OneSubsea - Processing
One Comprehensive Resource for Integrated Subsea Solutions

Subsea UK  21st August 2014
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OneSubsea Creation

**Schlumberger**
Leading oilfield services company

**Cameron**
Leading provider of subsea production systems

**Framo Engineering**
Leading provider of subsea measurement, boosting and process systems

**OneSubsea**
A Cameron & Schlumberger Company
A total of $2.5 billion in revenue with more than 6000 employees working in over 23 countries
OneSubsea Technologies and Services Offering

**Integrated Solutions**
- Field Development Planning
- Petrotechnical Services
- Flow Assurance Consulting
- Early Engineering Engagement
- One-System Approach

**Production Systems**
- Trees
- Manifolds
- MARS
- Connection Systems
- Wellheads

**Processing Systems**
- Multiphase Pumps
- Single-phase Pumps
- Multiphase Compressors
- Multiphase Meters and Wet Gas Meters
- Sampling
- Separation

**Control Systems**
- Tree and Manifold Controls
- Multiphase Pump Controls
- Multiphase Flow Controls
- Topside and FPSO Controls
- Wet-Mateable Diamould Connectors

**Swivel and Marine Systems**
- Swivel Stacks
- Turrets
- Submerged Loading Systems
- Offshore Cryogenic Transfer

**Services**
- Installation and Commissioning
- Life of Field
- Asset Management
Established 1983
800 Employees
Headquarter at Sandsli, Bergen, Norway
Total System Solutions – Subsea to Floater

Pumps & Subsea Process Systems

Multiphase Meters & Measurement Systems

Swivels & Marine Systems
We offer a unique and versatile range of pumps for onshore, platform and subsea applications.
We offer a unique and metrological very robust metering system for multiphase and wet gas measurement.
At Horsøy, close to Bergen, we perform assembly and testing of our pumps, multiphase meters and swivel stacks.
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Field Remote Interactive Enabling Diagnostics

- Increased equipment uptime
- Cost effective remote monitoring
- 24/7 specialized support
A System Approach
Case Study – Subsea Tieback
Cost Effective, Generic, New Subsea Field Development

Well No. 4
Well No. 3

Well No. 1
Well No. 2
Cost Effective, Generic, New Subsea Field Development

Well No. 4
Well No. 3

Well No. 1
Well No. 2
HXT Tree

- All tree types, Horizontal, Vertical, Dual
- Product or full system supply
- Market leading on reliability
Conventional vs. Multiport Manifold

Conventional Manifold System
- 16 Actuated Valves

Multiport Manifold
- 8 Manual Valves
Subsea MSM, Retrivable Design

- Stationary housing
- Inlet ports (8 off)
- Test outlet (1 off)
- Main outlet (1 off)
- MSM actuator
- MSM retrievable insert
- Test outlet (1 off)
- Selector & Ball seal
- Ball contour
Brenda Field Development
Manifold Layout
Multiphase pump for main artificial lift
Subsea Boosting – A Powerful IOR Tool

- More than 30 systems – 2 mill operating hours
- MTTF = 15 years
- 30% - 100% production increase
- Substantial IOR effects
- Standardised technology – Taylor made solutions
- Life of field solutions
- Ultra-deep water – HP/HT
Flowing Wellhead Pressure vs. System Resistance

- **Multiphase pump discharge pressure**
- **Flowing wellhead pressure (P_{wh})**
- **Natural production**
- **System resistance**

- Increased production
- **MPP diff. pressure**

**FLOW FROM WELL**
Brenda Field Development
Premier Oil Brenda Manifold
Seawater Injection System

Cost Effective, Generic, New Subsea Field Development
A cost effective alternative to conventional topside water injection system.
Conventional Platform Mounted Water Injection System

- **Expensive** Topside Water Injection System, including pump with filter, de-aerator, piping, valves, etc.
- **Extra** Interface Engineering
- **Expensive** Platform modifications/extensions
- **Expensive** Platform installation, hook-up and commissioning work
  - Extra space & weight requirement
- **Expensive** high pressure water injection pipeline

![Diagram of Conventional Platform Mounted Water Injection System]
Subsea Raw Seawater Injection System –

Subsea Raw Seawater Injection System

TOPSIDE CONTROL SYSTEM

PLATFORM

FILTER

WATER INJECTION PUMP

PIPE

DUMP VALVE

CHEMICALS

TO WI WELL
CNR –Columba E  Field Subsea Water Injection

First world wide!
Subsea Raw Seawater Injection

OneSubsea Dual pump station
- 2 x W.I. pumps
- 2 x 100% filter units
- 1 x subsea control module
10km of subsea power umbilical
FDS in Protection Structure

Protection Structure: $L \times W \times H = 23m \times 10 \times 6.5$, Weight = 110 T

Pump Module: $L \times W \times H = 8m \times 7 \times 5.5$, Weight = 100 T
FDS In Protection Structure
FDS Components

WI Pumps

By-pass Valve Insert

Filter Units

Control Pod

L x W x H = 8 x 6 x 7m
Weight = 110 T
First ever subsea seawater injection pumps

- Treated Seawater via OneSubsea Filtration System

- 2 x 2400 kW WIP's
- 2 pumps in series
- 430 bar diff press
- 140 m water depth
- 10 km tie-back

Combined OneSubsea Control System for Pump Module, Manifold & Trees
Generic, New Subsea Field Development
PhaseWatcher Vx Highlights

- More than 1800 PhaseWatcher Vx sold worldwide!
- 150 topside PhaseTesters in operation by Schlumberger
- First worldwide multiphase meter in successful operation in 1995 with BHP in UK
- First worldwide subsea multiphase meter in successful operation with Marathon UK in 1997
- Fiscal allocation experience since year 2000.
- First crossborderer fiscal allocation between UK/Norway 2007
- First crossborderer wet gas fiscal allocation between Norway/Denmark 2010
- 12 years of operating experience for subsea sampling, the only company in the world who has enabled this service
- Built in Full redundancy on all components
We offer a unique and metrological very robust metering system for multiphase and wet gas measurement.
West Brae Subsea Layout

West Brae Development

Subsea meter mounted in subsea manifold
Optimisation

Baseline production

MPFM replaced
17% increase in production
BOA Field - First worldwide "Cross Border" Fiscal Allocation multiphase meter application

BOA lies partly on UK sector and is equipped with a subsea PhaseWatcher Vx multiphase meter with the function of Fiscal Allocation Metering
On stream June 2008
Alvheim Development – Marathon Oil

Multiphase Meter
Accuracy was the main evaluation criteria

Cross border fiscal allocation

TRYM FIELD
Norway

Denmark

Gas condensate
GVF: 90% -99.5%
Topside Power and Control System on the FPSO or Platform
Brenda Field Layout
Typical Power & Control Module

- Integrated module designed for single lift installation
- Fully tested and prepared for Plug & Play
- Minimise offshore work

Typical size: 10 x 7 x 5 m (WxLxH)
Typical weight: 70 T
OneSubsea MultiManifold

- Multiphase Meter
- Multiphase Pump
- Multiport
- PSCM's

- Increased Reservoir Management
- Increased Production
- Increased Flexibility
- Increased Control Capacity

- MultiPurpose
- MultiField Applicable
- MultiWell
- MultiPhase Pumping
- MultiPhase Metering
- MultiFunction Control
Thank You!