

## LG Petrochemical Improves Performance with Honeywell Optimization Solution



“LGPC chose Honeywell for this ethylene project based on its practical approach to optimization and strong local technical support. LGPC eventually achieved significant improvement by applying it.”

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### Benefits

LG Petrochemical Corporation Ltd. (LGPC) located in Yeosu, South Korea, wanted a world-class, cost-competitive naphtha cracking center. To achieve this goal, the company was looking to not only increase production capacity but also to improve operating efficiency. A collaborative optimization solution with Honeywell led to the following benefits:

- Increased olefin production of unit by 5 percent over previous best sustained rate
- Reduced energy consumption in cold side towers by 8 percent by reducing steam consumption in separation towers and energy in refrigeration circuits
- Improved unit stability since implementation
- 95+ percent uptime for advanced applications and a very high level of operator satisfaction
- Improved composition control, saving about \$100,000 per year by operating closer to specifications in ethylene product

### Background

LG Petrochemical Corporation Ltd. is part of the LG group of companies and is responsible for the production of more than 1.5 million tes/yr of basic petrochemicals and more than .25 million tes/yr of polyolefins. The Yeosu complex produces ethylene, propylene, mixed C4s, polyolefins, C5s and aromatics, including more than 860,000 tes/yr of ethylene. LGPC chose Honeywell to implement a multivariable control solution with integrated dynamic optimization because Honeywell provided the most cost-effective and practical approach to solving the problem. LGPC also felt that Honeywell's solution fit best with the capability of its own internal resources.



### Challenges

The naphtha cracking center at Yeosu has 15 furnaces designed by ABB Lummus, which accept a variety of feedstock including naphtha, C4-LPG and gas oil. Already operating at a high level of efficiency, LGPC wanted to increase production and reduce energy consumption to remain competitive.

LGPC knew that with various naphtha feedstock being imported, changes in feedstock price and/or composition, flexible and responsive controls were needed to optimize production and maximize profit. In addition, numerous furnaces, decoke and dryer switches meant that the plant was rarely operating at a steady state. LGPC had previously tried to implement advanced control on this unit but had not realized much success. LGPC had used a complex steady-state optimization model that was difficult and costly to maintain and only infrequently came up with an optimization solution. LGPC knew that there were significant benefits to be realized so they decided to try again.

## Solution

LGPC considered several vendors and determined that Honeywell had the most cost-effective solution and the necessary experience with ethylene plants. LGPC liked the robust controller and dynamic optimization approach that Honeywell was offering, but most importantly, Honeywell could readily incorporate third-party furnace models into the optimization layer. LGPC had already developed furnace models internally and this enabled Honeywell to offer a cost-effective optimization solution. The objectives of the solution were to:

- Maximize ethylene and propylene production subject to constraints across the complex including refrigeration constraints
- Minimize energy consumption
- Stabilize cold section fractionation operation
- Transfer technology to LGPC engineers

To achieve the objectives, Honeywell and LGPC applied the following technology:

- 21 Honeywell Profit<sup>®</sup> Controller applications on 15 furnaces, quench and cold section towers.
- Internal furnace model was developed by internal LGPC resources and provided calculations for per-pass conversion and tube metal temperature. Results were used by Profit Controller as controlled variables.
- Profit Optimizer with furnace model to provide yield predictions of key products in furnace effluent and to update gains in underlying Profit Controller applications.
- Profit Toolkit applications that validate and extract gain information from the furnace model.

The overall project was executed in three parts – first, advanced process control (APC) on the cold section fractionation towers, then APC on the furnaces and finally, implementation of the optimization solution.

## More Information

For more information about Honeywell advanced control and optimization solutions, visit [www.honeywell.com/ps](http://www.honeywell.com/ps) or contact your Honeywell account manager.

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APC on the cold section focused on increasing recovery of ethylene and propylene, and reducing steam and refrigerant consumption in the towers. This effort resulted in an increase in olefin production (worth about \$100,000 a year) and approximately 8 percent reduction in steam to the de-ethanizer and de-propanizer.

APC on the furnaces increased olefin production by another 1.5 percent by maximizing feed subject to limits in the furnaces. The APC applications also scored very high marks from the operators for control performance, ease of use and stable operation during load changes.

LGPC used the APC applications for a year before they implemented the optimization application. Profit Optimizer used LGPC's furnace models to predict yields and update gains in the dynamic optimization solution that linked the furnace controls and the cold section controls. As a result, LGPC saw a further 3 percent increase in olefin production. The dynamic optimizer was able to increase feed up to limits in the C2 refrigeration compressor as well as the cracked gas compressor.

The advanced control and optimization solution was the result of collaboration between LGPC process experts and Honeywell control experts. The solution enabled LGPC to significantly improve operational performance so energy consumption per tone of olefin produced is at world-class levels.

By choosing Honeywell's ethylene APC solution, LGPC realized benefits in plant capacity, energy savings and reduced product variability.

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