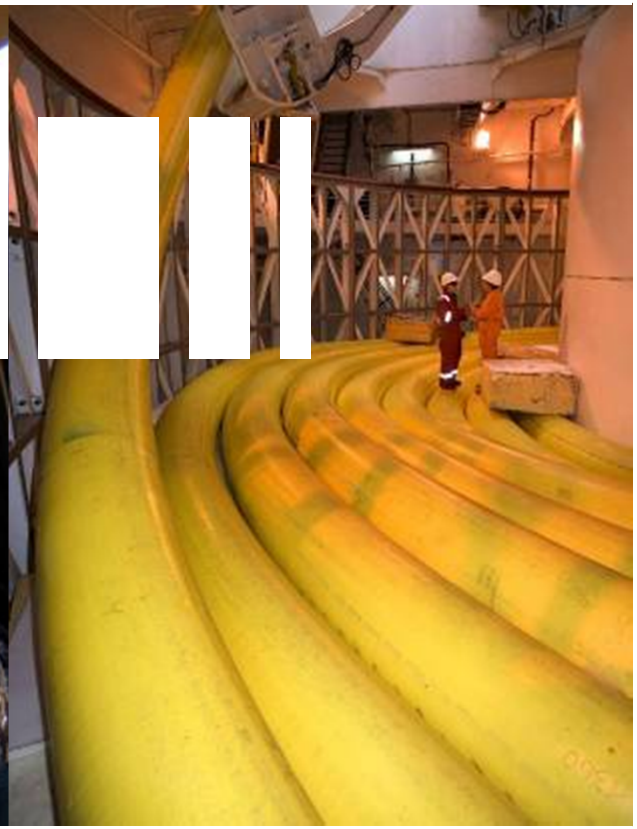
Subsea Technology



Alain Marion, Senior VP Assets & Subsea Technology

Investor Day in Brazil, October 4, 2011

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Subsea Technology

- **Technip's Commitment to Subsea R&D**
- **Technip Leadership Position**
- **Emerging Technologies Development**

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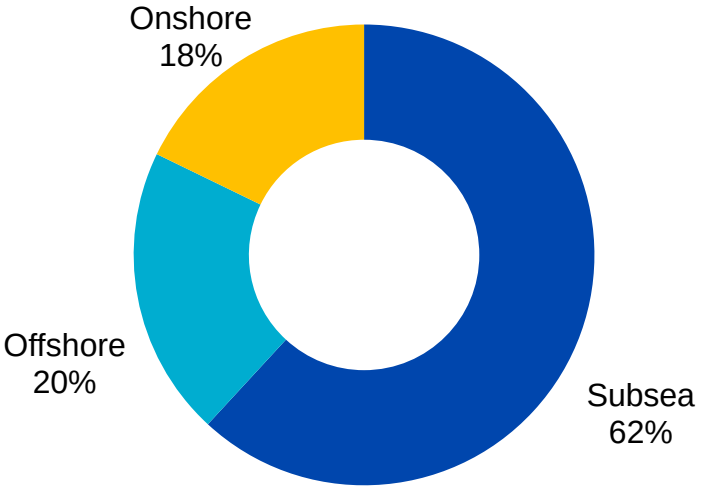
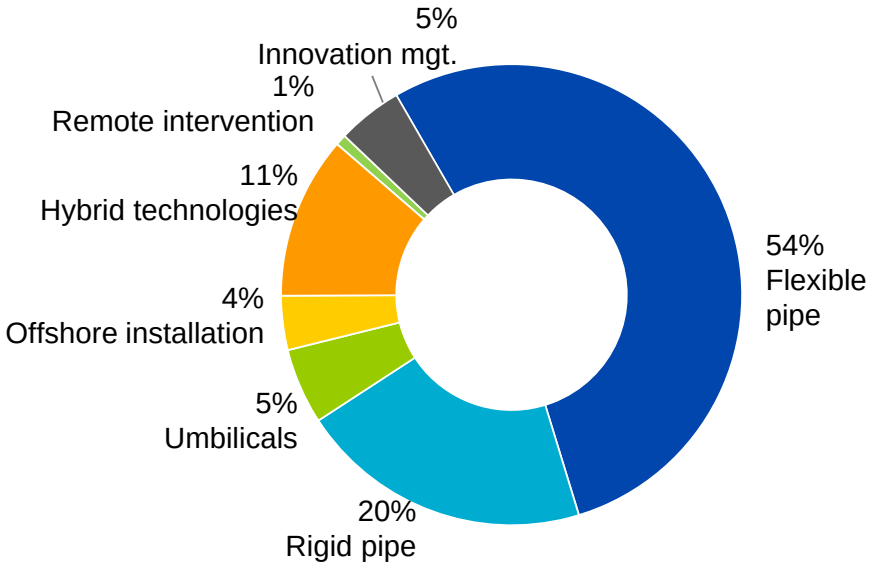
Technip's Commitment to Subsea R&D

Strong Commitment to R&D

Cumulative Group R&D Investment (2007 - 1H 2011)



Subsea R&D Engineers Worldwide 1H 2011



Over €250 million R&D investment* in all segments since 2007
263 Subsea R&D engineers worldwide in 2011

**Excluding Tax Credit*

Worldwide Subsea R&D Network

Subsea Technological Drivers

- Deepwater & ultra deepwater field development
- Flow assurance
- High pressure and temperature, corrosive fluids
- Asset integrity & in-situ monitoring
- Cost base optimization

Combining innovation with continuous improvement of today's technologies

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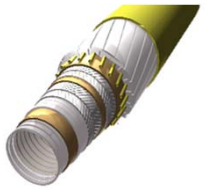
Technip Leadership Position

World Leading Subsea Solutions Deployed on Projects

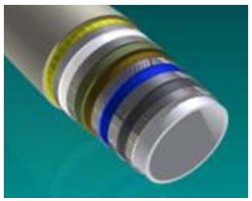
Flexible

Ultra Deepwater (3,000 meters)
MWCS, Gulf of Mexico

Integrated Production Bundles (IPB)
Dalia & Pazflor, Angola & Papa Terra, Brazil



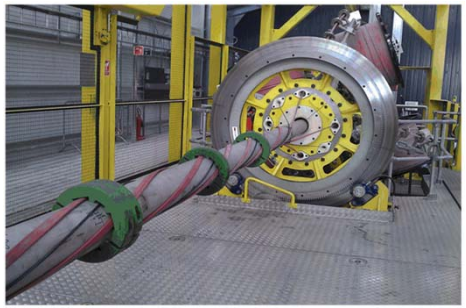
Smooth Bore Gas Export Riser
Asgard, Norway



Rigid

Deepwater Reeled Rigid Pipes
Nakika, Perdido, Gulf of Mexico

Electrically Heated Pipe-in-Pipe
Islay, North Sea



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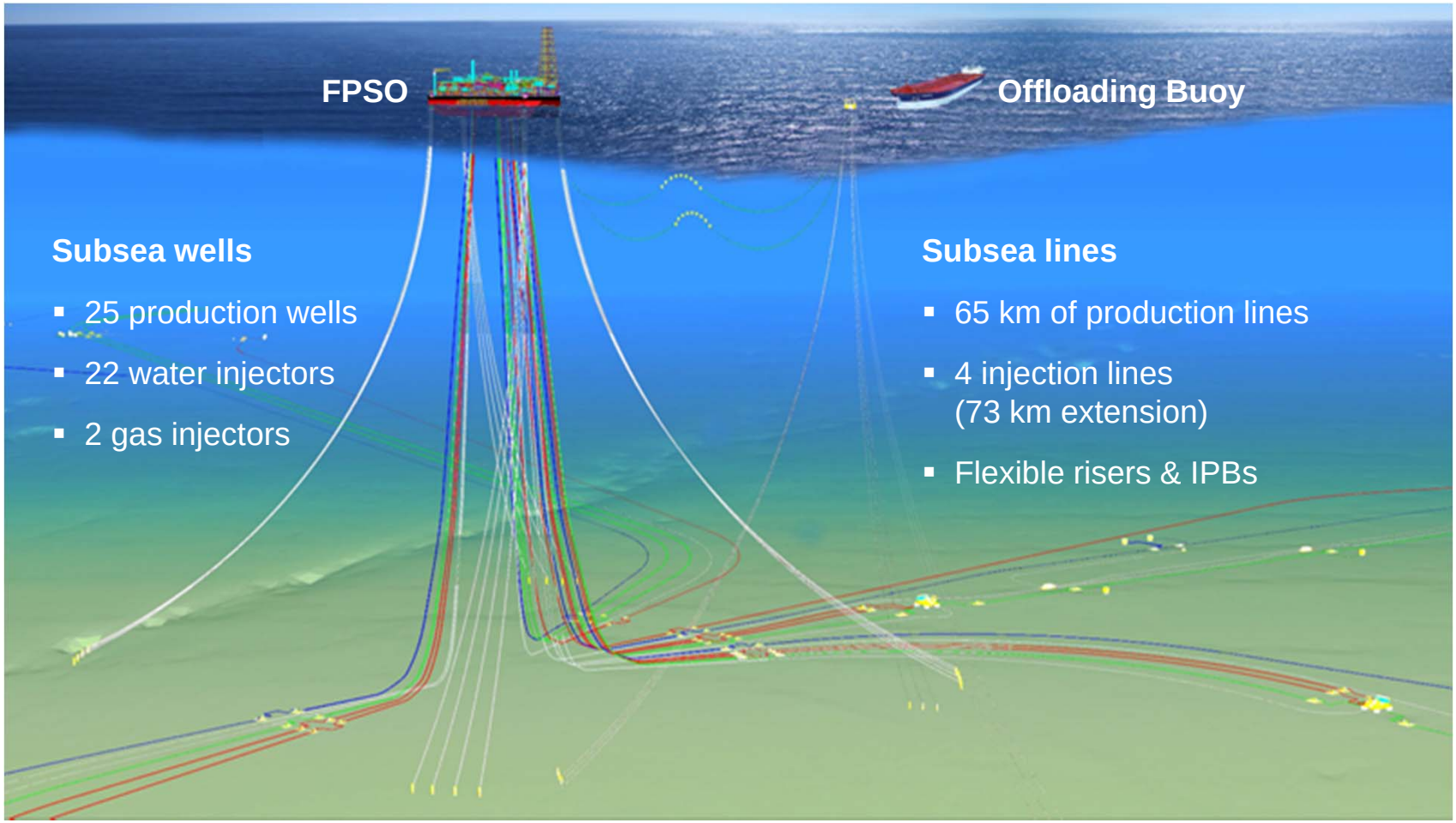
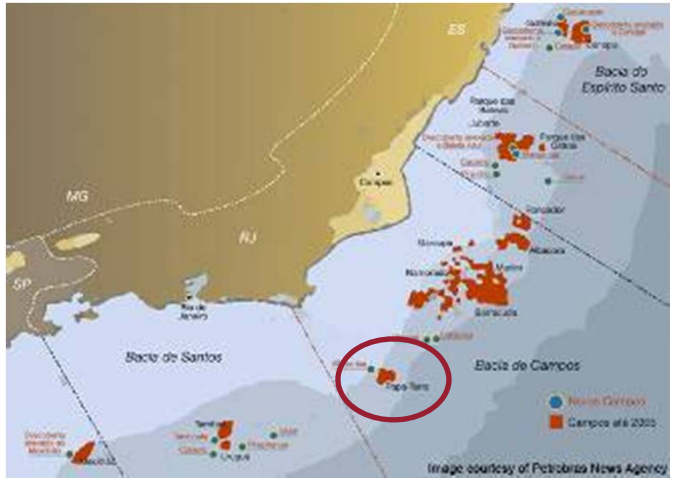
Technip: Major Player in Subsea Field Development



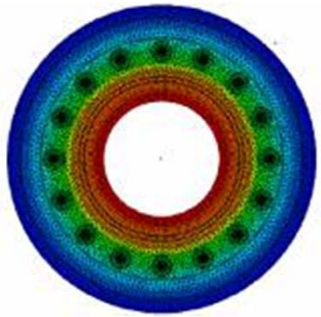
Pazflor, Angola

Flow Assurance: 1st Electrically Heated Flexible IPB on Papa Terra Field, Brazil

- **Challenges:**
  - Deepwater: 1,200 meter water depth
  - High viscosity fluid (API 14° to 16°)
  - Wax buildup mitigation



- **Solution: IPB with electrical heating & monitoring system**
  - 27 km of IPB risers and flowlines to be installed on the P-63 FPSO
  - 16 electrical cables
  - 2 control lines for optical fibre temperature monitoring
  - Delivery scheduled end of 2012



Technip's innovation matches Petrobras needs

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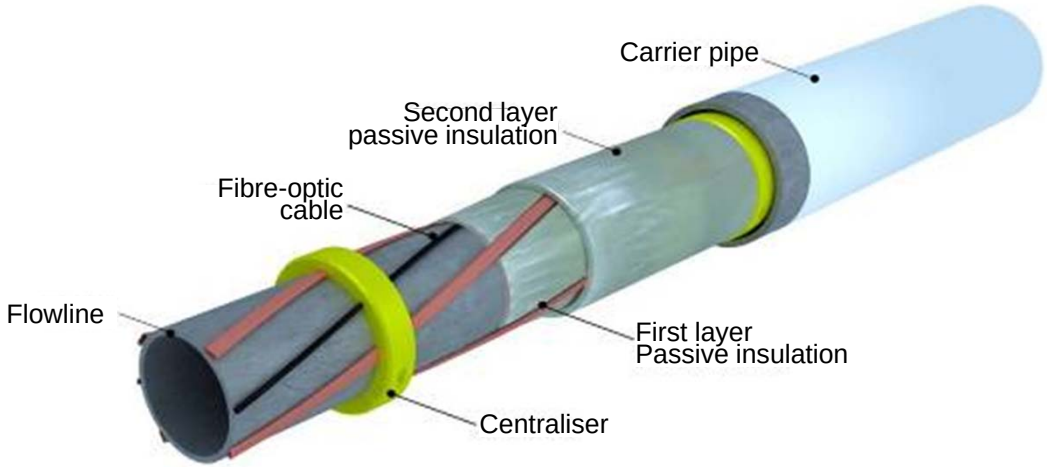
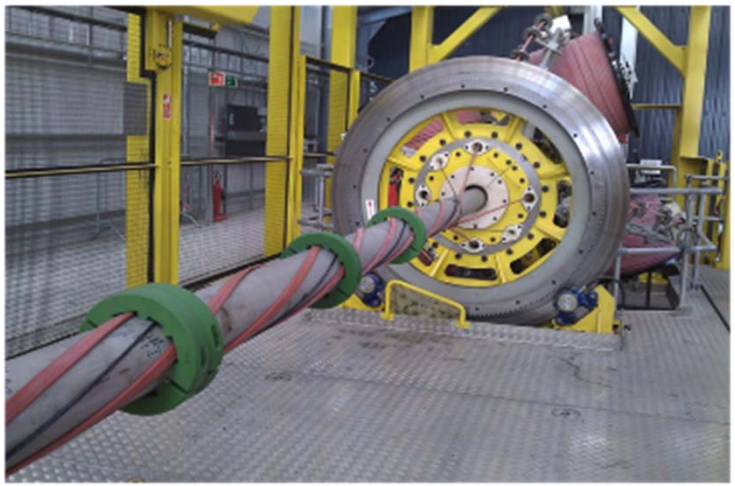
Flow Assurance: World's 1st Rigid Reeled Electrically Heated Pipe-in-Pipe on Islay Field, North Sea

- Customer involved during technology qualification process
- Heating energy optimization concept
- Enabled via reeled technology
- Patents pending





Innovation designed for both shallow and deepwater environments

Qualifying Large Diameter Flexible Pipe for Pre-salt Development in Brazil

Gas Injection: 11 tests

- Carcass Corrosion
- HIC/SSC (Sour Service)
- Permeation Test (Rilsan)
- Exposure & Characterization (Rilsan)
- Collapse (Straight & Bent Pipe)
- Combined Tensile and Pressure Test
- Deep Water Test (DIP)
- Material Fatigue Test (SN Curve)
- Dynamic Tension to Tension Tests
- Anchoring Tensile Armor Test
- Dynamic Fatigue Test

Production: 9 tests

- Carcass Corrosion
- HIC/SSC (Sour Service)
- Permeation Test (PVdF)
- Exposure & Characterization (PVdF)
- Material Fatigue Test (SN Curve)
- Collapse (Straight & Bent Pipe)
- Crushing Strength Test
- Deep Water Test (DIP)
- Dynamic Fatigue Test

QUALIFICATION NEAR COMPLETION

Water Injection: 5 tests

- Collapse (Straight & Bent pipe)
- Crushing Strength Test
- Outer Sheath Wear Test
- Outer Sheath Holding System
- Outer Sheath External Sealing

Gas Lift: 5 tests

- Carcass Corrosion
- HIC/SSC (Sour Service)
- Material Fatigue Test (SN Curve)
- Collapse (Straight and Bent Pipe)
- Deep Water Test (DIP)

- Successfully completed
- To be completed in 2011
- To be completed in 2012

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Reeled Mechanically Lined Rigid Pipe: Cost Effective Solution for Corrosive Products

- **Bimetal rigid pipe**
  - Comprises steel pipe hosting a thin corrosion resistant material
- **Cost-effective solution versus traditional corrosion resistant alloy (CRA) pipes or metallurgically bonded clad pipes**
  - Qualified for Reel-Lay: reduces offshore operations
  - Lower procurement cost and faster delivery time
- **Qualification process completed**
  - Endorsed by Det Norske Veritas*
  - Up to 12-inch Outside diameter

** Det Norske Veritas: an independent foundation with the purpose of safeguarding life, property, and the environment*

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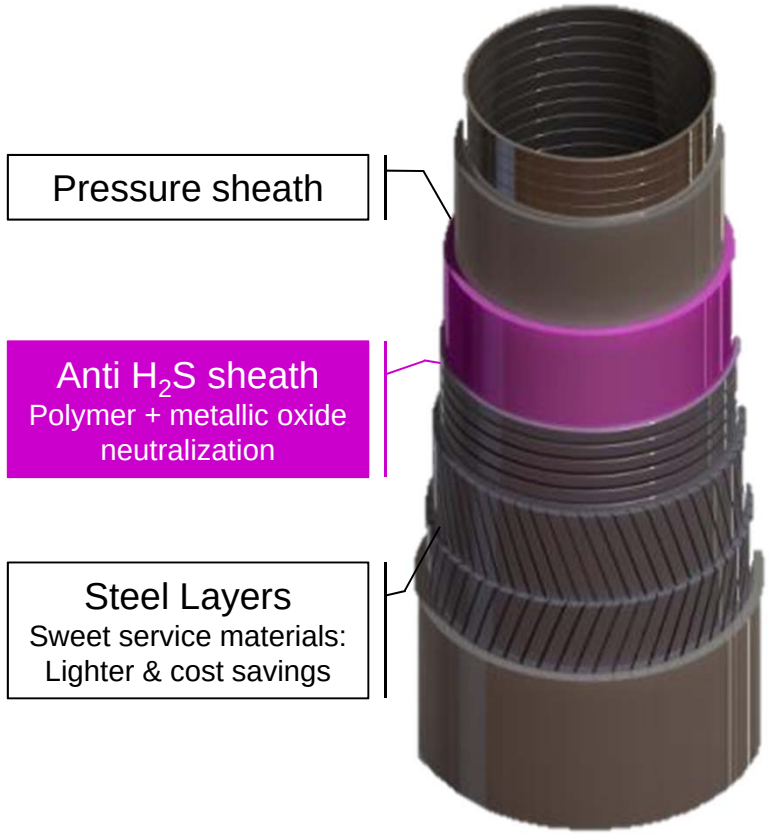
Emerging Technologies Development

Anti H_2S Layer: Patented Flexible Pipe Technology for Highly Corrosive Fluids

- **Concept: Anti-H_2S sheath**
  - Oxide composite to fully neutralize H_2S permeated from pressure sheath
- **Benefit: Weight and cost reduction**
  - Possibility to apply sweet service steel wires
  - Top tension reduction by 35%* relative to sour service
- **Ready for commercialization in 2012**
  - Presented at OTC Houston



** 8-inch flexible riser in a water depth of 2,500 meters (design pressure of 350 bars)*

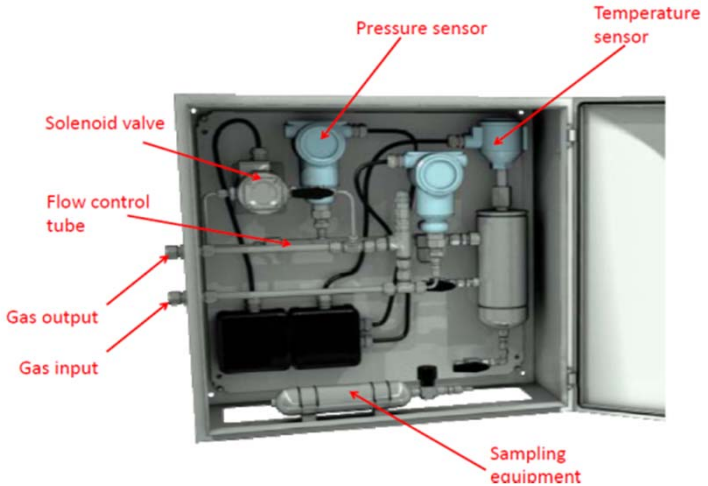
Carbon Fiber Armors: Lighter and Stronger Risers for Deepwater & Ultra Deepwater

- **Concept: Epoxy/Carbon Fiber composite**
  - 5 times lighter than steel
  - 2 times stronger than steel
  - Excellent corrosion and fatigue performance
- **Benefit: 50% deepwater riser weight reduction**
- **Application: Riser configuration for SPAR, semi-sub & FPSO**
- **Qualification program expected to be completed by 2011 yearend**
  - Pre-salt fatigue test successfully completed in July

Pre-salt FPSO

Intelligent Pipeline Development: Safety Enhancement & Production Optimization

- **Joint initiative with Schlumberger**
- **Following the Macondo incident, safety & integrity are more in focus for clients**
- **Riser Annulus Condition Surveillance**
  - Detection of breach & flow rate measurement
  - Detection of annulus flooding
- **Detection of armor wire failure**
- **Benefits**
  - Ensure and enhance safety of personnel, work environment and asset integrity
  - In-situ surveillance to ensure long-term reliability
  - Optimize inspection, maintenance and repair plans



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Remote Intervention Technology During Field Life: Initiative Started in 2011

- **Develop business opportunities around emerging remote intervention technologies**
- **Key technologies**
  - Autonomous Underwater Vehicles
  - Remote monitoring and inspection
  - Through-water data transmission
  - Survey and inspection capability
  - Simulation and animation

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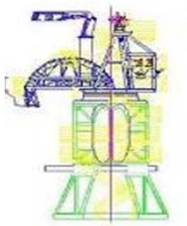
Vertical Laying Systems (VLS): Largest Set of Equipment & Greatest Capabilities

Vertical Laying Systems (VLS): Largest Set of Equipment & Greatest Capabilities

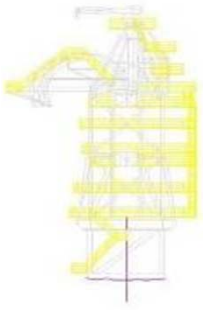
In tons

125



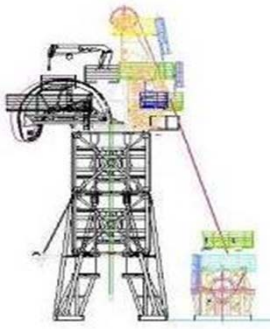
VLS-1/VLS-5

250



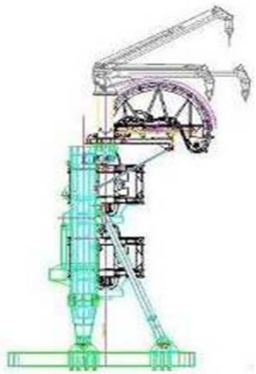
Sunrise

270



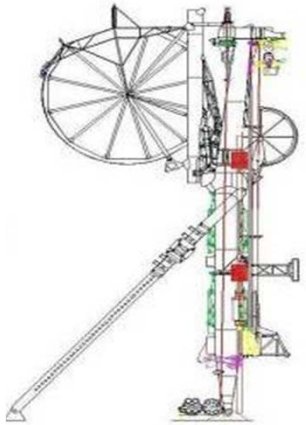
VLS-4
(Skandi Niterói)

350



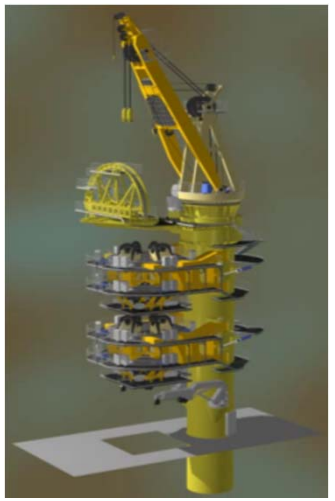
PPS1 / PPS2
(Deep Pioneer) /
(Skandi Vitória)

425



Deep Blue

550



New VLS

- Critical step in finalizing the specification of new construction vessels
- Key differentiating asset, particularly in deep-water market
- New VLS under development for ultra deep-water market

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Technip R&D Plan: 2011 - 2015
Key Technology Takeaways

- **Investment spending at similar levels**
- **Mix of internal and external spending including acquisitions**
- **Resource footprint expanded further**
- **Cross fertilize with Offshore technology**
- **Keep focus on Riser Integrity Management and monitoring**

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Thank you