Southern Water Corp – Technical Presentation

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Increased water demand has led to maximization of all desalination plants portending serious asset reliability issues, thus a spike in maintenance cost is expected as seen in the forecast. This cost must be controlled whilst preventing untimely asset failure which will ultimately lead to loss of revenue.

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Problem 1

Increased demand leading to increased pump wear

Due to the increased demand for desalinated water, preventive maintenance have been side tracked to meet production schedule. Machine wear and tear going unattended to is a problem in waiting.

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Problem 2

Expected Spike in Maintenance Cost

Scheduling all major maintenance programmes for the next financial year will see a sharp increase in OPEX

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Problem 3

Untimely asset failure leading to loss of revenue

If scheduled maintenance is not properly managed, a serious hit on revenue is impending because if the asset fails, the failed asset will not bring in any revenue.

Employing Descriptive and Inferential statistics models, current and forecast plant operational dynamics were analysed to determine most critical maintenance issues.

How will Southern Water Corporation optimize long term profitability and avoid asset failure whilst reducing maintenance cost by 20% year on year.

DESCRIPTIVE STATISTICS

INFERENTIAL STATISTICS

Overall time series analysis of pump performance shows particular signatures around a number of pumps that had provided abnormally high-pressure readings. These are indicative of system failure and should be closely monitored.

Overview of Regression Model for Pump Failure – [Surjek. 2014-2015]
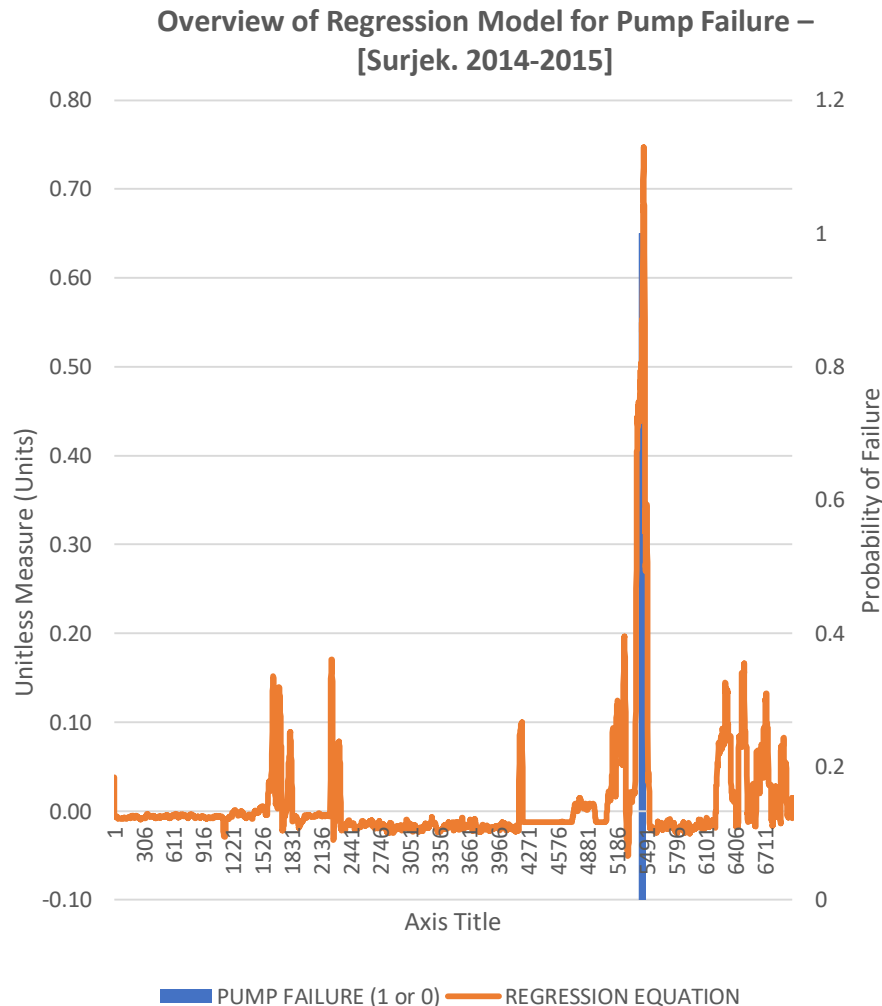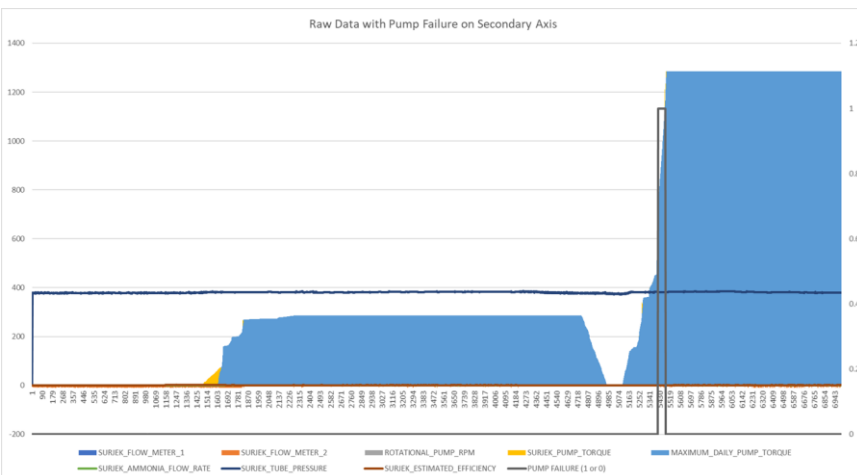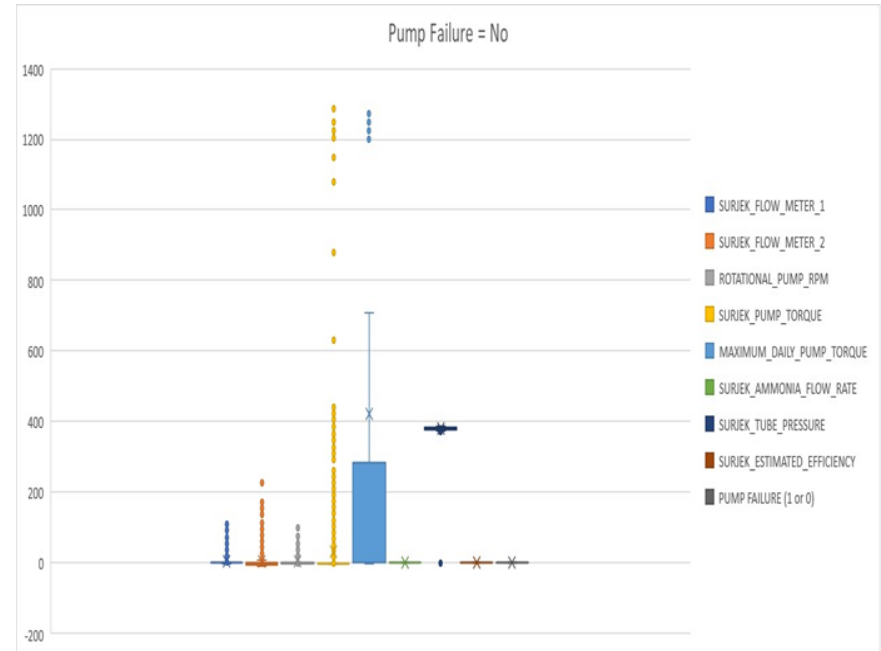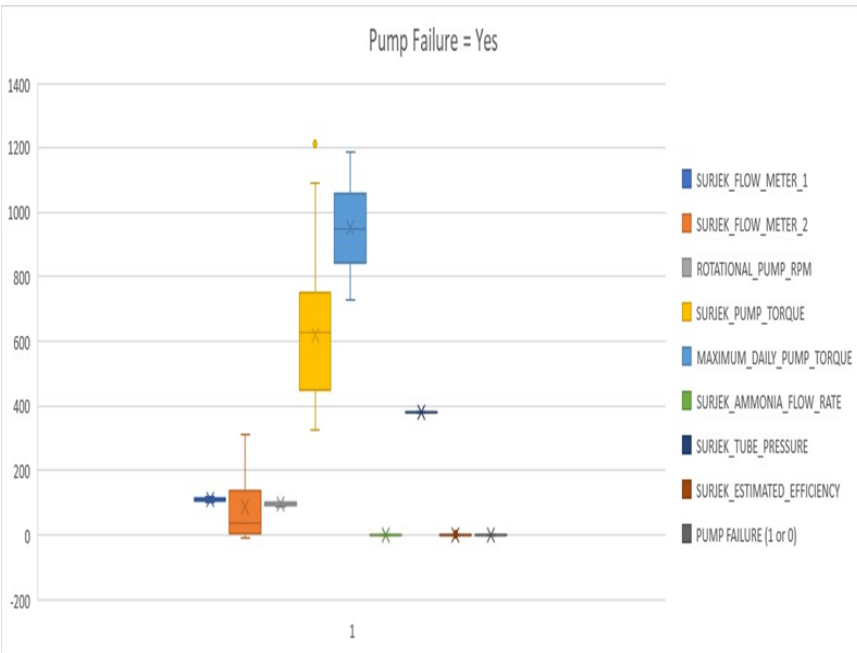
Key Insights

Having previously forecast an increase in maintenance costs due to major outages, Southern Water Corp management should be alert to control operational costs and prevent untimely asset failure which will lead to loss of revenues.

1. Management to look closely into what variables are mostly related to pump failure.

2. The multivariate regression equation should be considered to identify numerical readings indicative of pump failure.

3. It's safe to conclude that there's a correlation between max_daily_pump_torque and Surjek_Pump_Torque with respect to pump failures but this does not necessarily depict causation.

Source: Southern Water Corp Statistical Records

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It's safe to conclude that there's a correlation between max_daily_pump_torque and Surjek_Pump_Torque with respect to pump failure

Pump Failure = Yes

Pump Failure = No

Raw Data with Pump Failure on Secondary Axis

Key Insights

- 'Max daily pump torque' stands out as a major determinant of pump failure (blue region) and a little bit of surjek pump torque (yellow region)

- Pump Failure Mode = Yes/No – Max daily pump torque and Surjek pump torque are still the ones moving significantly with pump failure modes.

Overall Inferential statistics observing correlation and regression matrix reveals the key parameters for management to further look into.

Correlation > 0.5 is very significant

SURJEK_ESTIMATED_EFFICIENCY	-0.06984408
SURJEK_TUBE_PRESSURE	-0.02052327
SURJEK_FLOW_METER_1	0.21342086
ROTATIONAL_PUMP_RPM	0.382259028
SURJEK_PUMP_TORQUE	0.53529471
MAXIMUM_DAILY_PUMP_TORQUE	0.553287393
SURJEK_FLOW_METER_2	0.611275356
PUMP FAILURE (1 or 0)	1
SURJEK_AMMONIA_FLOW_RATE	#DIV/0!

Multivariate Regression Equation to Model Pump Failure

Y (Pump Failure) = -0.002(SURJEK_FLOW_METER_1)+ 0.003 (SURJEK_FLOW_METER_2) +0.005(ROTATIONAL_PUMP_RPM) +0.001(SURJEK_PUMP_TORQUE) +0.002(MAXIMUM_DAILY_PUMP_TORQUE) +0.001(SURJEK_TUBE_PRESSURE) - 0.020(SURJEK_ESTIMATED_EFFICIENCY) - 0.013

Note: all parameters in this model are statistically significant

Key Insights

SURJEK_PUMP_TORQUE

MAXIMUM_DAILY_PUMP_TORQUE and

SURJEK_FLOW_METER_2

- The above three parameters are of utmost importance. Management to focus maintenance crew in that direction to save time, money and achieve faster results

- The multivariate regression equation should be considered to identify numerical readings indicative of pump failure. This is a strong lever for management decision making.