Subsea Developments
Status and Trends

Tore Halvorsen
Senior Vice President
FMC Technologies at a Glance

2005 Revenue: $3.2 Billion

- Subsea Trees
- Surface Wellheads
- Manifolds
- Control Systems
- Floating Production Systems
- Separation Systems
- Fluid Control
- Loading Systems
- Measurement Solutions

- Loaders
- Deicers
- Boarding Bridges
- RampSnake

- Citrus Extractors
- Freezing Systems
- Food Processing Systems

Energy Systems: 73%

FoodTech: 17%

Airport Systems: 10%
Subsea Production Systems

FTI’s Largest And Fastest Growing Business

- Subsea

2001: $600
2002: $700
2003: $800
2004: $900
2005: $1000

26% Growth

FMC Technologies
FMC Global Presence – Subsea Plants
Market Share of Subsea Trees
Total 756 Trees

Global Aggregate Market Shares % 2005 - Q3 2006

- Aker Kvaerner Subsea: 26%
- Cameron: 3%
- Dril-Quip: 1%
- FMC Technologies: 36%
- Vetco Gray: 20%

Source: Quest November 2006
A changing world.....

1979

Main Avenue in Beijing

2006
Forecasting

GARY'S WEATHER FORECASTING STONE

CONDITION
Stone is Wet
Stone is Dry
Shadow on Ground
White on Top
Can't See Stone
Swinging Stone
Stone Jumping Up & Down
Stone Gone

FORECAST
Rain
Not Raining
Sunny
Snowing
Foggy
Windy
Earthquake
Tornado
Global XT Market Estimate by Region

Global Forecast From Quest Base Case Nov 2006

Source: Quest November 2006
Market Effects - Cost

- MEPS EU Structural Index - Actual
- Actual Forgings & Machined Parts Cost Increase (FMC SAP)
Market Effects – Lead Times (Months)

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Q3-2004</th>
<th>Q3-2005</th>
<th>Q3 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xmas Trees</td>
<td>14</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Manifold</td>
<td>15</td>
<td>17</td>
<td>23</td>
</tr>
</tbody>
</table>
Market Effect

Local Establishment - Example Angola

20 M$ Invested in Base

18% of BP’s Block 18 manufactured in Angola

100 Angolans hired and trained
Subsea Trends – in general

- Smaller discoveries, on average
- In deeper water
- In deeper geological formations
- Further from infrastructure
- More difficult to produce and transport (heavier oil, more gas and water, less natural drive mechanisms)
- More difficult to recover the reserves
- Acceptance for full field developments based on Subsea Systems
Subsea Advances in all Segments

Drilling
Field Developments
Fields in Operation
Subsea Product Lines – Well Established
Long Distance – Subsea to Beach

600 km

Paris

London
## Control System Advances

<table>
<thead>
<tr>
<th>Current</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Speed: 2400 bps</td>
<td>Communication Speed: 1,000,000,000 bps</td>
</tr>
<tr>
<td>Distance: 150km</td>
<td>Distance: 600+ km</td>
</tr>
<tr>
<td>Protocol: Proprietary</td>
<td>Protocol: Open</td>
</tr>
</tbody>
</table>

![Control System Image]
All-Electric Control System

Comparison with Electro-Hydraulic

Electro-Hydraulic Controls

All-Electric Controls

- No Topside Hydraulics
- Smaller Umbilical
- No Subsea Umbilical Distribution
- No Hydraulics Subsea
- Chemical Injection Line still required
Production Controls – Future Scenarios

Independent Subsea System

No Umbilical
Acoustic Communications
Subsea Power Generation
Subsea Processing – A Game Changer
Subsea Gas Compression – Another Game Changer
Subsea Gas Compression
- “Subsea to Pipeline” next?
Under-Ice Developments

Drilling

Well Intervention

Production – Sub Mudline Templates
Development in Environmental Sensitive Areas

1. Subsea Production System – overtrawlable
2. Subsea Processing
3. Re-injection of produced water
4. Electric Control – no hydraulics
5. Autonomous ROV for maintenance – from shore
6. Flowline / Pipeline tunnel
7. Control and monitoring from shore
Fields in Operation – Technology Advances

- Riserless Light Well Intervention (RLWI)
- Through-Tubing Rotary Drilling (TTRD)
- Integrated Flow Management Capability
- Condition and Performance Monitoring (CPM)
Well Intervention

Key to Enhanced Recovery

World Oil Production by Source
(million barrels per day)

Source: WEO-2004, IEA.
Well Intervention

Subsea Wells > 5yrs Old in 2012
Well Intervention Cost

- Land
- Platform
- Semi
- MSV

Amounts in US $1K
Through Tubing Rotary Drilling (TTRD)

Established Method from Platforms

Traditional Subsea Drilling w/BOP

Cost Efficient Subsea Implementation - TTRD
Increased Oil Recovery

Light Well Intervention
Typical Flow Issues

- Wax / Asphaltene
- Gas Hydrates
- Emulsion / Foam
- Scale
- Sand/Erosion
- Liquid Slugging
CPM
Monitoring the Health of Subsea Fields

Data Collection & Storage
- Sand Production
- Instrument Status and Calibration
- Choke Performance
- Corrosion Monitoring
- Hydraulic System Health
- Electrical System Health
- Multiphase Flow Meter Performance
- FSM Performance
- Valve Operation

Field Management Information
Closing Remarks

- Subsea Field Developments well established and accepted
- Continuous strong future for Subsea Production Systems
- Challenging new geographic regions
- Strong technology focus – expansion of traditional SPS
- North Sea still "First Mover" in the majority of the technology advances
Thank you for your attention!