Southern Water Corp – Technical Presentation

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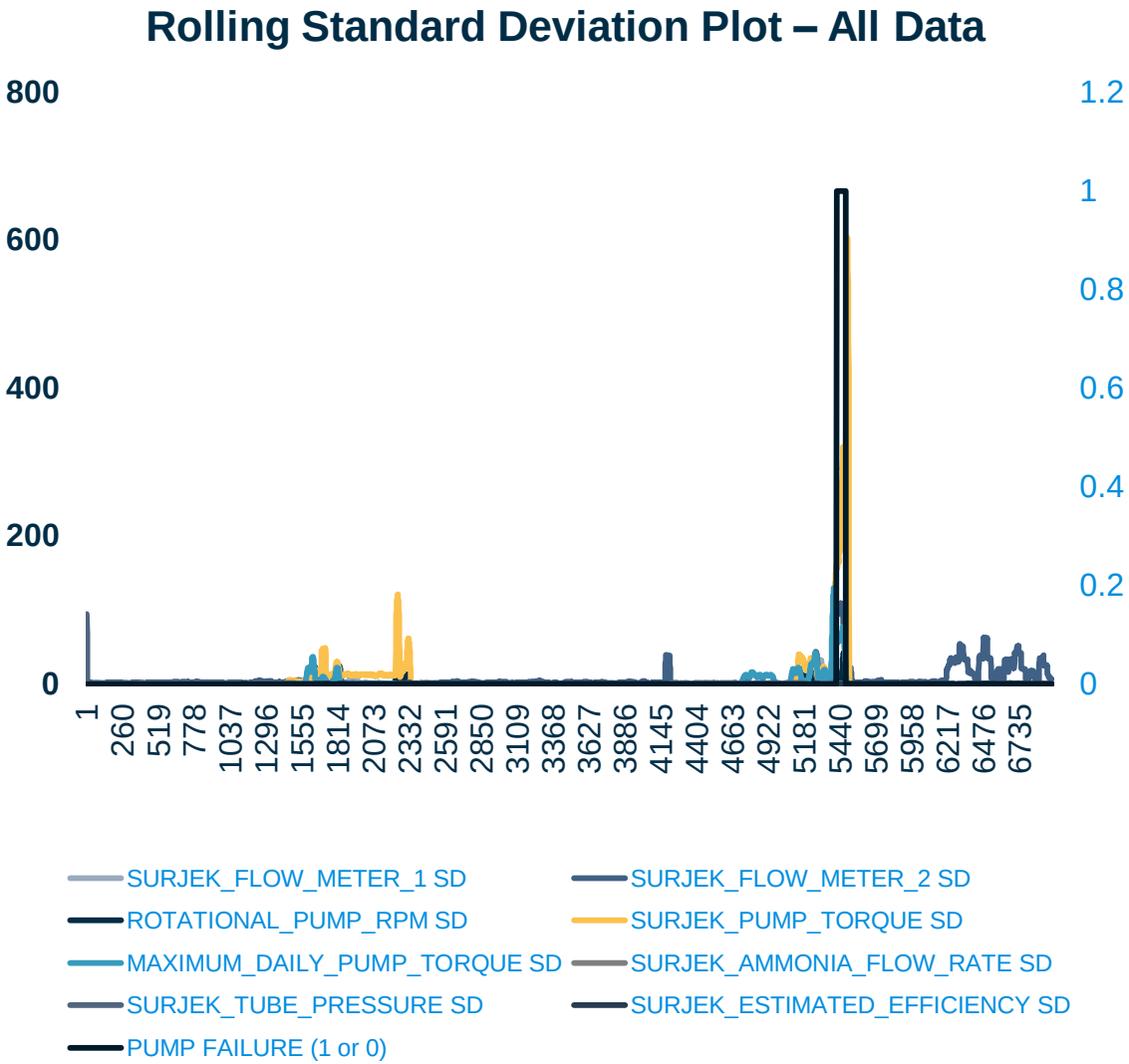
Surjek with an asset system failure of 1% causes rise in operational costs of Maintenance(47%) and loss of Revenue and production of water which require proactive maintenance strategies.

! Increased production of water to meet market demand leading to increased pump wear	Through the increased demand for desalinated water, production of water increase 1% from budget of 7,362,898.53 ML to actual 7,458,933.63 ML
! Age of Pumps and high-pressure readings, indicative of system failure which to increase maintenance costs	Maintenance cost increased from $241M to $356M(47%)
! The Four-month-Maintenance-Event which stop water production and raise operational costs(Maintenance) ➔ loss of revenues	The forecast cost-to-produce ($/ML) increase to $71.65 which is double of actual price and the overall market price is $53.98. This causes the loss of Revenue from $524M to $402M(23%)

The plot shows a clear spike up that indicates the pump failure are in relation to RPM, Maximum_Daily_Pump_Torque and Surjek_Pump_Torque



Key Insights

- Linear regression:

Forecasting the performance of pump failure

- Box Plot

Indicating the variables to Surjek_Pump_Torque and Maximum_Daily_Pump_Torque

- Correlation Analysis

Indicating the same result at SURJEK_PUMP_TORQUE, SURJEK_FLOW_METER_2

Source: Southern Water Corp Statistical Records

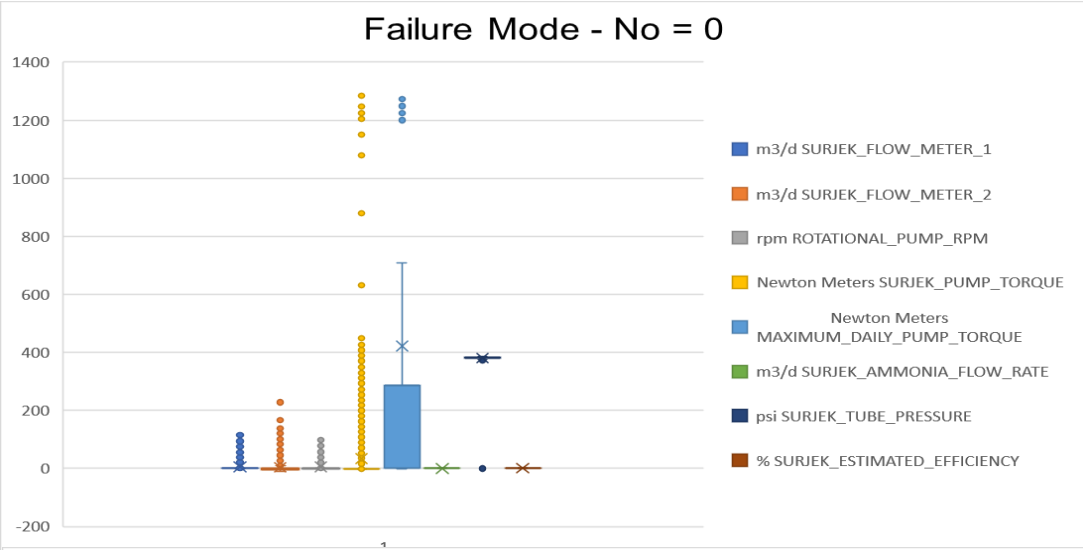
Unit Surjek's pump indicated the high Pressure Reading to show system failure.

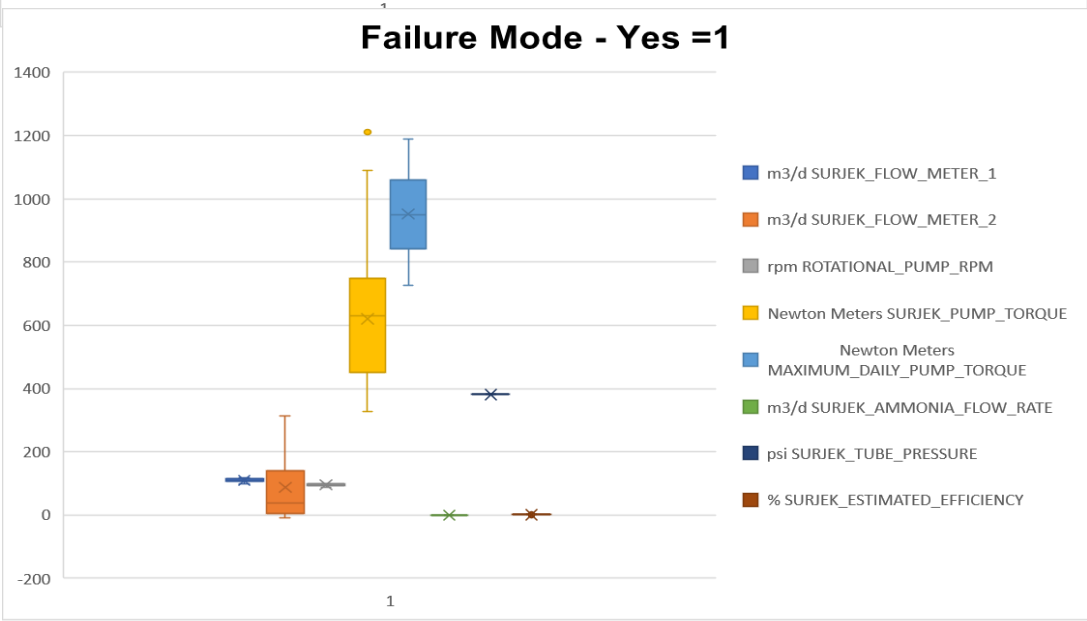
Surjek with an asset system failure of 1% causes rise in operational costs of Maintenance(47%) and loss of Revenue and production of water which require proactive maintenance strategies.

Descriptive Statistic #1

Inferential Statistic #2

Under two respective sets with normal behaviour or abnormal behaviour in Boxplots chart which indicated Surjek Pump Torque and Maximum Daily Pump are strongly correlated with failure mode.





Key Insights

After compare failure and no-failure

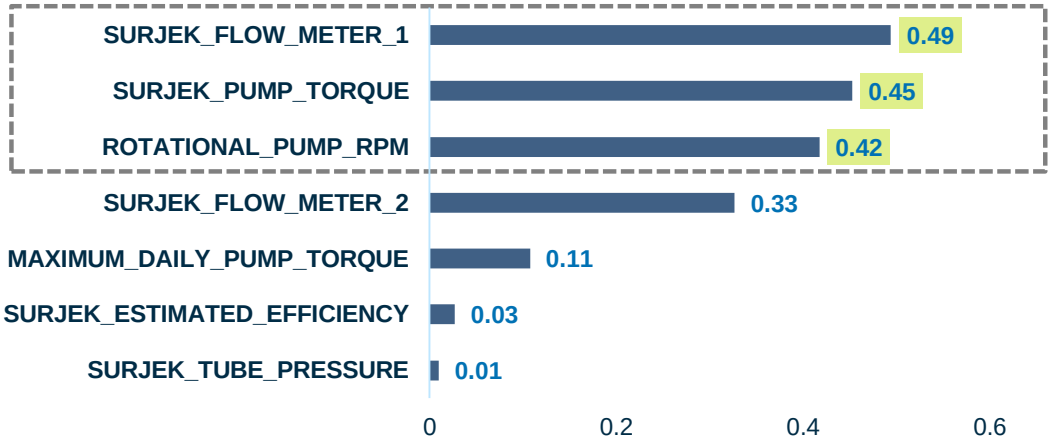
1. Variables standout while Failure mode = 0:
   - SURJEK_PUMP_TORQUE
   - MAXIMUM_DAILY_PUMP_TORQUE

2. Variables standout while Failure mode = 1:
   - SURJEK_FLOW_METER_2
   - SURJEK_PUMP_TORQUE
   - MAXIMUM_DAILY_PUMP_TORQUE

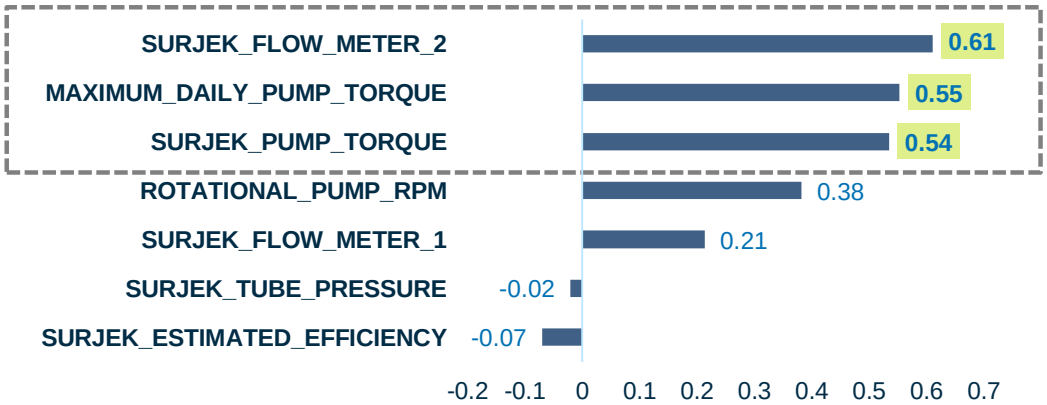
3. The variables of Pump Torque and Maximum Daily Pump are under both failure mode which tell while doing maintenance, Surjek should pay more attention on these two variables.

Under two further analysis of the dataset in correlations, both indicated Surjek Pump Torque will has the closely relationship with the failure signal which further confirm the variable we picked up in descriptive statistics analysis.

Correlations between All Variables and Pump Failure



Correlations between All Variables and Pump Failure(Rolling STD)

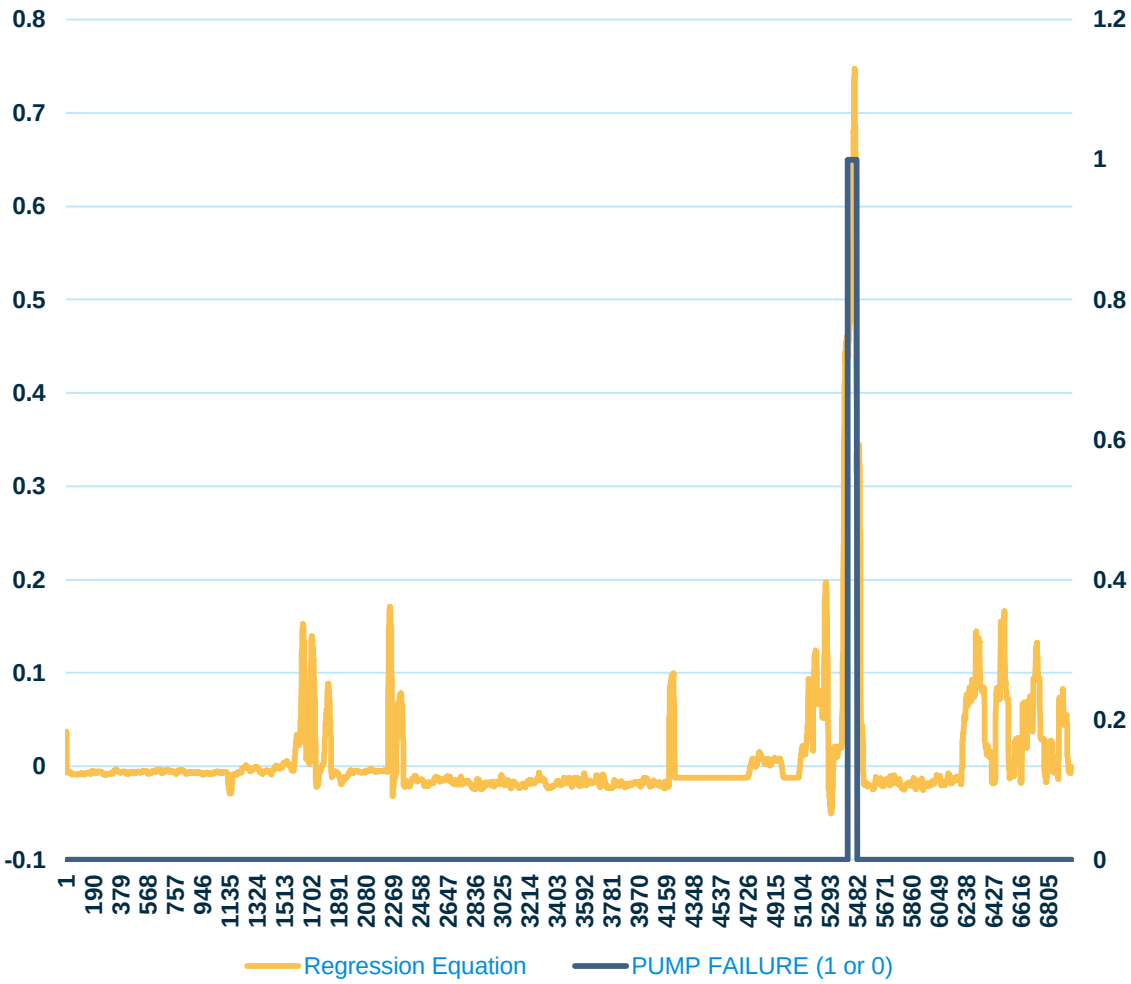


Key Insights

- While calculate all variables, the largest correlation is Surjek_Flow_Meter_1 and Surjek Pump Torque is following.
- While calculate all variables under rolling Standard Deviation of 30 points of the data, the largest correlation is Surjek_Flow_Meter_2 and Surjek Pump Torque is following.
- Compare the rolling STD chart in Descriptive Statistics analysis, Surjek Pump Torque has the highest STD, which has the same result when doing inferential statistic.

Summarizing the multivariate regressive equation to model a failure and will enabled Surjek through inferential analysis to avoid the potential failure variables.

Overview of Regression Model for Pump Surjek [2014-2015]



Key Insights

To keep the company Revenue and decrease the operational costs

Centralized check and analysis the 3 key failure signals to ensure the Surjek's desalination plants prevent further failure.

Source: Southern Water Corp Statistical Records