ITF Call for Proposals

Focus: Technologies for Well Intervention

Aims

This is an open invitation to any organisation, from any sector, seeking partners and funding for innovative technologies in the oil and gas industry to submit high quality proposals for research, development and / or field trial of potential solutions that will help in dealing with issues relating to 'well intervention'.

Specific areas of interest:

- Pressure control equipment
- In-line monitoring for: gas leaks, hydrates, system pressure loss
- Improved tree design
- Annulus intervention technologies
- Other

Justification

ITF members, major operating and service companies in the oil and gas sector, met at an international ITF Technology Challenge Workshop (TCW) and explicitly identified the current shared challenges they are facing across the industry in the area of 'well intervention'.

Who Should Respond

The invitation is open to all relevant industry sectors and all credible entities from small and medium sized enterprises, to academic and research institutions, to large industry players alike.

Benefits of Participation

- Funding: Up to 100% funding for any stage of the research, development and demonstration cycle.
- IP Protection: A proven confidential, collaborative and standard contractual process
- Exposure and validated applications for your scientific and technological expertise
- Access to the key global players in the oil and gas sector

How to Participate

Your contact points and outline method for submitting a proposal are provided in this document but you can immediately learn how to submit a proposal by going to our website http://www.oil-itf.com/index/submit-a-proposal

Alternatively you can ring us and talk to one of our analysts about your idea, +44 (0)1224 222410.

Keywords and Potential Technology Areas

Well Intervention, pressure control, tree design, sealing, sealant, BOP, lubricator, leaks, sensors, maintenance, braided cable, slickline, coiled tubing, annulus, gauges, valves, HPHT, tree, wellhead, tubing hanger, actuator, acoustics, scale monitoring, corrosion detection, cased hole logging, dielectrics, tracers, markers, wax removal, ceramics, nano engineering, extended well life, swellable elastomers, integrity, smart fluids, cement, barrier, wellbots, wellbore, artificial lift, abandonment, wireline, standardisation, sand control.

(NB. The above list is not necessarily exhaustive).

Well Intervention Challenges

The prime areas of concern have been identified by ITF members as follows:

- Pressure control equipment
- In-line monitoring for: gas leaks, hydrates, system pressure loss
- Improved tree design
- Annulus intervention technologies
- Other

Pressure Control Equipment

Pressure control encompasses both prevention and response. The pressure-control equipment package typically includes; kill line, choke line, choke manifold, mud return line, BOP controls and instruments and mud spool/riser. Along with the drilling manifold, these tools are the primary defence against blowouts.

The Challenges

- Better retained seal integrity after emergency cutting
- An early warning system for gas leaks or seal failure during operations and hydrate formation in high gas wells
- Wireless sensors for computer indication
- The definition of consistent industry design standards for intervention. For example an upgrade to API/ISO standards
- Alternative metal to metal sealing repair methods
- Electric blowout preventer (BOP) actuation
- Better lubricator design. For example, the lubrication length could be increased by using a telescopic lubricator instead of connecting joints
- Equipment reliability and reliability modelling with easy maintenance
- Rapid and remote closure of BOP's under low and high pressure conditions. Repeatability is required plus gripper and seal combination BOP's for braided cable
- Methods to monitor lubricator / riser assembly systems for excess movement during extended operations (with long rig ups) especially when running coiled tubing
- With regards to pressure gauges, valves and fittings – reduced monitoring ports and penetrations and reduced risk of external damage using transducer technology

- Improved online 'in hole' condition monitoring of wireline and slickline cable to identify damage and prevent 'bird nesting'
- Improved grease seal integrity under HP/HT conditions

Improved Tree Design

A review of subsea and surface tree design would be welcomed along with the development of standardisation. The introduction of new tree technologies should be explored in order to move from tried and tested designs. For example a hybrid horizontal conventional tree requires a new design of wellhead and tubing hanger. Generally, any new tree design should be retrofitable, instrumentation capable and have the ability to monitor and increase knowledge of what goes on during the lifecycle. In all cases the design should allow for easy maintenance.

The Challenges

- Design of hybrid horizontal, conventional tree to give more options for intervention (i.e. pulling the tree versus pulling the completion)
- Design of subsea trees with grease pots as they are often not currently lubricated or design a self-greasing system with an ROV replaceable cartridge of grease which is changed every year
- Radical design with reduced complexity, perhaps using concentric valves. However this may present problems on how to actuate the tree, as the size of the tree is often restricted by the size of the valves required
- A compact tree design for offshore platforms which prevents side valves from being knocked off
- Compact side outlet valves – provide double barrier isolation on all casing strings, dual valves in one body. Compact to fit restricted well bays, improved sealing ability and increased reliability
- A tree design to specifically cope with hydrates and waxy oils
- A lightweight tree design to allow it to be transported by helicopter for remote operations

In-line monitoring for: gas leaks, hydrates, system pressure loss

Future prevention is the prize here, specifically the ability to remotely and actively measure 'potential' and 'current' problems. In addition, there are opportunities to

extend well life, improve knowledge and to optimise Capex and Opex costs. Accessing the annulus and accessing downhole, coupled with necessary location coverage are all challenges, so solutions must last for the life of the well. The annulus is isolated and there are size limitations as well as temperature and pressure issues. Sensing, measurement, communications, interpretation, reliability and repeatability are all key factors to address. Sensors and communications equipment may not be commercially available off the shelf or current models that are available may not be sufficient. Perhaps new non-invasive measurement techniques could be used.

The Challenges

- Snapshot the entire well for leaks, perhaps via distributed vibration / acoustics
- Improved monitoring of asphaltene deposition
- New sensors to monitor early hydrate conditions
- Active corrosion detection, perhaps using in-line corrosion monitoring. Opportunities exist to apply cased hole logging or dielectrics techniques for example induction and gamma
- New micro or nano sensors (so called 'lab on a chip') could be used
- Water chemistry monitoring techniques
- Field history matching and metal condition measurement - sensor or detection mechanisms
- Improved visualisation using tracers and markers
- Downhole PH meter or method to predict downhole PH from surface more accurately
- Non-invasive B,C and D annulus corrosion monitoring to quantify fluids and scale build-up as well as techniques for its transportation and destruction
- Better, simpler, easier wax removal, perhaps using a well induction heater
- Alternative coating such as ceramics, non-stick (perhaps Teflon) tubing coating.

Annulus Intervention Technologies

The prize here is to extend well life, lower the well lifecycle cost and increase ultimate recovery levels. The two immediate aims are to detect leaks more easily and to repair them more effectively and economically. Currently leak detection is usually deduced from other indicators. There is an uncertainty about the location and root cause of the leak and delayed detection means a more expensive repair. Current repair methods are expensive and result in lost or deferred production. Sometimes the repair is not successful or lasting, partly for the reason that often the wrong repair practices are

used. If the root cause is not known, then recurrence is likely. Modelling is currently based on assumptions being made with a lot of uncertainty. Consequently, wrong operating practices for example pressure cycling, are often used.

The Challenges

- Smarter leak detection and repair. As an example, perhaps a device of small dimension (perhaps less than 2 inches) could be sent down the tubing or annulus to detect the leak using thermal, flow, magnetic, optical, radioactive, electric or other methods. This could be done in real time or in-memory. It could be autonomous or on-wire. A chemical compound deployed locally could repair the hole. In order to repair a circumferential (i.e. connection) leak, one could either deploy a chemical compound locally (e.g. a swellable elastomer with the capability of bonding on metal) or could patch with a memory metal alloy deployed through slim tubing
- Improved third based tubing sealants with high bridge strength and acceptable to regulatory bodies
- With regards downhole repairs for tubing leaks, 'sniff and squirt' technologies, such as for detection and repair would be desired
- New smart fluids employing nano technology
- Tools with memory and techniques for monitoring the annulus, identifying leaks and repairing them
- Subsea annulus intervention at wellhead e.g. using a horizontal tree designed to facilitate access to the annulus

Other

Other areas of interest identified at the workshop are listed below:

The Challenges

- A downhole camera that can 'see' in any wellbore fluid environment
- 'Wellbots' providing instant intervention and allowing subsea maintenance using high frequency operations. Sensors could be attached for data collection. Inspiration could be gleaned from something like the NASA Mars probe and from robotic vacuum cleaners which are used for short periods but on a frequent basis. Key considerations are capability, temperature and size limits, battery life (at temperature), reliability and cost (versus slickline)
- Development of a fast well start method without N2 pumping and a retrofit artificial lift system for any well. Existing artificial lift techniques could be

leveraged. This would maintain production, extend field life and delay abandonment as well as having no or reduced deferred production. Cryogenic hazards will also be eliminated, reducing the requirement for coiled tubing intervention. Flexibility in well design over life will be obtained with less complex completion. Key considerations are; through tubing restrictions; safety valve requirements; industry acceptance; reliability and power efficiency

- Retrofit sand control solution
- Solutions to increase the shallow water subsea intervention envelope due to weather impact
- Improved cased hole logging tools
- Methods for cheaper plug and abandonment, whether long completion or complete / permanent. For example:
  - techniques for removing an entire section of tubing from wells using wireline cutting and high pressure water
  - Ultra high pressure water jetting downhole
  - Improved logging technology to verify C annulus cement from inside the A annulus
  - Heat fusion
  - Techniques using clay pellets or epoxy polymers. Water-swellable clay pellets are currently used by the mining industry for closing off shafts. However, coating the pellets to induce slow reaction may be required.
  - Cement to metal bonding technology
  - High pressure water cut and drop off tubing
- Improved conveyance materials such as high strength lightweight composite cable or lightweight coiled tubing
- Miniaturisation of hydraulic fracturing pumps and equipment
- Improved intervention planning tools
- Subsea coiled tubing units
- Tubing that does not part when pulled
- Heat set annulus abandonment fluid
- Extended reach coiled tubing and wireline
- Fibre optic slickline
- Locking device for Q-unions preventing back off of connections during extended operations or indicators when back off occurs
- New conformance chemicals

ITF's Role & Approach

The Industry Technology Facilitator (ITF) is a not for profit organisation owned by, and with access to funds from major oil and gas operating and service companies that comprise its membership. ITF has an impressive track record in delivering finance to help develop new initiatives for oil and gas technologies from early stage joint industry projects (JIPs) through to field trials and commercialisation. Since 1999, ITF has supported around **170** projects and secured approximately **£50 million** in funding. ITF's key objectives are to identify technology needs, foster innovation and facilitate the development and implementation of new technologies.

A fundamental element of ITF's role as an internationally recognised champion for facilitating research, development and deployment of technology innovation within the upstream oil and gas industry is to engage with key industry sources. ITF uses a proven process, working in collaborative participation with both its Members and industry to identify technology needs and potential solutions.

The ITF process, illustrated below as a step-by-step course of actions, endeavours to bridge the gap between the industry's large global players and development community with the ultimate aim of implementing new technology solutions:

STEP 1 - Understand and Identify Technology Needs

STEP 2 - Engage the Development Community / Invite Proposals

STEP 3 - Evaluate Proposal Submissions

STEP 4 - Secure Funding

STEP 5 - Assist the Launch of JIPs

STEP 6 - Facilitate the Implementation of Technologies

ITF has contractual confidentiality arrangements with all its Members and will enter into a parallel agreement with all developers submitting proposal applications. Proposals will be submitted to our Members only for the purpose for which they are provided, i.e. assessment for funding support and implementation.

Proposals submitted under this Theme will be reviewed for financial sponsorship by **all ITF Members** therefore this is an excellent opportunity to gain a global audience in

seeking support for your technology. The focus of all ITF themes is to identify technologies which bring clear benefits to sponsors but which require assistance in **research, development, and / or field trial.**

For details of ITF's full Portfolio of Members, please visit our Website - www.oil-itf.com

Technology Challenge Timeline

The ITF Technology Challenge follows a staged timeline from the initial workshop through to launch of successful projects. The following list of tasks describes the key milestones and their associated dates.

Note: If there is significant interest in a proposal, ITF has a mechanism for fast tracking projects.

- Programme Start: Technology Challenge Workshop — May 2011
- Call for Proposals Issued — 4 Aug 2011
- ***Deadline for Receipt of Proposals*** — ***29 Sep 2011***
- Publish to Members for Review — Oct 2011
- Member Review and Voting — Nov 2011
- Technical Clarification Meeting — Dec 2011
- Members finalise commitment to sponsor — Mar 2012

Process for Submitting a Proposal

1. **Register Interest with ITF**

   Register your interest as early as possible by sending an email to Pauline Otręba at p.otręba@oil-itf.com

2. **Visit the ITF Website -** www.oil-itf.com

   On the ITF Home page, click on the "How to Submit a Proposal" button or follow this link to access all the information required to submit a proposal.

3. **Read the 'Project Application Guidance' Document**

   This document is available to view or download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website. Reading this document prior to submitting a proposal is essential. If you require further clarification or are unsure if your proposal is suitable for submission, please call ITF (Contact Information below).

4. **Download and Complete the 'Project Application Form'**

   This form is available to download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website.

5. **Download and Complete the 'Project Presentation Template'**

   This template is available to download from the 'ITF Downloads' / 'Proposal Submission' section of the ITF Website.

6. **Email the Completed 'Project Application Form' and 'Project Presentation Template' to ITF**

   Email the Completed 'Project Application Form' in Microsoft Word format **(not PDF)** and the 'Project Presentation Template' in Microsoft PowerPoint format **(not PDF)** to Pauline Otręba at p.otręba@oil-itf.com by **no later than 29 September 2011**. Proposals received after this date may not be processed.

Qualifying Technologies

In order to qualify for potential sponsorship, technologies submitted in response to this Call for Proposals must:

- be applicable to at least one of the identified requirements
- be novel or innovative
- demonstrate a clear business case for support
- have a clear and demonstrable path to commercialisation and implementation

Note: Proposals submitted to any other ITF Call in the past nine months or any previously unsuccessful applications should not be resubmitted without first consulting ITF (contact information provided later in this document).

Qualifying Organisations

Proposals are invited from any organisation including SME's, academia, research institutions, large organisations, consortiums or alliances. Proposals may be submitted by a national or international organisation, and equal opportunities will be extended to all proposers. Please keep in mind however that should your proposal be taken forward, you will be required to participate in meetings and make presentations to interested parties in the English language (teleconference and video conference are acceptable).

ITF Contact Information

If you would like to discuss any matters related to this call or any other issue related to ITF, please contact any of the following people:

Technology Challenge Manager and primary contact point for this Call:

Pauline Otręba– ITF Technology Analyst

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Other members of team available for your support:

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For more information on ITF please visit the ITF Website - www.oil-itf.com