence the plant location. Locating a plant with the facilities of good schools, housing and recreation for employees will have a greater impact on the organisation. These factor seems to be unimportant, but have a difference as they motivate the employees and hence the location decisions.

2. Special factors

The special factors that influence the plant location are:

1. Economic stability – outside investments
2. Cultural factors
3. Wages
4. Joint ventures – support of big time players