OIL REFINING & PETROCHEMICALS

Data Sources

- Process Data Historian: OSIsoft PI, PHD, others
- Catalyst and Reactor Design Data: Imported from asset database or created in Seeq by an engineer through scalars/signal

Data Cleansing

Seeq operators can efficiently find and remove all non-relevant data from unit/equipment shutdowns or non-steady state modes of operations, such as start-ups and shutdowns, making the analysis and monitoring process faster and smoother.

Calculations and Capsules

Capsules help to identify current and past cycles between replacements and regenerations. Users can employ the Seeq Formula Tool to implement first principles equations and calculate normalized WABT (feed rate, product and feed quality, treat gas ratio and H2 partial pressure). With the help of Seeq Prediction, operators can create a model for normalized WABT as a function of time within capsules for a cycle/steady state operation.

Fixed Bed Catalyst End-of-Run Prediction

Challenge

Are you challenged with managing the severity of reactor operation on a fixed-bed reactor and planning catalyst regeneration or replacement? It is important to analyze the catalyst activity and predict the end-of-useful life for the catalyst in order to optimize near and long-term economics. This process requires the calculation of normalized weighted average bed temperature, selecting historical data to “train” the correlations, and auto-updating with new data. For most refineries, this is not an easy task. Without using Seeq, engineers performing this analysis had to manually combine their data in spreadsheets and spend hours or even days formatting and filtering the data, as well as removing all non-relevant information (when equipment was out-of-service, for example.)

Solution

The Seeq Formula Tool allows users to implement first-principles equations to quickly calculate the Weighted Average Bed Temperature (WABT) for a fixed bed reactor system to monitor catalyst deactivation. Seeq’s Prediction tool further allows operators to create a model that will predict WABT as a function of time within capsules for steady state. This model can be used to estimate the date when the WABT will reach the system’s maximum operating temperature, which will allow for improved maintenance planning. In addition, this methodology can be easily applied to other fixed bed catalyst systems, significantly reducing the analysis time.

Benefits

Seeq analysis enables users to monitor catalyst deactivation and to co-optimize near-term economics and risk-based maintenance planning. With better end-of-run prediction, users can more effectively analyze the tradeoff between rate reduction and maintenance costs. This allows them to plan accordingly to minimize costs and maximize production. The ability to calculate end-of-life also allows users to quickly detect unexpected changes and to efficiently take corrective action. Using Seeq, the efficiency of monitoring operations can be greatly improved by creating best practices and involving the entire engineering staff.

Summarizing Results

Seeq enables the observation of the date on which the prediction intersects with the known U performance threshold to allow for fast prediction of end-of-life cycle. Users can better avoid operational challenges by enabling maintenance and operations teams to remove the exchanger from service for cleaning before the projected EOC date, while Seeq’s Journal allows users to document detailed analysis steps for further review and process revisions.