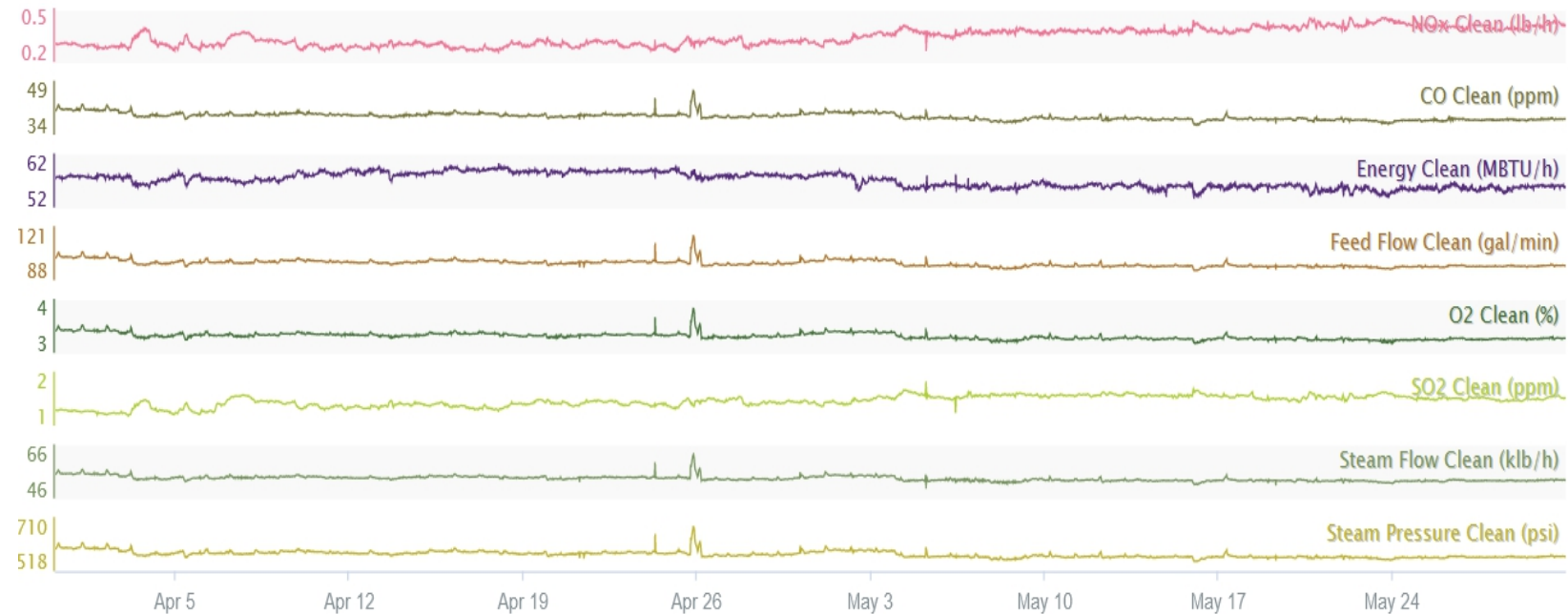**Use Case**

NOx and CO Prediction for Boiler

NOx and CO Prediction for Boiler

Objective:

- Identify the important Process Parameters (KPI's) that are correlated with the Emission parameters
- Prediction of Nox and CO based on historic and real time data

Collected Data

- CO, Nox, O2, SO2, VOC concentration
- Steam Pressure and Flow
- Feed Flow, Energy requirement etc

Monitoring the KPI's

NOx and CO Prediction for Boiler

Signal Cleansing:

- All the important parameters were cleaned using agile filter – Loess Method

- Interpolation was done by skipping the values at interval of every 5 mins

- The emission model for CO and NOx is dependant on feed flow rate, H2S concentration, H2SO4 and other parameters
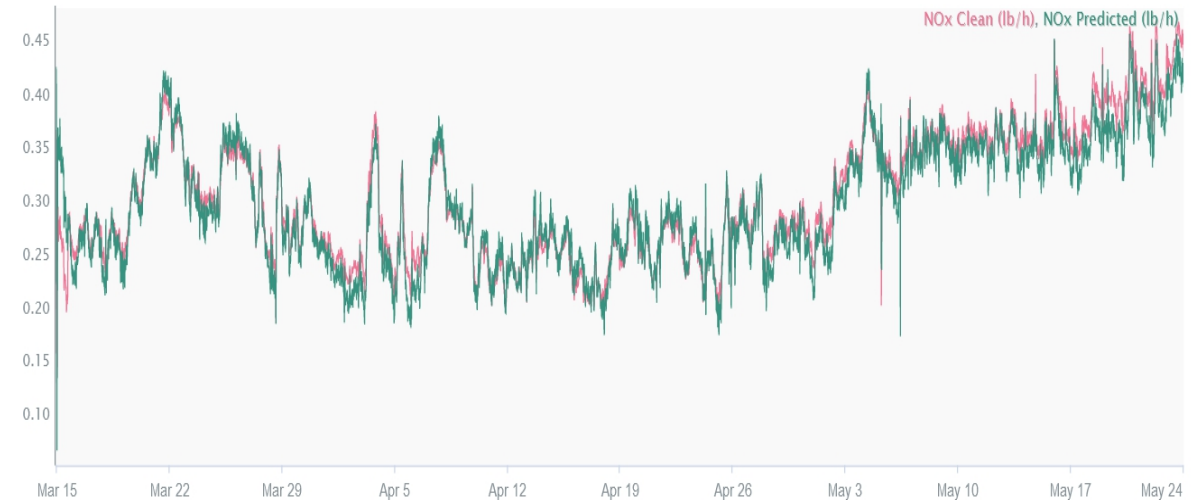
NOx and CO Prediction for Boiler

Emission Model:
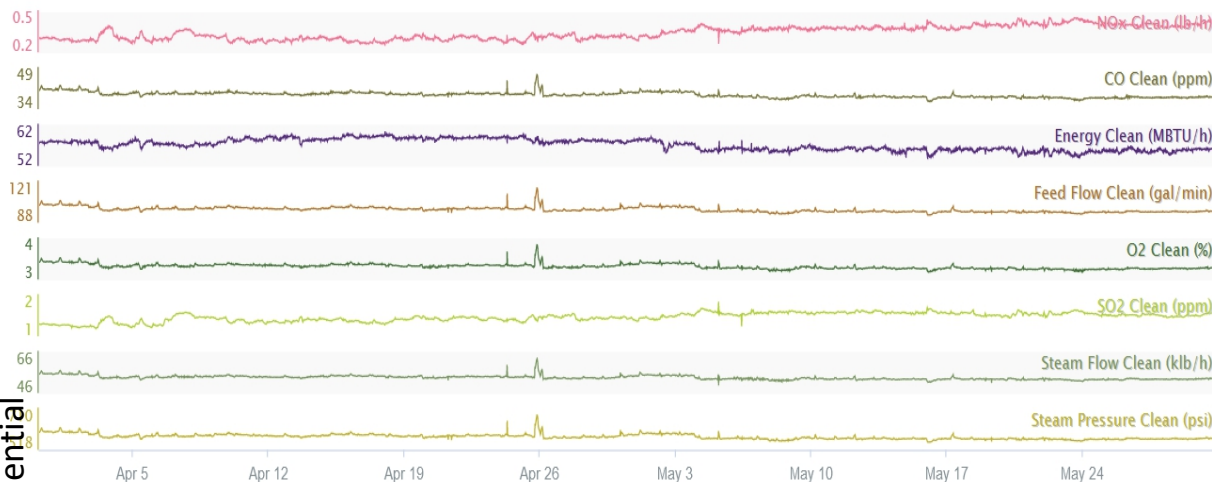
1. **NOx Model:**
   - Random Forest was used to predict the NOx concentrations with R2 value of 0.85

2. **CO Model:**
   - Gradient boosting algorithm was used to predict the CO concentrations in the emissions with R2 value of 0.94

NOX Prediction

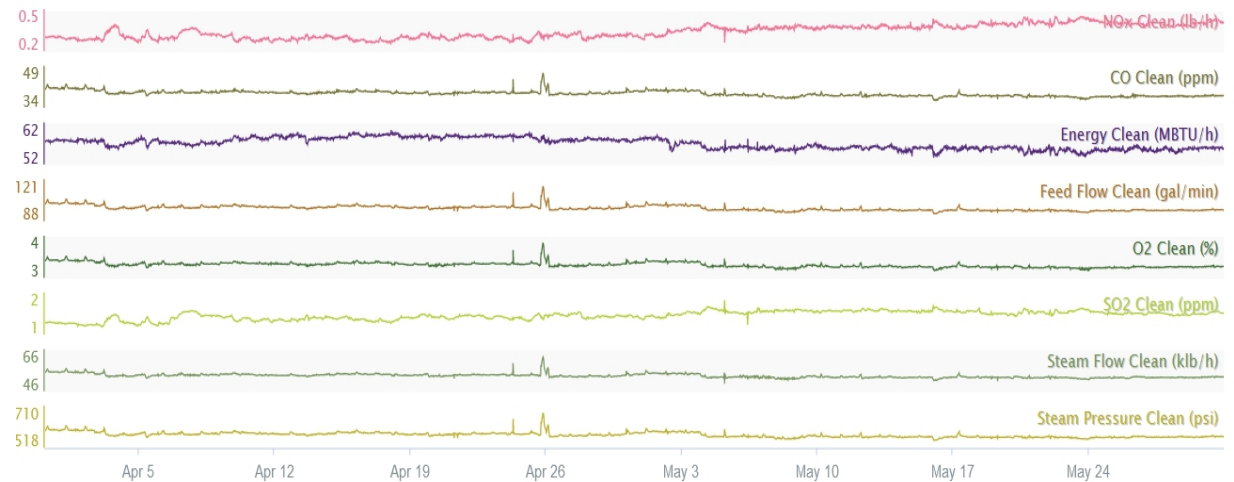Monitoring the KPI's

CO Prediction

Data Collected:

- Steam flow rate,
- Steam Pressure,
- Feed Flowrate,
- NH3 Slip,
- VOC Conc.,
- NOx Conc.,
- CO Conc.,
- H2S Conc.,
- H2SO4 Conc.,
- NG flow
- SO2 Conc.

Objective:

- To understand the parameters which are important for Energy Prediction
- To estimate the impact of Emissions on Energy

Monitoring the KPI's

Energy Prediction for Boiler

Energy Model:

- It was found out that Energy is heavily the function of the following parameters:
  - VOC, Steam flow, Nox, H2S Conc, Steam Pressure, O2 clean, Feed flowrate, SO2 Conc.

Name	Value
intercept	-0.231
interceptStandardError	0.2583
adjustedRSquared	0.7992
rSquared	0.7992
regressionSumSquares	353313
errorSumSquares	88764