Proposal for the Design of Automobiles Assembly Line

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Abstract– ***The objective of this project is to plane Proposal for the Design of automobile assembly line , An assembly line is a manufacturing process where the components are attached one by one to a unit in a sequential way by a series of workers to create a finished good product , The concept of assembly line has been introduced for cost efficient and mass production of standardized products , The equipment used for performing operations on automobile in assembly line is placed on several areas around the assembly line called stations. These stations are usually located in a certain order on the assembly line. automobile move between these stations for processing with transportation system. Here, we will discuss about the history, classification , technological procedure , cost and safety of automobile assembly line .***

I. Introduction

The equipment used for performing operations on vehicle in assembly line is placed on several areas around the assembly line, called stations. These stations are usually located in a certain order on the assembly line. Vehicle move between these stations for processing with transportation system, for example conveyer belts or automatic guided vehicles etc. Since the time of Henry Ford, the requirement and design of production system have changed. This change has occurred in order to satisfy the diversified demand of customers. Production companies allowed the individualization of products due to which efficient flow line systems for low volume of products have been developed and a modern terminology of mass customization has been introduced . In assembly lines work pieces are moved down the assembly line from one station to another for processing

II- Literature survey

Henry Ford started to build vehicles of various models, but was hampered because he had little cash available. He began to offer dealer franchises that required the dealers to pay for the vehicles upon delivery to them instead of after they were sold. With this added infusion of funds, he had capital to advance his manufacturing facility and continue researching to improve the model cars. He produced various models, including some for luxury and others for racing. His vision was to build an auto that the common workingman could afford. In 1908, he introduced the Model T that would soon become the auto he was seeking. Up to that time, the vehicles were custom-built one at a time in small quantities. In 1909, he started a facility to apply assembly methods. Little by little, improvements took place. He installed moving belts so that the workers could remain at one location and do their one task efficiently and in minimum time, rather than assigned a variety of tasks. With the efficiency in production, the line soon was producing 1,000 vehicles per day. Ford was then able to lower the cost of the vehicle to $290, and this was in the range of the common man. By 1915, he produced almost half of the world's automobiles, and by 1923, the production rose to 1,800,000 per year.

III. ASSEMBLY LINE TECHNIQUES

A- Classic :

This type of assembly line uses a number of steps, performed by different workers, to create a single product. That product is usually large and/or complex. Regardless of size or complexity, however, each product is essentially identical.

B- Automated :

An automated assembly system might look a lot like a classic one, but it features one critical difference. There are fewer humans and more machines. Machines governed by computers almost entirely staff today's automated systems. Many manufacturers adopted this technique over the past decade or two.

C- Lean :

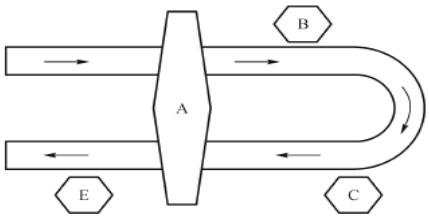
Like automated lines, lean assembly lines adapt classic assembly techniques. In lean assembly, products still come together piece by piece. However, teams of workers man each station instead of individuals. As a result, it makes assembly vastly easier for a range of different products, especially big, complicated items. Team members move around to different tasks, and assignments change periodically. In turn, this helps manufacturers get the most out of their assembly line workers,

IV. CLASSIFICATION OF ASSEMBLY LINES

A - **Layout Characterstics :**

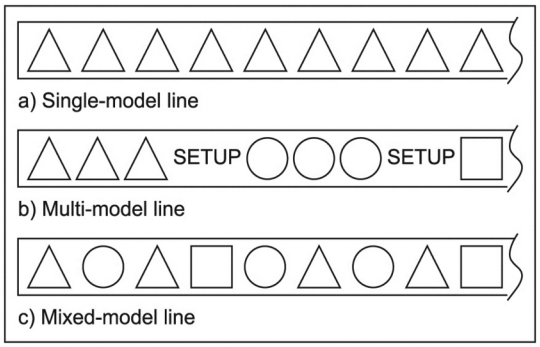
serial assembly lines stations : are arranged in a serial manner along the sides of the conveyer. Parts are moved into the assembly line and moved to first station. After finishing their processing on the first station they are moved down the line one by one from the current to the next and leave the line after passing through last station.

U-shaped assembly line : not only helps to reduce the number of stations but it is also useful to improve line efficiency by utilizing some of the stations which may have idle time in the assembly process U-shaped assembly lines can reduce the wasted movement of operators and work in process inventory, improve productivity and material handling . Miltenburg and Wijingaard first time described U-shaped assembly line problem to minimize number of stations.



two sided assembly lines: These lines are designed to assemble heavy and large sized products like, automobiles, trucks, busses and large construction machinery. Two sided assembly lines assembled parts from the both sides of assembly lines and more than one worker or machine are working together on a part simultaneously on a station. Bartholdi presented two sided assembly line in which stations are located opposite to each other on the left and right side of the line. Stations are working on the parts simultaneously and therefore, it needs less number of stations in two sided lines for assembly operations.

B - **Product characterstics**

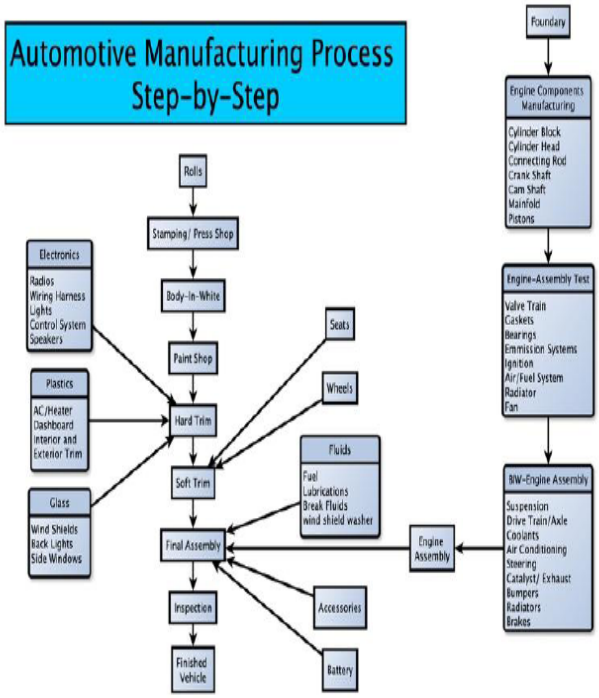


.In single model assembly line a large quantity of only one kind of product is assembled , Furthermore, automation in these assemblies is easy which can help to reduce the assembly operation time in single model assembly lines

.In a mixed model assembly line different models which are slightly different from each other but have the same parent product are assembled , Some stations may process models of larger time duration and some stations may process models of small time duration. This may lead to produce uneven workload distribution on different stations

In multi model assembly line,
different models are assembled in batch form. These products are not mixed with each other during production but are produced in batches. Once a batch of one model is produced, the setup of stations is changed according to the requirment of the next batch of product for its assembly.

IV. TECHNOLOGICAL PROCEDURE



A-STEPS FOR PRODUCING AN AUTOMOBILE

Stamping department :
The stamping department is responsible for the production of a complete vehicle body. It involves a metal cutting process where the coils of metal cut into uniform dimensions into smaller sheets

Body-In-White Department :
BIW standards for Body-In-White. BIW is a stage in Automobile manufacturing. Here the complete body shell of the Automobile is welded and structure from all the sheet metals formed into sub-assemblies The assemblies of all the Frames and Panels of both Structural Components, as well as the exterior parts of an Automobile combined with homogeneous materials, form car body structure

Painting Department :
Paint application is the most required process for vehicle production, and it is not exclusively done for covering but also for the safety of body surface, it also increases the visual interest by adding the shades as well as the shine and imperative offering focus . Car paint will be paint used on cars for both embellishment and security reasons . The painting process is done to give more attraction to the vehicle, good appearance, and to provide a protective layer against the corrosion as well as the weathering.

Final Assembly :
After the painting process completed, the B-I-W will move to the final assembly department. In the first station, the primary

operation is to dis-assemble the doors from the rest of the body, dashboard, and other instrumentation panels are fixed. This process is completed manually by the workers. The next station is the most important, and it is the assembly of B-I-W to Powertrain, which is termed as marriage station, here the body and powertrain meet together. A lot of many assembly works are carried out, and this station the Automobile gets its complete structure and final appearance, in the next station's wheels, seats. Finally, the doors installed to the Automobile, which previously removed for assembly process to the Automobile and all the necessary tests for the engine, chassis did, and a thorough final inspection is conducted to the vehicle and stored in the warehouse for distribution around the world .

V- SAFETY

Fire safety of factories include preventive and protective measures to be taken to eliminate the causes and sources of fire, and if a fire starts, prevent its disastrous action in the personnel, and ensure protection of building, equipment's, machines, etc.

IN THE factory.

1- Always keep your workplace clean to protect yourself and other from injury .
2- Do not leave tools or parts on the floor where you or somebody else may trip over them .
3- Immediately clean up any spilled fuel , oil to prevent yourself or others from slipping on the floor .
4- Be careful when handling heavy objects .

All professional automotive manufacturers are doing their best to ensure a safe and risk-free environment. If anything can be done to increase the safety standards – it should be done.

common safety issues :

1. Employees pushing vehicles

Moving a car by yourself is dangerous and heavy. Also, the more people you involve in that assignment, the more dangerous it gets. Many assembly line operators hurt their backs every year due to manual vehicle moving. Additionally, pushing a car inside a busy plant is a work environment issue.

Solution: When you use an electric vehicle mover, you won't have to pull people from their regular job to move a car. A vehicle mover is a one-person operation. That means there's only one person in charge of moving the car, and this person is behind the vehicle, protected by the machine.

2. Run-over accidents

Another risk of pushing vehicles inside the plant is run-over accidents. These kinds of severe accidents are rare, but unfortunately, they occur. Run-over accidents often inflict serious injuries, sometimes even death. When operators push a vehicle from one place to another, they move away from their safe zone e.g. by the assembly line. Moving around in the plant with a heavy car where safety is determined by how well communication works between the people involved is hazardous – for operators moving the vehicle and for other employees. Anyone can get caught by surprise by the moving vehicle, and their safety is in the hands of the operators assigned to move the car. Usually, the operators pushing run the most considerable risk of getting run-over if communication is poor.

Solution: Since a vehicle mover is a one-person operation, all operators can stay in the safety zone where they are assigned. Also, the operator responsible for moving the vehicle is safe when using a ride-on machine. The operator cannot get run-over when standing on a secure platform. The vehicle mover is also equipped with safety features, enabling the operator to alarm other employees about the vehicle approaching.

3. Long-distance moving

If you need to transport your vehicles for long distances, there's an increased risk for both cars and people. The greater the distance, the more opportunity there is for safety issues.

Solution: With a vehicle mover, you can go a mile without taking any direct risks. The operator is protected, and the vehicle is safely loaded upon the machine. Using a vehicle mover with terrain capability, you can transport cars long distances on rough ground while maintaining stability.

4. Vehicle damage

When your operators are pushing a vehicle, many hands are touching the car. If one of the operators or the driver isn't paying attention, there's a risk of damaging the vehicle. Using a mechanical pusher also involves touching the body of the car. Painted bumpers, distance sensors, and tail lights are standard parts that can be damaged. With better safety standards, you can prevent this from happening.

Solution: A vehicle mover only operates on the tires. Therefore, it won't do any damage. Using a professional machine instead of pushing is an efficient way of reducing car damage records.

VI- COST

The main goal is to estimate the cost of some main items in order to get an approximate value of total cost.

A- Land cost :

The net area =5000m2 square meter costs about 750 L.E

Landcost=5000*750=3,250,000 L.E

B- Cost of administration factory.

1- Construction
The total cost of administration construction =750.000 L.E

2- Air condition
Each condition cost about 6000 L.E
Total of air condition=6000*8= 48,000 L.E

3- Furnishing

- For first manager Furnishing cost about 7000 L.E
- For 3 engineering managers Furnishing cost about 3000 L.E
- For employers the office cost 2000 for Furnishing
- For security Furnishing cost about 1000 L.E
- For 2 security office cost 1000*2=2000 L.E
- For reception Furnishing cost about 2000 L.E
- Total cost of Furnishing = 17.000 L.E

4- Machines :
Total cost 18.000 $

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