Flexible Pipe Solutions – a competitive approach for Shallow water development

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Agenda

1. Subsea at Technip in Brief and Asia Pacific presence

2. Flexible Pipes Solutions
   a. Main differences between Flexible and Rigid
   b. CAPEX
   c. OPEX
   d. Main advantages
Subsea at Technip in Brief
Technip Group overview today

38,000 People
€20.9 bn backlog*

FORSYS
JV with FMC
Worldwide Alliance

Present in 48 countries

25 vessels

€10.7 bn
2014 Revenues

A strategic Alliance
with Heerema

4 flexibles plants
4 umbilical plants
5 spool bases

* End 2014
Technip Main Differentiation in Subsea
Unique Vertically Integrated Business

Concept - FEED ➔ Design ➔ Fabrication ➔ Installation ➔ LoF / Monitoring

R&D since 1958

Project Management
## We are pioneers in flexible pipe technologies

<table>
<thead>
<tr>
<th>Flexible solution</th>
<th>Smooth Bore</th>
<th>Flexible riser with Anti H₂S sheath</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Worldwide applications</strong></td>
<td><strong>Increase flow</strong></td>
<td><strong>Exclusive technology</strong></td>
</tr>
<tr>
<td><strong>Corrosion resistant, lower OPEX solution</strong></td>
<td><strong>Eliminate noise &amp; vibration for dry gas risers</strong></td>
<td><strong>Cost effective solution for highly corrosive fluids</strong></td>
</tr>
<tr>
<td><strong>Quicker and cheaper to install than rigid</strong></td>
<td><strong>Reduce pressure drop</strong></td>
<td><strong>35% flex-lay vessel top tension reduction &amp; steel wires not subject to H₂S corrosion</strong></td>
</tr>
</tbody>
</table>

We are pioneers in flexible pipe technologies.
We master all rigid pipe laying technologies

Rigid pipelines laid by S-lay vessel
- Large Diameter (up 60")
- Concrete Coated Pipe
- Shallow to Deep Water
- Horizontal welding offshore

Reeled rigid pipes: an extensive track record
- Diameter Range 4” to 18”
- Shallow to Deep Water
- Polymer coated pipe
- Up to 5,800 t pipe on Two Reels
- Up to 550 t top tension
- High efficiency / high quality installation method (all welding is onshore)

Rigid pipelines laid by J-lay vessel
- Large Diameter (< 28”)
- Ultra Deep water
- Up to 770 t top tension
- Vertical welding offshore
Our presence in Asia Pacific
Our presence in Asia Pacific

Assets & Activities

- Engineering & project management centers
- Flexible/umbilical manufacturing plant: Asiaflex, Malaysia, 1st and only one in Asia
- Logistic base: Batam, Indonesia
- Fabrication yard: MHB, Malaysia, with solid platform track record
- Vessels: G1201, Deep Orient

Key Projects

- Prelude FLNG, Australia
- Petronas FLNG1, Malaysia
- Wheatstone, Australia
- Malikai TLP, Malaysia
- Block SK 316, Malaysia
- Jangkrik, Indonesia
- RAPID PMC, Malaysia
- Bangka, Indonesia

Technip in Asia Pacific

- ~9,800 people
- Founded in 1982
- Successful partnerships and alliances: COOEC, HQC & MMHE

1 8.5% participation
2 Operating partly in Asia Pacific
Your one-stop-shop for your subsea projects

Offering of Technip in Asia – Pacific

<table>
<thead>
<tr>
<th>Project Management &amp; Engineering</th>
<th>✓ Subsea Offices in KL, Jakarta, Chennai and Perth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td></td>
</tr>
<tr>
<td>Flexible</td>
<td>✓ Asiaflex</td>
</tr>
<tr>
<td>Umbilical</td>
<td>✓ Asiaflex</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td>Flex &amp; Umbilicals-lay</td>
<td>✓ Deep Orient</td>
</tr>
<tr>
<td>Rigid S-lay + Heavy Lift</td>
<td>✓ G1201</td>
</tr>
<tr>
<td>Rigid Reel-lay</td>
<td>✓ Deep Energy*</td>
</tr>
<tr>
<td>Rigid J-lay</td>
<td>✓ Deep Blue*</td>
</tr>
<tr>
<td>Diving</td>
<td>✓ Wellservicer*</td>
</tr>
</tbody>
</table>
Full spectrum of projects in Asia Pacific from SW to DW - from Flex Supply only to XXL EPCI

**ENI, Jangkrik EPCI, Indonesia**
- Rigid S-Lay from shore to deep
- Flexibles / Umbilicals

**PETRONAS, Kanowit PFLNG Tie-In, Malaysia**
- Flexibles Supply & Install in SW

**CHEVRON, Bangka, Indonesia**
- Flexibles & Umbilicals Supply & Install in DW

**SHELL Prelude FLNG Subsea scope, Australia**
- Rigid Reel lay, Flex, Construction

**SHELL, Laila & D12, Malaysia**
- Flexibles Supply & Install in SW

**INPEX Ichthys**
- Flexible Supply, Australia
Flexible Pipes Solutions
Since 1974, our job is to solve your problem with our flexibles!

WE HAVE NO CATALOGUE
OUR HOSES ARE NOT FOR SALE
AS SUCH
OUR JOB IS TO SOLVE YOUR PROBLEM
WITH THEM
Key facts on flexible pipes

Very broad range of applications
*WI, Prod, Gas, High Pressure, ….*

From 2” to 20” ID

11,000 km fabricated to date
7,800 km of Static section / 3,200 km of Dynamic

55% in Shallow Water

Service Life 20, 30, 35 years *(and counting)*

Qualified for WD = 0 to 3,000 m
and up to 150 deg C
Technip Flexible Pipe Manufacturing Facilities Worldwide

Flexi France Since 1974

Asiaflex – Since 2010

2 plants in Brazil (1st opened in 1986, 2nd in 2014)
Zoom on Asiaflex

- Inaugurated in 2010
- The first and only flexible pipe manufacturing facility in Asia
- 50 projects, 280 km of Flexibles, 75 km of Umbilicals

Key features
- Shorter delivery lead time for projects in Asia
- Specialized team of local engineers and technicians
- Fulfilling local content requirements for Malaysia
- Supported by flexible project management and engineering capabilities in KL, Jakarta and Perth

Complemented by the Deep Orient - dedicated to Asia Pacific market
- Multipurpose vessel: flex lay, umbilical lay, diving, tie-ins, subsea construction
The table compares the main differences between a rigid and a flexible pipe:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>RIGID: Standard ND 4-80”</th>
<th>FLEXIBLE: Any ID 2-20”</th>
<th>IMPACTS: Optimized solution / flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion</td>
<td>Corrosion Allowance Required</td>
<td>Corrosion free Maintenance free</td>
<td>Lower Life Cycle Costs</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Route Radius: 100m to 800m Pipe MBR: 50m</td>
<td>Route Radius: 5 to 25m MBR: down to &lt;2m</td>
<td>Enhanced route selection / shorter length</td>
</tr>
<tr>
<td>Fabrication</td>
<td>Primarily Welded &amp; Tested Offshore</td>
<td>Pipe Completed &amp; Tested Onshore</td>
<td>Higher quality control</td>
</tr>
</tbody>
</table>
**CAPEX / Execution comparison - example**

- **Case study**
  - Project connecting a Well Head Platform to a turret moored FPSO
  - 3 lines from FPSO to WHP – 3 km distance
  - Shallow water ~ 100 m

RIGID (STATIC) **AND FLEX (DYNAMIC) SOLUTION**

MULTIPLE VESSELS: RIGID + FLEX / DSV

MULTIPLE MANUFACTURING SITES: 1 or 2 JUMPERS + 1 PLET per line

POTENTIAL FREE SPAN CORRECTIONS / CROSSING MITIGATIONS
CAPEX / Execution comparison - example

- Case study
  - Project connecting a Well Head Platform to a turret moored FPSO
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  - Shallow water ~ 100 m

FULL FLEX SOLUTION
NO SPOOL – NO PLET – NO FREE SPANS CORRECTION - SHORTER ROUTE
ONE MANUFACTURING SITE – ONE VESSEL – ONE CONTRACTOR

Up to 30% savings using flexible pipes
29-years old flexible
0 maintenance / 0 days of shut down

- Project: Qatif Flank-1 - Field Location: Arabian Golf, Saudi Arabia
- Water Depth: from shore to 15 m
- Year in service: 1984
- Application: Water Injection 8”
  - Flexible pipes operated within their design limits
- Maintenance from 1984 to 2013
  - Pigging: 0
  - Cleaning: 0
  - Corrosion inhibitor: 0
  - Subsea inspection: visual only
- Days of shutdown in 29 years: 0

Sample recovered after onshore section damaged due to erosion
Flexible repaired and still in operation
Typical applications for flexible pipe in APAC

- **Pipe replacement projects and EOR**
  - Corrosion resistant pipe
  - Easy crossings, optimized route and platform approach
  - Smaller foot print on “aging” topsides
  - Ideal solution for mature and congested field

  *anchor vessels induced risk on existing pipeline while flexibles are installed by DP vessels*

- **FPSOs, FSOs, FPUs for risers and flowlines**
  - Connected to subsea structures or WHP

- **Small diameter (<14”)**
- **Short length (up to 20 km – depending on diameter)**
- **Deepwater development risers or full field**
- **EPS involving high pressure lines**
Flexible Pipe Solutions – a lower Life Cycle Cost solution for our clients

- **Lower CAPEX**
  - Optimized costs for lengths up to 15 / 20 Km with enhanced route selection due to inherent flexibility
  - No metrology, no spools, …
  - Products Engineered and Manufactured in Malaysia
    - *Locally based project teams, manufacturing unit, and installation vessel*
    - *Lower PMT / Inspection Costs for our clients*

- **Lower OPEX**
  - Corrosion free / ultra light maintenance program + Long life cycle (Design life > 20 years)

- **Higher control on execution / Less risks**
  - Quicker offshore installation operations, no welding, no or less diving
  - Installed by DP vessel, no risk on integrity of existing pipelines
  - One Manufacturing site – One contractor

- **Possibility to farm-in the frame agreement for accelerated field development and controlled budget**

![Technip logo]
Apple products
Designed in California
Assembled in China

Technip flexible products
Designed in Malaysia
Assembled in Malaysia

... with a longer design life