Success Story

Honeywell

PETRONAS Increases Aromatics Production with Honeywell's Advanced Process Control

"Linking UOP models with Honeywell's Profit® Controller allowed us to embed valuable process knowledge into our advanced control strategies."

Kamrul Arrifin, Process Control Group Leader, PP(T)SB

Malaysia's PETRONAS Penapisan Sdn Bhd plant in Kerith, known as PP(T)SB, contracted Honeywell to implement complex-wide advanced process control (APC) to help maximize production of paraxylene and maintain product quality. Honeywell implemented a series of advanced control applications across the complex, resulting in a 2.5 percent increase in overall aromatics production and a reduction in energy consumption.

The Challenge

The PP(T)SB aromatics complex processes naphtha condensate from two condensate feeds before passing it through a series of unit operations to produce paraxylene and benzene. The front-end process is similar to naphtha processing in a refinery – distillation, hydrotreating and naphtha reforming. The back-end process involves aromatics separation from non-aromatics followed by high purity distillation and aromatics upgrading through isomerization.

The units are closely linked together even though there is some intermediate strorage, which means that feed or feed composition changes upstream affect the operation of units downstream. Furthermore, disturbances such as changes in pressure could have a significant effect on the operation of high purity towers where constraints in the overall complex may appear.

PP(T)SB appreciated that Honeywell's APC technology could help maintain product quality. The company also felt that by designing the APC strategies early, they would reduce costs by ensuring the correct instrumentation was in place as the unit was being constructed.

The Solution

Honeywell completed the initial designs, including regulatory controls, initial APC design, operator interface and UOP module interface, before the plant was completed. The plant's DCS platform was not a Honeywell system so Honeywell and PP(T)SB designed and implemented custom graphics for operator interaction with the advanced control applications.

PP(T)SB Aromatics Complex in Kerith

Honeywell used its extensive expertise to implement multivariable control solutions using Profit Controller on each of the units in the aromatics complex. By working with UOP, Honeywell incorporated UOP process models into the Profit Controller applications. A total of 12 Profit Controller applications were implemented as well as several UOP process models providing either inputs as controlled variables or setting the limits for a particular variable within the controller.

The Profit Controller applications had to be designed to handle the interaction between the units. Once the whole complex was operational, it became clear that some key control objectives would have a big effect on the overall throughput.

The complete APC solution was implemented over two phases. The front end of the plant up to and including the reformer applied APC first, and about a year later, APC was applied to the remainder of the units.

Results

Operations maximized C9s into one unit by maximizing the heavy naphtha cut and making sure that there was enough hydrogen produced in the reformer. Good quality control in the Sulfolane unit meant smaller losses of aromatics to raffinate stream.

The UOP Platformer directly controlled the percentage of aromatics while honoring constraints such as reactor tube metal temperatures and maintaining the desired coke on catalyst to ensure that the regenerator was not overloaded.

The incorporation of a column profile predictor helped stabilize operation in the high purity columns.

Profit Controller handled these disturbances very well and enabled plant staff to achieve a stable operation throughout the complex and increase production of aromatics by 2.5 percent.

"We are seeing the benefit from the APC program within two years of plant start-up which has considerably increased the complex profitability and provided a focal point for plant improvement," said Kamrul Arrifin, Process Control Group Leader, PP(T)SB.

The table below summarizes the objectives of the control solution in each unit.

Condensate Fractionation	Maximize light and heavy naphtha production Maximize LPG production
Naphtha Hydrotreater	Maximize feed subject to unit constraints Control bed temperature
Platformer/ Cat. Regen	Control total aromatics production (interface with UOP process model) Control reactor coke formation (interface with UOP process model) CCR temperature and O2 limits (interface with UOP process model)
Reformate Splitter	Maintain separation and quality control
Sulfolane Extraction & Benzene/ Toluene Fractionation	Control purity of aromatics extract Minimize loss of aromatics Maintain separation between benzene and toluene by controlling column profile Maintain benzene product quality
Xylene and H. Aromatic Fractionation	Control separation between xylene and C9 (Carbon 9) components subject to constraints Maximize C9 recovery to Tatoray unit
Parex Unit	Control separation between desorbant, para-xylene, and mixed xylenes in units Maximize recovery of para-xylene
Isomar Unit	Maximize conversion to para-xylene subject to reactor severity (ring loss) (Interfaced with UOP process module) Maintain separation between C7 and C8 components in the deheptaniser
Tatoray Unit	Maintain C7 and C9 conversion Maintain separation between C7 and C8 components in stripper.

For More Information

To learn more about Honeywell's advanced process control technology, visit www.honeywell.com/ps or contact your Honeywell account manager.

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