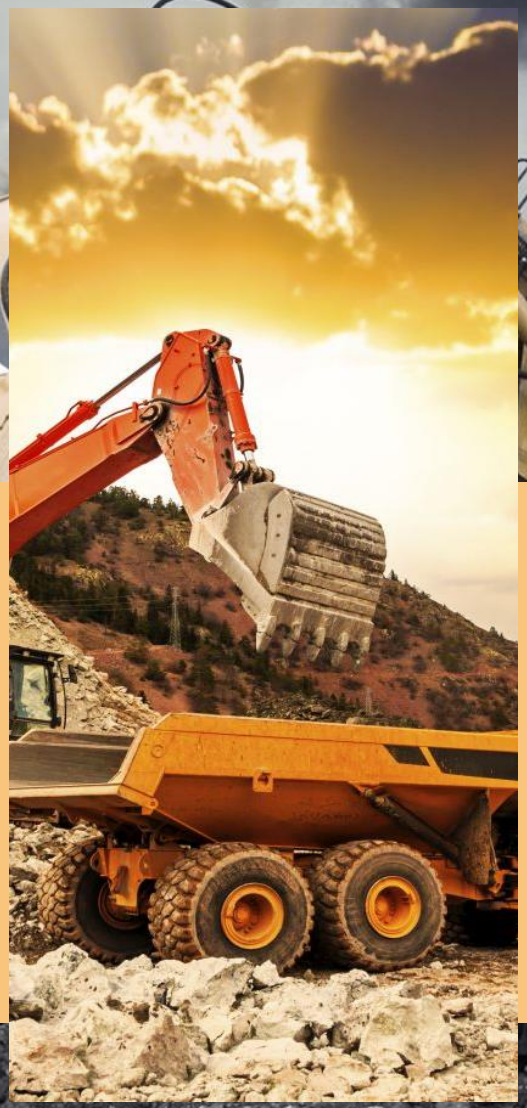


Open Pit Mining House

Supply Chain Analytics Capstone

Contributor:

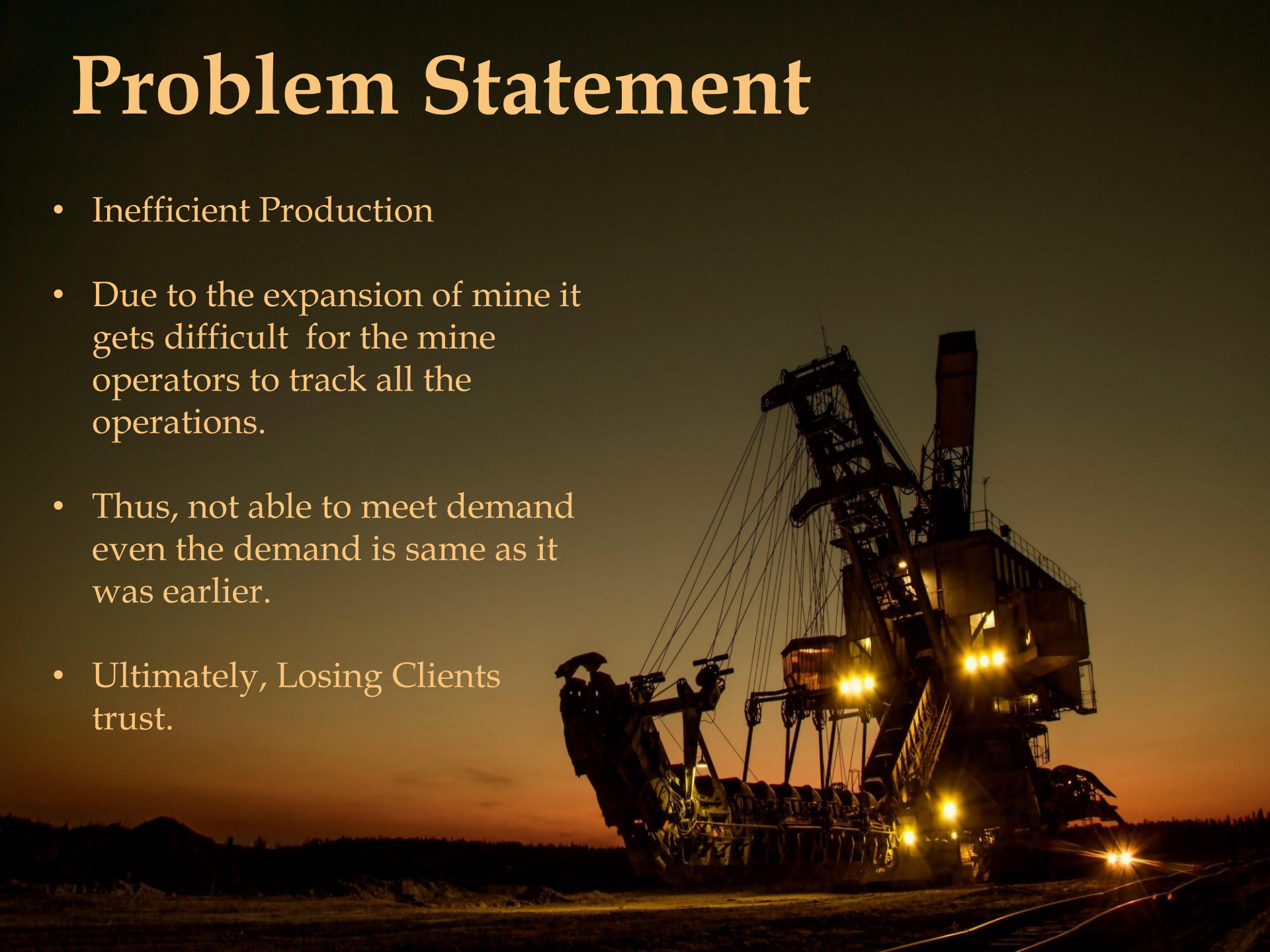
Ashish Arora
Rajeshwar R
Shyam Rajagopal

Agenda

- Problem Statement
- Objective
- Mining Process
- Key Insights
- Recommendations
- Appendix

Problem Statement

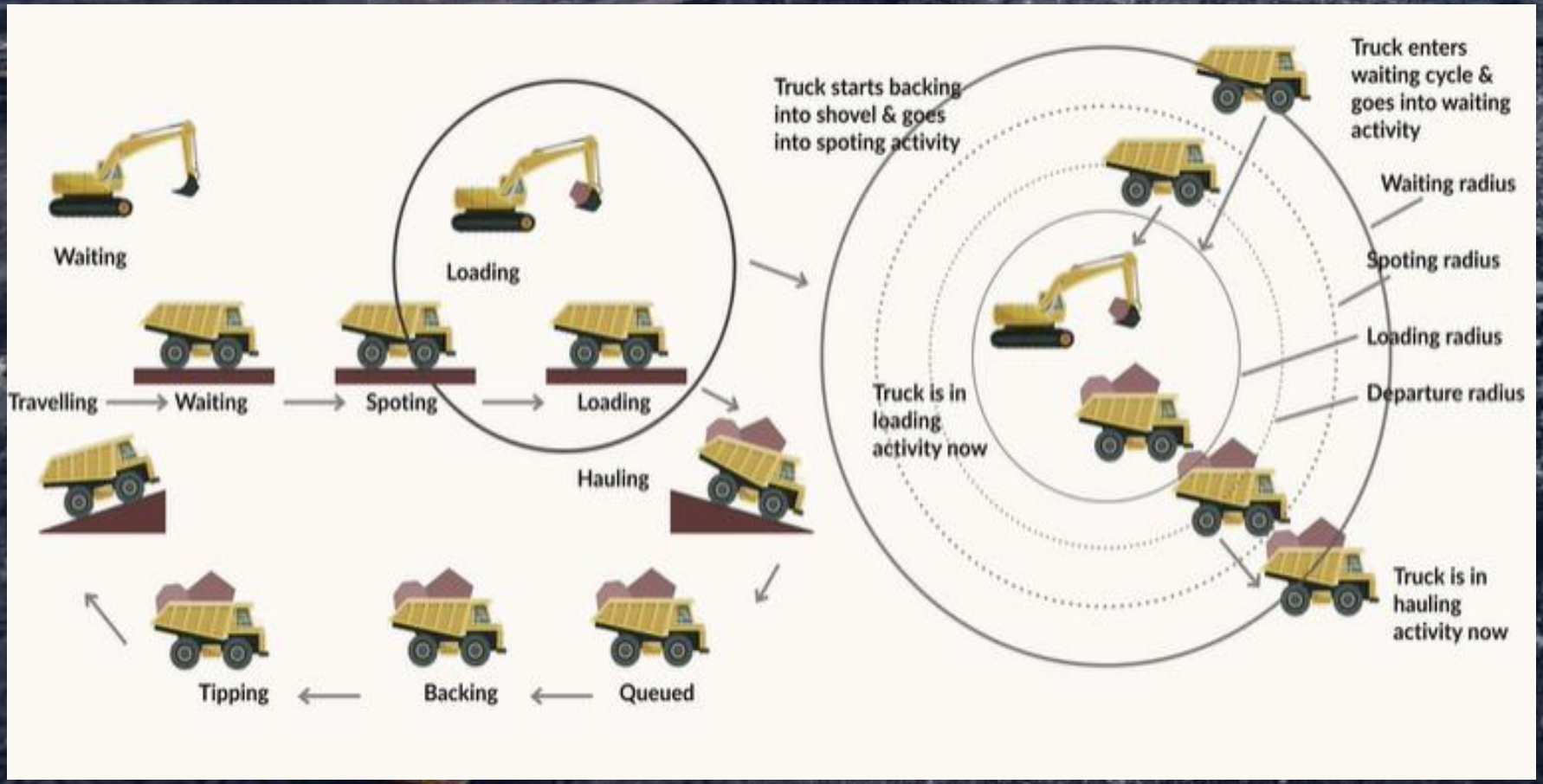
- Inefficient Production
- Due to the expansion of mine it gets difficult for the mine operators to track all the operations.
- Thus, not able to meet demand even the demand is same as it was earlier.
- Ultimately, Losing Clients trust.



OBJECTIVE

- **Build Smart Live monitoring system of mine operations.**
- **Track Trucks Locations**
- **Evaluating Reason for Down Time**

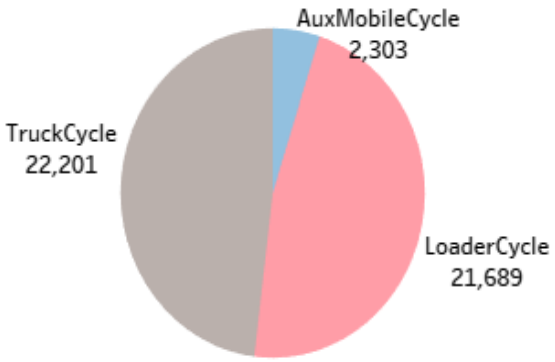
MINING PROCESS



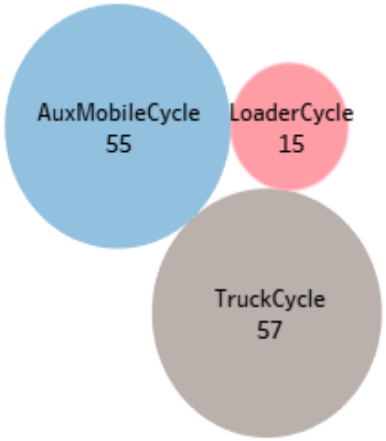
KEY INSIGHTS

Open Pit Minning House: Daily Operations

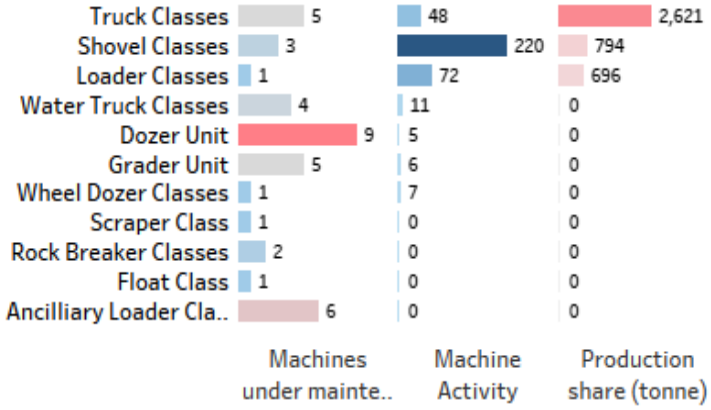
Number of Operations in Each Cycle



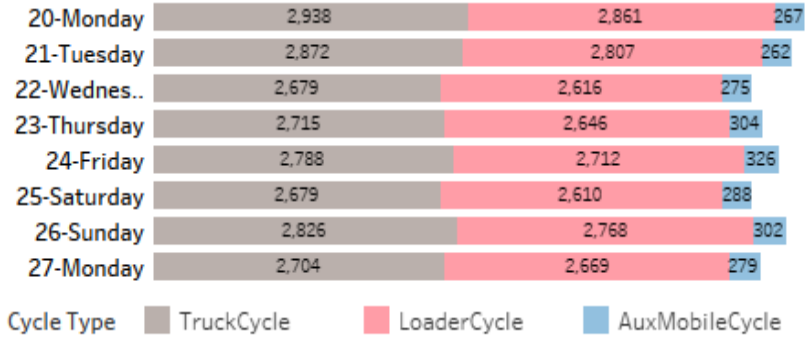
Numbe of Equipments in each cycle



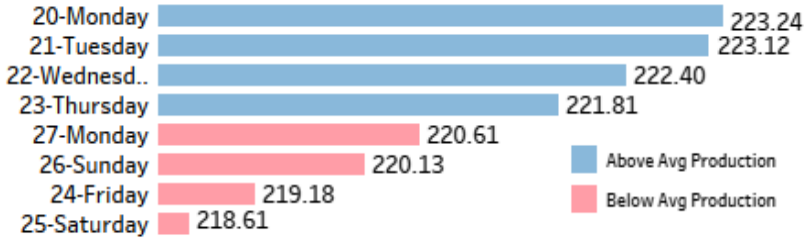
Machines Under Maintenance



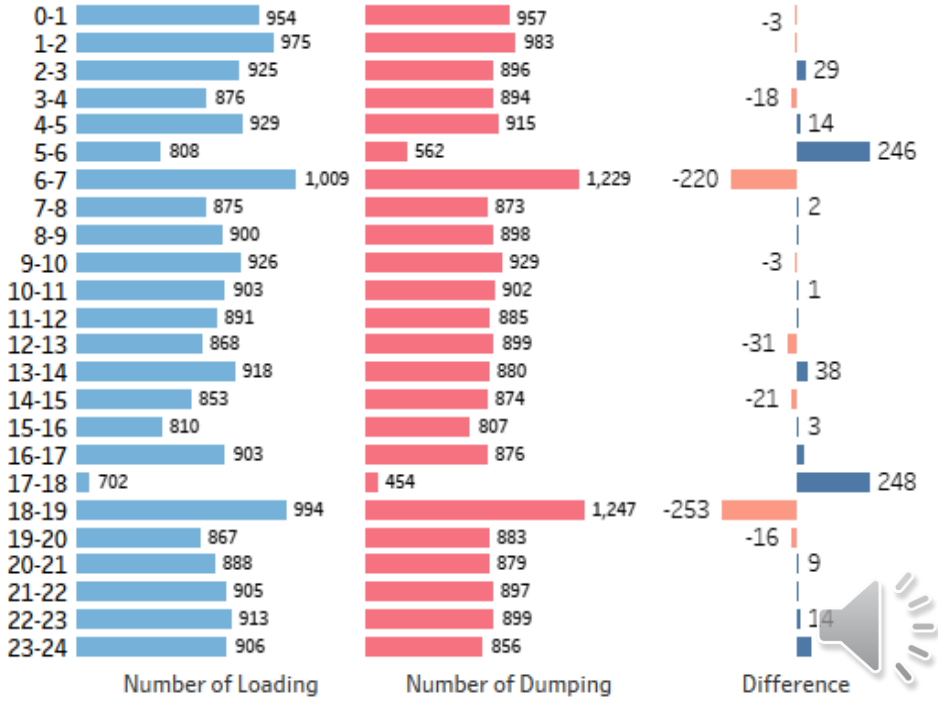
Number of Operations on Each Day



Daily Avg Payload vs Avg Payload (221.2 tonnes)

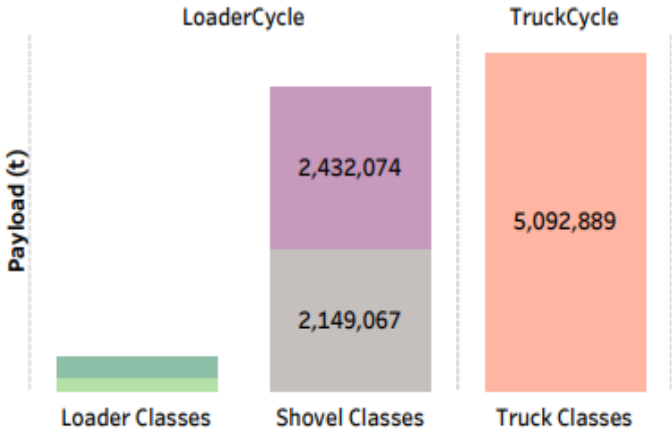


Number of Loading and Dumping in Day Hours

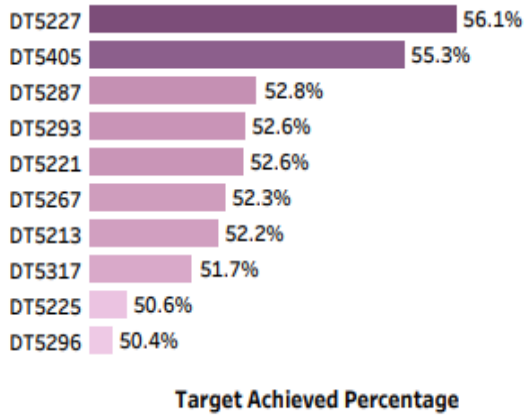


Open Pit Minning House: Production

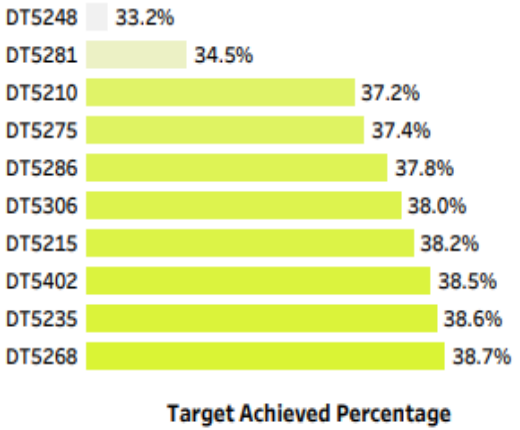
Total Production: Shovel, Loader, and Dumper



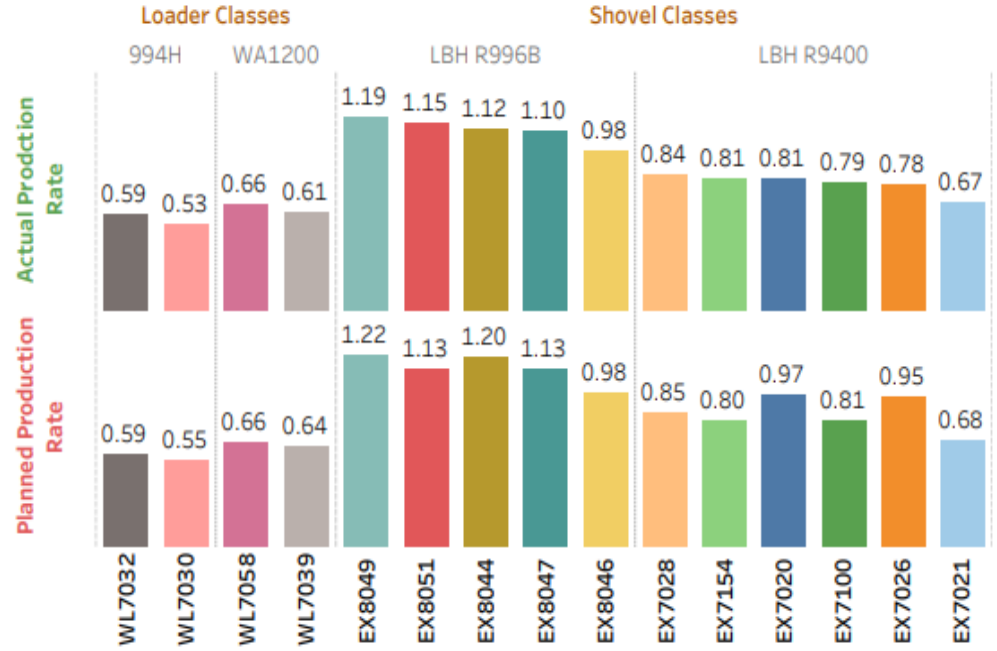
Top 10 Most Favorable Trucks
(Achieving Planned Production Rate)



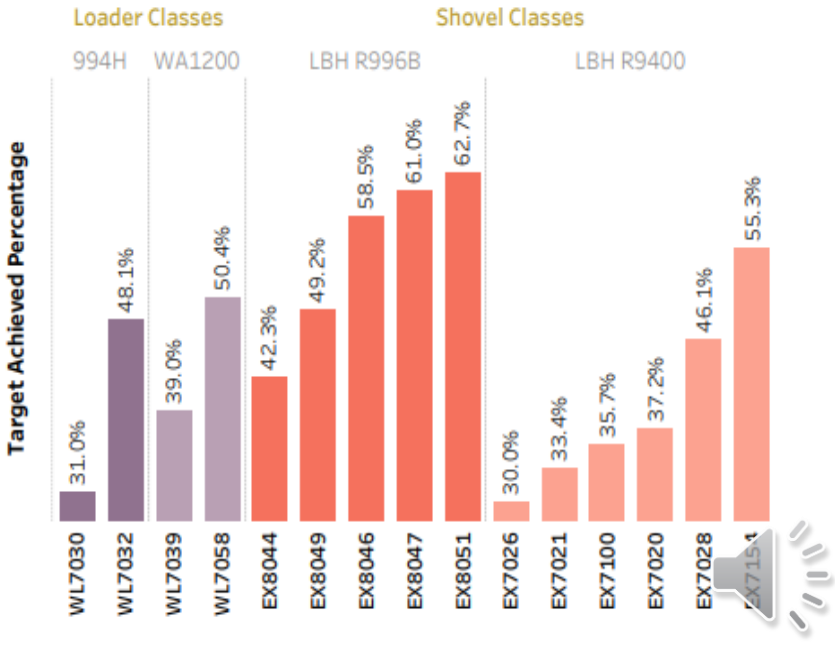
Top 10 Least Probable Trucks
(Achieving Planned Production Rate)



Plan vs Production Rate of Loaders & Shovels

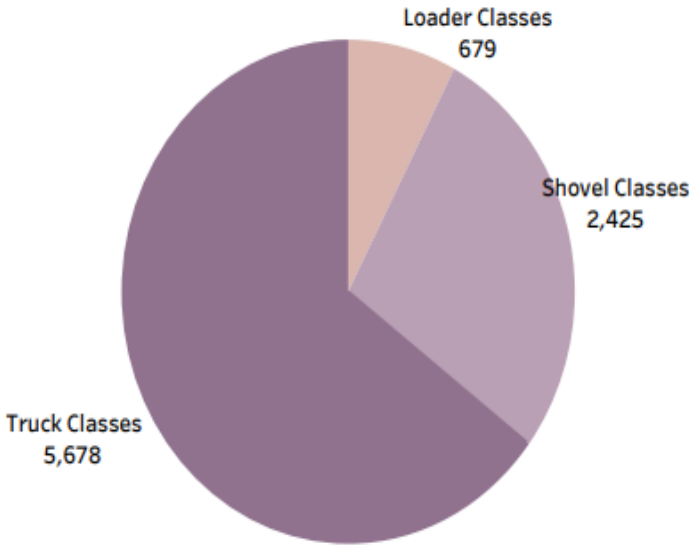


Probability of Shovels Achieving: Planned Production Rate

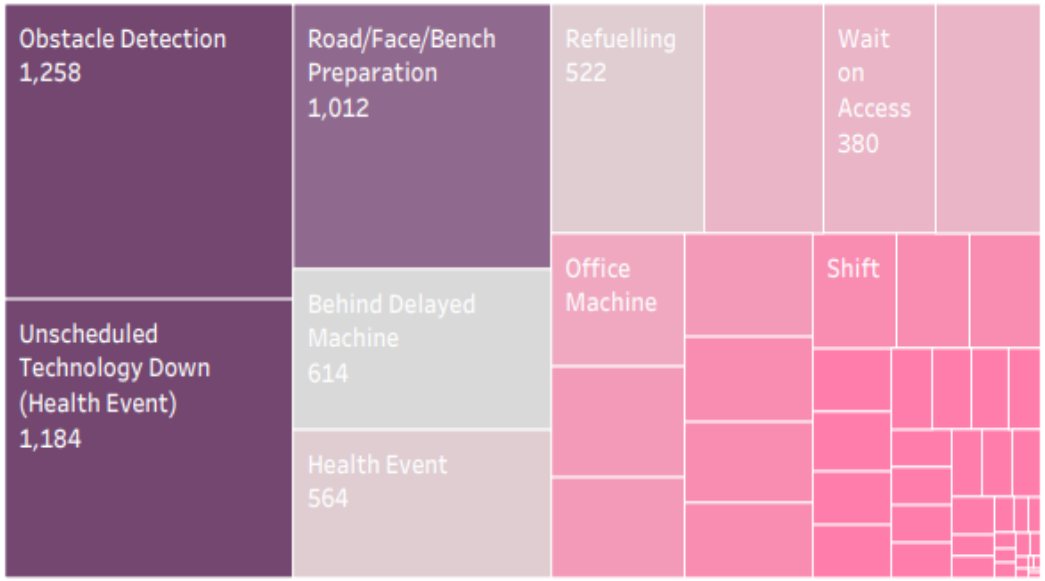


Open Pit Minning House: Down Time

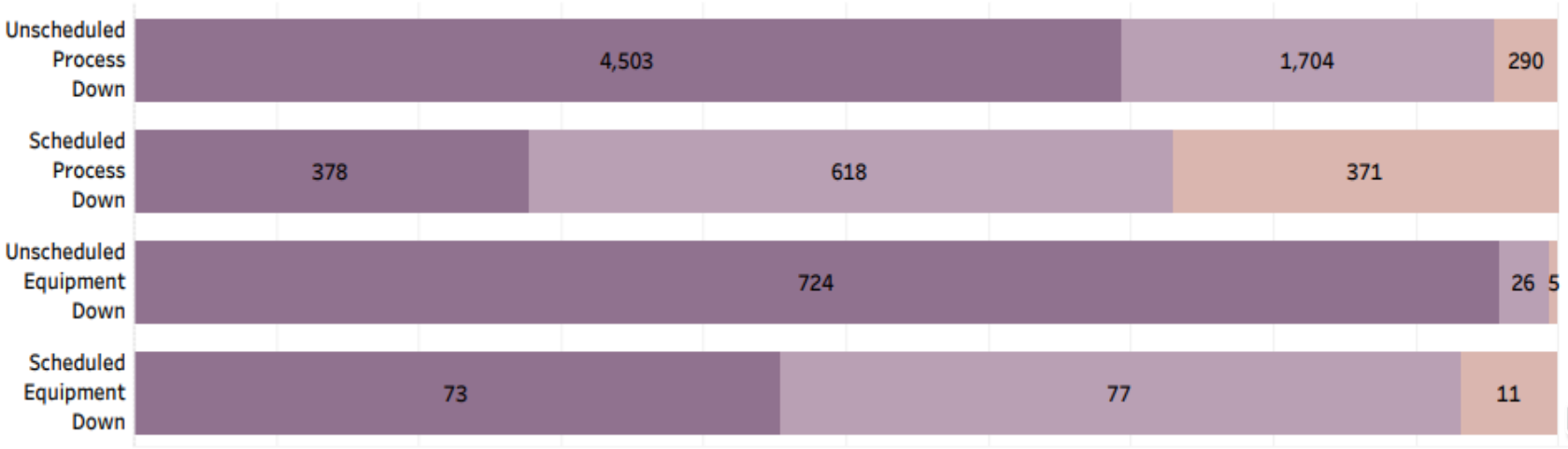
Number of Delays in Each Class



Major Reasons For Down Time

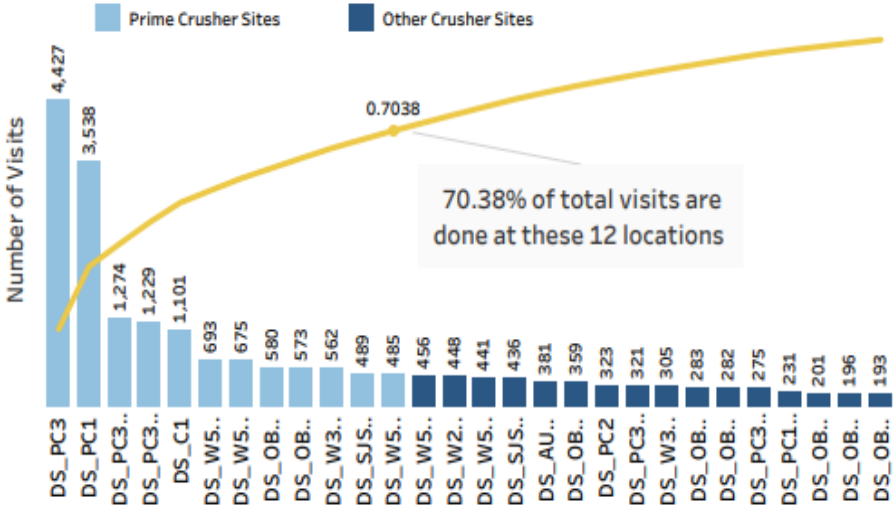


Process Down Time Vs Equipment Level Down Time in each class.

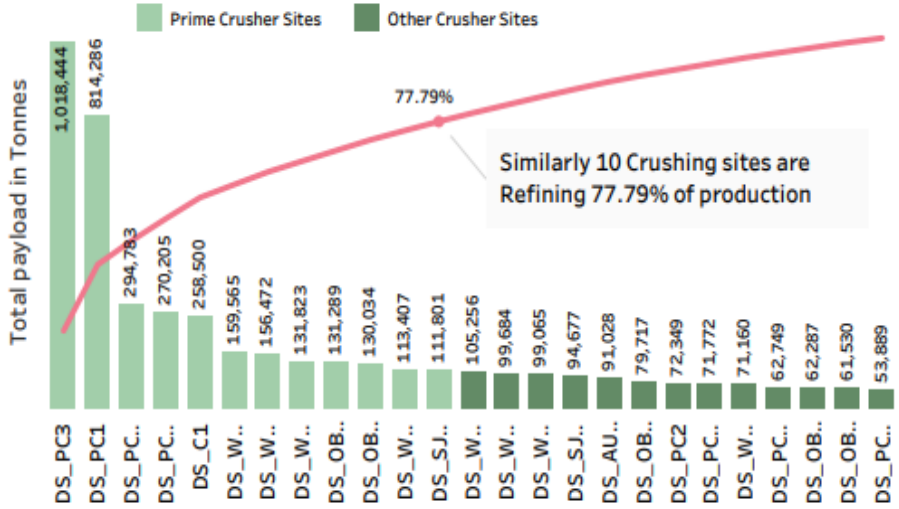


Open Pit Minning House: Crusher Site

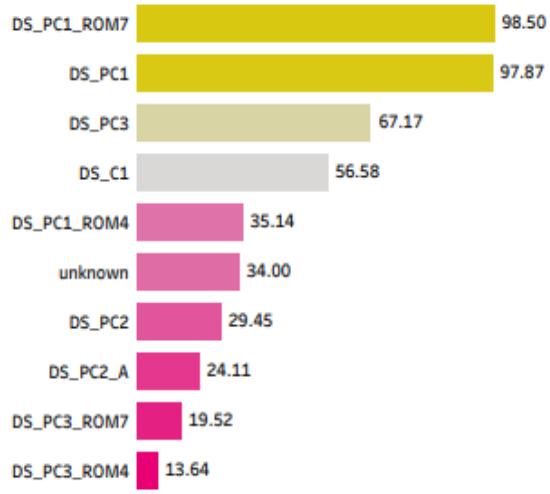
Number of Trucks visits at Crusher Site



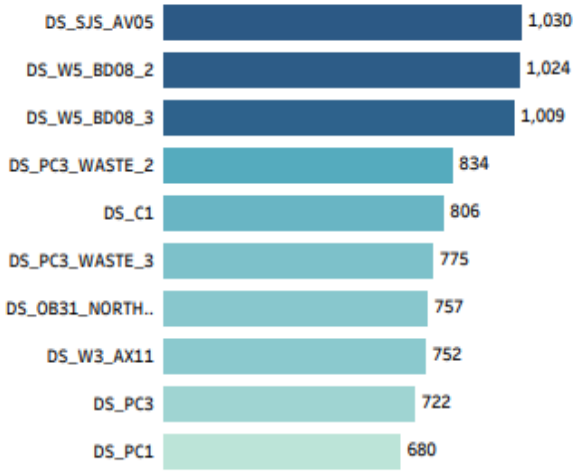
Total Payload at Each Crusher Site



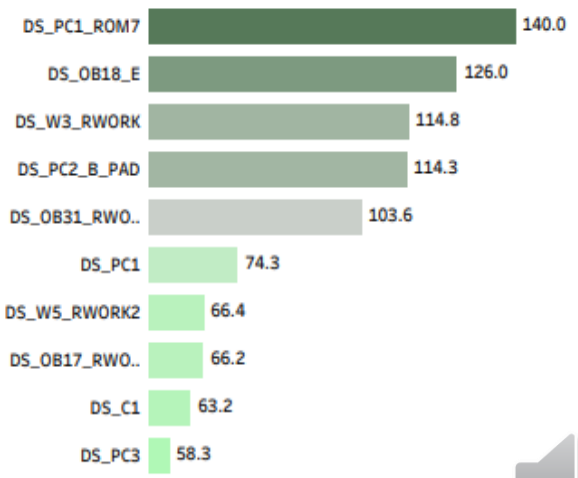
Top 10 Crusher Sites where Average Wait Time is High.



Top 10 Crusher Sites where travel time of Trucks is High.



Top 10 Crusher Sites where Avg Queue Time is High

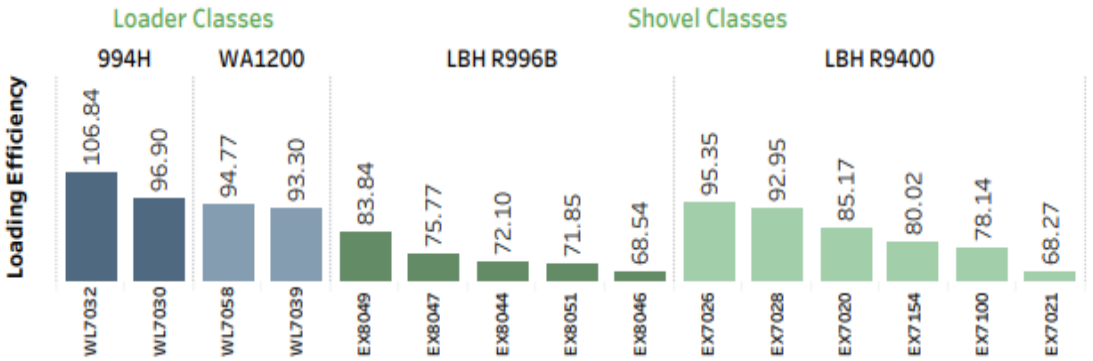


Open Pit Minning House: Shovels and Loaders Efficiency

Avg Cycle Duration for Machine Class

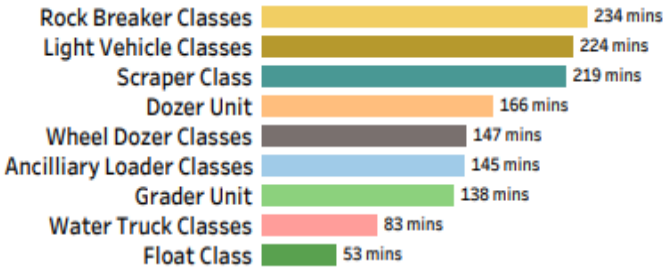
(Loader & Truck Cycle)

Shovel and Loaders: Loading Efficiency

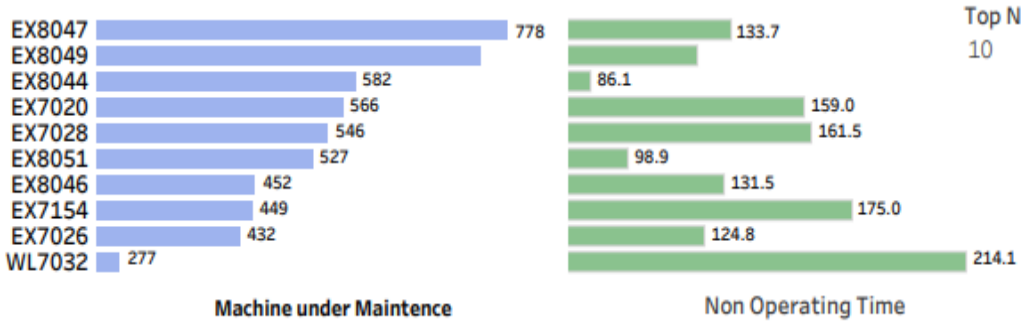


Avg Cycle Duration for Machine Class

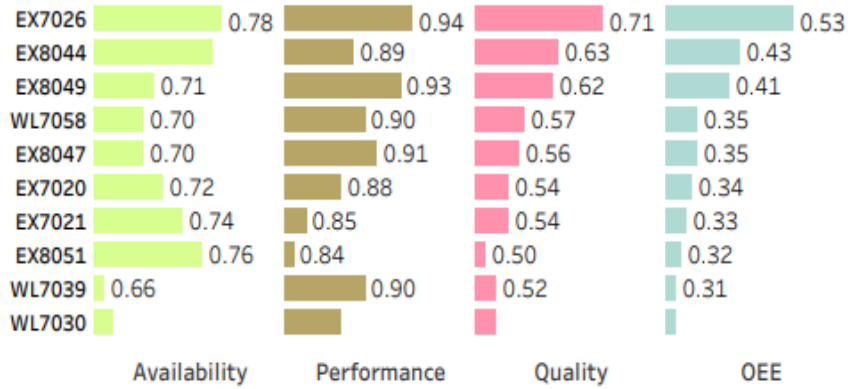
(AuxMobile Cycle)



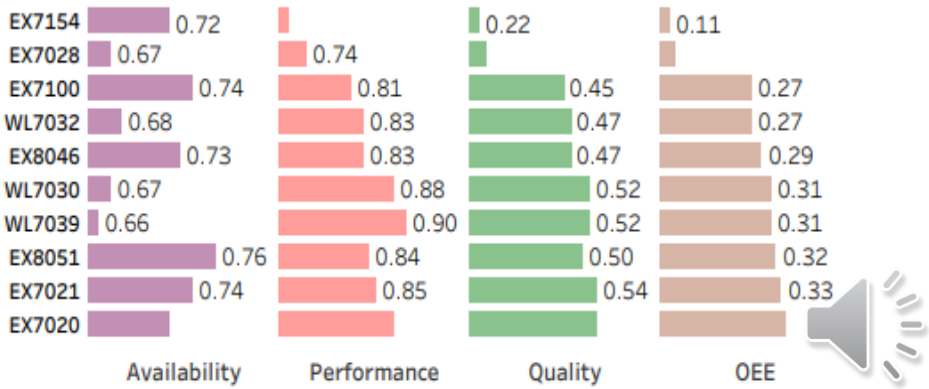
Top 10 Loaders and Excavators at Risk: Avg Down Time Duration and Frequency



Top 10 Shovel or Loaders: Availability, Performance, Quality & OEE



Bottom 10 Shovel & Loader: Availability, Performance, Quality, & OEE

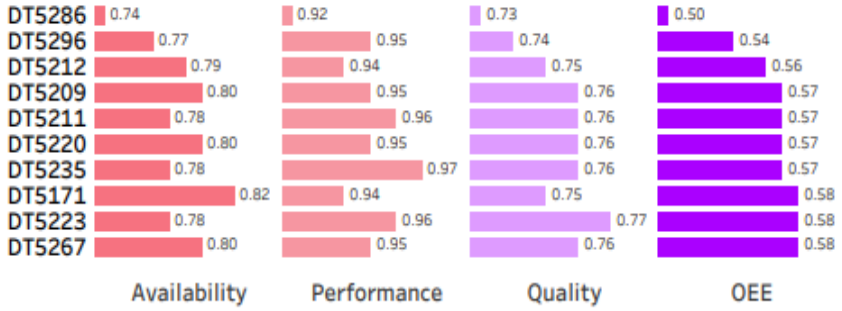


Open Pit Minning House: Truck Efficiency

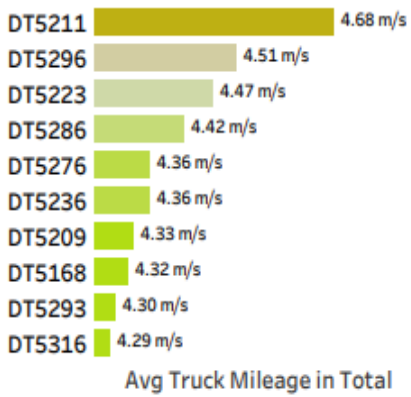
Top N
10

Top 10 Trucks: Availability, Performance, Quality and OEE

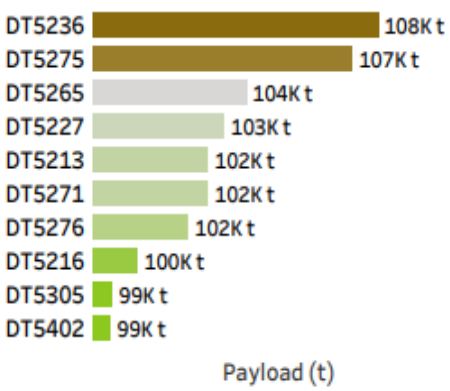
Bottom 10 Truck: Availability, Performance, Quality, & OEE



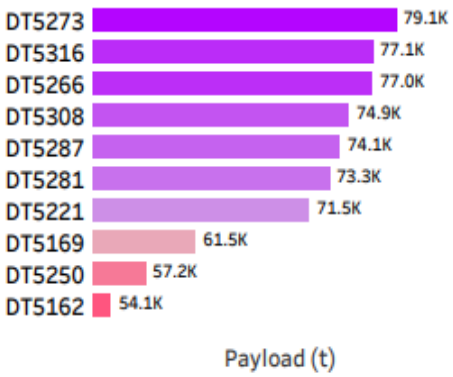
Top 10 Trucks: Best Mileage



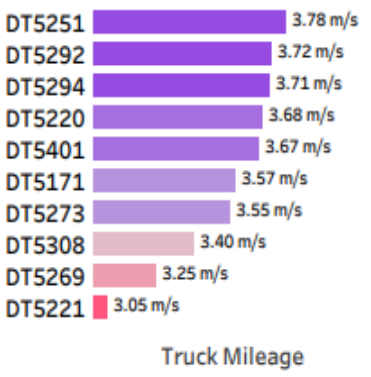
Top 10 Trucks: Total Payload



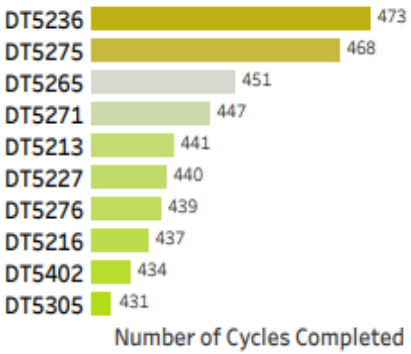
Bottom 10 Trucks: Total Payload



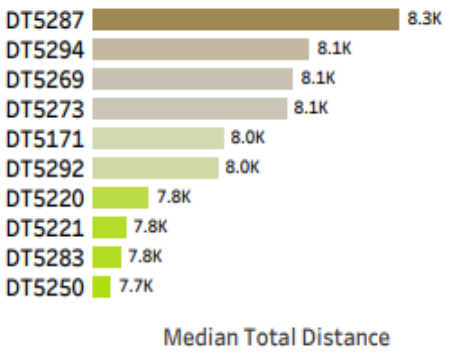
Bottom 10 Trucks: Mileage



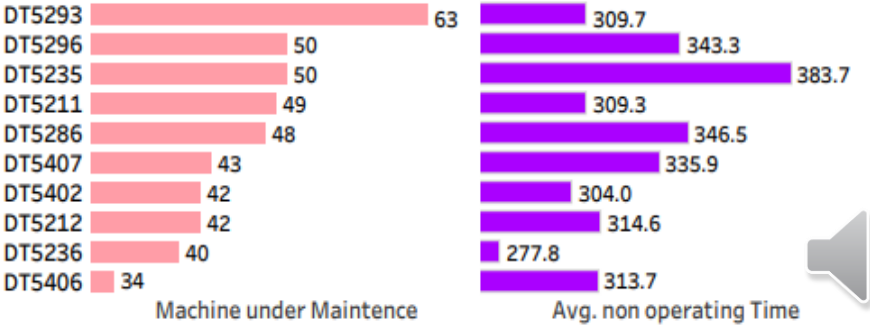
Top 10 Trucks: Cycle Completion



Top 10 Trucks: Avg Distance



Top 10 Trucks at Risk: Avg Down Time Duration and Frequency



Recommendations:

- Trucks with least probability to achieve planned production rate should be closely monitored.
- Obstacles or Road construction should be minimized or special machines should be brought up which can fasten this process and ultimately minimizes the down time.
- Few crusher sites have large wait time because of high visits of truck on those sites for dumping. Hence trucks with load should be spread out to other dumping sites having less operations pressure.
- For both morning and evening hours between 5-7, there is a huge gap between the dumping and loading operations, this difference should be minimized.
- Number of shovels are less in production, the company can look for buying few of them. This may increase the production.
- Equipments in each cycle with overall low efficiency, should be monitored closely and reasons of their time down time should be thoroughly analyzed.

Appendix

Data Assumptions:

- Fuel used and TMPH are considered as transformed values and product of them will give the total fuel consumption.
- Twice of Empty travel distance and travel inclined distance is considered as total distance of a truck cycle.
- Less analysis is done on AuxMobile Cycle and prime focus is done on Truck Cycles and Loading Cycles
- For finding the machine under maintenance, we assume machine which operates than or equal to 60% of it total available time are machine under maintenance.

Tools Used:

- Python: For Data Cleaning, Data Preparation and Quick analysis.
- MySQL: For Data Analysis, Data storing and Query folding for stored Procedures.
- Tableau: For Creating Live Interactive Dashboards


Thank You!