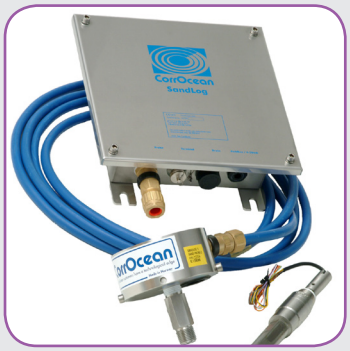
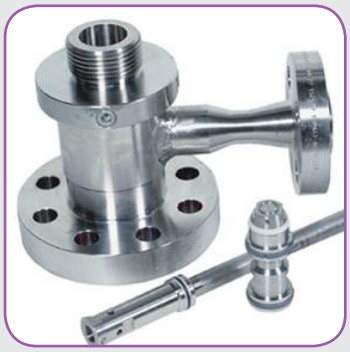
# Roxar CorrOcean Product line

## TOPSIDE



The Roxar topside CorrOcean Product Line
– Meeting Your Flow Assurance Challenges.

roxar
MAXIMUM RESERVOIR PERFORMANCE

EMERSON
Process Management

**As oil & gas demand continues to outstrip supply and operators look to maximise production while keeping down costs, the importance of an integrated and flexible integrity monitoring system, that can face down threats to production, such as sand erosion and corrosion, has never been more important.**

The Roxar topside CorrOcean Product Line provides the most extensive range of integrity management solutions for internal corrosion and sand/erosion monitoring on the market today. The product range comprises:

- **A full range of corrosion coupons and probes** to measure corrosion and erosion rates, with portable and on-line instrumentation and associated user software.

- The **non-intrusive Field Signature Method (FSM)** for monitoring uniform and localized corrosion directly at the pipe wall.

- A **sand erosion monitoring system** for installation directly into the flow. The system can also be combined with the non-intrusive Roxar Sand monitor for optimum sand monitoring.

- The **Roxar Fieldwatch** software for the visualization, analysis and management of the corrosion and sand monitoring data, as well as the configuration and maintenance of instruments.

The Roxar topside CorrOcean Product Line, which can also be integrated with other Roxar monitoring solutions, provides operators with a continuous stream of measurement, production and flow assurance data - all integral to enhanced production and real-time decision-making.

## INTERNAL CORROSION MONITORING – INTRUSIVE SENSORS

Traditional corrosion monitoring is based on sensors being installed into the pipe or vessel through an access arrangement. Applications can vary with one of the most common being to monitor and control the efficiency of corrosion inhibitors in carbon steel piping.

The Roxar CorrOcean internal corrosion monitoring product line comprises:

*Roxar CorrOcean Hydraulic retrieval tool*

- A full range of **weight loss coupons and corrosion probes** - electrical resistance (ER), linear polarisation resistance (LPR) and galvanic probes. The probes come in different styles and shapes, suitable both for high pressure 2" systems and retractable/fixed probe arrangements, typically used in land-based industries and refineries.

- Highly **accurate corrosion monitoring instruments** including:
  - The **MultiCorr** portable meter for the direct interrogation of ER, LPR and galvanic probes. The meter includes data storage capabilities and seamless communication with the Roxar CorrOcean MultiTrend Software for monitoring the data.
  - The **CorrLog** instrument for ER, LPR and galvanic probes. CorrLog is available in an off-line configuration, with 4 – 20 mA output, and with the CorrOcean proprietary field bus system. CorrLog can easily be upgraded and has an excellent record for resolution and field reliability. A wireless version, Roxar CorrLog Wireless, based on Emerson's Smart Wireless technology, is due to come to market in 2011.

- **Access fitting assemblies** for high pressure and low pressure applications with retrieval tools for both mechanised and hydraulic systems. For low pressure applications, a range of retractable and fixed probe arrangements are available. For high pressure applications, both a standard 2" mechanical system and the CorrOcean hydraulic access and retrieval tool system are provided with the tool having an unrivalled 25 years of operational experience without recorded injury.

- **Injection fittings** with nozzles and injection quills designed for both mechanical and hydraulic access systems.

- The **Roxar CorrOcean MultiTrend Software** for offline systems and the **Roxar Fieldwatch** software for on-line systems, both providing system control, data acquisition and high quality reporting capabilities.

## FSM (FIELD SIGNATURE METHOD) FOR NON-INTRUSIVE CORROSION MONITORING

FSM is based on measuring the changes in voltage over time from an electric current fed between a matrix of sensing pins installed on the external surface of the pipe or vessel. This allows the direct measurement of metal loss from the pipe wall with uniform and localised corrosion – weld corrosion, for example – identified at an early stage.

FSM is often used for:

- **High temperature corrosion monitoring in refineries**, often related to the use of high acid crudes. The temperature limit of the FSM is set at 500 oC (932 F), but can be expanded if required.

- In **underground pipelines**, FSM can be installed directly on the pipe wall, with no space required for changing probes or coupons under the pipeline The FSM matrix installed on the pipe has the same life

*Operator collecting FSM-IT data using FSM-IT instrument at connection post for an underground pipeline.*

expectancy as the pipeline itself.

- FSM provides more reliable measurements in **sour (high H2S) production environments**. Non-intrusive monitoring is also often preferred for safety reasons, due to H2S being a poisonous gas.

FSM topside comes in two main versions:

- **FSM-IT**, where a portable instrument is used to manually interrogate FSM-IT sensing matrixes installed in plants, platforms or pipelines. Data is imported to the PC through MultiTrend software.

- **FSMLog**, where each monitoring location has one dedicated instrument, providing data continuously and on-line to the user. FSMLog is a new product, offering improved performance at a fraction of the cost of earlier FSM on-line system versions. System configurations are the same as for the CorrLog instrument and FSMLog can be part of an integrated monitoring solution. FSMLog is available in ex.certified (zone 1 and 2) and non-ex-certified versions.

- **MultiTrend** software for FSM-IT and **Fieldwatch FSM Manager** software for the on-line FSMLog system.

## SAND EROSION MONITORING

Sand is another barrier to flow assurance – as a major contributor to erosion and as a factor behind production equipment being clogged and wellbore access impeded

Sand erosion monitoring optimizes production and prevents damage to equipment or leaks as a result of erosion damage. Furthermore, as fields get older, water cut (and thus sand production) tends to increase while, at the same time, increased gas ratio heightens flow velocities and the risk of erosion damage.

The Roxar CorrOcean product line provides two approaches to sand erosion monitoring:

- **Non-intrusive, acoustic sand monitors** that are normally clamped to a bend in the production pipes (see separate fact sheet on the Roxar Sand Acoustic monitors).

- **Intrusive sand erosion probes** with online **CorrOcean SandLog** instruments. The probe measures the erosive effect of sand on the probe element using the ER principle, and sand production rates are quantified by combining measured erosion rates with flow data and average sand particle size.

The best and optimum results can often be achieved by combining the two monitoring technologies into one integrated system.


*Hydraulic access fitting with Sandprobe and SandLog instrument installed in vertical pipe.*

The CorrOcean SandLog system consists of:

- **Access fittings and retrieval tools**, as previously described for intrusive corrosion monitoring.

- A multi-element **Sand Erosion Probe**.

- The **SandLog** instrument, with configuration options as previously described for the CorrLog system. A wireless version, based on Emerson's Smart Wireless technology, is also due to come to market in 2011.

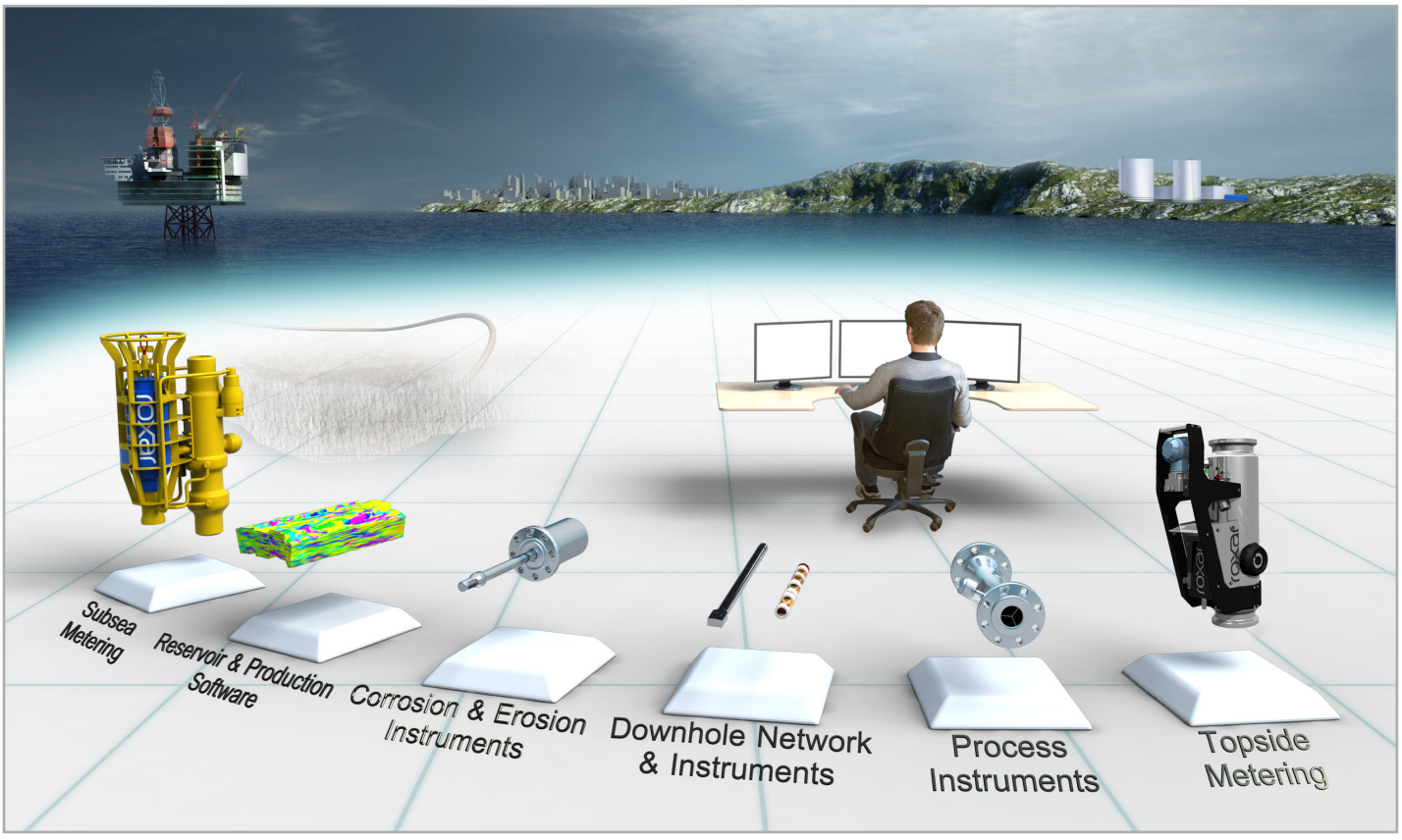
- **Fieldwatch** software for sand management, visualization, data analysis and reporting.

## ROXAR FIELDWATCH - A COMPREHENSIVE FIELD MONITORING SYSTEM

The extensive Roxar product range and Roxar Fieldwatch provides operators with a comprehensive field monitoring environment where a wide variety of instruments can be integrated within a single, windows-based system. The scalable and efficient architecture allows remote connectivity and enables multiple users to access the same data and instruments.

As well as providing unique tools for the performing of real time analysis on sand, erosion and corrosion data, the modular system allows for other related monitoring functions to be incorporated within an integrated infrastructure. The Roxar CorrOcean product line, for example, can be combined with pig detection or flow measurement, with such integration resulting in reduced purchase and installation costs and reduced training, operational and maintenance costs.

Roxar Fieldwatch is designed for collaboration across the reservoir management team, bringing high definition data visualization and analysis tools both to the control room on-site and to the production or flow assurance engineer's desktop, allowing the different data users to work efficiently together.



www.roxar.com

For further information please contact your regional office or email info@roxar.com or visit www.roxar.com

| | |
|---|---|
| Head Office: | Tel: + 47 51 81 88 00 |
| CIS: | Tel: + 7 495 504 3405 |
| Europe: | Tel: + 44 1224 215 700 |
| North America: | Tel: + 1 713 334 2222 |
| Middle East: | Tel: + 973 17 517 111 |
| Asia: | Tel: + 603 2177 4450 |
| Australia: | Tel: + 61 8 9315 9500 |
| Latin America: | Tel: + 55 212 222 1941 |
| Africa: | Tel: + 27 71 60 61 737 |