Ford Assembly Plant

Case Study

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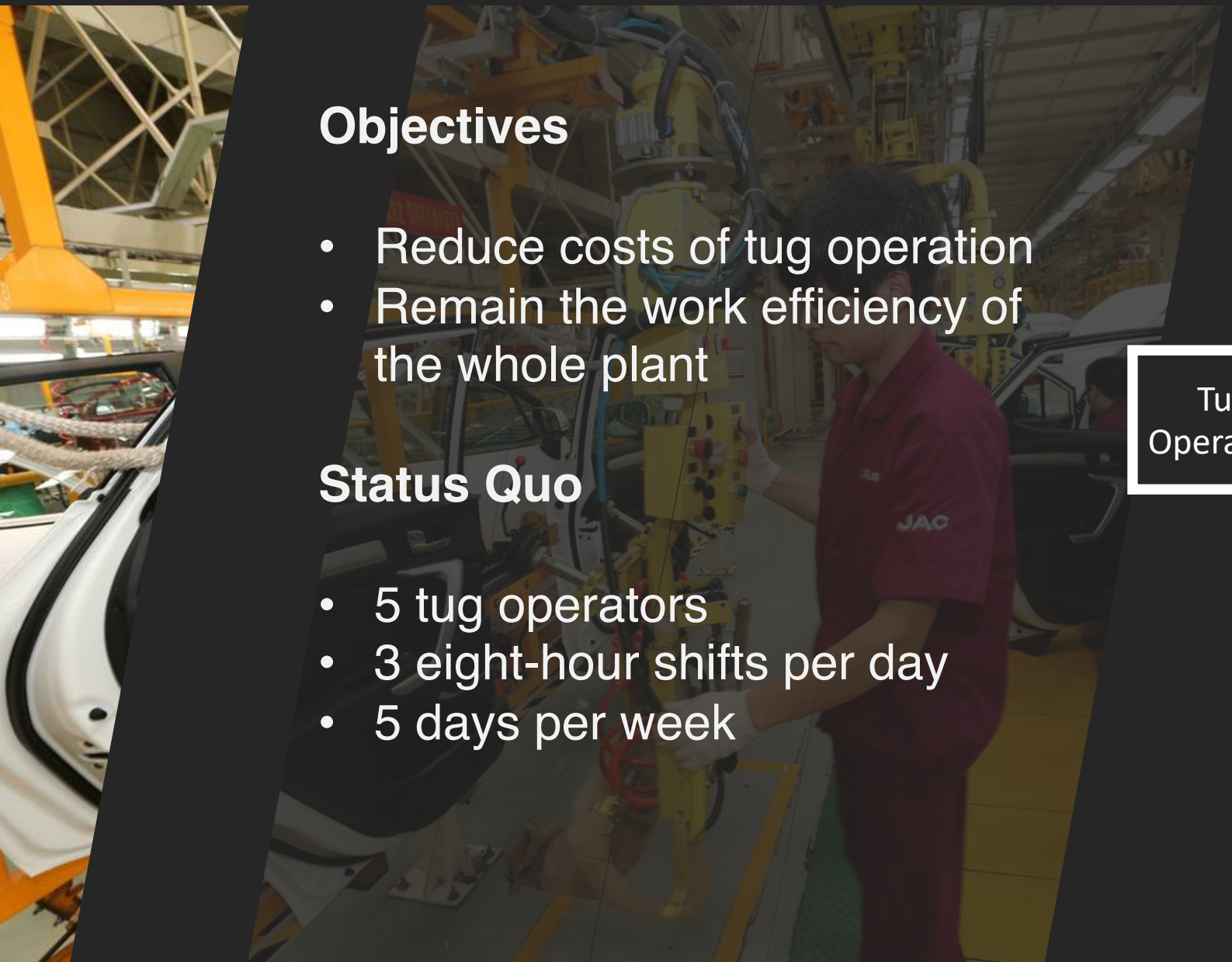
Introduction

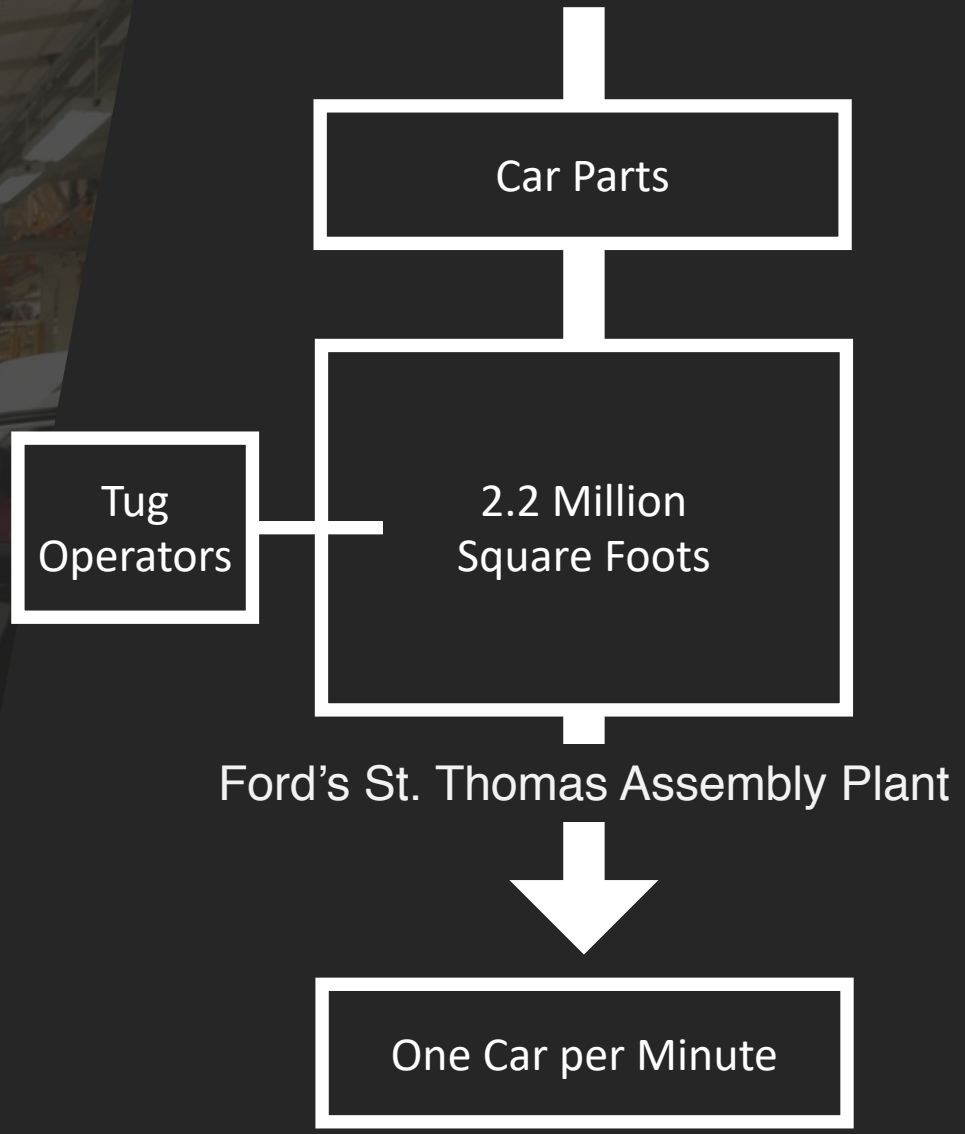


Objectives

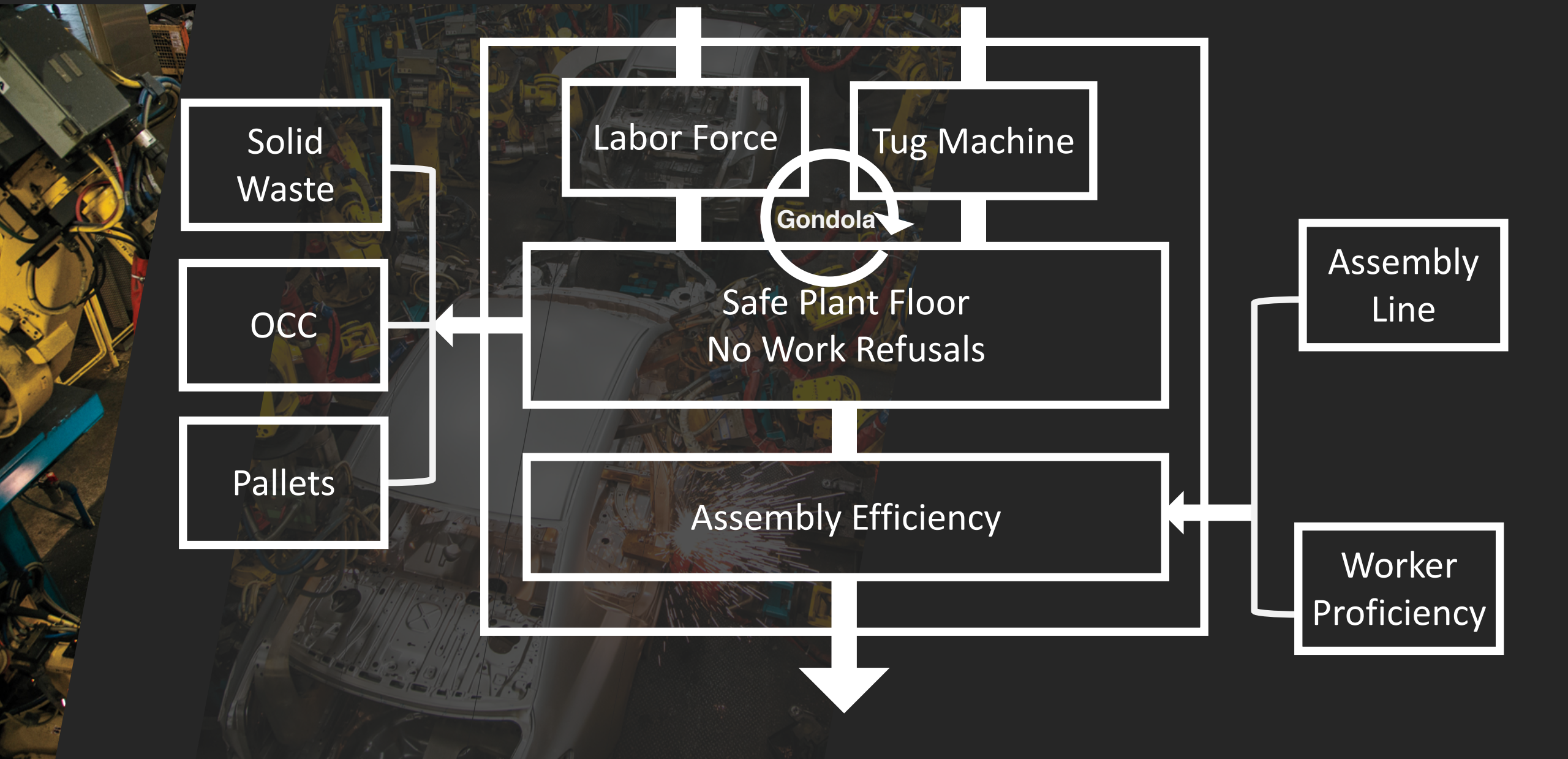
- Reduce costs of tug operation
- Remain the work efficiency of the whole plant

Status Quo

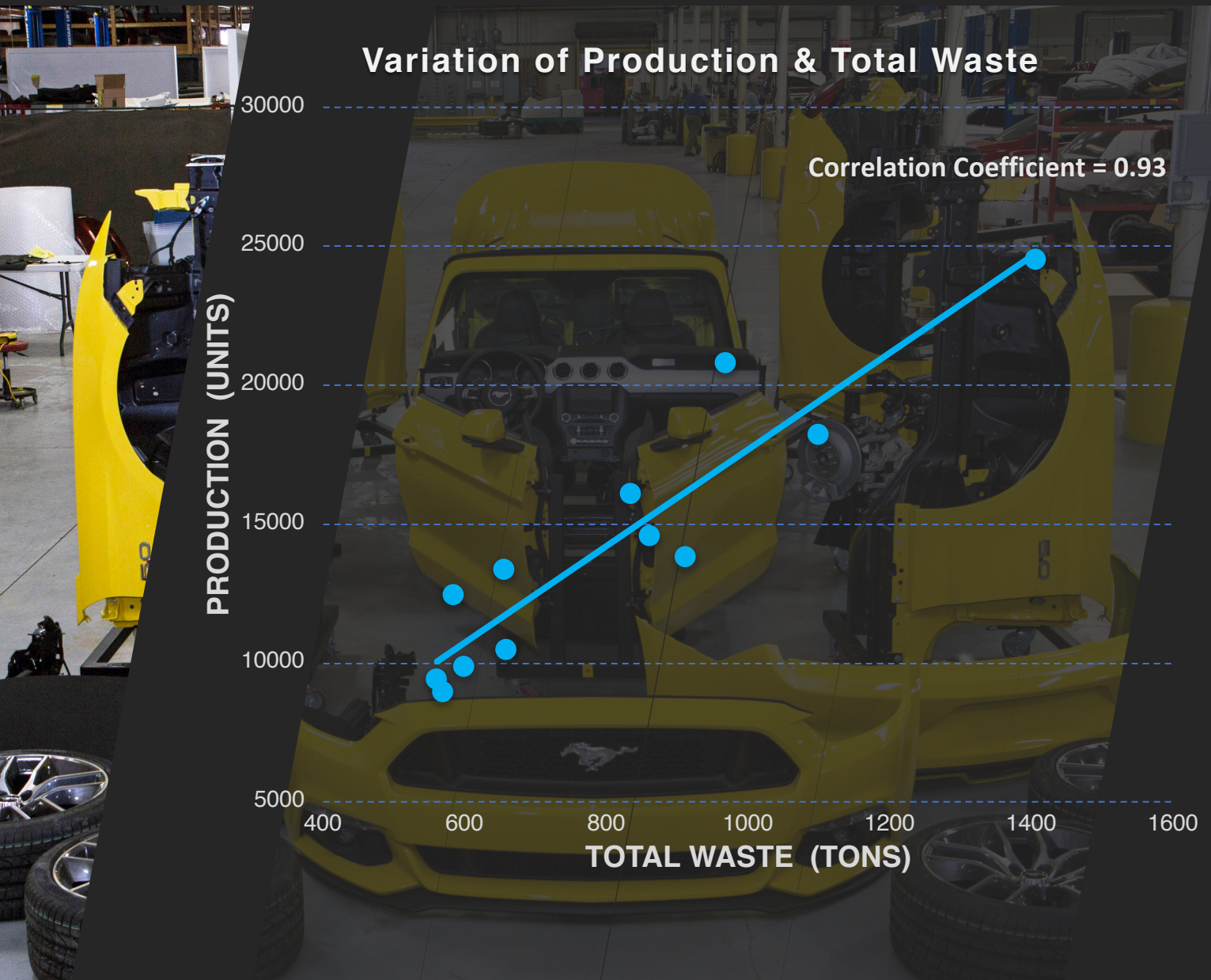
- 5 tug operators
- 3 eight-hour shifts per day
- 5 days per week



System Analysis on Tug Operation



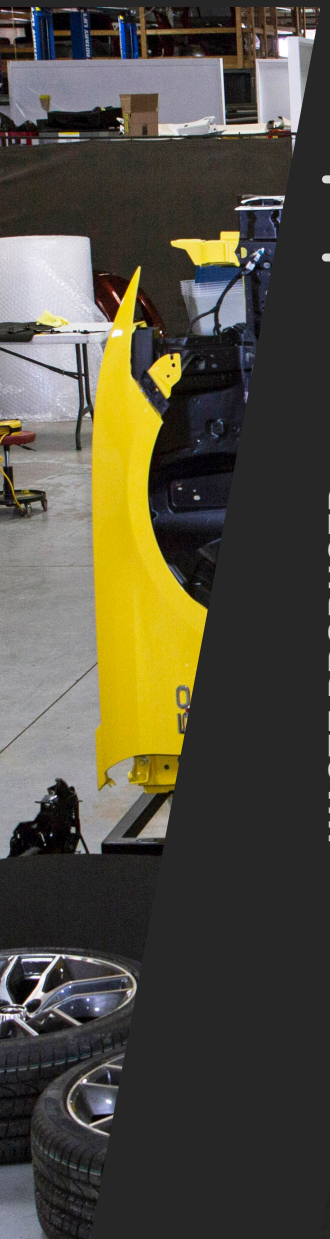
Existing Data Analysis



	Solid Waste To Landfill	OCC	Pallets	Total Waste
Production	0.08	0.97	0.89	0.93

- The Units produced and total amount of waste produces are highly correlated.
- The major amount of waste produced contained OCC and Pallets.
- OCC and Pallet waste was mainly produced as the parts to be assembled were packed in these ,which were for a single time use and thus go as a waste once parts were removed.

Existing Data Analysis



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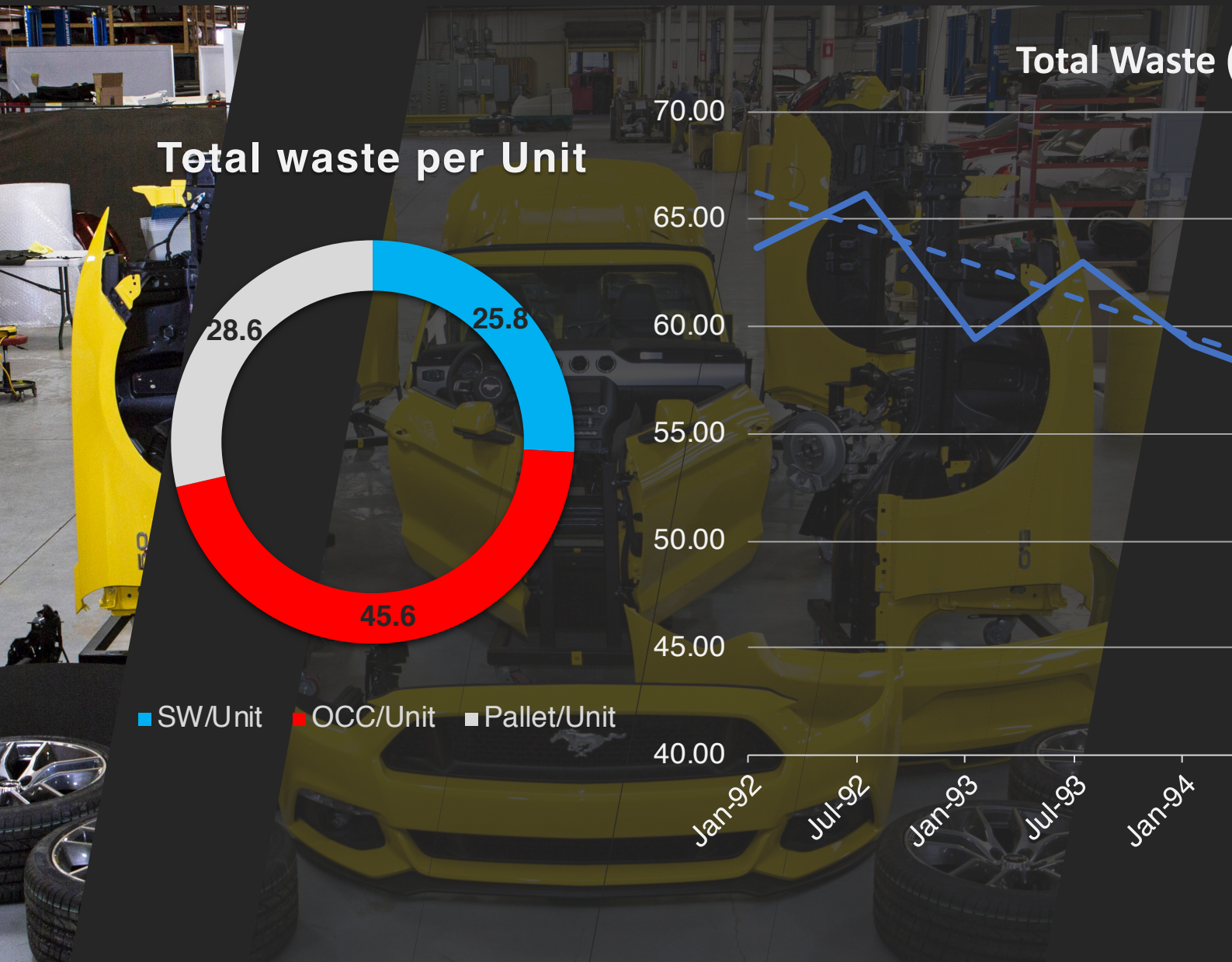

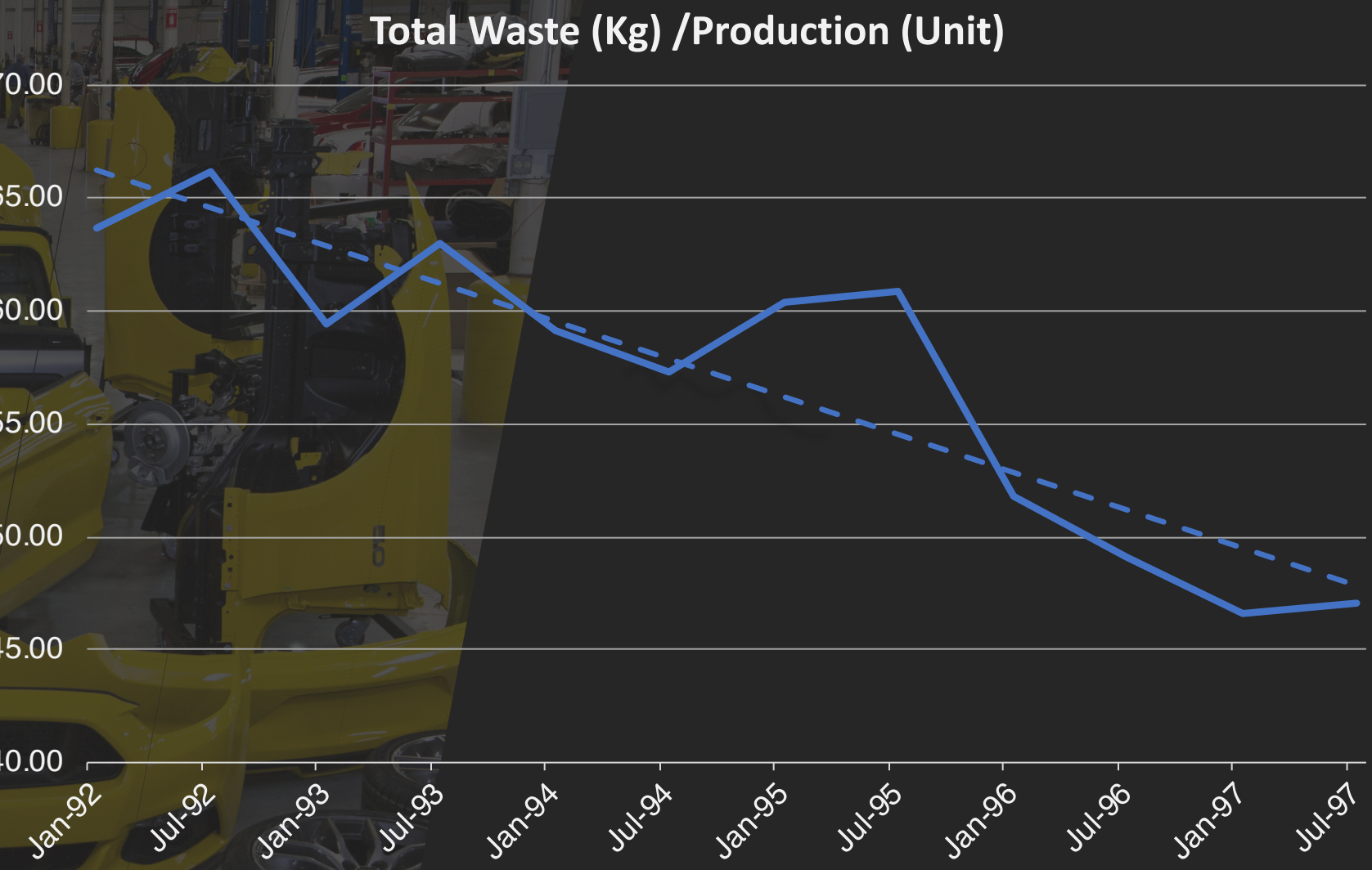

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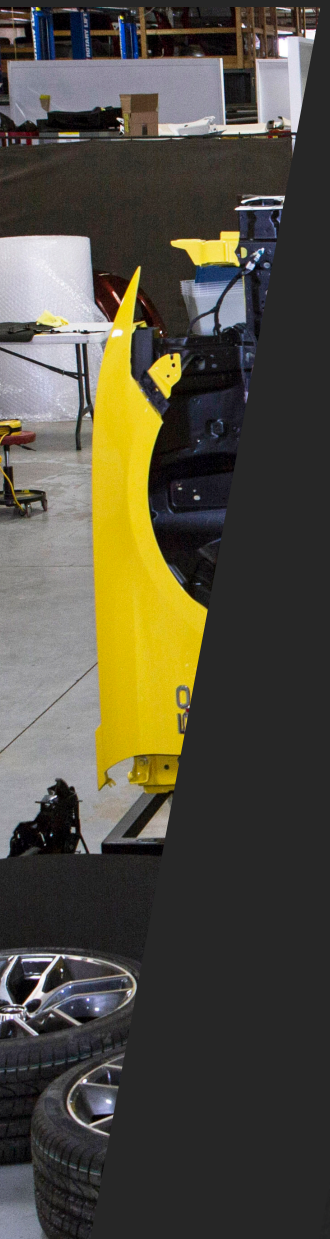
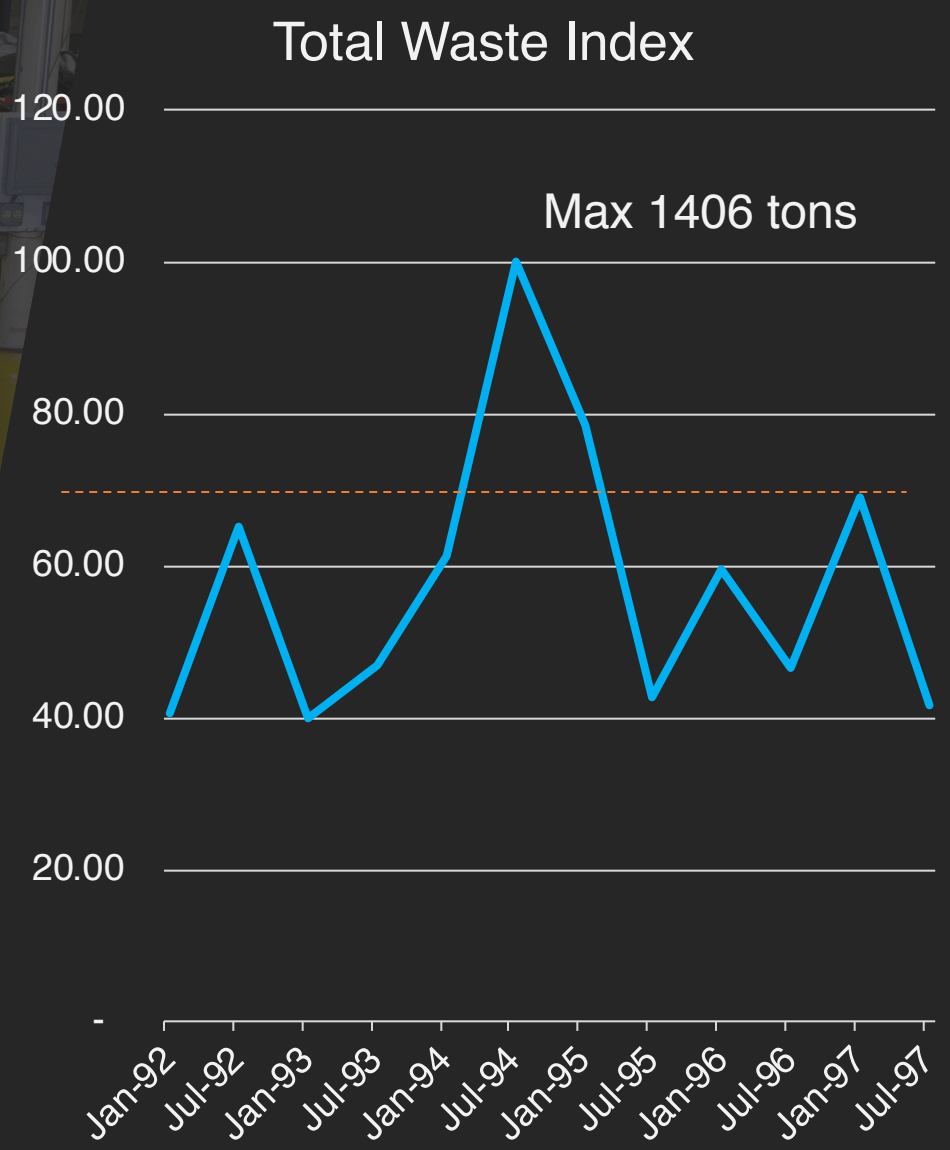


- Pallets and OCC are recyclable waste that are majorly dependent on the number of units to be produced.
- There is a 26% decrease in the waste produced per unit over time where 80% of this decrease was evident from decrease in the amount of solid waste.
- Assuming that if 5 tug operators could manage to handle the max amount of waste produced i.e. 1406 tons.
- Indexing other values with the max waste produced we could see that the waste produced has decreased by 30%



Additional Data Required

Solid Waste

OCC

Pallets

Labor Force

Tug Machine

Gondola

Safe Plant Floor
No Work Refusals

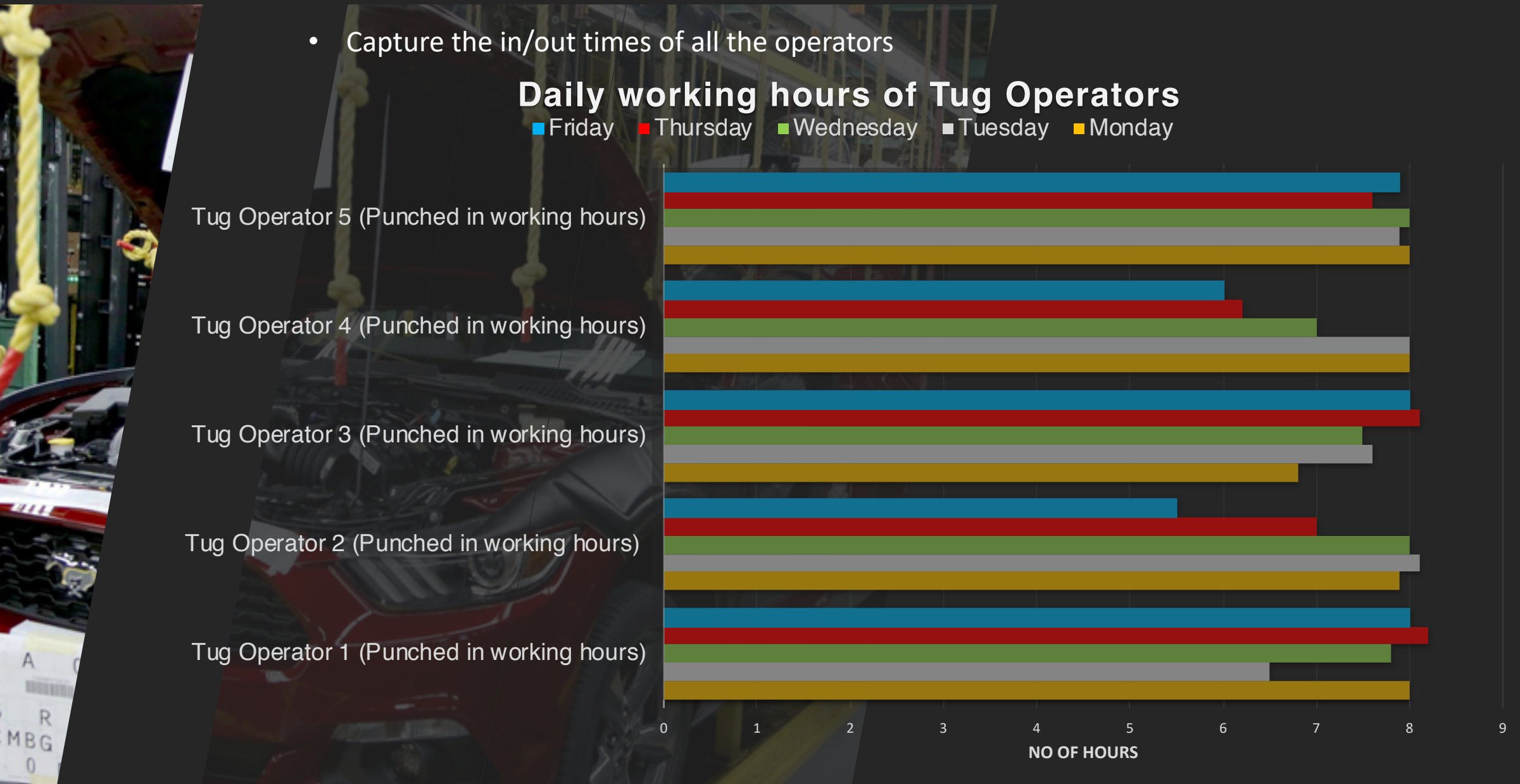
Assembly Efficiency

Assembly Line

Worker Proficiency

Data Collecting

- Capture the in/out times of all the operators



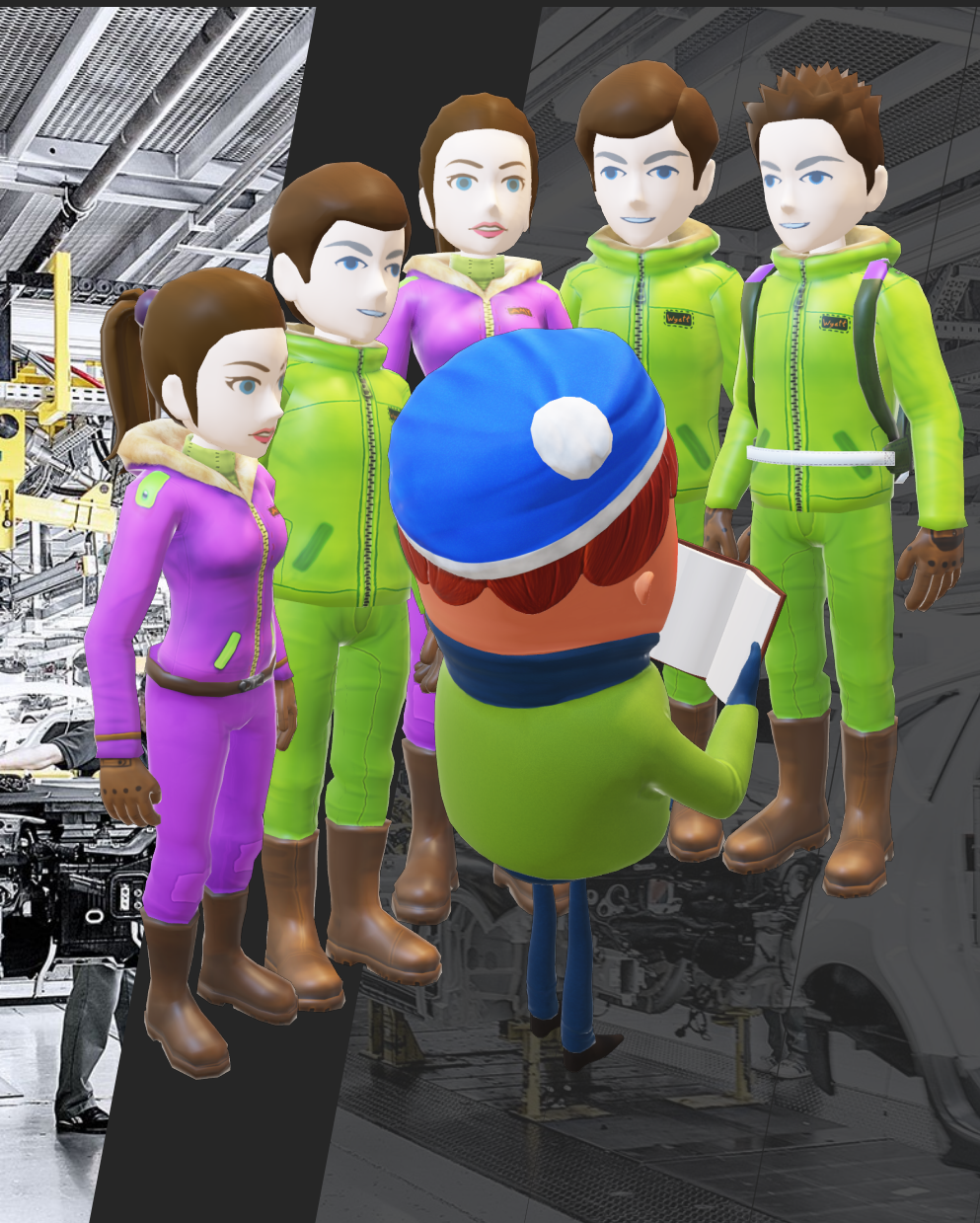
Additional Data Required

- No. of tug operators- 5
- Shift length- 8 hours
- No. of shifts in a day- 3
- Total work done- 5 * 8 * 3 = 120 units

Using In-Out timings of the tug operators, we compute the mean of tug operators. i.e. Let us assume that mean is **6.25 hours** instead of 8 hours

THEN…

Additional Data Required



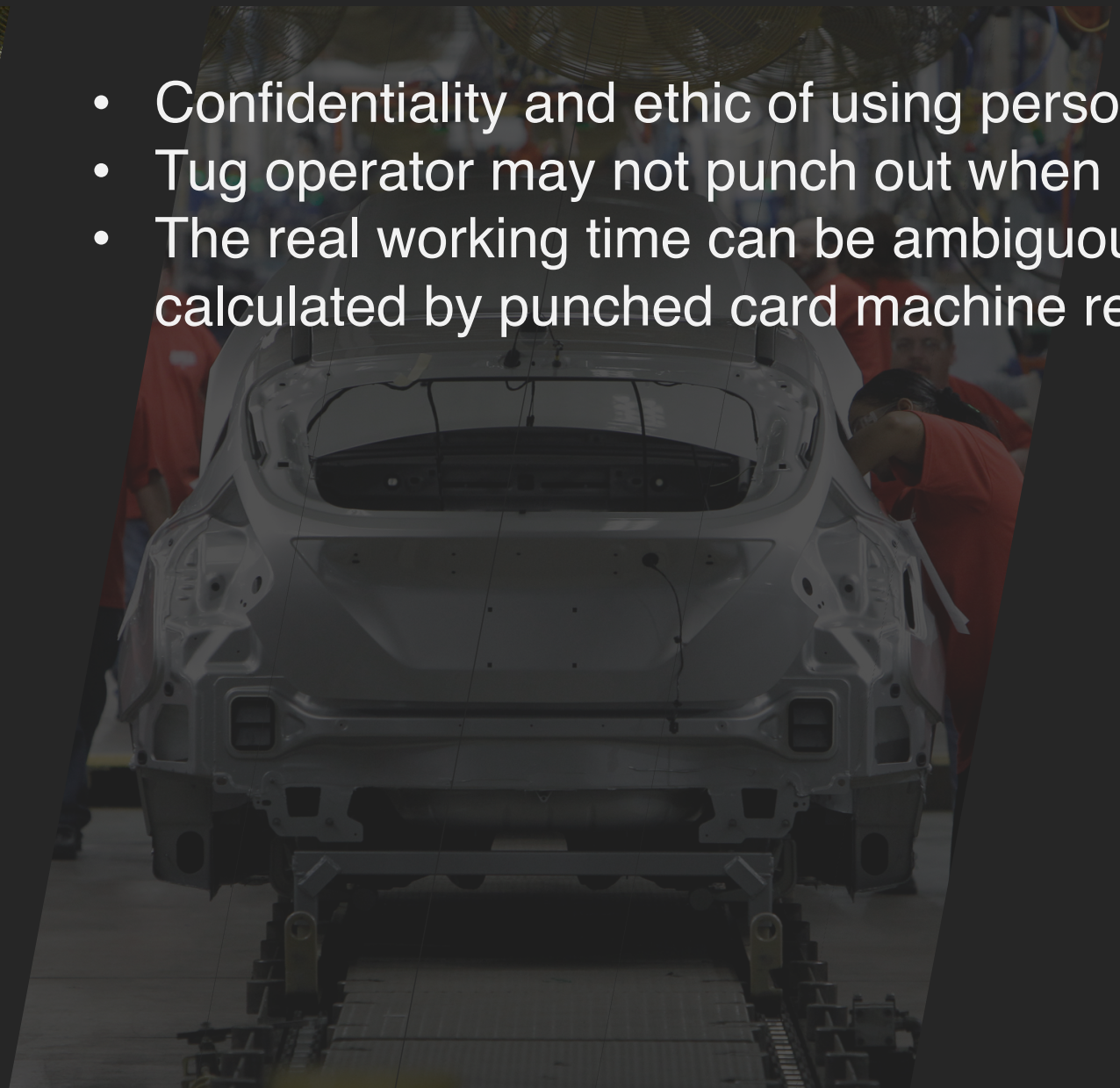
- No. of tug operators- 5
- Shift length- 6.25 hours
- No. of shifts in a day- 3
- Actual work done- 5 * 6.25 * 3 = 93.75 units

- Actual Shift length- 8 hours
- No. of shifts in a day- 3
- Actual work to do- 93.75 units
- No. of tug operators- 93.75 / (8 * 3) = 3.91

Additional Data Required

Thus, removing one tug operator…

Potential Problems



- Confidentiality and ethic of using personal data.
- Tug operator may not punch out when leaving early.
- The real working time can be ambiguous and less than the hours calculated by punched card machine records.

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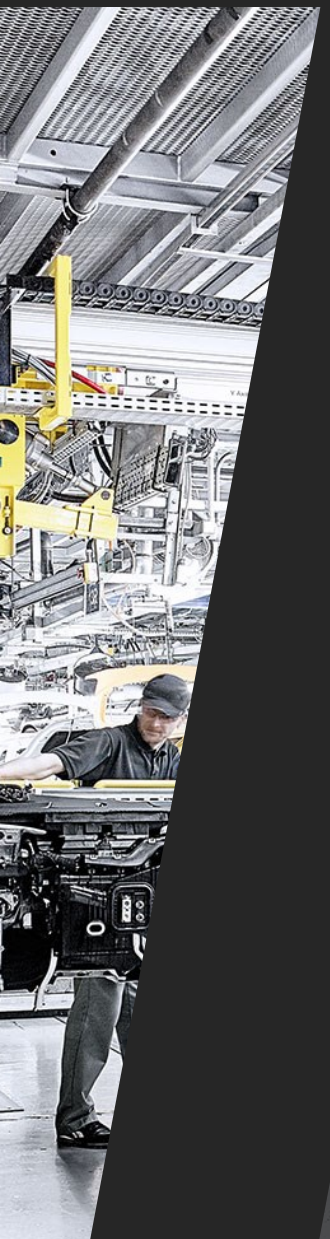
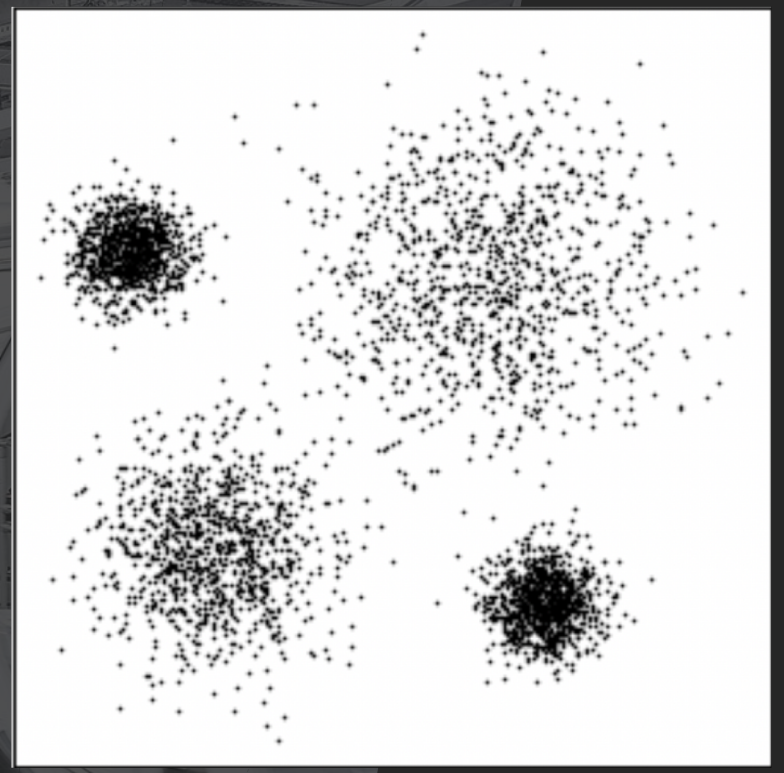
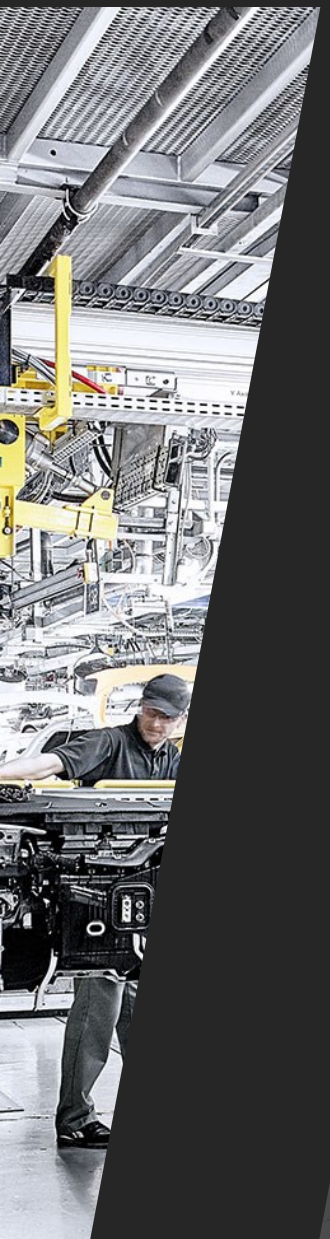
Data Collecting



- Distance of each gondolas from plant floor to garbage room
- Volume of gondola filled when picked for dumping
- Frequency of the gondolas picked on the floor



Technique used



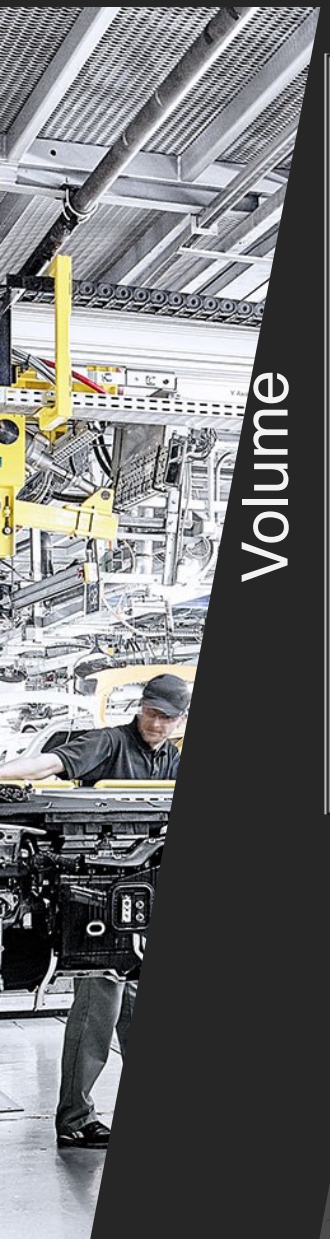
Clustering

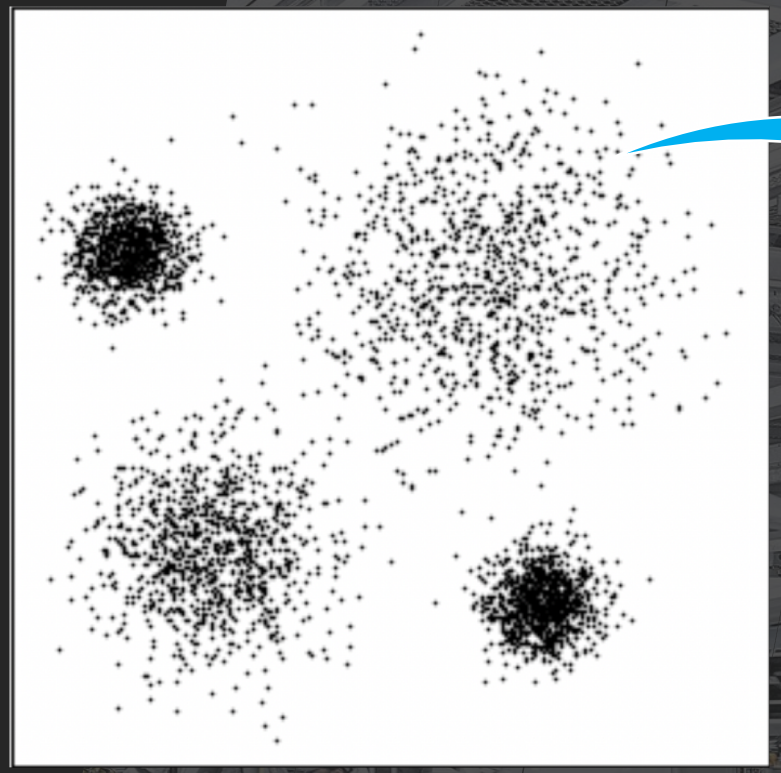
Cluster analysis or **clustering** is the task of grouping a set of objects in such a way that objects in the same group are more similar to each other than to those in other groups (clusters). Popular clustering algorithm we can use in our case study is:

K-means Algorithm

Starting with a pre-specified number of cluster centres each point is initially assigned to its nearest centre. In the next step, for each segment, the centres are moved to the centroid of the clustered points. The points are then reassigned to their nearest centre. The process is repeated until moving the centres derives little or no improvement.

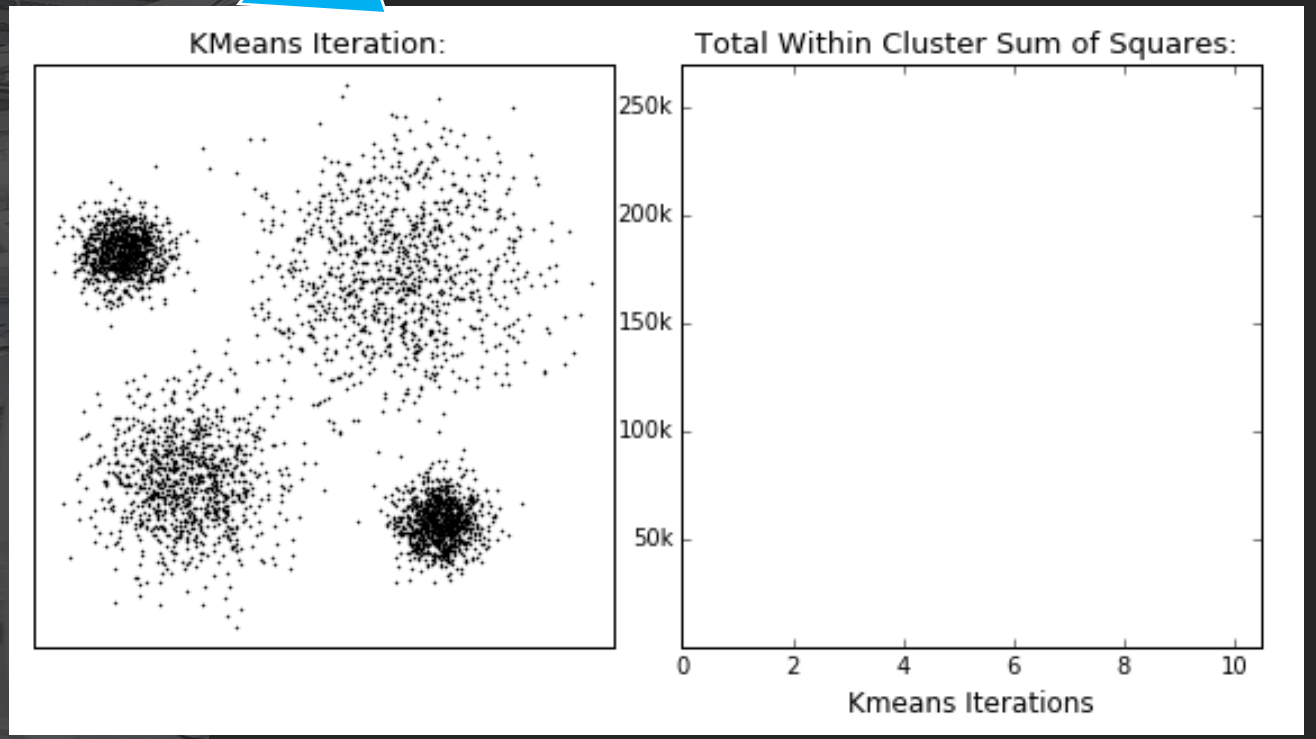
Technique used





K Means Clustering

K=4 Tugs



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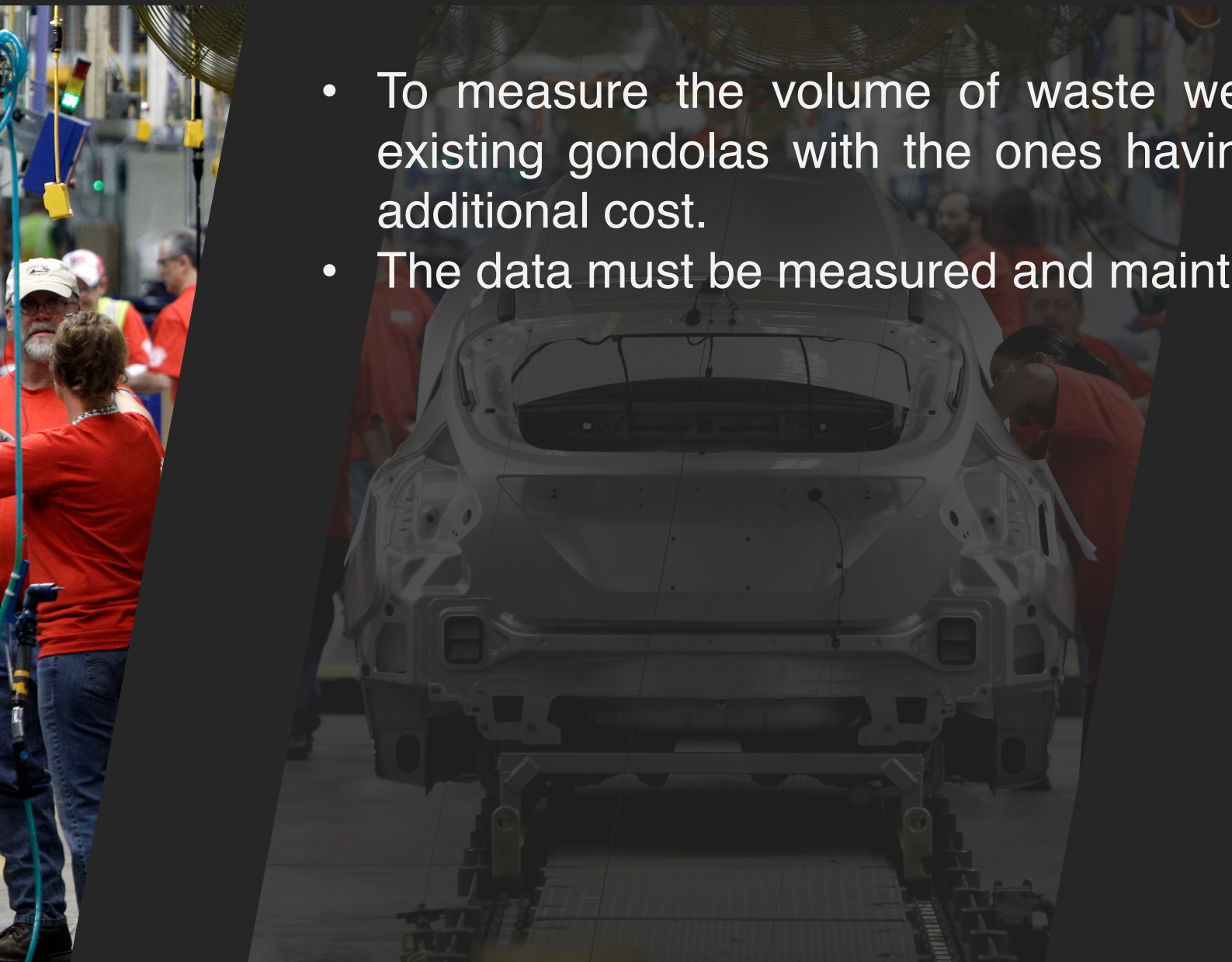

- To measure the volume of waste we need to add or replace the existing gondolas with the ones having sensors which will incur an additional cost.
- The data must be measured and maintained in a daily base.

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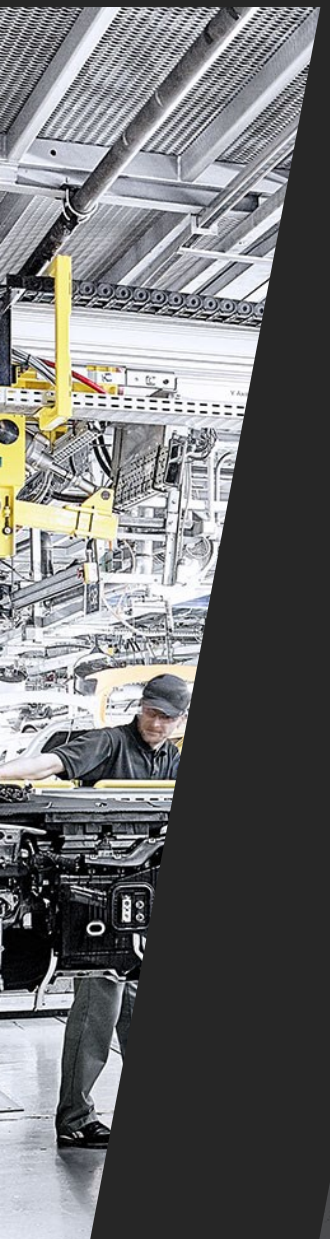
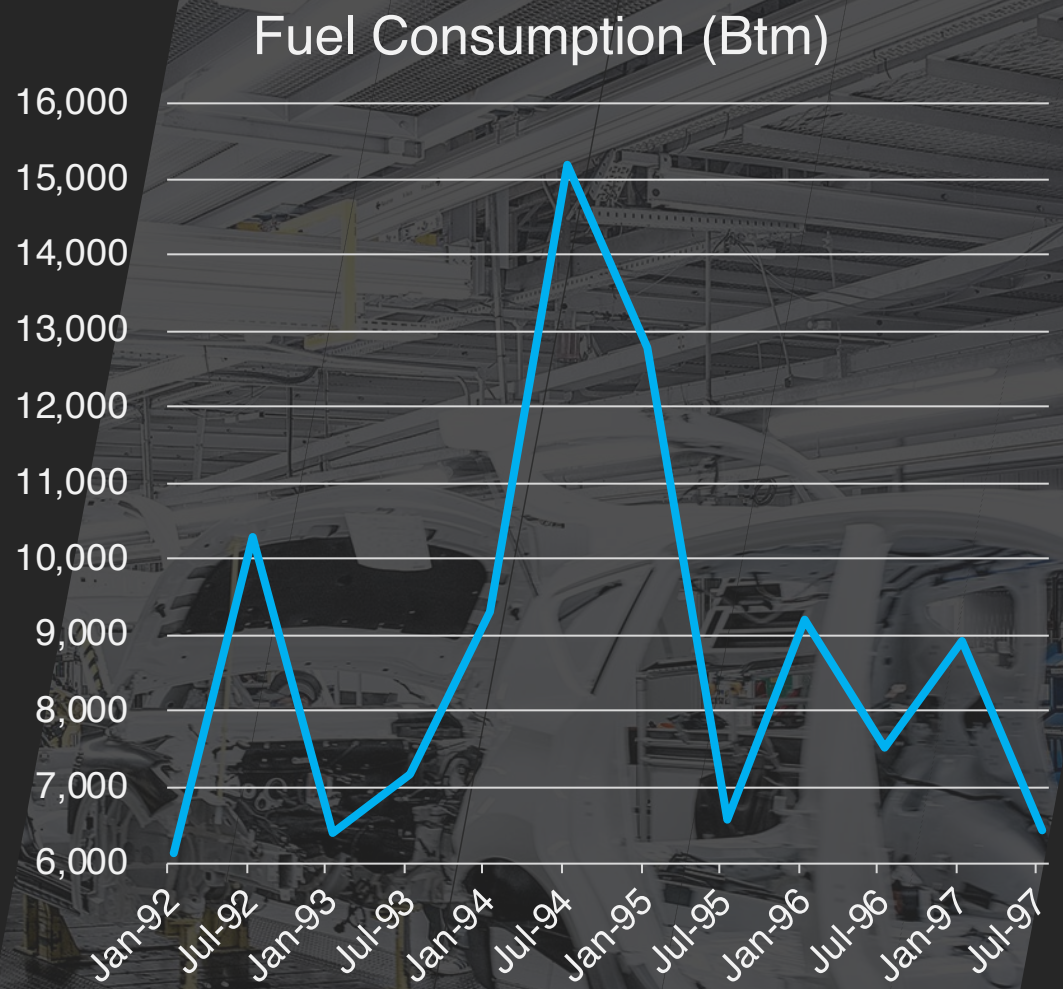
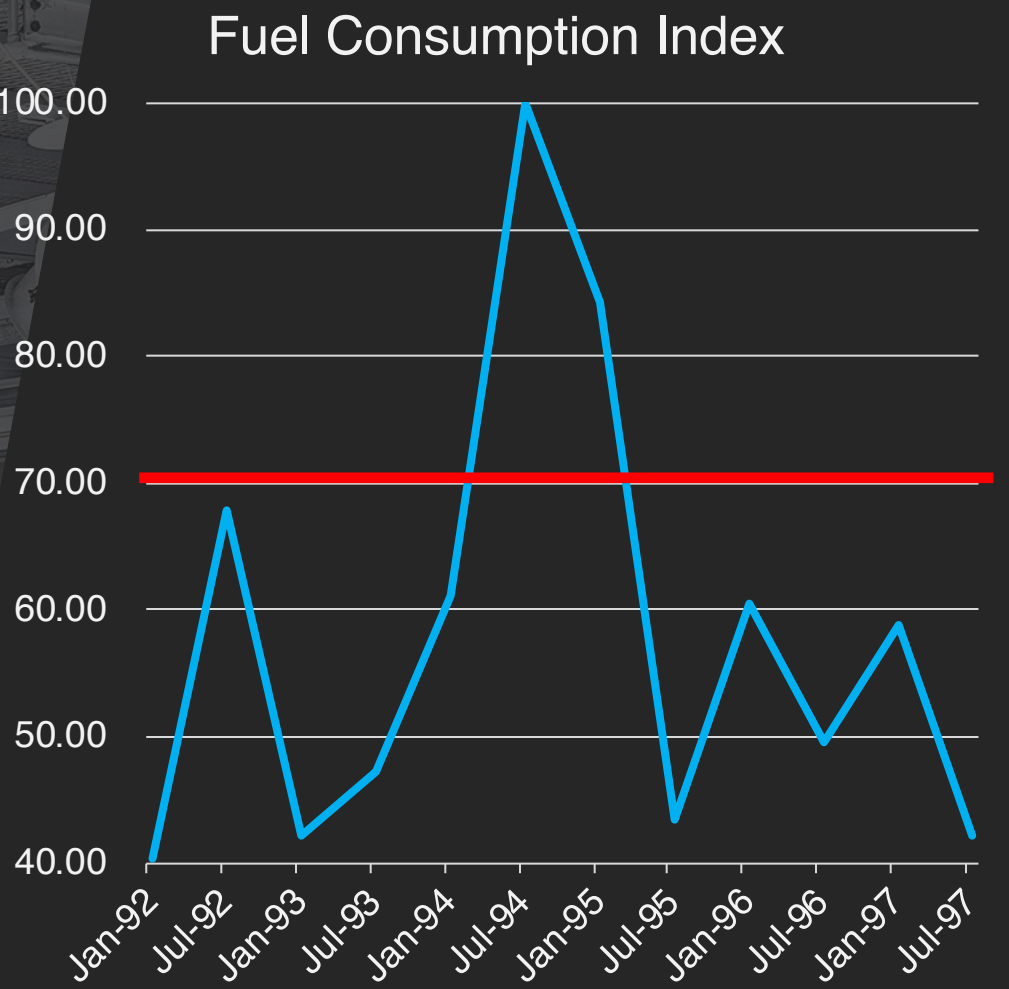
Additional Data Required



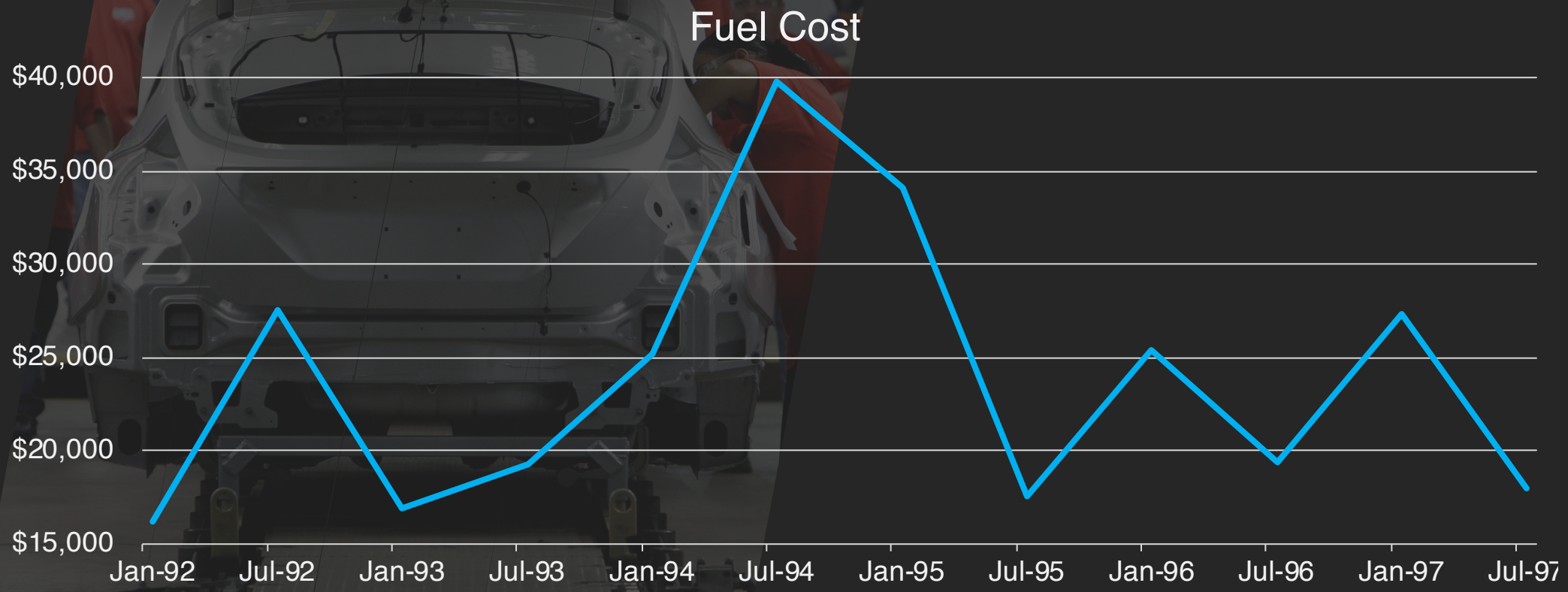
- Utilization of Tug Machines





Potential Problems

- Fuel consumption data may not be available in the plant's database.
- Tug machines may change over time.
- Fuel cost in finance report can be used as a reference but natural gas price changes over time.



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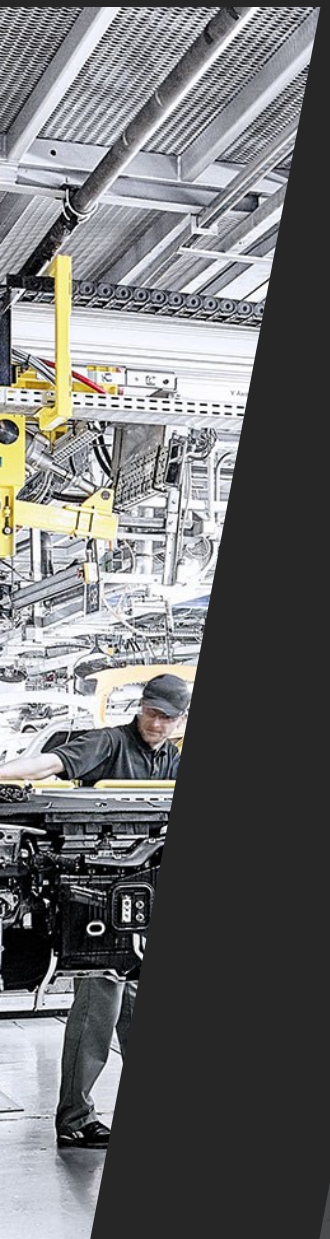

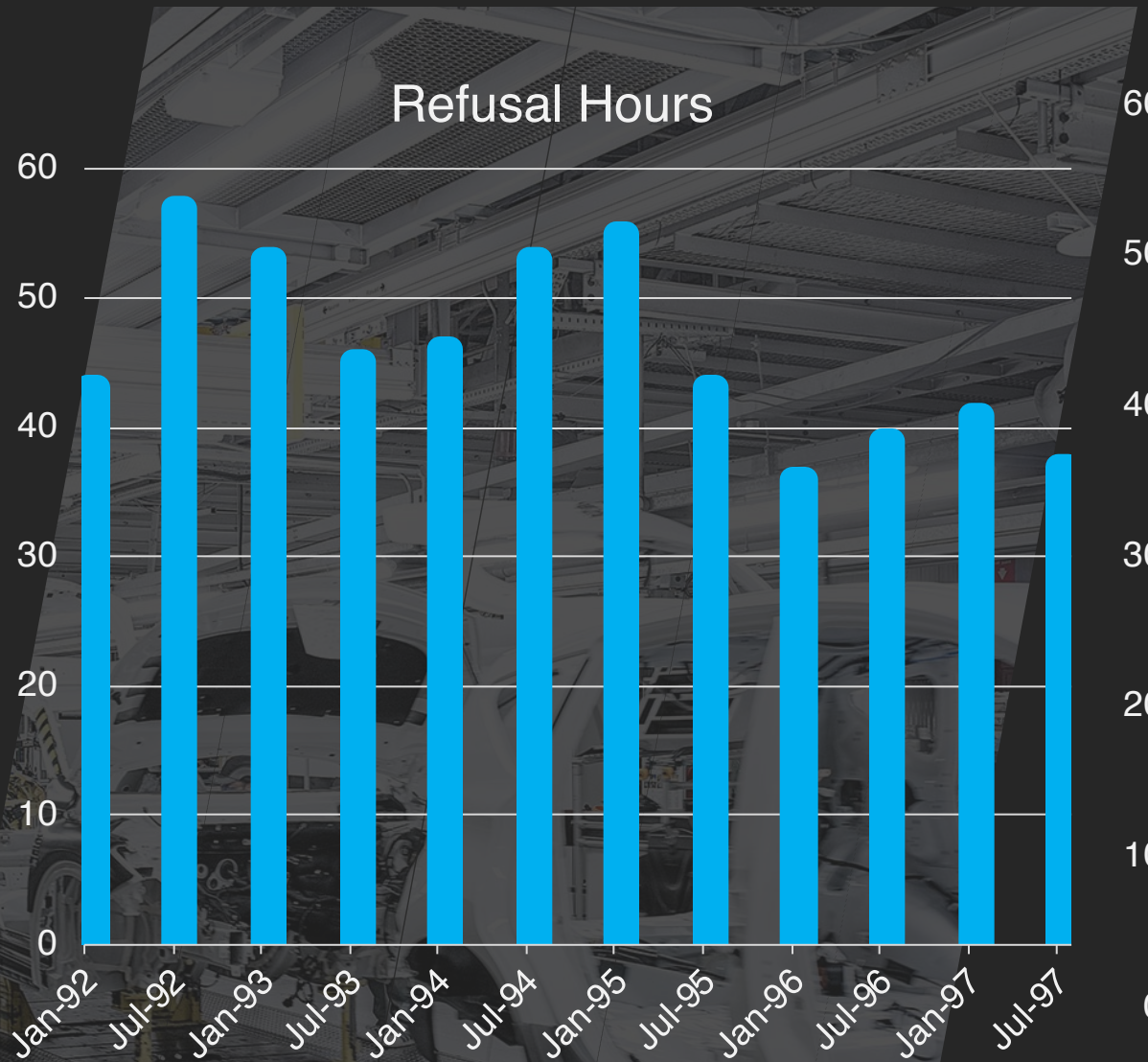

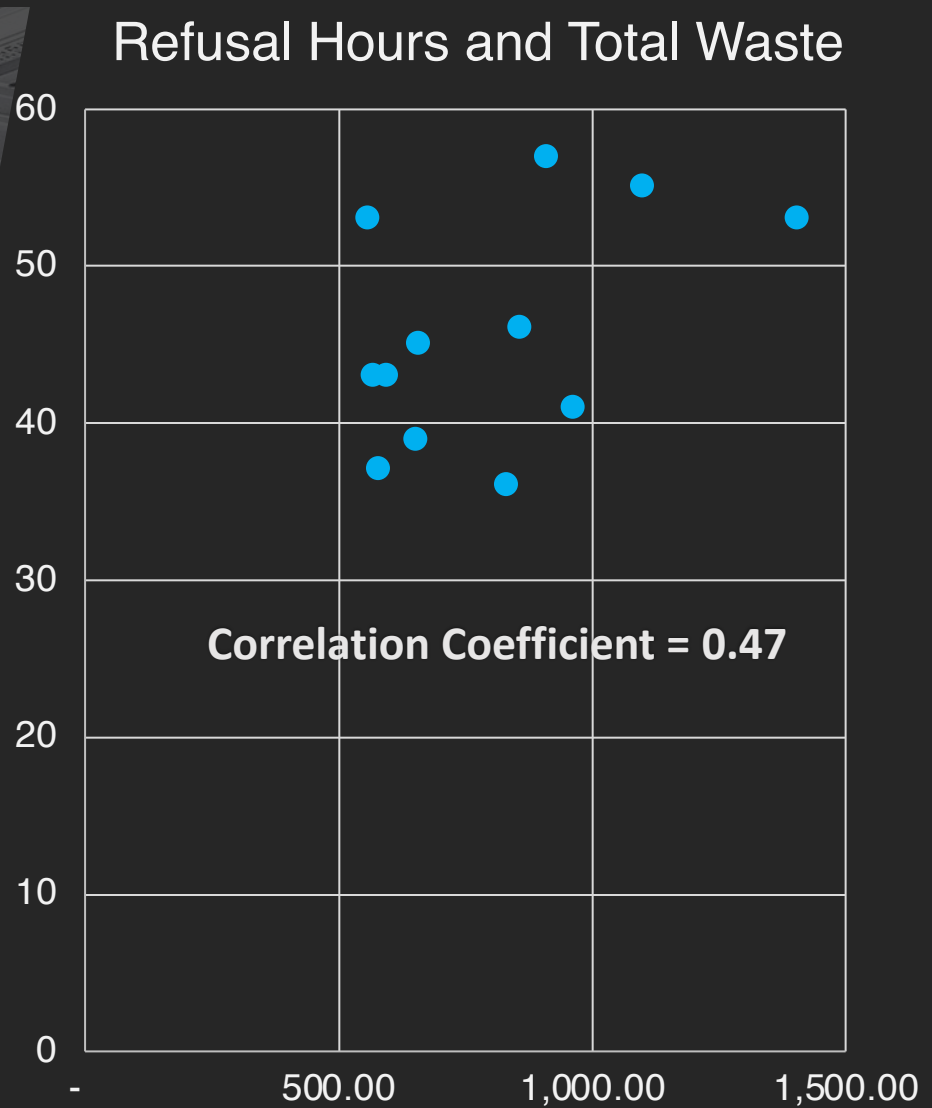

Potential Problems

Data Collecting

- By measuring the running time of assembly lines
- By measuring the energy consumption of assembly lines

Problems

- Refusal Hour data may not be available in the plant’s database.
- Production data can be used as a reference. But production is influenced by different factors.

Thank You

Questions?