Volume ChE 27 No 3 – ISSN 0157-9762

CHEMICAL ENGINEERING IN AUSTRALIA

NEWSLETTER

JUNE 2002

NEWS

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newsletter
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Valve protection

Scaling inhibitor used on offshore platform

by A H Truman

A special descaling system designed to reduce and/or eliminate scaling inside flow control valves has proven successful after an eight-month trial in an industrial application. The system, a magnetic fluid conditioner (MFC), was developed by Magnetic Technology Australia (MTA) of Melbourne, in conjunction with A&A Process Engineering, also of Melbourne.

MTA was invited by Petronas/Carigali of Malaysia (PCSB) in 1999 to develop a solution to a severe scaling problem on one of its gas/oil platforms in the South China Sea.

Oil control valve after three months without magnetic fluid conditioners installed.

Oil control valve after eight months with magnetic fluid conditioners installed.

The platform has a high water cut and the scaling problem occurred at the first gas/oil/water separation vessel, due to the large amount of gas liberated. Scale buildup in the oil and water outlet stand pipes, the level control valves and downstream piping reduced production output by 18% every three months and required quarterly shutdowns to descale the system. The control valves became stuck (inoperative) within 28 days of de-scaling with injection of chemical scale inhibitors and 15 days without. Bypass valves were then used to maintain manual control of vessel liquid levels. The scale composition was mostly calcite with some dolomite and barite formed during release of CO2 from the formation water at points of pressure reduction.

Most MFC industrial applications are in recirculating systems, such as cooling water circuits, and there is a cumulative magnetic energy effect due to multiple passes through the applied magnetic field. Even poorly designed MFCs can produce some observable benefits in recirculating systems.

The oil platform application is a once-through process where there is only one chance of affecting a treatment, and the majority of commercially available MFCs are only suitable for small-bore recirculating systems.

Radically different specially designed MFCs were required for the single pass, high volume, large high-pressure pipework of the oil platform.

MTA investigated the whole fluid process, the chemistry and mechanisms of scale formation, and the fluid dynamics of magnetic fluid treatment, in conjunction with a detailed study of the platform process and operations.

Laboratory trials were conducted simulating the scale forming conditions on the platform. Various MFC designs were then tested by Thames Water Australia Pty Ltd.

Two MFCs incorporating the new designs were manufactured and installed in the separator last August. These units replaced the existing vortex breakers and fulfilled velocity amplifier, flow profiler and vortex breaker duties. Careful consideration was given to magnetic field structure, field penetration, field strength, the intersection of the field gradient and the fluid velocity vector, and available locations for installation of the MFCs relative to the scale generating points.

The installation was so successful that the three-monthly descaling shutdowns were no longer required. Only after eight months operation, during a shut-down due to a general oil field closure lasting five days, was there an opportunity to examine the units and the downstream piping.

The inspection revealed that:

- scale buildup in the zones of treatment of the MFCs, that is in the vessel outlet stand pipes and downstream control valves of the separation vessel, had been eliminated
- the MFCs had removed the existing scale in the pipes after the valves, which had not been removed during the descaling shutdown last August
- tthe oil and water outlet control valves had remained fully operational, that is there was no reduction in the stroke of the valves; scale inhibitors are no longer required
- there had been no drop off in production output or change in the fluid system operating pressures and vessel liquid levels.

The installation was so successful that the three-monthly descaling shutdowns were no longer required.

Tony Truman is from A&A Process Engineering, Melbourne. He also lectures in the Chemical Engineering Department of the Royal Melbourne Institute of Technology.