2018 American Fuel & Petrochemical Manufacturers
OPERATIONS & PROCESS TECHNOLOGY SUMMIT
Conference Daily Published by
HYDROCARBON PROCESSING®
DAY THREE | #AFPMSUMMIT
Wednesday | Oct. 3, 2018

Case study: Optimization of refinery middle distillate system

ADRIENNE BLUME, *Hydrocarbon Processing*

At the Monday afternoon Operational Planning, Control and Automation Technologies (OPCAT) session, Vikram Gokhale and James Gunderman of Chevron USA talked about the closed-loop, real-time coordination of a refinery middle distillate system in California.

Project scope. Gunderman first explained the process flow for the refinery's middle distillate system. The two crude units are under advanced process control, as are the coker, the fluid catalytic cracker, the diesel hydrotreater and the jet fuel hydrotreater. The goal of the project was to coordinate APC applications across several units to diesel production, while staying within specifications on the key properties, including sulfur and distillation 90% point for diesel and freeze point and pour point for jet fuel.

The optimization operations assistant (OOA) worked with console operators to implement the short-term plan and optimize the refinery, based on current conditions. The new refinery optimization center (ROC) was a major enabler for the project.

Technology selection. Gokhale then spoke about the technology chosen for the project, which included APEX Optimisation's Generic Dynamic Optimization Technology (GDOT). APEX built the GDOT model with assistance from Chevron process control and planning staff, using elements derived from refinery planning models, simple first-principles models and APC models. GDOT was then used to optimize targets sent to selected APC variables.

"Ultimately, what the model is looking for is an end-to-end, front-to-back connection," from the crude header to the blend header, Gokhale explained. If the process units do not operate in a typical configuration, or if blendstocks are produced, then the model must be adjusted to accommodate these elements of the process.

Project benefits. Gunderman next discussed the benefits of the project. Sulfur giveaway was reduced by 70%, resulting in increased throughput to the hydrotreater. Furthermore, 90% diesel giveaway was reduced by 80%, leading to increased diesel production from gasoil, and jet smoke giveaway was decreased by 25%.

To sustain these benefits, refinery and centralized EPC staff were developed for post-project support, and daily and weekly routine checklists were initiated. Model maintenance procedures were documented, and offline simulations were conducted to improve understanding of the application. Additionally, new process control engineers and console operators are trained. Daily interactions are planned for schedulers and planners, and monthly application performance reviews are carried out with planners and process engineers.

Project takeaways. In closing, Gunderman and Gokhale shared tips from project experience. Ensuring that underlying APC applications have a strong support structure and show high uptime is important. Also, a pre-project benefits study helped involve oils planning and operations staff from the beginning. An extensive model review should also be conducted before and after commissioning and may encompass several sessions.

A final lesson learned includes a focus on the modeling and application integration philosophy. Classroom training is only a starting point, Gokhale explained, and site control engineers should budget time to seek answers to their questions from the GDOT commissioning team.

"To develop an understanding of how everything comes together can take time. You may have to ask the same questions three times," Gokhale said. "This is not somebody coming and installing a new refrigerator in your house … This is a much longer exercise, and the only way to ensure quality is to go in depth." •

NOTE: APEX Optimisation (including the software product GDOT) was acquired by Aspen Technology in February 2018.