UPCOMING CHALLENGES FOR OPERATORS IN DEEP WATER

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Presentation Content

- Introduction to ITF
- Upcoming Brazil Call for Proposals
  - Insight to challenges for our members in deep water
- Other ITF Activities Reflecting Member Challenges
ITF Member Companies
Introduction to ITF (Industry Technology Facilitator)

- Global “not for profit” organization (Est. 1999)
- Facilitates technology development through to implementation
- Owned by 32 oil and gas companies
- Launched over 200 projects (JIPs)
- Currently: ~30 on-going projects; £15.3 million of direct member funding
ITF Development Community

ITF identifies the best available innovators from the global research and technology development community:

“Calls for Proposals”

Benefits of developer engagement include:

- Retain Intellectual Property
- Up to 100% Funding
- Development & Implementation of Innovative Solutions
- Showcase technology to their ultimate client
Deepwater Subsea Flow Assurance - Brazil

- Meetings and Workshop in Brazil
  - Early to Mid 2013

- Key Challenges
  - Water Production
  - Hydrates
  - Heavy Oil
  - Thermal Energy Management

- “Calls for Proposals” in September 2013
Subsea Flow Assurance Scope

- Commencing at the interface of the reservoir and the well bore
  - Getting products out of the reservoir
  - Through the near-wellbore area and up to the wellhead
  - Along the pipelines and risers and into the production facility

- In deeper water, flow assurance is a significantly greater constituent in production economics
Water Production

- Minimising produced water and the disposal of produced water are key challenges.
- Enhance our ability to control unwanted water production from the reservoir, especially in subsea, deepwater applications.
- Increased profitability and improved HSSE exposure through:
  - Reduction in topsides facilities footprint and facilities retrofits
  - Reduced water handling and disposal costs
  - Providing increased well operating time
Water Production – The Challenges

- Improve feasibility of downhole separation and disposal
- Better prediction of water production from the reservoir during well life:
  - Data acquisition in appraisal, downhole detection of approaching water front, etc.
  - Improved subsea multiphase metering accuracy
  - Use of fibre optics to detect water inflow or to monitor approaching water front
  - Improve the water quality for reinjection, disposal and overboarding in line with regulatory requirements
  - Improve the availability and economics of retrofit (surface and downhole) water control systems
Hydrates

- Deeper water is more difficult for hydrates due to higher pressures and lower temperatures.
- Advanced insulation and heated pipeline technology are used to maintain sufficient temperatures.
- Use of hydrate inhibitors injected into well or above wellhead.
Hydrates – Overcoming The Barriers

- Lack of understanding of hydrate formation kinetics
  - How quickly hydrates form depending on how far the pressure and temperature operating conditions are into the hydrates region

- Limited understanding of hydrate slurry flow
  - How hydrate crystals affect fluid properties and flow

- The Prize: Ability to operate more inside the hydrate region, leading to:
  - Chemical / Inhibitor optimisation
  - Identification of potential blockage risks and locations
  - Increased availability
Hydrates – Specific Challenges

- Improved online monitoring to identify:
  - Time in hydrate region and how far into hydrate region
  - Kinetics of hydrate crystal formations
  - Transportation and cold flow of hydrate crystals
  - Risk of hydrate blockage
- Implement better models into existing online monitoring software (OLGA / LEDA)
- New hydrate detection tools utilising ultrasound, pressure pulse and acoustic technologies
- Alternative and cost effective insulation materials to minimise heat loss to environment and energy to heat pipelines
- Improved internal pipeline coatings for hydrate plug prevention
- Ability to operation inside hydrate regions to optimise chemical / inhibitor optimisation
HydraCHEK™ Hydrate Inhibitor Monitoring System

Hydrafact

Provides the actual concentration of hydrate inhibitors and salts through regular onsite downstream produced water analysis. Allows the operator to continuously monitor and optimise inhibitor injection rates. Works with all salts and inhibitors (MEG, methanol, KHI’s and AAs).

- Trialled by: Statoil, TOTAL, & Petronas
- Funding: £395k
- Duration: 24 months
Online HydraCHEK

- Herriot Watt HMEWS JIP
  - Hydrate Monitoring Early Warning System
  - Ongoing Phases facilitated by ITF involving over £1.5m direct member investment
  - Several field trials and actual implementation
  - Online HydraCHEK system being developed by Hydrafact
  - Optimise chemical inhibition in subsea pipelines and processing facilities
Thermal Energy Management

TOTAL ISLAY FIELD DEVELOPMENT - KEY FACTS

- Onstream April 2012, Pilot Project
- World’s first application of Electrical Trace-Heated Pipe-in-Pipe ETH-PiP
- Simultaneous application of heat tracing and fibre optic cables (temperature monitoring)
- Power requirement less than 10 times that of DEH
- Resolves difficult flow assurance problems & through-life flow optimisation
- Developed by Technip in collaboration with Total

Source: Technip
Current ITF Calls

- Calls relating to Well Integrity
  - Improved Subsea Blow Out Preventer (BOP) Control Systems
  - Subsea Annulus Management
  - Well Completion Equipment Reliability Database

- See under “Calls for Proposals” and “ Archived Calls” at www.itfenergy.com
Seismic While Drilling JIP

► Look Ahead of Bit Seismic Capability
  ► Better image potential drilling hazards and allow real-time decision making
    ◄ Unstable shallow gas pockets; abnormal high pressures ahead of bit; presence of salt layers
  ► Considerably reduce risks for deepwater drilling

► Two new technologies being developed:
  ► SeismicPULSER™ Sparker by Technology International Inc.
  ► HydroSeis™ by Tempress Technologies
  ► Further development of these technologies with an experimental well test plan proposed

Prototype Seismic Pulser™ Tool
(Source: US DOE Report 2009)
Subsea Processing – Sample FMC Projects

**Total Pazflor:**
- Gas / Liquid Separation
- Boosting

**Petrobras Marlim:**
- Subsea separation in mature field
- Reinjection of water into reservoir
Running Projects – Production & Wells

Down-hole Gas Compression
Corac Ltd

Feasibility Study which will design test & manufacture a 7” Prototype.

Build a multiphase flow loop and full test prototype.
Commercial implementation discussions on-going with major service company.

Sponsors: Eni, Repsol-YPF, & ConocoPhillips
Funding: £1750k
Duration: 36 months
Statoil – Subsea Factory Concept

Source: Statoil
Running Projects - Subsea

SURFIM
Wood Group Kenny

Advancing and automating Integrity Management strategy for Subsea Umbilical, Riser and Flowline (SURF) Systems.

Sponsors: Chevron, Hess, BG Group, Woodside, BP, TOTAL, Maersk Oil, Petrobras, BHP Billiton, Shell, Suncor, & Petronas

Funding: £320k
Duration: 18 months
What is the collaborative technology space?

The answer to this question needs a convincing definition

Likely to include:

- New frontiers of technology with few solutions developed
- Technology qualification and trialling new technology
- Safety, Environment, Decommissioning & Abandonment
- Facilities development and asset integrity
- Improved design and analysis methodologies, setting good industry practice
- Avoiding areas of competitive advantage between our members
- Members wanting to demonstrate there is a market for the technology