**Laboratory Assignment 5: Production Systems, Operations Strategy**

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**1.1 List in tabular form below at least 5 examples of ETO, MTO, ATO, MTS products**

|  |  |
| --- | --- |
| Type of Product | Examples |
| ETO | 1) Professional Bat  2) Furniture  3) Clothes  4) Statues  5) Bicycle |
| MTO | 1) Rolls-Royce  2)House(bungalow or villa)  3)Aeroplane  4)Submarine  5)Jewellary |
| ATO | 1) Computer  2) Car  3) Bikes  4) Bhel puri  5)Pizza |
| MTS | 1) Pen  2) Toy  3) Mouse  4) Notebook  5)Detergent powder |

**1.2 For the products mentioned below against your group number, identify order qualifiers, order winners (along with assumptions, justifications and remarks) and list them in the table below:**

Group 1: Glucose Biscuits, Bread, Pizza Restaurants

Group 2: Hatch Back Cars, 100cc Bikes, Cold Beverages

Group 3: Laptops, Push Button Mobile Phones, External HDDs

Group 4: LED TVs, Refrigerator, Pen Drives

Group 5: Wrist Watch, Wall Clock, Smart Phones

Group 6: Washing Machine, Microwave, Soaps, Detergents

|  |  |  |  |
| --- | --- | --- | --- |
| Product | Order Qualifiers | Order Winners | Assumptions/ Justification /Remarks |
| 1)Hatch Back Cars | Large cargo area, Folddown Second row seating, two box design style, efficient. | Price, size, capacity, quality, practical, less costlier than sedans. | The large cargo space and the very large space are the best selling points about the car. |
| 2)100cc Bikes | Good power, torque, mileage, fuel capacity, brakes used. | Usability in India, price, size, mileage. | The use of bikes in India but to heavy population is one of the best features. |
| 3) Cold Beverages | Taste, price, sugar content. | Price, caffeine content, volume/quantity. | Their taste and the quantity provided are the key features as a selling point. |

**1.3 Case Study: Manufacturing at Ashita Diesel Works**

Introduction: Ashita Diesel Motor manufactures a range of diesel engines for use in marine applications, manufacturing plants and agricultural applications. The company has always tried to be progressive in terms of product design and in fact pioneered the development of a particular type of internal combustion engine. Originally, they only manufactured large marine diesel engines but have now diversified into small stationary type engines.

Design: Many of the engines designed were one-off products and made specifically to order. Although this type of work still represents 60 per cent of those manu­factured. There has been a move towards standardizing many of the component parts to reduce the variety of parts. This allows a degree of interchangeability, especially for small components such as mechanical fasteners. There also has been reduction in the variety of engine sizes available with the introduction of a standard range of three engine sizes: 20, 40 and 60 HP.

Production planning: In terms of production planning and control, there is no formal system in place. In fact, there is resistance from the Production Manager to imple­menting any such formal system. The lack of any such formal system has resulted in high WIP and failure to meet delivery times due to lack of WIP monitoring and information on manufacturing lead times. Production plan­ning has also failed to take advantage of the economies of scale afforded by the use of standard parts. They issue orders for small lots of the same part up to eight times in a month. There is also lack of a formal approach to lot sizing and how the lots are processed through the shop floor. This has led to lots being lost and the order being reissued only for the lot to turn up.

Manufacturing:In keeping with the approach to production planning and control, there is no formal recording of any manufacturing data. This has resulted in there being no operations lists for any parts as it is left to the discretion of the individual involved. The task of routing parts through departments and sequencing the operations is left to the manufacturing department foreman. The manner which he carries this out has resulted in high set-up costs and thus. High manufacturing costs in general. Despite all of the above, the manufacturing methods employed are sound and reliable and appropriate for the type manufacturing system being employed. Most of the equipment is general purpose in nature, although pieces of equipment are close to obsolescence. It is intended that this will be replaced with dedicated, single purpose production equipment. Although there is a facility for the design and manufacture special tooling, there is very little use made of this. Finally, there is poor utilization of the production equipment available and this often leads bottlenecks occurring, despite the fact that there is sufficient capacity on the shopfloor.

Summary

The senior management recognizes that in order to survive, there is an urgent need for change. However, they are having difficulty in convincing the work-force of this and implementing any change. In the main, the management. sees the problem as the resistance of the workforce to change their working practices. However, the workforce see the main problem as being the fact that the senior management are essentially sales minded and don’t under­stand the problems of production planning and manufacturing.

Answer the following questions in crisp

1. What kind of manufacturing environment have Ashita Diesel Works traditionally employed? Comment on the type of workforce and equipment.

Ans:

Traditionally it is ETO.However it is shifting to ATO.The Equipments are mostly general purpose with some facility for special tooling though.Pieces of equipments are close to obsolescence.Workforce is unable to manage equipments efficiently and also resistant to change.

1. How is the manufacturing environment changing based on the increased use of standard parts?

Ans:

The manufacturing department is increasing the use of standard parts however they are still less in use.The manufacturing environment has standardized many components decreasing the variety but increasing interchangibility. Moreover the depart is failing to take advantage of economies of scale.

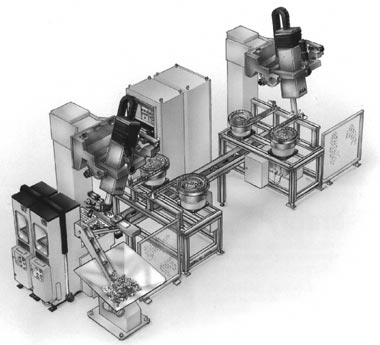
1. Comment on the state of the design manufacture interface.

Ans:

Manufacturing sector satisfies the most of the requirements..Design faculty is failing to take advantage of economy of scale.

**1.4 Case Study: Robots take over some of the repetitive work at Ecco Shoes and at Scania Trucks**

Ecco, a Danish shoe company, produces over seven million shoes each year and has invested in extensive robot facilities in the manufacturing operation, primarily to improve its quality consistency. Initial manufacturing stages are still processed by hand. The soft leather upper is cut and sewn together in the Indian and Indonesian factories before being shipped to the more automated plants for completion. A robot is used to cut a 5 mm track around the leather upper which is then transferred by a second robot to the sole-forming machine where the leather upper is molded onto a flexible sole. A third robot is employed to cut away any excess material from the sole, without damaging the upper. Each robot is programmed to operate according to the recognized size and model of the shoe being processed. Ecco operations managers believe that the working environment is much improved by using robots for the more physically demanding or boring tasks, as well as giving increased productivity and enhancing quality.



**Robots used in small parts assembly**

The Swedish truck group Scania decided to build a new painting facility for its axle factory at Falun. The decision to use robotics in the paint shop was based on their ability to meet precise customer requirements for paint type, colour and specification. The robots are easily and quickly changed over and adaptable to new products. Two operators can run the whole system from a control room, where computer screens depict the movements and settings for each of the robots. The robot first prepares and cleans the parts, then dries off the moisture by blowing compressed air into the cavities and remaining holes; the parts are then primed and finally painted, again all by robots. The axle parts on Scania trucks are shaped differently, which means that the spray guns on the painting system need to be adjusted continually during the process. There is an integrated computer control system which co-ordinates all of these adjustments, controlling the amount of paint being sprayed and thus reducing spillage (both an environmental and cost benefit). Essentially, the main feature of the robots is their flexibility. Scania is confident that it can adapt the systems as necessary to suit its precise needs in the future. The use of robots has also improved the working conditions of the employees and has assisted in reducing waste and solvent emissions.

Questions

* In Ecco’s shoe factories, why are some manufacturing stages performed by hand and some by robots?

Ans -

Performed by hands- Initial manufacturing stages are still processed by hand because it is difficult for robots to performs. The soft leather upper is cut and sewn together in the Indian and Indonesian factories before being shipped. Leather is a difficult material to handle in sheet form. It relies on a human’s ability to sense the degree of movement and elasticity in the material. Cutting and sewing the soft leather upper, although a relatively simple task to a human being, requires a degree of sensory skill and dexterity beyond most robots ‘abilities.

Performed by Robots: Robots for the more physically demanding or boring tasks, as well as giving increased productivity and enhancing quality.

* What are the advantages of using robot technology to paint axles at the Scania plant?

Ans –

Advantages of using robot technology:

1. The robots are easily and quickly changed over and adaptable to new products.
2. Robots are flexible and adjust as per requirement.
3. Reduce Wastage of paints
4. Robots have ability to meet precise customer requirements for paint type, colour and specification.
5. reduce spillage (both an environmental and cost benefit).

**1.5 Case: Meindorf GmbH**

Meindorf GmbH is a part of large German cable company that manufactures compounds (the material used to cover the copper or aluminum conduit) to meet inter-group and external demand. It has four process units that heat and mix the various fillers and oils that make up a range of standard product specifications. Order sizes from customers range from 1 to 40 tonnes. To meet a customer order typically require several mixings.

* Process Unit 1 produces natural and coloured elastomers
* Process Unit 2 manufactures the whole range of thermoplastics
* Process Unit 3 makes black elastomers
* Process Unit 4 produces small order quantities of thermoplastics and experimental compounds for the research and development department. The unit is not fully utilized.

On leaving these process units, the compounds move onto the next stage that involves shaping, cutting and packaging.

The mixing stage lasts between 8 and 14 minutes and the number of mixes required to meet a customer order are completed one after the other. At the end of a run the process units are changed to make the next product. The length of colour and compound changeovers take between 40 minutes and 2 hours. The most difficult colour changes involve moving from dark to a lighter colour. In order to minimize changeovers, similar colours and similar compounds are run together wherever possible and in line with customer schedules. Typically, changeovers for Process Unit 2 account for 20 percent of available time while changeovers for Process Units 1 and 3 account for up to 10 percent of available time.

Delivery reliability is an order-losing sensitive qualifier for most customers and trends towards smaller customer orders is giving concern to operations in terms of meeting schedules.

Questions

1. Which process type (project, job order, batch, line or continuous processing) is used to heat and mix compounds in this plant?

Ans – Batch process

1. Draw a flow chart of the production process.

Ans

1. Give reasons for the different changeover levels (10, 20 and 10 percent respectively of available time) for Process Units 1,2 and 3.

Ans – 1) for process unit 1, the changeover accounts to 10 percent of available time, because it is difficult to move from dark to light shade ( from unit 3 to 1) .

2) for process unit 2, the changeover accounts to 20 percent of available time, because it is completely different process, from unit 1 and 3, and thus takes twice the time.

3) for process unit 3, the changeover accounts to 10 percent, because it’s a time taking process to change from light to dark color as well.

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