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Modular DCS helps UK chemical synthesis plant exploit new technology

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the first full-scale production facility for continuous multipurpose chemical synthesis via supercritical fluids recently opened at Thomas Swan and Company Ltd in Consett, UK. The control system chosen to run it was a DeltaV digital automation system from Emerson



FIG. 1: The Swan-SCF plant can synthesize up to 1000 tonnes of TMCH per year.

Process Management. The Swan-SCF® plant has proved to be particularly effective for hydrogenation, with advantages in reaction rates and selectivity. In addition, it avoids the use of conventional volatile solvents, along with their associated environmental and waste problems.

This facility can synthesize up to 1000 tonnes (1102.3 US tons) per year (Fig. 1).

Initially, the plant is synthesizing trimethylcyclohexanone (TMCH), an acetone derivative used in styrene products, as a basic trial product to calibrate the equipment. The plant exploits proven new technology to replace conventional solvents by inert supercritical fluids for key chemical technologies, including hydrogenation, Friedel-Crafts alkylations and acylations, hydroformylations and etherification.

Hardware and software

The Swan-SCF plant uses carbon dioxide as the supercritical fluid. This is a gas compressed to a point where it displays solvent-like properties, which can be tuned through adjustments to temperature and pressure. Emerson supplied Rosemount temperature and Rosemount 3051 pressure transmitters to monitor these critical process parameters, which are recorded throughout the production cycle by the DeltaV Historian.

The system's Historian has been useful in tracking all events throughout the run, particularly any process upsets. Analysis of the final product shows how well the process conditions were tuned to the requirement, and allows us to identify any differences run to run. In this way, we can tune our Swan-SCF process to achieve 100% selectivity and conversion in a single pass.

The plant is highly instrumented, as might be expected for a process development and proving plant. Emerson



FIG. 2: Close-in shot of the SCF reactor where pressures of up to 500 bar are maintained.

Micro Motion Coriolis meters are used to monitor carbon dioxide density as it passes through the pressurization stages. The SCF reaction vessel is typically maintained at up to 500 bar (Fig. 2). The

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Emerson DeltaV system provides the operator with two digital displays—typically one screen shows the overall process, and the second shows a detailed view of interest, or utility services such as the hydrogen and carbon dioxide delivery and compression systems.

Our operators picked up plant control using DeltaV quickly and easily. They use on-screen alarms to react to any process problems. As we develop the processes we add modules and con-

trol loops, with new graphics (this we can do ourselves, easily). All the DeltaV hardware has been stable and reliable. It does what it claims to do, and is easy to understand.”

Conclusion

Thomas Swan (www.thomas-swan.co.uk) developed the Swan-SCF® process used in this plant, and has demonstrated 100% selectivity and 100% conversion in a number of reactions, in a single pass. The promise of high yields with reduced environmental impact, and the potential to explore process routes not available in conventional synthesis, have created in-

ternational attention. ■■■

About the author

Ian Richardson is a chartered chemical engineer with ten years experience working as a project engineer in the UK fine & speciality chemical industry. More recently he has been involved in specification, installation, software configuration & commissioning of a number of DeltaV systems at two production sites in the UK. He can be reached via email at IRichardson@thomas-swan.co.uk.



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