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Case study: Use of Compact MPFM Well Testing Solution in India

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Outline

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- Operator Challenges
- Conventional Well Testing Using Separators
- Emerson's Well Test Solutions Implemented
- Bettis Multi Port Flow Selector
- Roxar Multiphase meter
- Summary & Added Value for the Operator
- Suggested Further Reading
- Q&A

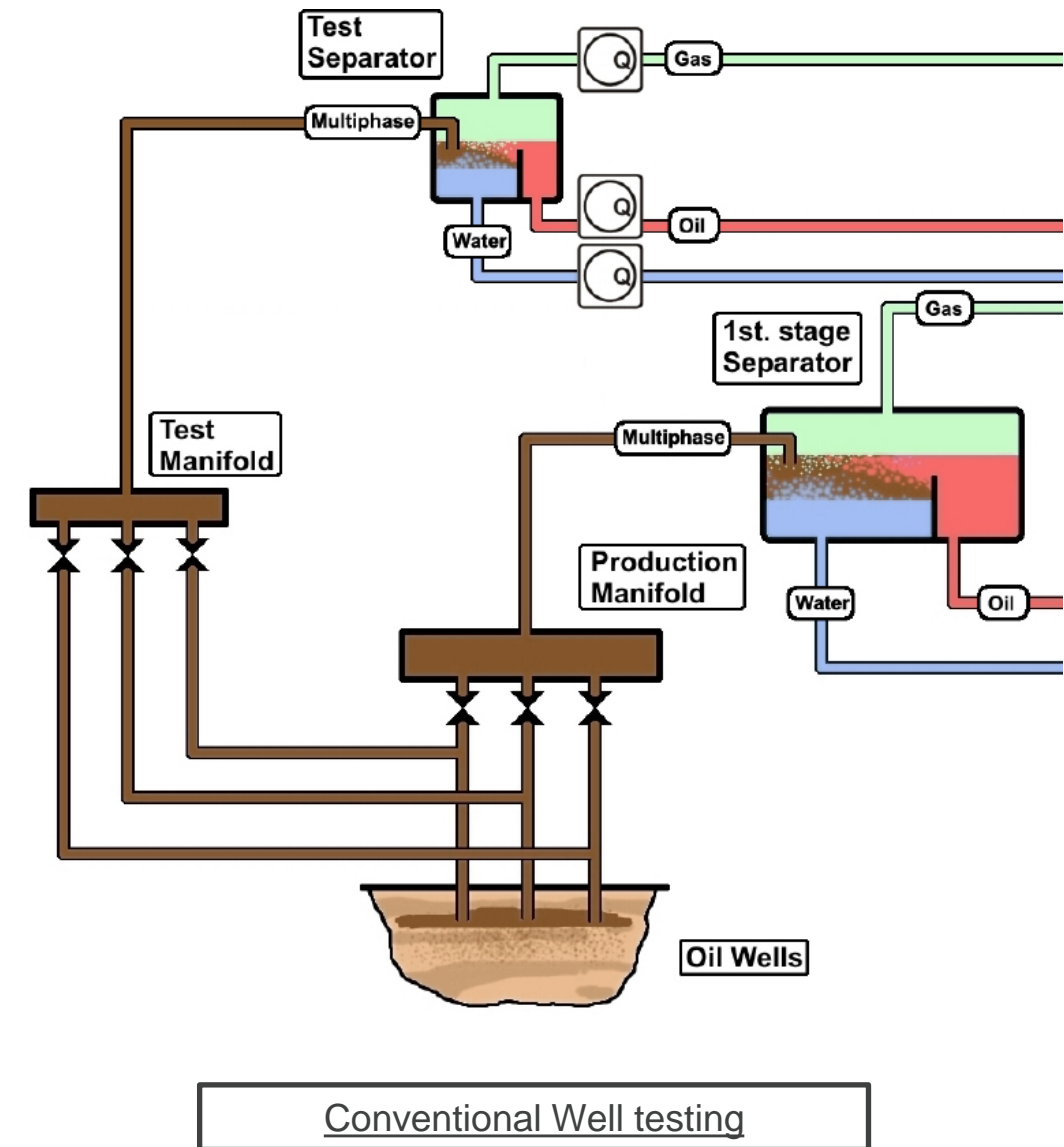
Introduction & Background

- The 1974 discovery **Mumbai High North (MHN)** is an offshore oilfield operated by India's Oil and Natural Gas Corporation (ONGC) and located 160 kilometers west of Mumbai
- Decline in oil and gas production led to the need of a **redevelopment plan**, and ONGC announced its plan for Mumbai High redevelopment in the year 2000.
- The first phase was completed in 2006 and the **second phase was completed in 2012**
- The production rates were around **265,000 bopd** with an average of 63% watercut and an average production of 1,200 barrels of liquid per well
- The field is exploited using **gas lift**



Operators Challenges

- They wished to develop an **effective and reliable well testing system** that would optimise production, provide real-time operational data and **could be accessed remotely**
- As this was an unmanned platform, ONGC wanted to **minimize transfer of people** to and from the platform
- They wished to **limit weight and space due to restraints** in these areas and also power consumption as most of the power is **provided by solar panels**
- ONGC wished to progress with an **alternative to traditional well test separators**, which take up large amounts of space with extensive piping requirements, are often resource-intensive and could be argued are **not ideal for unmanned platforms**



Test Separators and Conventional Manifold – Build, Size & Weight

| | Dimension | Weight |
|------------------------|---|-------------------|
| Typical Test Separator | Length: 5.7 meters Width: 2.3 meters Height: 2.5 meters | 15,000 kg |
| Roxar MPFM | Length: 65 cm (3" meter) | 150 kg (3" meter) |



Conventional Manifold



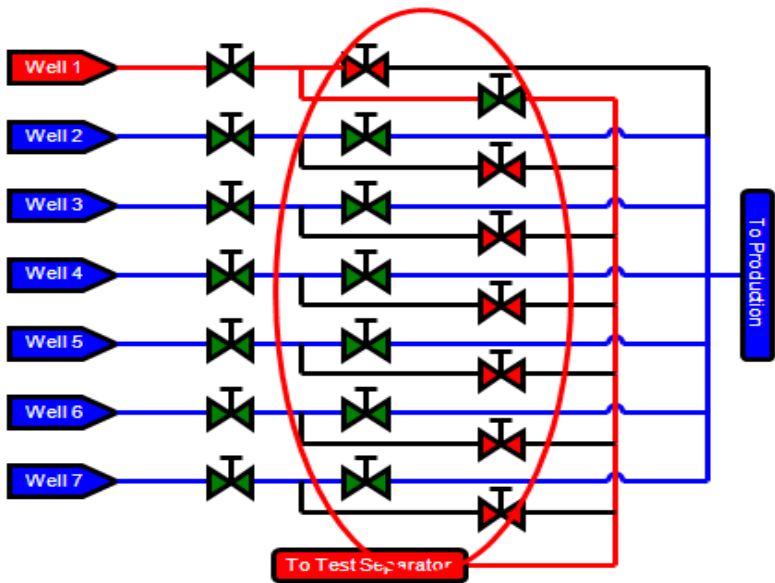
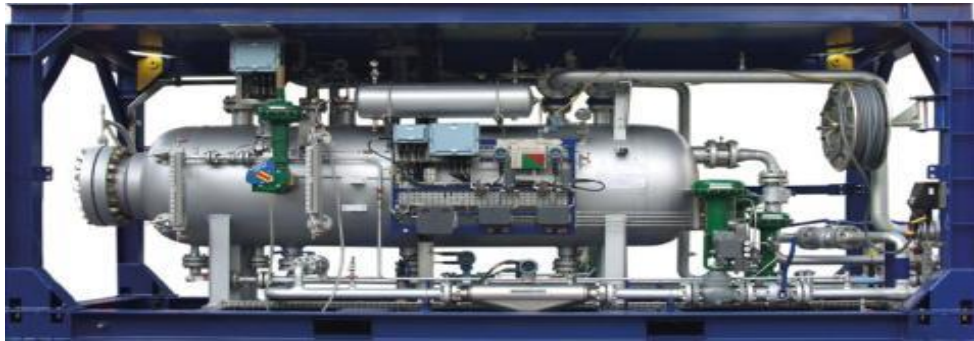
Test Separator Examples

Well Test Solutions Implemented

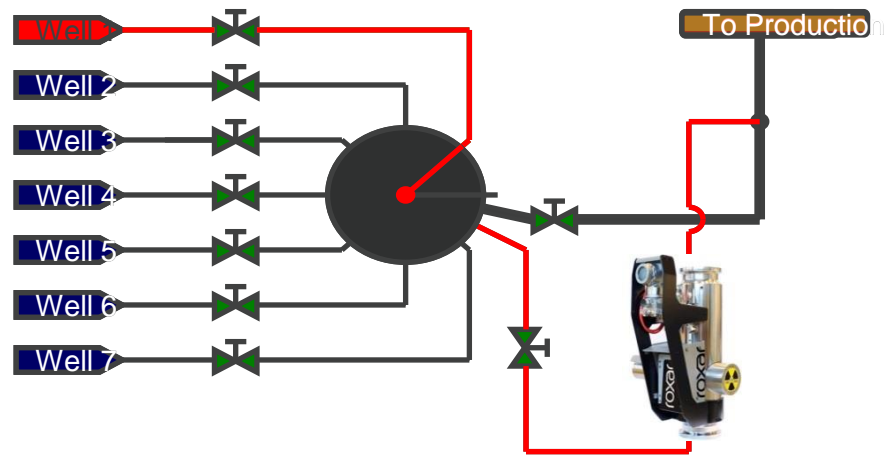
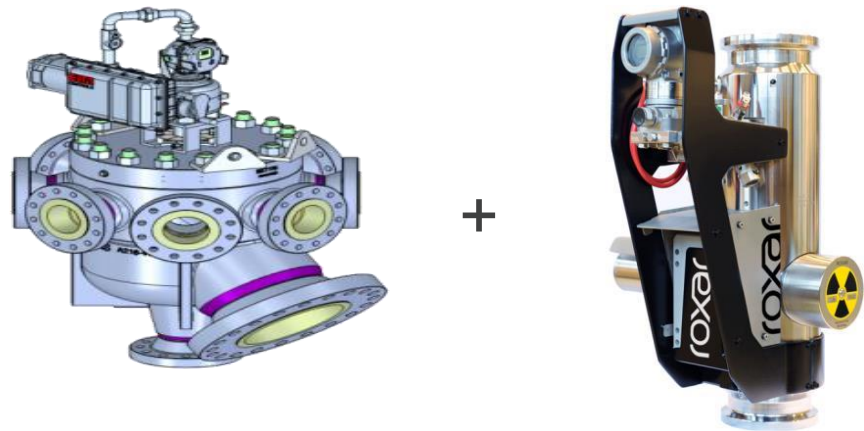
- The solution consists of a **compact, multi-component assembly**, with:
 - Roxar Multiphase meter
 - Valve Automation Bettis Multi Port Flow Selector
- This provides ONGC with a **highly cost effective, compact and flexible means** of improving production management and well optimisation



Well Test Solutions Implemented



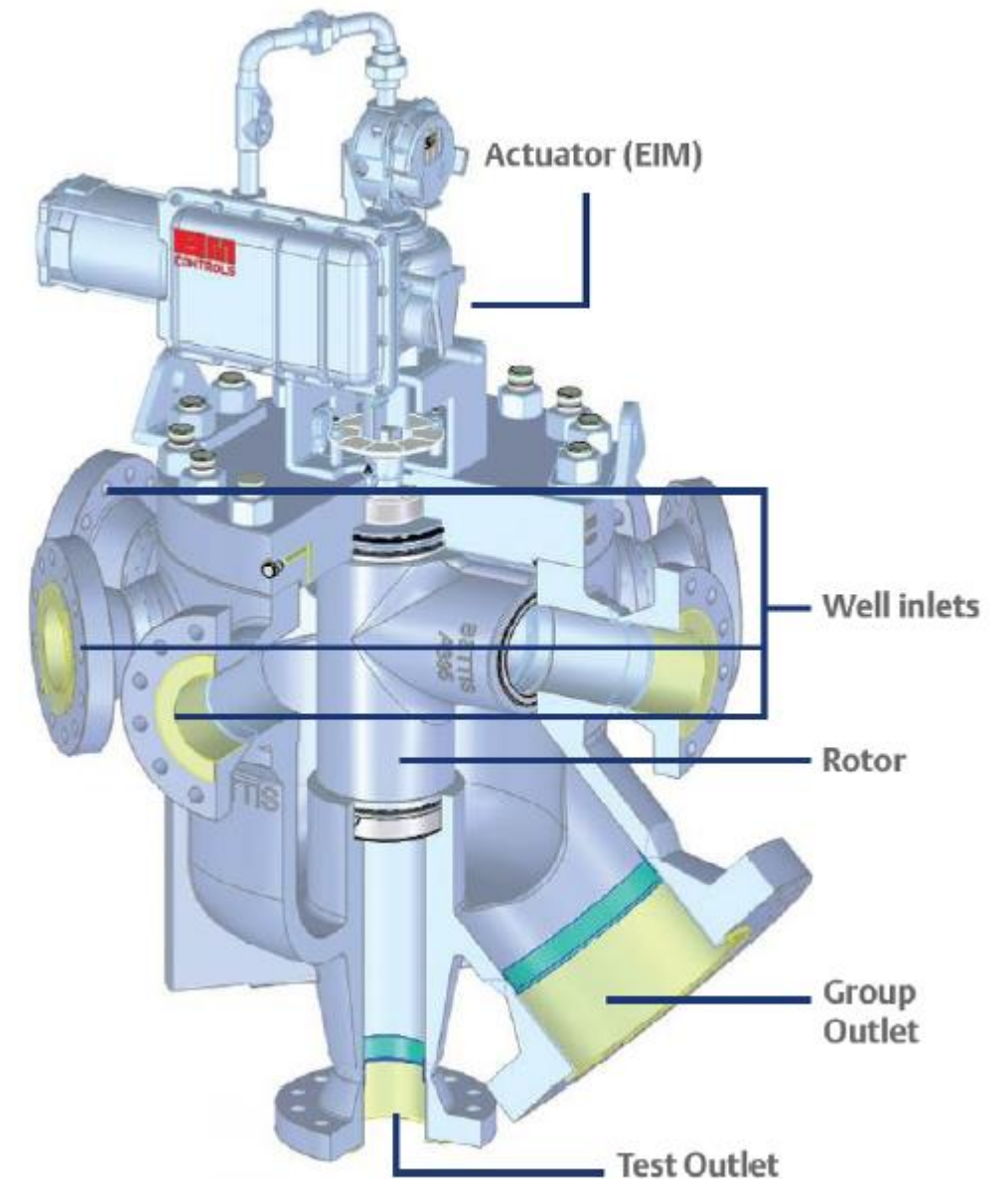
Conventional Approach



Multi Port Flow Selector with MPFM

Multi Port Flow Selector (MPFS) Operation

- The **rotor rotates 360 degrees** to internally align one inlet port with the test outlet port
- **The Roxar MPFM** is located on the test outlet port
- The remaining 7 inlet ports **continue to allow flow into the MPFS**, and out of the group outlet port
- **One inlet port** normally left blinded for inspection purposes



Roxar MPFM 2600 Key Features Ensures Strong Fit For ONGCs Requirements

- **Compact, light-weight design** – Meeting ONGCs requirements for space and weight constraints
- **Innovative Zector® technology providing advanced signal processing and innovative electrode geometry** – Providing high accuracy and robust multiphase measurements
- **Field replaceable insert venturi** – Providing flexibility in the future as flow rates change
- **Compact, integrated measurement solution for pressure, differential pressure and temperature** – Providing accurate and stable measurement, increasing robustness of overall measurements achieved
- **Measurement in Multiphase and Wetgas mode** – Provides flexibility of extended measurement range if this is required in the future
- **Multiple PVT data storage space within the flow computer** – Provides the ability to remotely select the correct PVT data set for the well being tested based on the position of the actuator



Combined Solution - Added Value for the Operator

- **Reduced well testing footprint** - 7 valves, flow selector & meter replaced 21 valves & test separator
- **Smaller skid sizes and light-weight piping** structure reduced installation time & cost
- **Reduction in joints, cables and instrumentation** compared to test separators
- **Personnel cost** savings
- **Reduced power** consumption
- Adherence to all ONGC's **HSE** requirements
- Installation – **Faster, Easier**



Summary

- A highly cost-effective, compact and flexible means of improving **production management and well optimization**
- Combines Bettis Multiport Flow Selector and Roxar Multiphase meter 2600 to **offer an alternative to traditional test separators**
- Entire system is **fully accessible remotely**, allowing greater flexibility and reduced costs
- More information and **greater control over their wells on an unmanned platform**
- **Real-time information** on how their reservoirs and wells are performing
- Greater intelligence, **automation and integration** in their production operations



MPFM + Flow Selector

Suggested Further Reading

- Roxar has a comprehensive library of **technical bulletins covering** various multiphase and wetgas related topics

Category Descriptions

- A – Cross Product for Flow Metering
 - B – Topside Multiphase Metering
 - C – Topside Wetgas Metering
 - D – Subsea Multiphase Metering
 - E – Subsea Wetgas Metering
- **This presentation is based on Roxar Technical Bulletin B06:**
“ONGC’s Mumbai High North Use of Compact Well Testing Solution”

Would you like a copy? Please contact your local Emerson Roxar Sales Representative, or email me: LarsAnders.Ruden@Emerson.com





Thank you for your attention!