# BGEPIL Mumbai Offshore Oil Platform Production Tubing

**May 2006**

## Eliminating Calcite Scale Blockages Caused by $CO_2$ Release

Gas lift is used in wells where the well pressure is insufficient to lift the oil and formation water to the surface. High pressure gas is injected at various levels in the well to force the oil to the surface. British Gas Exploration & Production India Ltd (BGEPIL) now have a solution to chronic scale problems in the production wellhead piping of the gas lift wells on their offshore oil platforms off Mumbai.

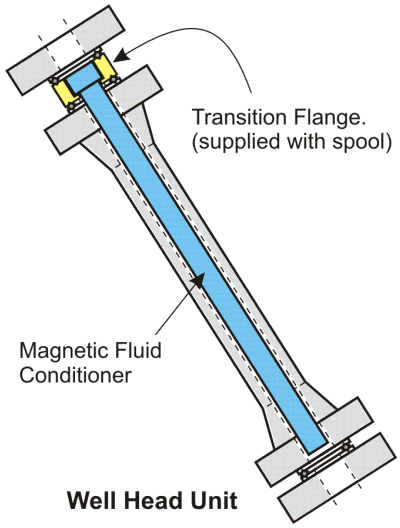
A scale buildup 24mm thick of calcite (calcium carbonate CaCO3) occurred within four months reducing the pipe cross-sectional flow area to less than 10%. This severe scale blockage resulted in significant production losses. Descaling of plant on an offshore oil platform is a time consuming and very costly process. These wells have a high water cut, that is, there is significantly more formation (subterrean) water than oil, with the formation water having an high calcium content. A study conducted on the gas lift wells indicated that the primary reason of scaling was due to CO2 deficient lift gas used for gas lifting. Utility gas after treatment for H2S removal results in removal of CO2 from 8% to 2%. This leads to a shift in partial pressure of CO2 that then leads to scaling deposition of CaCO3 scale in gas lift wells.

All chemical scale inhibitors were ineffective in stopping the scale deposition. Regular descaling shutdowns were required and the scale was removed using hydrochloric acid which presents a safety hazard on the platform. It was therefore necessary for BGEPIL to look for an alternative solution to the ineffective chemical scale inhibitors. After a search of the web for other possible solutions and a review of Magnetic Technology Australia's (MTA) success in eliminating chronic scale problems in separation vessels and control valves on a South China Sea offshore oil platform by using **Scale-X** magnetic fluid conditioners (MFCs), BGEPIL decided to trial these MFCs in wellhead production piping on gas lift wells. This move to trial a non chemical scale inhibitor was a radical departure from the existing, but ineffective, practice of using chemical scale inhibitors.

The MFCs used in the trial were a new generation of MFCs developed by MTA, a company that specializes in large industrial fluid processes. These MFCs have proven to have a profoundly improved performance over earlier generation MFCs.

Magnetic fluid conditioning is usually associated with recirculating fluid systems which rely on a cumulative magnetic energy effect due to multiple passes through the MFC. Single pass fluid systems are much harder to treat by magnetic fluid conditioning as there is only a "one shot" at treatment. Production piping on offshore oil platforms are single pass fluid systems. Specially designed MFCs are required for this application, both for the single pass high volume through put and the extreme conditions under which the MFCs are required to operate on a platform. The MFCs operate under very high pressures, designed for up to 40000kPa (5800 psi).

**Wellhead Magnetic Fluid Conditioner.**
**These MFCs are mounted in pipe (tube) spools.**




The MFCs are designed to treat the high calcium content formation water which is the cause of the scaling when CO2 is released. The formation water and oil have a lower velocity than the gas. **The MFCs were installed in October 2004 at a location just downstream of the "Christmas Tree" wellhead choke valve. After fifteen months of operation scale deposition had been eliminated and there was no longer a production loss due to scale deposition.**

More information on Scale-X Magnetic Fluid Conditioners is available at www.scale-x.com.

**Pearl Protim Bezboruah** – Senior Completion Engineer,
British Gas Exploration Production India Ltd, managed this project.

**Anthony Harry Truman** - was formerly a lecturer in the Chemical Engineering Department of the Royal Melbourne Institute of Technology University and is now the Technical Manager of A&A Process Engineering Pty Ltd.

**Tubes are clean after 15 months with MFCs installed.**

**NOTE:- Without MFCs installed the scale thickness was 24mm (1 inch) after only 4 months.**

**Shows the MFC partly removed after 15 months continuous operation. This shows the fluid entry end of the MFC.**

**Note the transition flange which is supplied with the spool.**