TITLE:

AUTO ANALYTICS AND TRACKING OF ETHYLENE PLANTS FOR PLANT PERFORMANCE IMPROVEMENT

AUTHOR:

Kaushal Sampat, Ingenero Inc.
Nihar Gulwadi, Ingenero Inc.

ABSTRACT:

Reliable operation of key equipment in the Ethylene plant is necessary for availability of the asset for production and hence the overall performance of the plant. In addition to improving capacity utilization and yield, overall plant performance requires minimizing unforeseen downtime on account of Reliability issues.

Typically, there is a wealth of data in the form of a variety of measurements, available at a high velocity to the plant operations. Unfortunately the volume of this data is so large, that it is impossible for the unaided human operator to decipher anomalies that point to a potential reliability issue before it is too late. Symptoms of a reliability issue can be found in the data being collected and archived. However, it is rarely spotted with sufficient time to take proactive corrective action to avert the reliability event.

A library of tools have been developed and utilized for continuous performance management of ethylene plant operations that leverage Digitalization technologies, like Machine Learning and handling of Big Data, for example:

1. Early Warning Tracker Reliability Tool
2. Live Auto Furnace benchmarking
3. Auto tuning furnace run length predictor

These tools specific to Proactive monitoring and overall asset performance improvement of Ethylene Plants have been successfully used and deployed with different Ethylene technologies.

This paper focuses on the application of these tools utilized successfully at Ethylene plants, that live benchmarks key performance metrics with historical or expected performance, predicts based on history and also provides early warning to possible anomalies.

The paper will include a case example of application of the Early Warning Tracker at the Quench Tower operation of an Ethylene Unit in the USA, which allowed proactive identification of early symptoms of a future failure.

The tracker is based on Machine Learning techniques, with predictive models used as a reference, built based on historical data, with added intelligence based on Fundamental models and domain expertise. The models serve as a reference point for auto tracking and auto flagging of anomalies, based on a simultaneous tracking of 100 key correlated variables (measured as well as inferred) for the Quench tower itself. The data includes Process, mechanical and utility variables. The model has the ability to dynamically change the reference data depending on current feed slate. The tool will automatically identify the current feed-slate and refer the model of the corresponding reference data. The approach combining Machine Learning with fundamental analysis intelligence minimizes the “False Positive” identification of anomalies.

When pre-tested to do a Retro-analysis on a past failure, the tracker captured early signs of variable relationship departure identifying early signs of deviations a year and a half before the failure realization. This

would have provided ample time to take precautionary steps to avoid damage to the tower internals that were detected only after the column was shut down for inspection.