UNIVERSITY OF HERTFORDSHIRE
School of Physics, Engineering and Computer Science

Assignment Briefing

SCENARIO: Using the principles of Toyota production system, and the Theory of Constraints, you need to design and model the assembly line and warehouse layout for the Tesla Model 3 rear brake hub, knuckle and suspension. Assume that the facility is separate from the rest of the Tesla factory, and that the parts will be delivered to the facility (see appendix 1), and after being assembled, be shipped to the Tesla factory.

Part of your consideration is that you will need to hire a building to do this, and you need to design a layout before selecting an appropriate building. You are considering a number of **square** buildings of different sizes available to you and you wish to hire the smallest building possible to minimize on rent, heating, lighting and other costs.

Both the assembly line and the single warehouse area need to be housed in the in the same **square** building, separated by a STRAIGHT internal wall. Moreover, you also need to consider the ongoing costs of running your single forklift truck inside the plant.

Thus, for this assignment you are to design the assembly line layout and adjoining warehouse layout, as well as each work station's part storage layout for a Tesla model 3's rear axle assembly for the parts shown in Appendix 1, based on a demand for parts based on your student number – see Appendix 2 to find your number of assembles required.

As part of this, you will also need to calculate the number of operators needed to achieve the required build. Approximate assembly times for each part are provided in the Appendix 1.

Your submission should consist of the following:

Part 1 – Flexsim Simulation File - .fsm file

Part 2 – Logic, Calculations and Theory Behind the design – PDF Document.

Part 1 – Flexsim File - .fsm file

Using flexsim express, you are required to model the movement of the forklift truck as it supplies the assembly line with palletised parts and takes the completed assembles to the warehouse.

Your Simulation should also include:

A) The layout of the assembly line, showing the following:

- Assembly station locations (HINT: you could represent the assembly stations as a processor).
- The assembly stations' part storage for PARTS ON PALLETS ONLY (HINT: you could represent this as a queue on flexisim).

You should arrange your part storage around the assembly stations allowing for convenient access to the parts and the workstations by the assembly workers and forklift truck as appropriate.

B) The layout of the warehouse with appropriately sized storage areas for each **palletised** part, assuming:

- A 6 day working week – Monday – Saturday, with only ONE 7 hour shift per day.
- TWO deliveries of parts each week (Mondays and Thursdays) – assume that each delivery for a part might be on ANY time of the day and might vary from one day to the next.
- ONE shipment of completed assembles leaves the facility each Wednesday and Saturday at the end of the shift.
- Left and right completed assemblies can be packed into identical pallets interchangeably.
- HINT: you could represent each part storage area as a Source in Flexsim.
- Parts in boxes can be ignored – Provide storage for **PARTS ON PALLETS only.**

See Appendices for part dimensions, capacities etc.

C) You will need to model the movement of the single forklift truck for transporting **PARTS ON PALLETS only.**

Assume that:

- for each pallet of parts, the forklift needs to collect it from the warehouse & deliver to the assembly line
- For each pallet of completed assemblies the completed assembly neds to be taken from the last assembly station to the warehouse storage area.
- You do not need to model removal of empty pallets from each station.

Part 2 – Logic and Theory Behind the design and outcome.

This should consist of 4 parts:

A. In this section you have the opportunity to explain to the markers the logic and theory you've used in creating your design (for example how you have endeavoured to minimise Ohno's wastes).
B. Show your calculations and assumptions for the number of operators needed to complete your process. Assume that each operator has his/her own separate workstation.
C. Calculate and indicate the takt time of your process.
D. Show your calculations and assumptions for the amount of storage in the warehouse for each part and completed assembly.

Submit this as a PDF file

This will be marked alongside Part 1.

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General Notes, Requirements and Constraints:

1. In the warehouse, show each location for PALLETISED parts as an appropriately dimensioned and labelled area.

2. In the warehouse, show the location for completed assemblies in appropriately sized and dimensioned area.

3. Provide an area 50% larger than one day's production for completed assemblies in the warehouse where they will await shipping

4. Provide transportation for the completed assemblies from the final station to the warehouse.

5. Assume that loaded pallets can NOT be stacked, and that pallets are placed on the floor, without any sort of racking.

6. Aisles should be a minimum of 3m wide to allow for forklift access.

7. Assume that (for security reasons), you wish to keep the warehouse area separate but adjoining to assembly area, with a 4m wide doorway in a STRAIGHT wall that separates them. The position of the doorway can be anywhere along this wall.

8. Assume that the footprint of each pallet is 1m x 1m

9. Assume that pallets are unpacked by the operator directly at the assembly station.

10. Assume that completed assemblies are placed on pallets: Assume that each pallet can take 2 left + 2 right side assemblies.

11. Assume that there are no quality problems from suppliers or in the operations

12. You may use only 1 forklift truck in your operation

13. Show the location of the exterior door (also 4 m wide) from where parts will be supplied and completed assembles shipped.