Flow Assurance and Production Optimization
Real Time Flow Assurance Applications

The Online Flow Assurance applications are focused on control and monitoring during start-up and normal operation to ensure stable production, avoid hydrates, minimize sand production, and achieve minimum risk of sand erosion/corrosion.

Flow Assurance is about avoiding problems with slugging/instability, erosion, corrosion and various deposits like sand, scale, wax, and hydrates. Our real time applications for monitoring and active control of pipeline and wells, provide unique and effective tools to avoid such problems.

**Insight Erosion Management System**

Well production performance monitoring and flow assurance surveillance with focus on sand/erosion management. Insight calculates the sand erosion rate in different production chokes and other components where sand erosion may occur. Well production rates can be taken from well test rates or allocated rates based on simple polynomial models, multiphase flow meters or virtual flow meters. In addition, it compares the measured choke pressure drop with the calculated to detect erosion of the choke insert. Similar “hydraulic performance monitoring”, can easily be made and is also available in our Well Monitoring System (WMS), for example by comparing measured and calculated pipe pressure drop. If deposits or clogging starts to occur, the hydraulic performance monitoring system will detect it.

**WMS - Well Monitoring System**

WMS is a virtual metering system which calculates production rate, watercut, gas oil ratio and distribution of pressure, temperature, velocity, etc. from reservoir to processing facilities. The flowrate of water together with pressure and temperature distribution is critical information to know the required inhibitor injection rates to avoid hydrates and corrosion. The velocity at any point is also available, which is required to calculate sand erosion rates and to know whether the rate is high enough to lift sand and droplets out of the wells.

WMS can utilize any instrument in the production network, including density-, watercut- and flow- meters. WMS can be used as a backup or replacement of multiphase flow meters. It is also a valuable tool for data validation of well tests and for reconciliation of multiphase flow meters or any other sensor.
WRIPS - Water Reservoir Injection Pressure System
This application is used to avoid damage to the reservoir during water injection due to unwanted and uncontrolled fracturing. It calculates the most probable downhole pressure and water injection rate to each well. When the calculated downhole pressure is above the limit which gives risk of fracturing, an alarm is given to the operators.

EFDD – Early Fault and Disturbance Detection
The EFDD system together with Insight and WMS is used to, as early as possible, detect changes in hydraulic performance caused by deposits and/or choke erosion. Early warning of deposits is vital to maintain and assure the maximum flow of wellstream and eventually avoid complete line blockage.

AFC – Active Flowline Control
Automatic control of multiphase flowlines to ensure stable production conditions without severe slugging problems. Reduced flow and pressure oscillations reduces risk of shutdowns due to topside overloading, avoids well quenching, eases well testing and virtual flow metering, and minimizes risk of failures due to piping vibrations.

AWC – Active Well Control
Automatic control of production wells, both naturally flowing and artificially lifted, for optimized and stable production conditions. AWC gives the same advantages as AFC. In addition, AWC is used for controlled start-up to avoid excessive drawdown and rates to reduce risk of near well damage, high sand production, and excessive erosion. AWC is also used to maintain target rates or bottomhole pressures.

Integration with OLGA Online
An integrated solution with WMS/AFC/AWC and OLGA Online is available. This is beneficial for softsensing and virtual metering during shutdown and transient conditions.

HydratCon
Online finite element model of a pipeline to estimate remaining time to hydrate forming conditions during shutdown. Similar functionality can be provided with OLGA Online, but at a higher cost and with higher complexity. HydratCon provides an additional functionality for tuning against operational data.

For more information, please contact:
ABB AS
Ole Deviks vei 10
N-0666 Oslo
Email: io@no.abb.com
www.abb.no/oilandgas

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