Case Study

A CCC Case Study
**SITUATION**

An owner/operator of the ethylene processing unit for one of the main petrochemical industry plants in Bashkortostan, Russia, was challenged with upgrading their facility to become more efficient, reliable and safe.

The processing unit was successfully operating CCC’s single rack Simplex Series 4 Control system since 2001 on its complicated turbomachinery trains. Each train was composed of a compressor driven by a steam turbine.

A five-section M1 machine was designed to compress the pyrolysis stream to a pressure of 38 kg/cm². The M1 was comprised of three recycle lines, each with a dedicated antisurge valve and was recently replaced due to damage.

A three-section turbo compressor, the M5, was part of a closed circuit ethylene refrigeration cycle used for fume exhaust and compression of ethylene vapors to a pressure of 20.6 kg/cm². The M5, similar to the M1, also included three recycle lines and an antisurge valve in each line. Each suction line of the M5 was equipped with a throttle valve.

Also part of the complex turbomachinery train was the M6 turbo-compressor that worked within the closed-circuit propylene refrigeration cycle and was used to compress the propylene vapors. The M6 consisted of two casings, the first of which included two suction inlets with associated inlet throttle valves. It had a steam turbine drive with an automatic intermediate steam extraction pressure/flow and was equipped with three recycle lines and antisurge valves.

After a ten-year successful operation run, the control system and all controlled turbo machinery hardware required substantial modifications to keep it safe, reliable and productive. To facilitate this, the operator’s parent company chose CCC for a second time in an open bid for their control solutions.
SOLUTION

CCC consulted with the client to develop a customized solution to fit their specific needs. After lengthy discussions with engineers, operators, and project personnel, it was determined that a fully deterministic, multi-tasking operating system would provide the most comprehensive solution. Three Vanguard Duplex chassis, one per compressor were installed.

The scope of work included:

• Panel modifications and final checkout of the control panels for the M1, M5 and M5 compressors
• Installation, connection and configuration of two new operator workstations
• Communication establishment and verification between all three control systems and a CCC TrainView operator workstation
• Operator interface modifications per an on-site client request
• Control system software loaded, configured and verified for proper operation
• Verification and testing of analog, discrete and frequency inputs on all systems
• Testing of output commands from the controllers to the actuators
• Testing of all antisurge valves
• Implementation of CCC recommendations on AS valves
• Establishment of communications between the new controllers and DCS “Yokogawa”, complete with full verification and MODBUS adjustments
• Establishment of a second communication channel
• Performance of start-up routines for all new units
• Stability check up and tuning on all related control system settings
• M1 compressor surge testing
• Ethylene processing unit’s operation personnel training

RESULTS

The control systems for the compressors operated efficiently in the operating mode for over 72 hours without incident. CCC handed to the client the complete project documentation package on all control system configurations and set up. With the successful completion of this project, CCC surpassed the client’s expectations by offering consultation, expertise and world-class customer service - not only in turbomachinery control solutions, but in ethylene production technology as well. CCC’s experience, commitment to excellence and proven track record of client service is what led the operator and its parent company to choose to continue their partnership with CCC. This synergy allowed CCC to customize a solution that met their specific issues.

In an anonymous post commissioning survey, CCC received extremely high grades, highlighting a solid partnership and teamwork delivering excellence on all project stages from facility research to design and delivery of the control system.

The project was so successful that based on this implementation, CCC is looking forward to using it as a reference for other prospective clients.