Executive Summary

Samsung Petrochemical Co. Ltd. (SPCL), a major Korean petrochemical company, produces 700,000 tons per year of purified terephthalic acid (PTA) at its Daesan plant. PTA, a white powder substance that is produced by oxidizing and refining para-xylene, is a precursor to polyethylene terephthalate (PET), a polyester material that has excellent thermal resistance and wear resistance and is widely used as a substitute for natural cotton fibers and in film packaging, beverage bottles, tire cords, paints, adhesives, and other applications. As of 2010, global annual demand for PTA stood at 39 million tons, and is expected to continue growing by 7% a year until 2016. Growth is especially strong in Asia, particularly China and India. (Source from Petrochemical industries in ASIA 2013 issue)

SPCL is striving to improve safety at this plant and wants to reduce operator workload and ensure consistent product quality by automating complex operations. To achieve these aims, Yokogawa Korea installed the Exapilot operation efficiency improvement package and integrated it with the plant’s existing CENTUM CS 3000 production control system. With these new systems in place, the SPCL plant is operating flawlessly.
The Challenges and the Solutions

Up until 2000, SPCL was using the CENTUM CS DCS and an advanced process control (APC) package. Around this time, Exapilot was installed and used on a trial basis, as part of an effort to improve quality control in each department and ensure more efficient production. Within the company’s quality control (QC) activity, four different production groups received prizes for their efforts in using this package to automate manual procedures.

When SPCL upgraded from CENTUM CS to CENTUM CS 3000, it extended the use of Exapilot to all other operations throughout the plant, including the startup and shutdown of three oxidation reactors. Prior to the introduction of Exapilot, emergency shutdowns of the reactors were particularly labor intensive, requiring operators to carry out many different manual operations such as ramping down the set points for the reactor temperature controller, opening and shutting valves, transferring intermediate chemicals to temporary storage tanks, and carrying out various other recovery processes. Similarly, many different manual operations were necessary to start up the reactors. Exapilot automates the execution of all these procedures and allows operators to monitor and confirm these operations while they are in progress. Safer operation and greater consistency in product quality was available now.

Another very labor intensive operation involved the treatment of the plant’s wastewater. The filters used in the separation process need to be cleaned by means of carbon purification, this takes up to eight hours, needs to be done two or three times per day, and requires the manipulation of 15 valves per filter. This process has also been automated using Exapilot. As a result, Exapilot reduces operator work load.

Filter purification by Exapilot

Assignment of the Internal switches for Exapilot
Customer Satisfaction

Jun Ho Hwang of Associate Daesan Maintenance Team, commented, “First of all, our company pays careful attention to quality control, and every department is striving to make improvements in this area. Our group aims to improve efficiency by automating manual procedures as much as possible. This helps to ensure safe operations 24/7, to reduce operator work load, and to ensure the consistent product quality.”

He added, “All of our operations are managed by Exapilot. Only the interlocks have been implemented through the CENTUM CS 3000 system. APC software and the Exaplog package have also been introduced to bring added improvements in efficiency. Maintenance engineers have assigned a total of 160 internal switches for Exapilot configuration, and all the logic is implemented by the skilled operators. So the know-how from the skilled operators is transferred by Exapilot to younger operators. Our central control room is quiet and our production operations have been going smoothly.”

Central control room (CENTUM CS 3000 and Exapilot displays)