Straddle Technology for Well Intervention

INTSOK - Deep Water & Harsh Environment Seminar
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Ed Van Sickle
VP of Business Development - Interwell Americas
Agenda

• Company Introduction
• Interwell element introduction
• Straddle design
• Where can a straddle be used
• Case studies
• Summary
Interwell Background

- Founded in 1992
- Number of employees: 350+
- Headquarters: Stavanger, Norway
- Engineering and R&D Centre: Trondheim, Norway
- Operations in international operating locations including - Norway, UK, Azerbaijan, Houston, Malaysia, Saudi Arabia, Oman, Abu Dhabi, Qatar, Dubai and Australia
- Interwell has and continues to provide product solutions in more than 35 countries worldwide
- Operational track record delivering solutions for 96 operators and over 3800 wells
Interwell Core Competency

- Mechanical Expansion (HEX Technology) up to 87% and Retrievable
- Pressure (HPHT Platform) Up to 15,000 psi
- Temperature Rating To 428° F

Serving Every Well
Straddle for Several Well Completion designs
Anchored Production Straddle – APS

Applications
- Water or sand isolation, repair leaks, PBR straddles, Safety Valve Repair, Gas-Lift etc.

Features & Benefits
- Cost effective alternative to carrying out an expensive workover
- Available in single or multi-run solutions
- Slim design: small OD, large ID
- Unique snap latch/stinger system
- HEX Plug technology can be adapted to provide straddle solutions to pass through the tightest of well restrictions
- APS systems have been produced to suit tubing/casing sizes from 3-1/2” to 9-5/8”
- ISO 14310 & API 11D V0 qualified up to 160°C and 6,000psi
- Can be run on slickline, e-line, CT and drillpipe
Where can a Straddle System be used?

- Safety Valve Insert/Repair - several solutions

- Connections and Tubing leaks - single run or stackable system

- Gas Lift Valve Leak - can also punch hole in tubing to retrofit completion with a gas lift straddle

- Packer PBR / Seal Leak - can run one packer thru tubing and set below prod packer

- Water and Sand management - straddle with screens, ICD or blank pipe
How is a Straddle System designed?

- Single Run or Stackable Multi-Run Solution
- Spacer pipe between packers for isolation purpose such as water shut off and tubing leak.
- Straddle system can be set using slickline, e-line, tractor, coiled tubing or pipe
- ISO 14310 or API11 D V0, Q1 QCP, NACE qualification performed if needed
- Unique latch system for Stackable Multi-Run Solution
How is a Straddle System designed?

- **Stackable Multi-Run Solution**
- Additional Spacer Pipe runs are used to achieve required Straddle length
- Other equipment used between packers such as Gas Lift Valves, Screens, PBR, ICD, etc.

Multi-run Straddle
How is a Straddle System designed?

• Unique latch system for Stackable Multi-Run Solution
APS Case Study

Challenge
• Extensive corrosion experienced in client’s well
• Initial attempts to restore well integrity were not successful, primarily due to the reduced tubing drift
• Wellbore modelling revealed severely buckled tubing above the required straddle setting depth.

Solution
• The operator required a slim straddle design which was capable of passing through the tight restrictions.
• The APS was customized to accommodate the depth and length parameters of damage within the well.

Value Added
• The APS was successful in returning a challenging well to production and reinstating the production tubing integrity.
• Due to the nature of the well, the robustness of the APS allowed for more than 150 downward jars to deploy to depth.
Gas-Lift Straddle

Applications
• Gas-Lift repair or increase Gas-Lift

Features & Benefits
• Gas Lift Straddle is a means of retrofitting a gas lift device into an existing well
• Straddle can be used to remedy existing gas lift systems that have failed or to extend the point of gas lift in the well
• Utilizes a specially designed, fixed gas lift valve placed in between the straddle packers
• Run as a Multi-Run straddle
Gas-Lift Straddle Case Study

Challenge
• Premier Oil’s Brenda D3 well: UK sector of the North Sea.
• Three gas-lift mandrels were installed - lower two valves were deemed too deep, so the well was lifting from top valve only.
• A failure occurred in top valve and production ceased.

Solution
• Install a retro-fit 5½” dual packer gas-lift straddle with gas-lift valve to increase the lower gas-lift effectiveness.
• Straddle the existing upper Side Pocket Mandrel with 5½” Straddle Dual Packer Module across the upper Side Pocket Mandrel and a Single Packer Module with gas-lift valve, creating a retro-fit 5 ½” Triple Packer gas-lift straddle.

Value Added
• The Brenda D3 well was unable to flow prior to the intervention.
• Post intervention, the production rate was 1,685 BOPD, and is still flowing at similar rates 18 months later.
Gas-Lift Case Study

Lower Dual Packer Straddle

Run in and set Upper Packer Module with Gas Lift Mandrel

Run in and set Lower Packer Module
Upper Triple Packer Straddle

Favor decision to straddle upper Gas Lift Mandrel
Tubing Punch Carried Out
Applications
• Avoids recompletion and reduces cost by allowing retrofitting of third party replacement valves

Features & Benefits
• Makes use of the existing hydraulic system to activate the newly positioned SSSV
• Can make use of existing No-Go profile and lock in place with dogs or slips
• Can be set in or across a landing nipple damaged by wireline/coil tubing wear, scale, corrosion etc.
• If the sealing areas or key profile are too damaged, the IVC can anchor on slips and seal in other IDs than the seal areas, such as flow couplings above/below the landing nipple
• ISO 14310 & API 11D V0 or V1 tested
• Expanding elements use existing hydraulic control line ports
• The system is run on wireline/slickline and retrieved on standard GS retrieving tools.
IVC Case Study

Challenge
• The no-go profile in the existing safety valve had worn off.
• As a result, it was not possible to set a standard Wireline Retrievable Safety Valve with a lock landed on the no-go.
• The operator was seeking a solution to avoid an expensive re-completion operation.

Solution
• Interwell’s Insert Valve Carrier (IVC) straddle was developed to retrofit damaged safety valves.
• Interwell provided a straddle to seal off the entire TRSSSV assembly; it was anchored with slips in the 7” tubing.

Value Added
• By using the Interwell IVC straddle, the operator avoided a $5 million recompletion and weeks of lost production.
Summary:

• Retrievable Straddle Packers can be used to fix many different well problems

• Can be built as a one-run system or as a stackable system

• Unique latch system for stackable system

• Can be built with different packer element systems to be able to pass well restrictions, increase P/T rating

• Tested according to ISO14310 V0 or API11D1 V0, Q1 quality grade, NACE approved

• Established track record with jobs performed globally
Questions?

Thank You!