

Global Automotive Seating Company



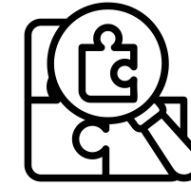
BDA03 Group 5

Background



- Major supplier of seating systems for automobiles across the world with 200+ seat manufacturing plants in 30+ countries.
- 25 million cars equipped annually.

Business Objectives



- Incorporate real time diagnostics of plant operational process to better manage available production lines and increase profit margin.
- Use data and analytics to track production process of various machines in real time to provide better visibility of the seat manufacturing process.

Business Problem



- The automotive seating manufacturing company profits has been declining over time because of the steep increase in plants operating costs
- Lack of visibility in the production process such as machine downtime, products defect rate, etc. is leading to ineffective operational process in turn increasing costs.

Analytics Objectives



Build an analytics dashboard to track plant's operational process i.e., downtime minutes, total machine utilization time, etc.

How Might We

How might we provide clarity of the company's overall plant's operational performance and cost to better manage production and increase the profits.

Observations



Machine Utilisation

- 1) Machine utilisation is generally increasing over the 5 days, reaching highest at 80.81% on 22 June 2018.
- 2) Average machine utilisation is at 79.38%.

Right First Time, Scrap Rate, Rework Rate

- 1) Average RightFirstTime for 5 days is at 97.65%.
- 2) Average scrap rate is at 0.33% and average rework rate is at 2.02%.
- 3) Line ID 3 and Team ID 2 had comparatively higher rework and scrap rate for all production dates.

Downtime and Sum of Production

- 1) A total of 170,265 pieces are produced in 5 days.
- 2) Total downtime across all dates is 497.75 minutes.
- 3) Highest daily production occurred on 21 June 2018 while lowest daily production occurred on 22 June 2018. Highest daily downtime happened on 19 June 2018.

Correlation

- 1) Moderate correlation of 0.66 noted between ProductionFBE and ScrapFBE.
- 2) Very strong correlation of 0.93 noted between ProductionFBE and ReworkFBE.

Recommendations



Recommendation #1

Highest machine utilisation coincide with lowest production pieces on 22 June. This is a cause for concern, as productive capacity of machines is not used to produce production pieces. This warrants further investigation.

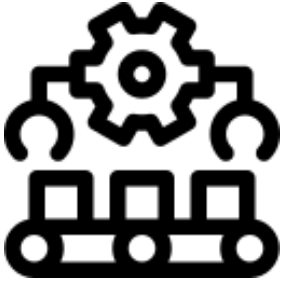
Recommendation #2

Among all the failure to achieve Right First-time production, 85% of error is due to need for rework. Such machines producing error pieces requiring rework should be diagnosed and addressed.

Recommendation #3

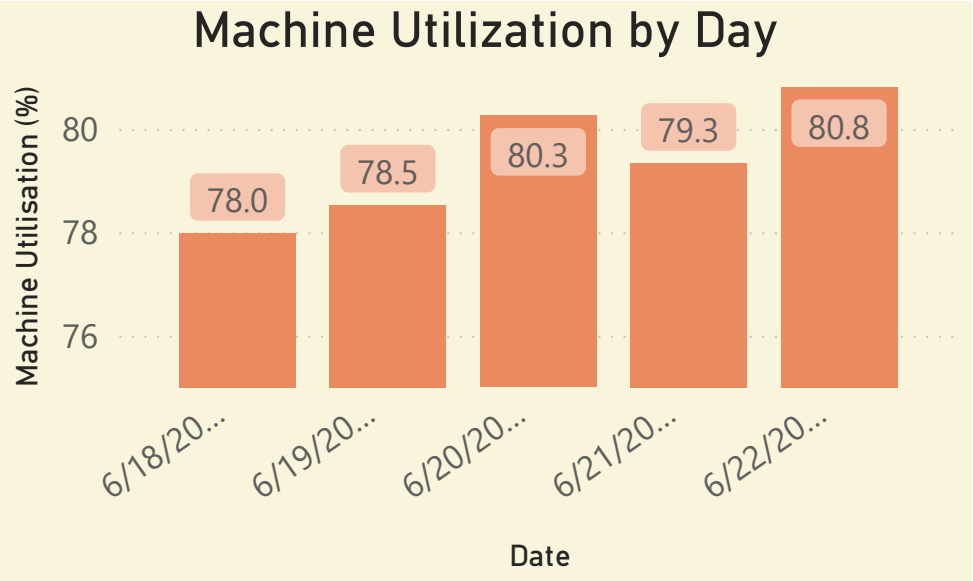
Higher positive correlation between production-rework pair compared to production -scrap pair correspond to much higher rework rate than scrap rate observed over the 5 days.

Machine Utilization



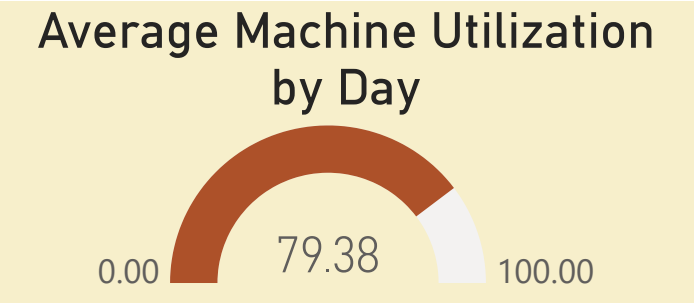
Average Machine Utilization over the period of time

TeamID	1	2	3	SubTotals
1	80.47	77.33	81.05	79.61
2	81.66	79.18	78.54	79.79
3	81.07	77.84	77.32	78.74
SubTotals	81.06	78.12	78.97	79.38



Machine Utilization = (ProductionFBE - ScrapFBE)/ProductionFBTheoretical

- Feature Engineering done to fill up missing ProductionFBTheoretical values (Annex1).
- Feature Engineering done using Python to observe patterns.



Date

6/18/2018

6/19/2018

6/20/2018

6/21/2018

6/22/2018

LineID

1

2

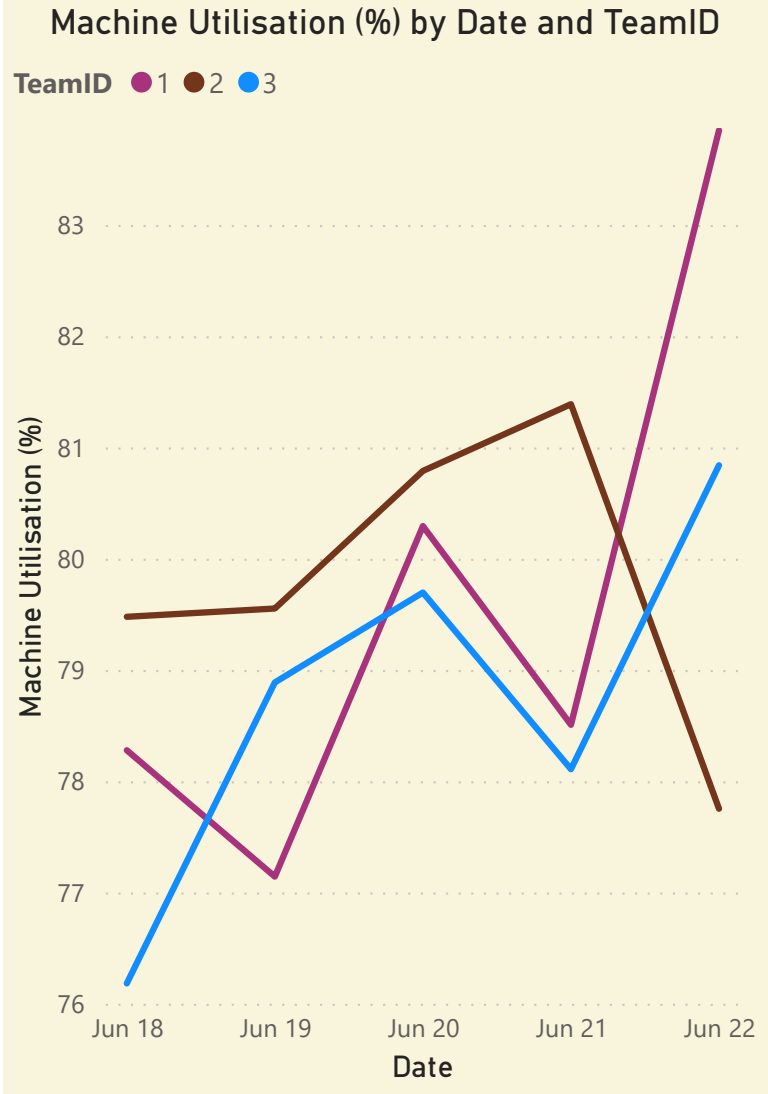
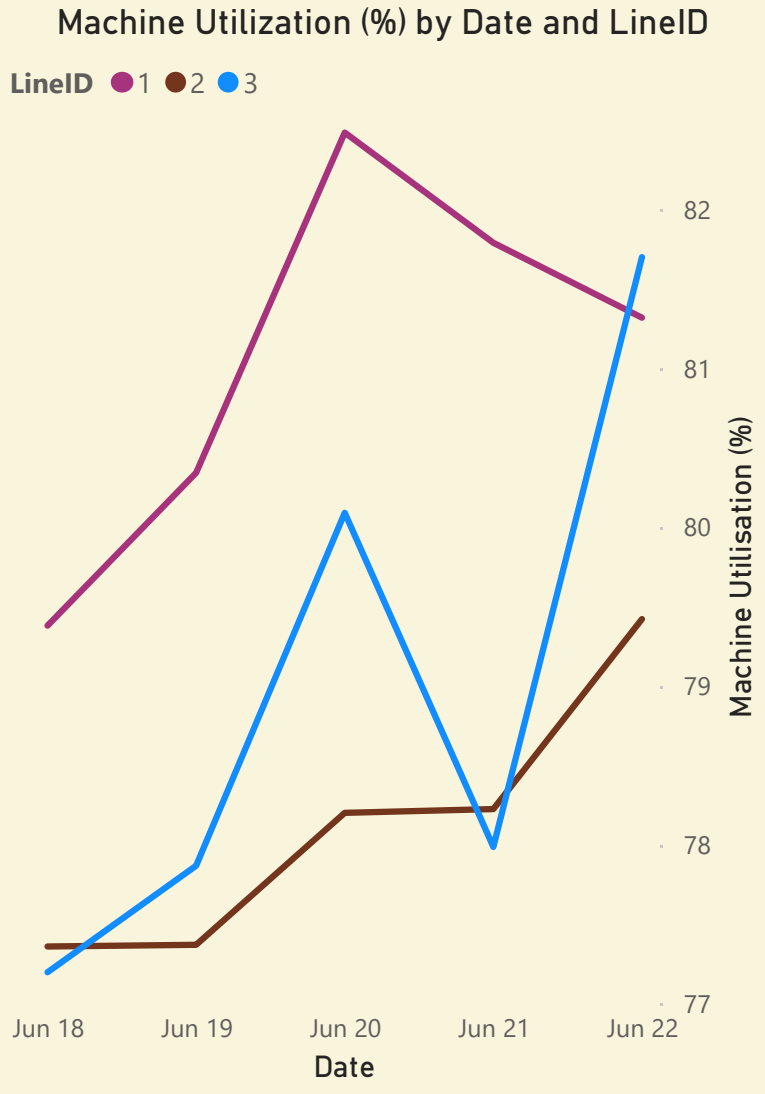
3

TeamID

1

2

3



Right First Time, Scrap Rate & Rework Rate



Date

- 6/18/2018
- 6/19/2018
- 6/20/2018
- 6/21/2018
- 6/22/2018

LineID

- 1
- 2
- 3

TeamID

- 1
- 2
- 3

Average Right First Time



Average Scrap Rate

0.33

Scrap Rate (%)

Average Rework Rate

2.02

Average of Rework Rate (%)

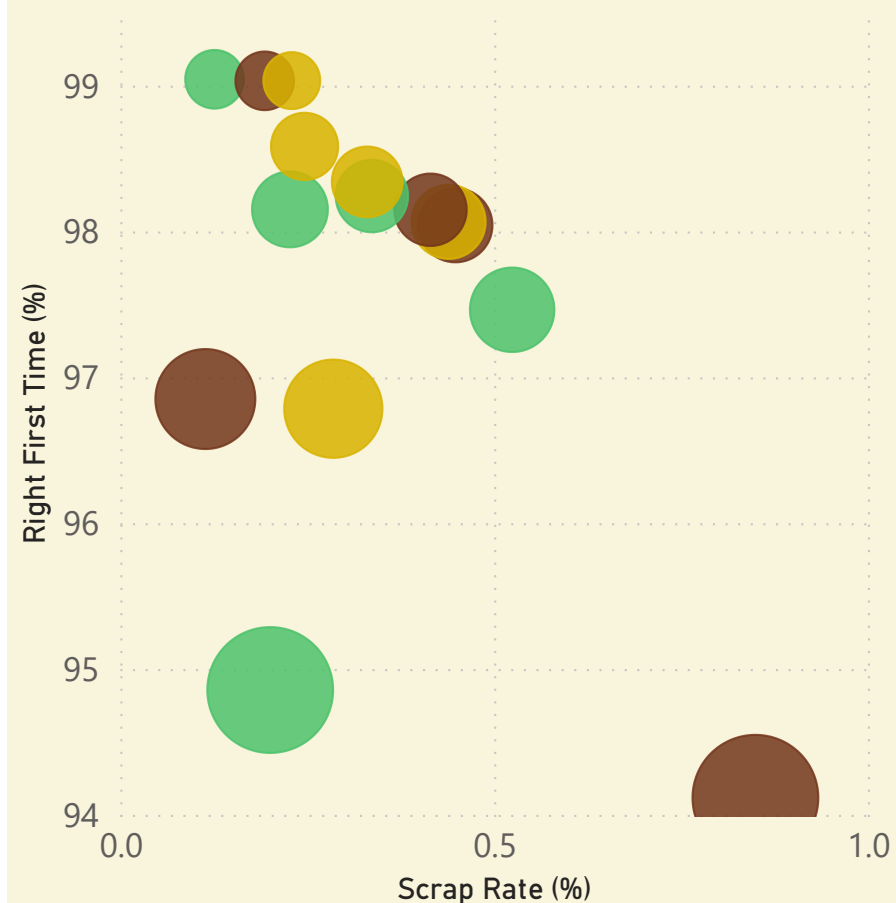
Right First Time = (ProductionFBE - ScrapFBE - ReworkFBE) / ProductionFBE

Scrap Rate = Scrap/ProductionFBE

Rework Rate = Rework/ProductionFBE

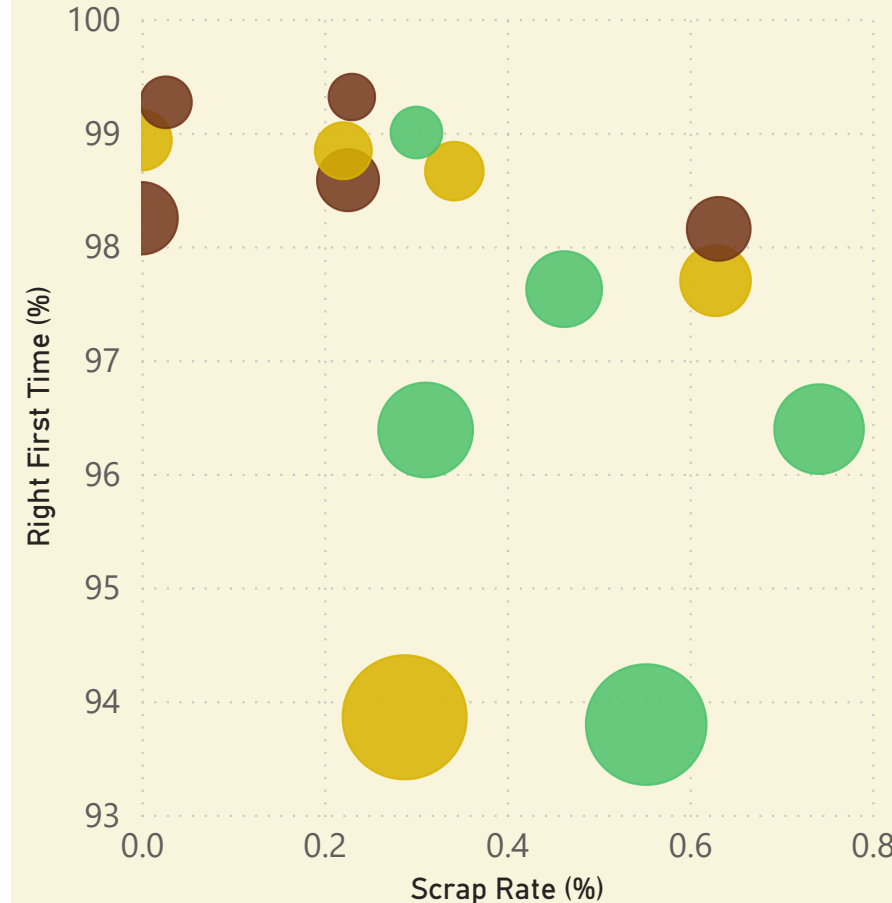
Relationship between KPIs for LineID

LineID 1 2 3

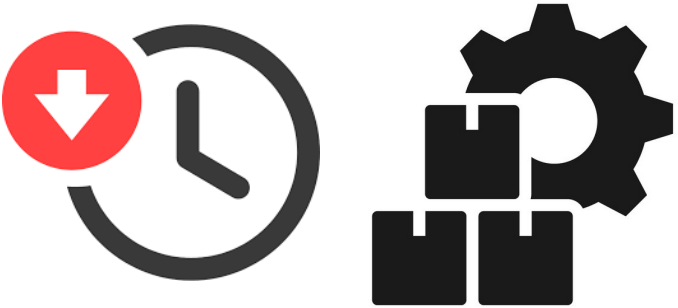


Relationship between KPIs for TeamID

TeamID 1 2 3



Total Downtime & Production



Date

- 6/18/2018
- 6/19/2018
- 6/20/2018
- 6/21/2018
- 6/22/2018

LineID

- 1
- 2
- 3

TeamID

- 1
- 2
- 3

170.27K

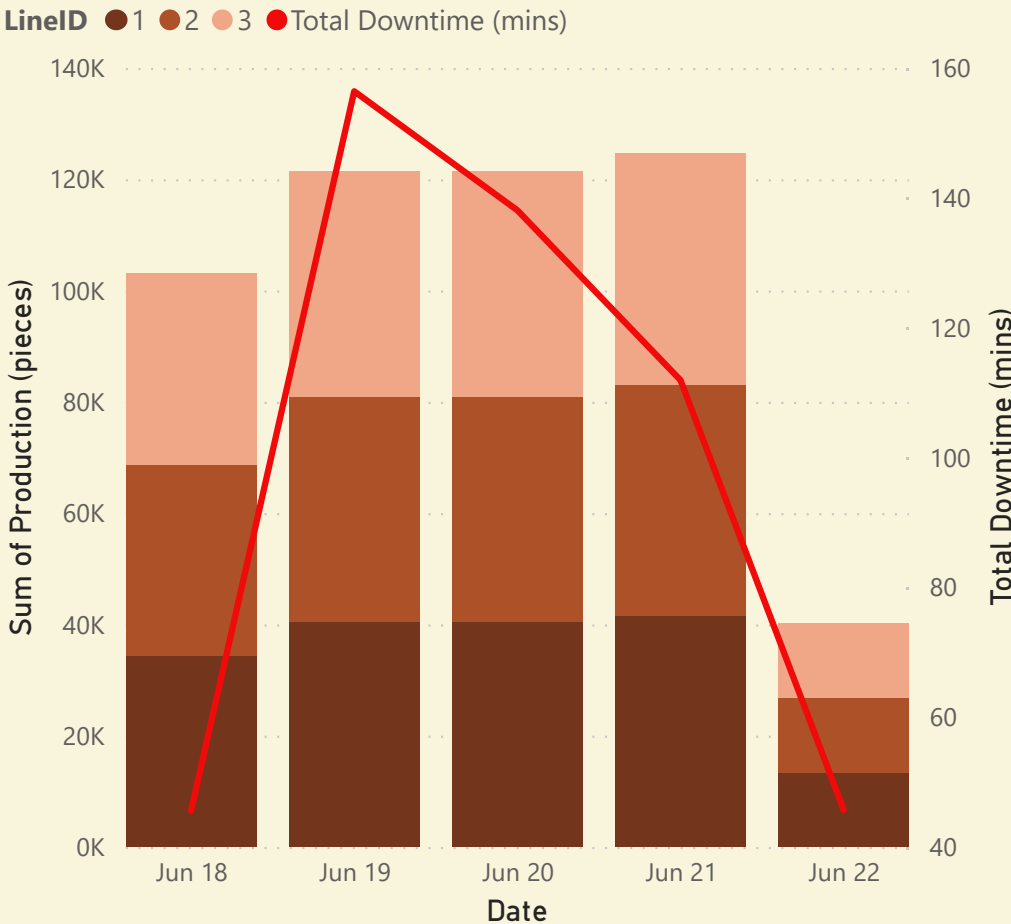
Sum of Production (pieces)

497.75

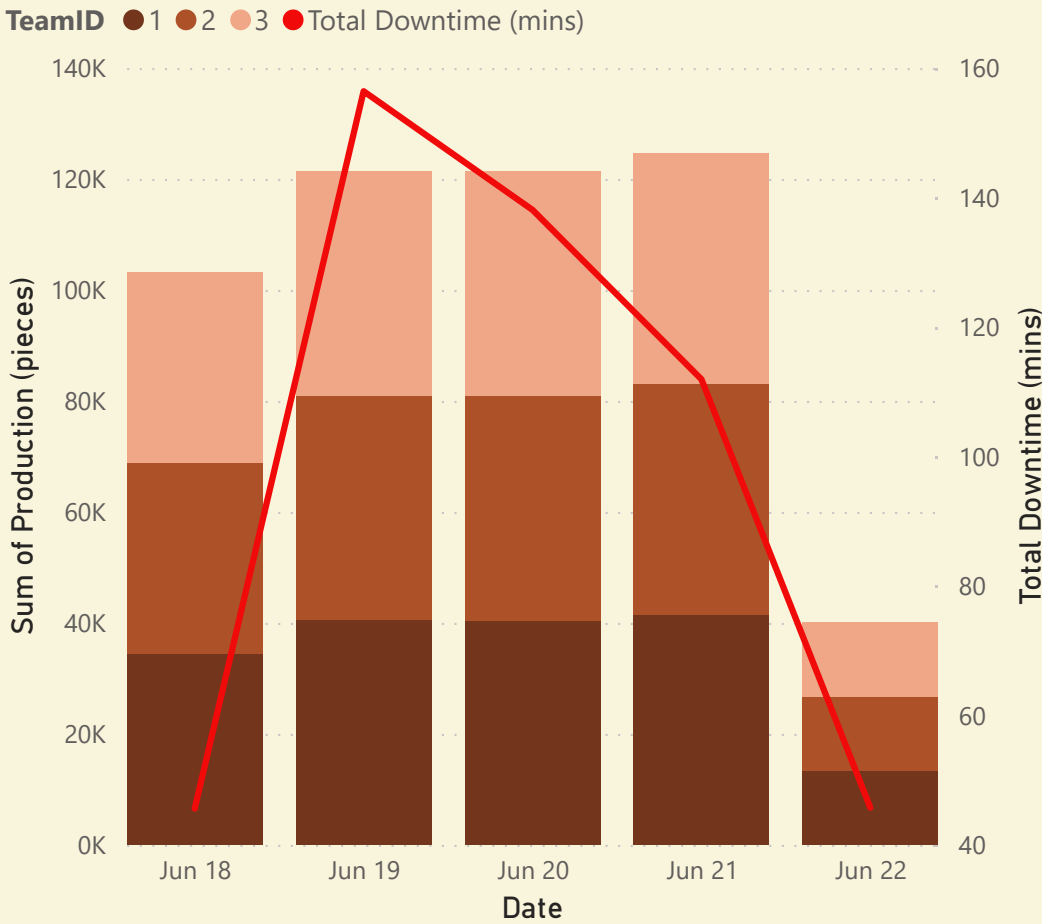
Total Downtime (mins)

Downtime = Sum of downtime
Production pieces = Sum of items produced

Production (pieces) & Downtime (mins) by LineID



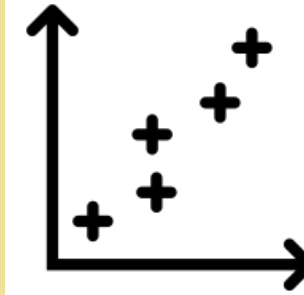
Production (pieces) & Downtime (mins) by TeamID



Correlation Coefficient

(a) Total Production vs Scrap pieces produced

(b) Total Production vs Rework pieces



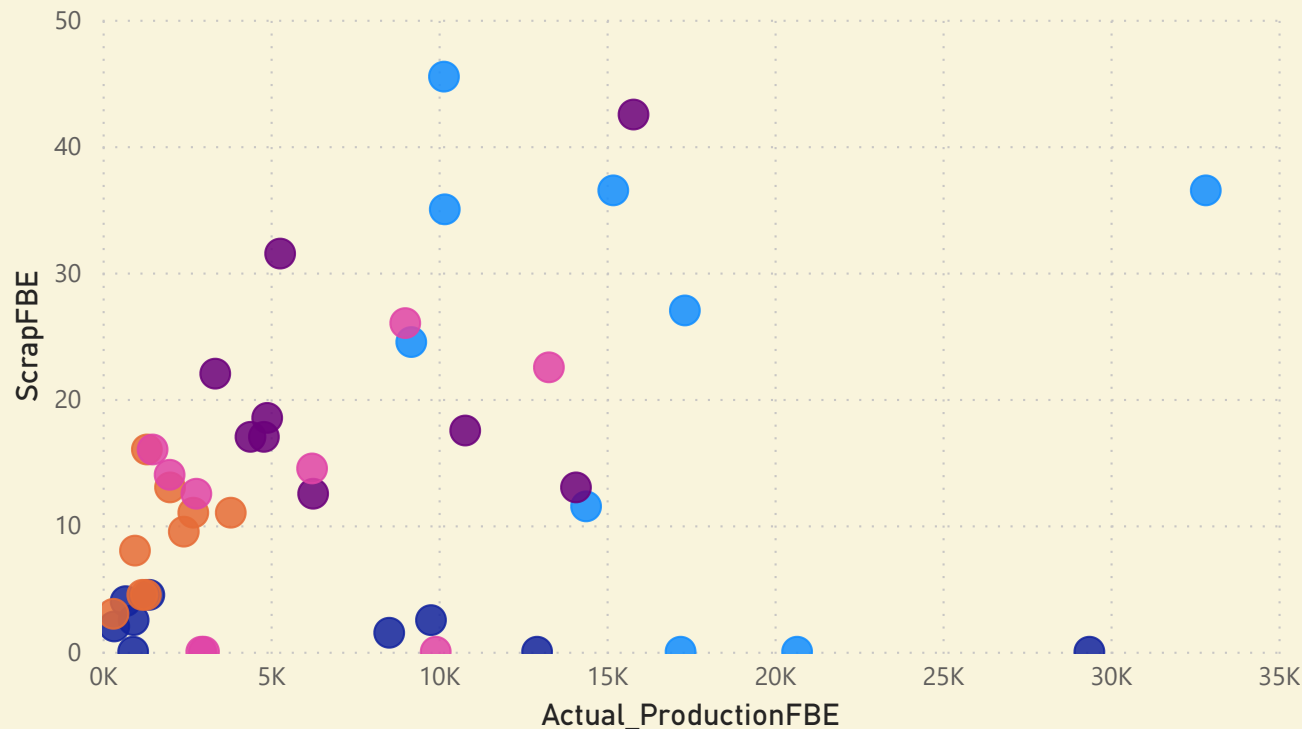
Date

- 6/18/2018
- 6/19/2018
- 6/20/2018
- 6/21/2018
- 6/22/2018

0.66

Correlation Coefficient between Total Production and Scrap Pieces

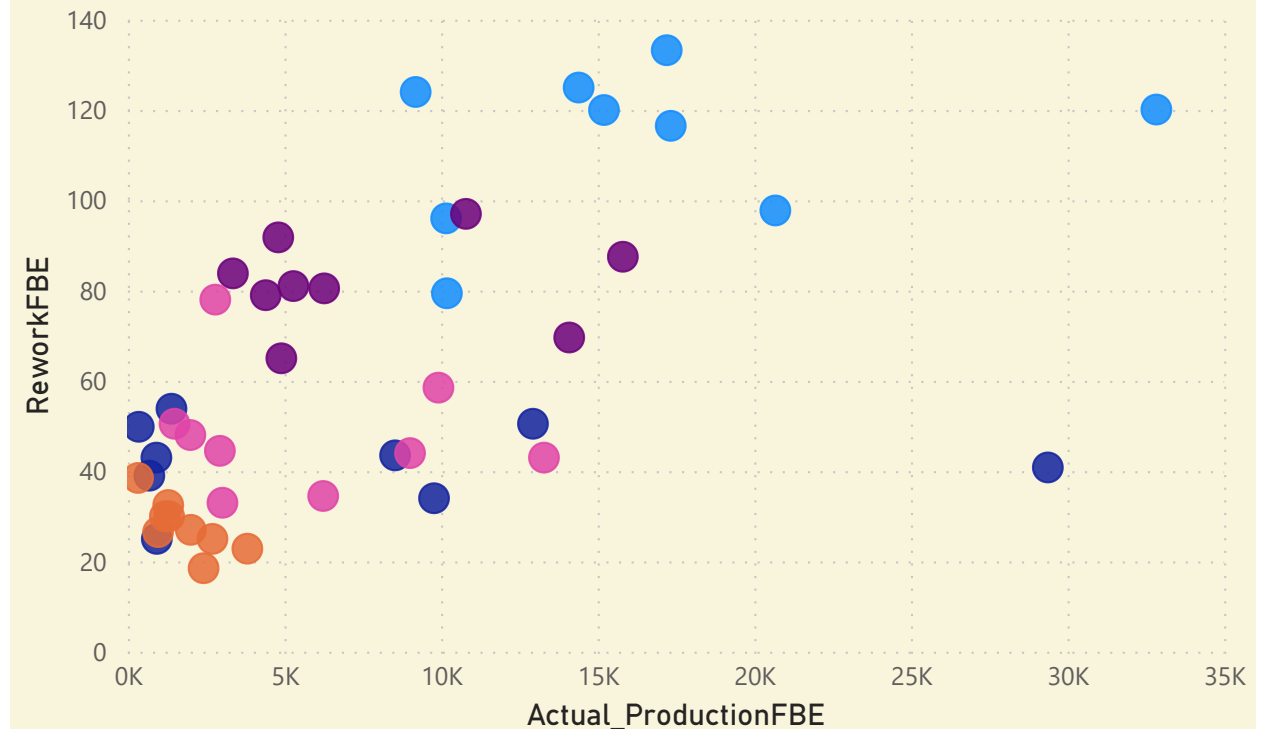
Correlation between ProductionFBE and ScrapFBE



0.93

Correlation Coefficient between Total Production and Rework Pieces

Correlation between ProductionFBE and ReworkFBE

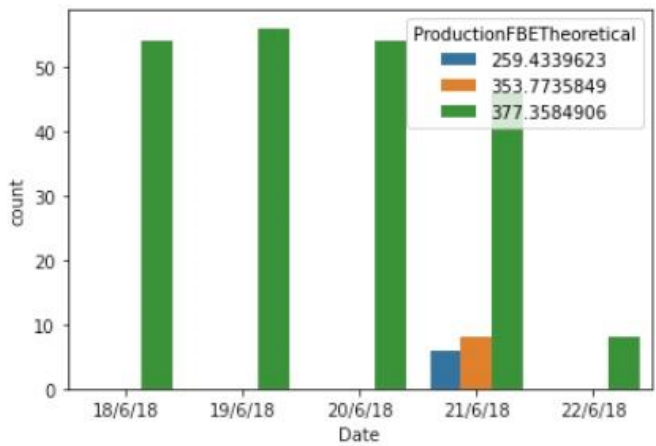


Annex: Feature Engineering for missing ProductionFBE Theoretical using Python

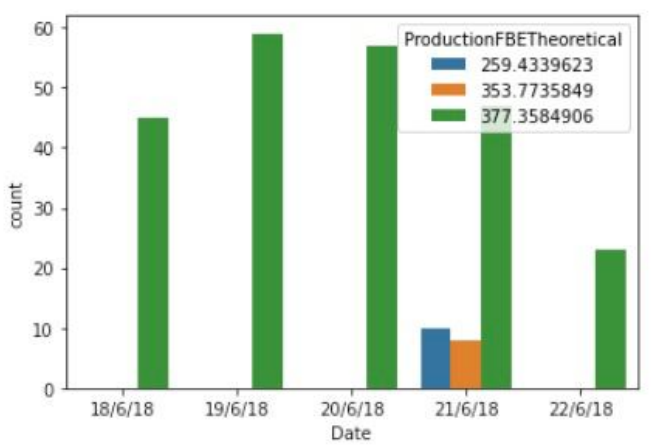
LineID= 1

Observation: ProductionFBETheoretical is largely 377.3584906

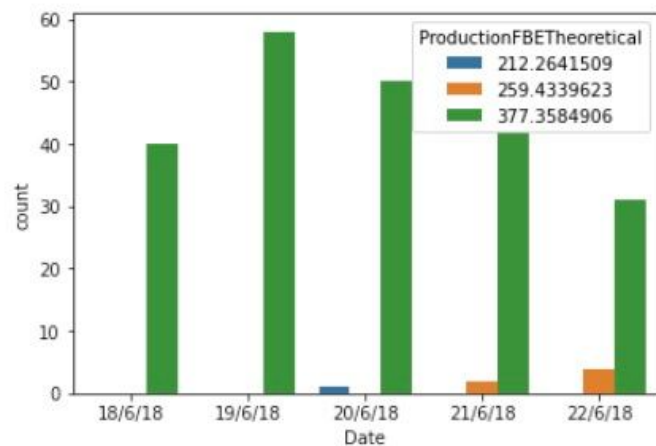
TeamID= 1



TeamID= 2

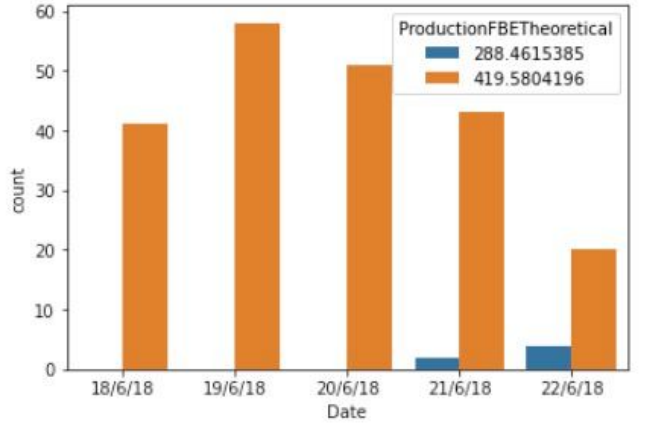
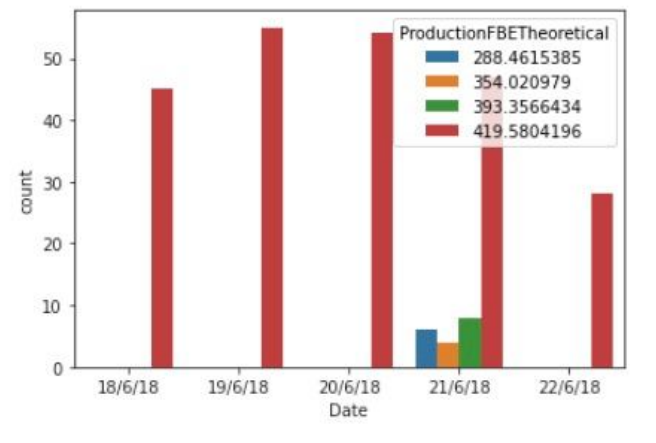
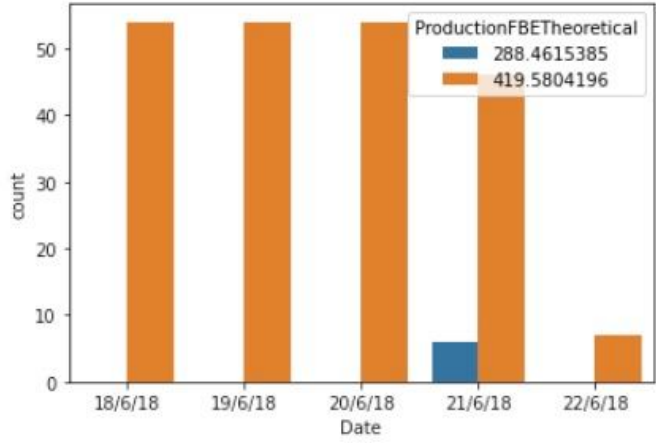


TeamID= 3



LineID= 2

Observation: ProductionFBETheoretical is largely 419.5804196



LineID= 3

Observation: ProductionFBETheoretical is largely 411.8993135

