Success Story

Controls Improvement Program (CIP) Helps Control Shell Deer Park Chemicals Complex

Project Name: Olefins Plant 3 (OP3) Unit CIP
Location: Deer Park, Texas, USA
Completion: February 2013
Industry: Chemical, Petrochemical

"Shell Global Solutions and Shell Deer Park Management were completely satisfied with the way the project was implemented and the results achieved."

About Shell Deer Park

Shell Deer Park is located about 20 miles east of downtown Houston, Texas. In 1941, Shell Chemicals Company formed the Deer Park Chemical Plant (DPCP). The assets of Deer Park Chemicals are managed and operated by Global Shell Chemicals.

Deer Park Chemicals consists of Aromatics unit (Benzene and Xylene), Light Olefins unit (Ethylene, Propylene, Butylene), Heavy Olefins unit (Isoprene, Butadiene, Piperylene), and Phenol unit (Phenol and Acetone). A wide range of products like aspirin, plastics, synthetic rubbers, tapes, paints, solvents, pesticides, dyes, detergents, perfumes, adhesives, etc., are manufactured using the chemicals produced from Deer Park Chemicals.

Challenges and Actions Taken

The hot side and cold side of the OP3 unit are operated without any major operational issues. However, the hot side of the OP3 unit was limited most of the time due to the furnace emissions (SOx, NOx, CO, etc.) were maintained high due to wrong calculations of emissions without flow and density compensations included. Because of this, feed cannot be pushed to the unit. The Pyrofrac, Compressor, Cold Box and the Separation sections were operating normal without any constraints. Honeywell TDC3000 is the control system used in the Deer Park Chemicals OP3 unit, and the existing hot side Advanced Process Control application of the OP3 unit was cutting feed to the unit due to high furnace emission constraints on the furnace.

Yokogawa precisely followed Shell's methodology of project implementation, actively participated in technical discussions, and took responsibilities in executing the project with required support from Shell. This Controls

Improvement Program is implemented on all the 12 furnaces available in the OP3 hot side with the objective being to calculate the CEMS calculation more accurately, allowing more feed to be pushed to the unit. With the emission calculations accurately calculated, the existing Advanced Process Control application is always operated in optimization mode which enabled more feed to be pushed to the unit until the furnace hits constraints on the emissions.

"…this resulted in maximizing the desired products and reducing overall specific consumptions on the unit"

The Controls Improvement Program implemented on the Deer Park OP3 unit helped to push more feed to the unit by operating the furnaces close to constraints. This resulted in maximizing the desired products and reducing overall specific consumptions on the unit.

"… furnaces returns a benefit of pushing 5.3% extra feed to the unit with a VIR of 750."

Conclusion

Yokogawa assisted in the project implementation by providing design review, calculation modifications, pre-commissioning, training of operators and engineers, commissioning and post implementation review.

A post-implementation study estimated that the overall Controls Improvement Program implemented at Deer Park OP3 hot side furnaces returns a benefit of pushing 5.3% extra feed to the unit with a VIR of 750.

Customer Satisfaction

Shell Global Solutions and Shell Deer Park Management were completely satisfied with the way the project was implemented and the results achieved.

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Success Story

Shell Deer Park Refinery Benefits from Advanced Process Control Application on Delayed Coker Unit

Project Name: Delayed Coker Unit APC
Location: Deer Park, Texas, USA
Completion: April 2012
Industry: Refining

John Williamson, Principal Technical Expert in the Process Automation and Control Optimization group, said, "Great job Vinh and Saravanan. I appreciate the push to get this out as well as all the benefits you guys delivered."

About Shell Deer Park

Shell Deer Park is located about 20 miles east of downtown Houston, Texas. In 1993, Shell Oil Company and PMI Norteamerica, S.A. de C.V., a subsidiary of Petroleos Mexicanos (Pemex), formed a 50/50 joint venture, resulting in Deer Park Refining Limited Partnership (DPRLP). The assets of the refinery are managed and operated by Shell Oil Company through Shell Deer Park Refining Company, a division of Shell Oil Products Company (a Shell Oil subsidiary).

Today, Shell Deer Park is home to the sixth largest refinery in the United States with a crude oil capacity of 340,000 barrels a day. The Deer Park Refining complex has a variety of processing units, including a distillation unit, a vacuum flasher unit, a delayed coker unit, hydrotreator units, hydro cracker units, a cat cracker unit, and a platformer unit. The APC implementation is carried out in the delayed coker unit.

Challenges and Actions Taken

This is the first project in which Shell Global Solutions US has used a contractor outside of Shell for its Advanced Process Control (APC) implementation. Yokogawa's number one priority during this project was to build confidence within Shell. From a technical point of view, the controls on the coker heaters and fractionator were not appropriate during the drum switch operations, which resulted in loss of the valuable product within coke.

Yokogawa precisely followed Shell's methodology of project implementation, actively participated in technical discussions, and took responsibilities that helped build Shell's confidence in Yokogawa. The APC application implemented on the delayed coker unit helped control the plant with less variation, even during drum switch operations, thus recovering the valuable products found in coke which were no longer lost.

Conclusion

Yokogawa assisted in the project implementation by providing step testing, model identification, model acceptance, pre-commissioning, training to operators and engineers, commissioning, and tuning and post implementation review.

The study shows that the overall delayed coker APC controller returns a benefit, which is almost three times the original promise.

David Williams, Team Lead in the Process Automation and Control Optimization group, said, "Not only was there an improvement in plant operations with significant benefit, but everyone was also able to buy into the benefit. Benefits like recovering valuable materials out of coke paved the way for us to continue to do APC projects around the globe."

Rick Linn, Product Manager of the Process Control Platform & Products, said, "It is a good example of our cooperation together."

Customer Satisfaction

Shell Global Solutions and Deer Park Management were completely satisfied with the way the project was implemented and the results achieved.

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Success Story

Shell Deer Park Refinery Benefits from Advanced Process Control Application on Gas Oil Hydro Treater Unit

Project Name: Gas Oil Hydro Treater Unit APC
Location: Deer Park, Texas, USA
Completion: December 2013
Industry: Refining

"Shell Deer Park Management was completely satisfied with the way the project was implemented and the results achieved."

About Shell Deer Park

Shell Deer Park is located about 20 miles east of downtown Houston, Texas. In 1993, Shell Oil Company and PMI Norteamerica, S.A. de C.V., a subsidiary of Petroleos Mexicanos (Pemex), formed a 50/50 joint venture, resulting in Deer Park Refining Limited Partnership (DPRLP). The assets of the refinery are managed and operated by Shell Oil Company through Shell Deer Park Refining Company, a division of Shell Oil Products Company (a Shell Oil subsidiary).

Today, Shell Deer Park is home to the sixth largest refinery in the United States with a crude oil capacity of 340,000 barrels a day. The Deer Park Refining complex has a variety of processing units, including a distillation unit, a vacuum flasher unit, a delayed coker unit, hydrotreator units, hydro cracker units, a cat cracker unit, and a platformer unit. The APC implementation is carried out in the Gas Oil Hydro Treater unit.

Challenges and Actions Taken

The Advanced Process Control (APC) application is implemented on the reactor/recycle gas heater, six pack exchangers, stripper/main fractionator heater, and main fractionator, with the core objectives of maximizing ULSD production, controlling WABT tightly, and pass balancing of flow and temperature for the main fractionator heater. The APC application is always operated in optimization mode to meet the objectives with the operation parameters controlled within the specified operation limits.

One key product of the Gas Oil Hydro Treater (GOHT) unit is diesel, and sulfur in the refinery diesel pool was very difficult to control since the pool has diesel coming from various units. The GOHT unit acts as a swing unit for controlling ULSD sulfur and, therefore, the sulfur target for the GOHT unit is varied based on ULSD pool. The GOHT SMOC application is designed to minimize giveaway on ULSD pool sulfur.

The APC application implemented on the GOHT unit helped control the plant with less variation during coker drum switch operation and with less operator interactions during plant operation. This resulted in minimizing the giveaway on the ULSD pool sulfur, thereby maximizing the production.

Conclusion

Yokogawa assisted in the project implementation by providing support for step testing, model identification, pre-commissioning, operator training, and controller commissioning.

A post-implementation study estimated that the overall GOHT Unit APC controller returns a savings of about 198% greater than the originally estimated benefits. The project was implemented 8% less than the originally planned budget with a payback period of three months.

Customer Satisfaction

Shell Deer Park Management was completely satisfied with the way the project was implemented and the results achieved.

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