Nirma Optimizes Production and Reduces Energy Consumption with Advanced Process Control Solution

“The implementation of Honeywell’s advanced process control solution at the LAB complex has improved the dynamic control of both front- and back-end processes while optimizing production and reducing energy in addition to substantial monetary savings.”

R. V. Shastri, Unit Head, Nirma Ltd.

Benefits

Based in India, Nirma is one of the world’s largest and most integrated manufacturers of detergents and toiletries. Nirma sought ways to reduce its fuel and power consumption and to attain consistent control of parameters to maximize production at its linear alkyl benzene (LAB) plant. The company also wanted to optimize the recovery from costly feed kerosene used in its manufacturing process.

Nirma engaged Honeywell and UOP, a Honeywell company dedicated to delivering cutting-edge technology and processes, to provide engineering services to design and implement advanced process control (APC) at its LAB plant. The scope of the APC project included complete front-end and back-end processes.

Some of the benefits achieved by Nirma since implementing Honeywell APC solutions include:

- N-paraffin recovery improvement from feed kerosene
- Reduction in fuel consumption
- Reduction of energy consumption
- Sustaining maximum production and consistent control of plant parameters leading to reduction in overall standard deviation

Honeywell’s APC solution helps Nirma optimize production, reduce energy consumption and save money at its LAB plant.

Background

Nirma manufactures detergents, bath soaps, salt, industrial products and fertilizer with a reach of over 2 million retail outlets and more than 300 million consumers across India. Nirma, the proverbial rags-to-riches story of Dr. Karsanbhai Patel, is a classic example of the success of Indian entrepreneurship in the face of stiff competition. Started as a one-man operation in 1969, today Nirma has about 15,000 employees.

Nirma’s LAB complex is one of the most efficiently run LAB plants in India. The LAB production process starts with the processing of straight run kerosene fraction. During processing, normal paraffin is separated from other kerosene fraction. The normal paraffin separation process is called the front end. The normal paraffin is olefinated and eventually reacted with benzene
which results predominantly in LAB. It also produces some heavy alkyl benzene (HAB). The LAB production unit is called the back end. For providing heat to the distillation column, reboilers and other heaters, hot oil is used in both front-end and back-end processing. Hot oil return is sent to a furnace for maintaining its supply temperature.

**Challenges**

Nirma’s main goals for the implementation of Honeywell’s APC solution at its LAB plant were to improve energy efficiency and to optimize normal paraffin recovery from kerosene. Because of the high level of interaction between the variables and large amount of dead time and settling time, Nirma had to overcome inconsistencies and waste, and provide dependable control with available resources.

On the control front, there was difficulty in maintaining paraffin molecular weight and maximizing n-paraffin recovery from feed kerosene simultaneously. Paraffin molecular weight control was a challenge as the control handles and property measurement were in different sections of the plant. In addition, control dynamics had lengthy dead time and settling time. Other front-end challenges included return kerosene flash point control and hydrotreater reactor pressure control, which needed regular adjustments. On the back end, compound ratio control was the primary concern for operation.

On the energy front, Nirma wanted to minimize the hot oil consumption in the distillation columns and attain power savings in hot oil circulation pumps.

**Solution**

Nirma has regularly embraced technology initiatives to maintain its competitive edge. Nirma engaged Honeywell and UOP to design and implement APC at its LAB plant and bring the most advanced processes to light.

“We selected Honeywell because of our past experience in terms of technical support and Honeywell’s understanding of our work processes,” said R. V. Shastri, Unit Head, Nirma Ltd. “We were confident with the competency of the Honeywell solution based on the positive results from our existing Honeywell DCS system.”

To manage n-paraffin molecular weight control, Honeywell’s inferential property prediction tool Profit® SensorPro was used to develop inferentials for predicting molecular weight. To attain control in the individual columns and gain global level optimization, Honeywell’s distributed quadratic program tool Profit Optimizer was used.

The back end offered more challenges due to the nonlinear nature of the process. Predicting the kinetic properties like conversion, selectivity and recycled gas composition was a challenging task. Inferentials were engineered to predict the catalyst selectivity, conversion and recycled gas hydrogen composition. These inferential inputs were linearized based on first principle equations before inferential property prediction.

A total of 11 Honeywell Profit Controllers were implemented along with Profit Optimizer on the front end and back end, and one for the complete hot oil system. Profit Optimizer was implemented to achieve the plant-wide real-time dynamic optimization. Profit Optimizer provides the interconnection between the front end and back end processing.

Nirma worked with UOP technology, the key enabler for production of normal paraffin and linear alkyl benzene to supply the latest process technology, catalysts and adsorbents to achieve the desired product quality.

“We have the talented and committed people from both Honeywell and Nirma to thank for this successful program that met all of our business goals,” said Shastri. “And the project was completed on budget and ahead of schedule adding to the value received from Honeywell.”

**More Information**

For more information on Honeywell’s advanced process control solutions, visit www.honeywell.com/ps or contact your Honeywell account manager.

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