

MECHANICAL SOLUTIONS

Welltec



LOWER COST,
REDUCED CAPEX,
HIGHER PRODUCTION –
ABSOLUTELY.



welltec®

SERVICE OFFERINGS BEST IN CLASS

MECHANICAL SOLUTIONS

The ability to intervene in a producing well can extend the life of the well and in turn the reservoir. Welltec's mechanical solutions help accomplish these objectives. Shifting from traditional intervention methods to Welltec's e-line mechanical solutions provides multiple advantages such as real-time feedback, surgical precision and improved accuracy.

Range of services:

- Setting and pulling plugs
- Setting and pulling packers
- Opening and closing valves
- Shifting sliding sleeves
- Retrieving and setting gas lift valves
- Cutting tubulars

EXPLORE YOUR OPTIONS!



TOOLS

MECHANICAL SOLUTIONS



WELL STROKER®

WELL STROKER® FOR ACTUATION

The **Well Stroker®** is at the core of Welltec's mechanical solutions portfolio. This tool is designed to provide the actuating force required for most mechanical intervention jobs. The Well Stroker® can push or pull multiple times in the same run irrespective of the depth and deviation. The built-in SRO feature allows fine tuned surface controlled force and position during operation. The **Well Stroker® 100** can apply up to 100,000 lbs of axial force downhole by the use of a bi-directional hydraulic ram, which can be fitted with various shifting tools. Furthermore, mechanical solutions can be performed when the well is still under pressure, which precludes having to 'kill' the well.

The Well Stroker® provides the flexibility to be incorporated in a wide range of completion designs for cost-effective workovers and other applications where downhole force is required.

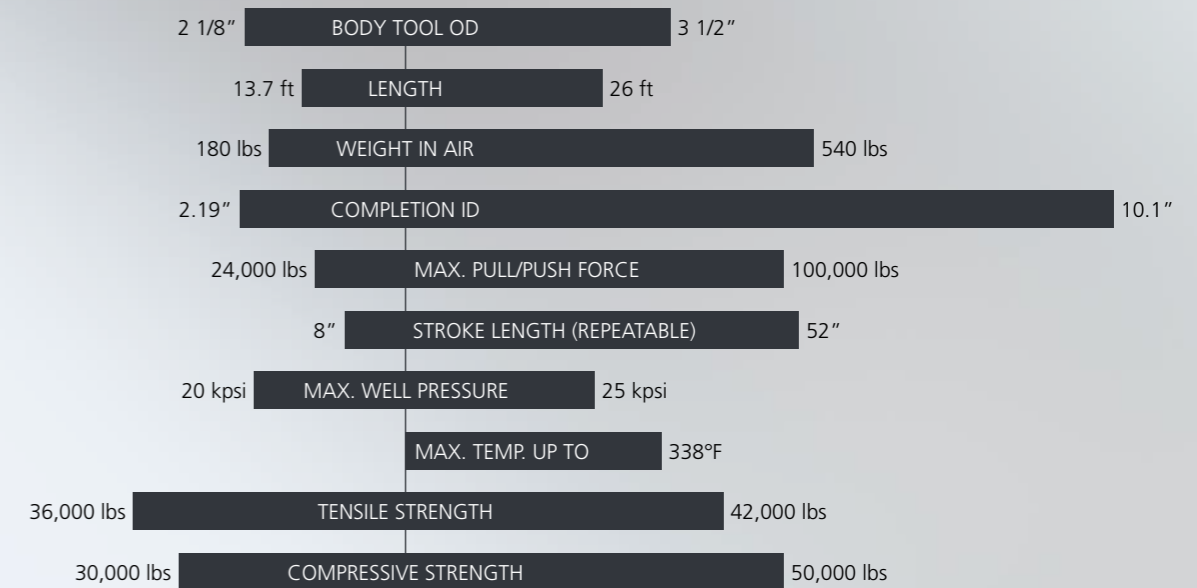
The Well Stroker® is currently available with 33,000, 60,000 and 100,000 lbs of axial force and is fully combinable with the Well Tractor® and other Welltec® services to provide mechanical solutions in horizontal and extended reach wells.

Types of jobs

- Opening valves
- Closing valves
- Opening sliding sleeves
- Closing sliding sleeves
- Retrieving gas lift valves
- Setting gas lift valves
- Setting straddle packers
- Setting plugs
- Retrieving plugs
- Fishing operations

SPECIFICATIONS

WELL STROKER® FOR ACTUATION



TOOLS

MECHANICAL SOLUTIONS



WELL KEY®

WELL KEY® FOR VALVE MANIPULATION

The **Well Key®** brings a high degree of efficiency to completions as it is designed to shift multiple sliding sleeves and open/close valves in a single run. With pin-point accuracy, the Well Key® provides the flexibility to open any type of valve.

A significant feature is that due to its active hydraulic system, full integrity of downhole jewelry is maintained as the Well Key® is only opened when the tool reaches the targeted depth.

The optimum solution for valve manipulation on e-line is the powerful combination of the Well Key® and the Well Stroker®. The Well Key® engages the required profile while the Well Stroker® applies the necessary force to shift the sliding sleeve.

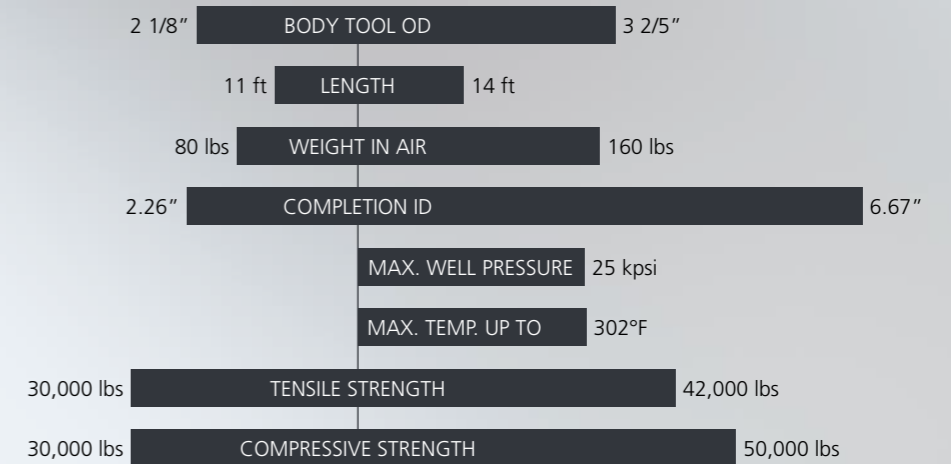
The Well Key® is fully combinable with the Well Tractor® and other Welltec® services to provide mechanical solutions in horizontal and extended reach wells.

Types of jobs

- Opening valves
- Closing valves
- Opening sliding sleeves
- Closing sliding sleeves
-

SPECIFICATIONS

WELL KEY® FOR VALVE MANIPULATION



ADVANTAGES

HEAVY INTERVENTIONS

WITH A LIGHT TOUCH

KEYHOLE SURGERY

A main feature of Welltec's solutions is the ability to deliver heavy duty results with robotic precision. This enables operators to apply surface-monitored and controlled applications to a specific and predetermined part of the well, reducing the risk of damaging the wellbore, providing safer operations and enabling future interventions. As a result, reservoir drainage is optimized and the economic lifespan of wells and fields is prolonged.

ENVIRONMENTAL BENEFITS

One of Welltec's key values is to provide solutions that minimize negative impacts on the environment. This is achieved by building small equipment for performing interventions, resulting in less emissions and a reduced carbon footprint. Welltec's solutions can even be transported by helicopter minimizing both impact on the environment and mobilization time.

INHERENTLY SAFER OPERATIONS

As a company, Welltec® continuously strives to increase safety. During operations, this translates into using fewer people, requiring a reduced number of lifts and eliminating the need for explosives. At locations with limited space, such as small offshore platforms, between decks, and Light Intervention Vessels, Welltec's e-line solutions offer improved logistics and reduced safety risks.

FEATURES

- Surface read-out
- High force
- Multiple repeated strokes
- Multiple repeated open/close functionality
- Passive fail-safe system
- On command open and close

BENEFITS

- Fewer runs
- Reduced risk
- No stress on wireline
- Force applied at depth
- Reduced risk of damage to well hardware
- High reliability
- Increased confidence



TOOLS

MECHANICAL SOLUTIONS



WELL CUTTER®

WELL CUTTER® FOR PIPE RECOVERY

The **Well Cutter®** is a tool that enables efficient, safe drill pipe, liner, tubing and casing recovery operations without the need for explosives.

The tool uses a rotating head to remove pipe incrementally, which prevents the creation of shavings. Due to the smooth, beveled surface it produces, a polishing trip with drill pipe may be eliminated. Conveyed on e-line for accurate depth control, the Well Cutter® incorporates a 'fail-safe' mechanism that prevents the tool from getting stuck.

A key benefit of the Well Cutter® is that it eliminates the use of explosives which can pose an operational risk, especially when simultaneous operations are being conducted. The transfer of explosives may also cause complex logistics and significant operational delays, making the Well Cutter® an attractive alternative for pipe recovery operations.

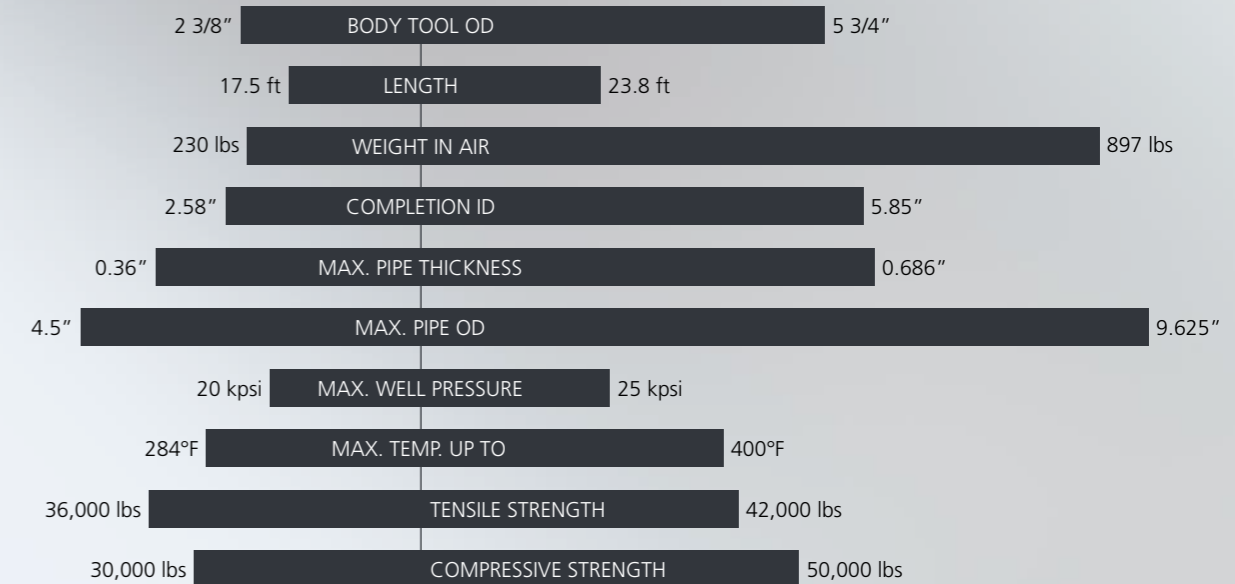
The Well Cutter® is fully combinable with the Well Tractor® and other Welltec® services to provide mechanical solutions in horizontal and extended reach wells.

Types of jobs

- Drill pipe cutting
- Casing cutting
- Liner cutting

SPECIFICATIONS

WELL CUTTER® FOR PIPE RECOVERY



TOOLS

MECHANICAL SOLUTIONS



WELLTEC® SETTING TOOL

WELLTEC® SETTING TOOL FOR HARDWARE INSTALLATION

The **Welltec® Setting Tool** has been designed to set plugs downhole on e-line by providing up to 55,000 lbs of force without the use of explosives. The Welltec® Setting Tool offers a controlled expansion allowing the elements of the plug to adjust during the process. Surface read-out provides real-time, unique knowledge of the job progress. The tool can operate effectively at any deviation.

By eliminating the requirement for explosives, the Welltec® Setting Tool offers both a safer and more time-efficient approach to plug setting, especially for rig-based interventions or when simultaneous operations are being conducted. The Welltec® Setting Tool can be conveyed by the Well Tractor® on e-line for accurate depth control.

Types of jobs

- Plug setting
- Packer setting

SPECIFICATIONS

WELLTEC® SETTING TOOL FOR HARDWARE INSTALLATION

BODY TOOL OD	3 7/8"
LENGTH	15.1 ft
WEIGHT IN AIR	250 lbs
FORCE DELIVERED	55,000 lbs
MAX. WELL PRESSURE	25 kpsi
MAX. TEMP. UP TO	338°F
TENSILE STRENGTH	42,000 lbs
COMPRESSIVE STRENGTH	42,000 lbs

THE WELL CUTTER® GIVES YOU
TUBULAR CUTTING WITHOUT EXPLOSIVES



TOOLS

MECHANICAL SOLUTIONS



WELLTEC® PUNCHER

THE WELLTEC® PUNCHER FOR CONTROLLED PIPE PUNCHING

The **Welltec® Puncher** provides an efficient, e-line conveyed, non explosive method for equalizing pressures between tubular strings. Its innovative design quickly creates a large diameter hole in the tubular at the target depth for pipe recovery or completion removal without the use of explosives. Utilizing a fast, drilling technique rather than a blade, the Welltec® Puncher produces a precise, uniform, large area hole. It can be run slick to any depth in the well or equipped with a 'no-go' for a hole punch at an exact depth. Multiple holes can be drilled in a single descent

and it can be deployed independently or combined with the Well Tractor® for punching in highly deviated or horizontal wells.

Types of jobs

- Pressure equalization
- Heavy fluid circulation
- Multiple perforation holes in one run

SPECIFICATIONS

WELLTEC® PUNCHER

FOR CONTROLLED PIPE PUNCHING

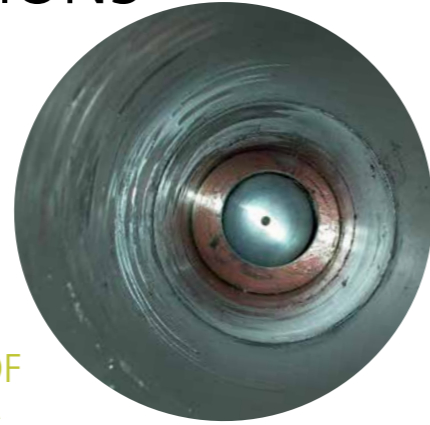
BODY TOOL OD	3 1/8"
LENGTH	15.4 ft
WEIGHT IN AIR	355 lbs
MIN COMPLETION ID	3.2"
MAX. PIPE THICKNESS	1"
MAX. PIPE ID	7"
HOLE DIAMETER	0.5"
MAX. WELL PRESSURE	25 kpsi
MAX. TEMP. UP TO	302°F
TENSILE STRENGTH	42,000 lbs
COMPRESSIVE STRENGTH	50,000 lbs

THE WELL KEY® UNLOCKS
THE POTENTIAL OF YOUR WELL



CASE STORIES

FOR MECHANICAL SOLUTIONS



WITH PROVEN RESULTS IN A WIDE VARIETY OF ENVIRONMENTS AND THE ABILITY TO TAILOR SOLUTIONS TO YOUR NEEDS, WELLTEC® OFFERS A FAST, EFFICIENT OPTION FOR ENABLING INITIAL PRODUCTION OR RETURNING WELLS TO FULL POTENTIAL AS ILLUSTRATED BY THE FOLLOWING CASE STORIES.

CUTTING 5 1/2" TUBING ON A DRILL SHIP WITH PIPE IN COMPRESSION

A well offshore Nigeria was required to be recompleted as a dual producer which meant having to pull the upper completion. During planning, it was decided to cut the tubing above the main packer for retrieval. However, most explosive and mechanical cutters require the pipe to be in tension. Being able to cut pipe in compression, the Well Cutter® saved several days of rig time as the operator did not have to remove the subsea tree and work tension to the cut depth. Overall, the Well Cutter® increased safety, fit within the tight rig-up requirements and enabled a very efficient operation.

MEC.OFF.AF.14.04.V1

UNCONVENTIONAL ACID STIMULATION IN THE PERMIAN

In West Texas an operator wanted to individually stimulate each production zone in a horizontal well. Conventional ball-drop frac sleeves couldn't be used as each sleeve had to be closed before opening the next one in this 18 stage completion. Welltec® deployed the Well Tractor, Well Stroker and Well Key with dual acting keys as a Mechanical Solution. The toolstring remained in the wellbore during the entire operation and all 18 sleeves were re-opened for production before POOH. The operator gained considerable efficiency as the operation was completed in just five days.

MEC.ON.US.13.03.V2

WELL STROKER® XXS REPLACES COILED TUBING AND SAVES 5 DAYS

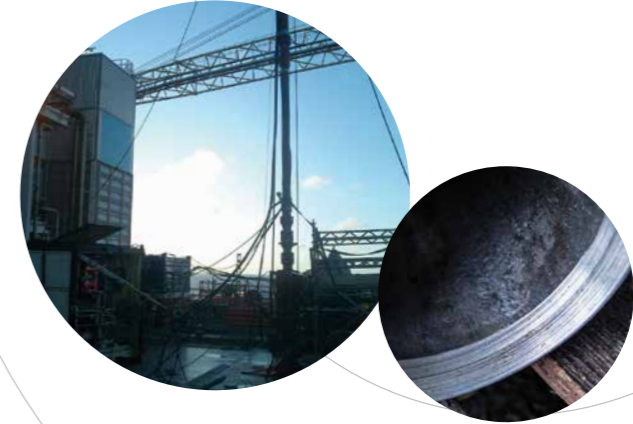
An operator was challenged offshore Azerbaijan when a routine operation to set a 7" retrievable packer on e-line got stuck. Then they were even more challenged again when the slick-line fishing tool also got stuck. Weighing the options between Coiled Tubing and Welltec's Mechanical Solutions, they were delighted to discover that the Well Stroker® XXS was able to deliver the required pulling force to free and successfully recover the fishes. Performing the operation on e-line saved the operator a minimum of five days of rig time and an estimated ~ \$2 million.

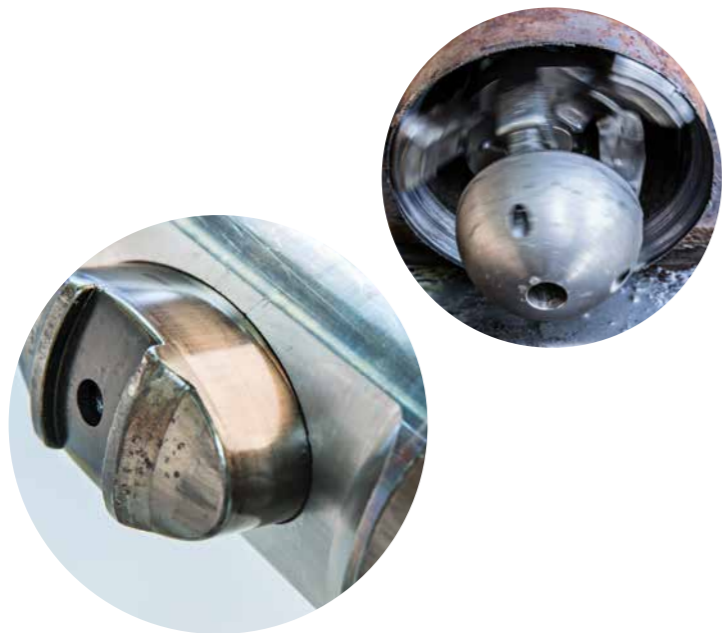
MEC.OFF.KAZ.15.01.V1

THE WELL CUTTER® EXCEEDS ITSELF – TWO CUTS IN ONE RUN

The Well Cutter® was being used by an operator in the Middle East to routinely cut pipe during their workover operations. Pleased with the current results, they nonetheless challenged Welltec® to perform the required multiple cuts in one run. A new bit design was completed and a System Integration Test performed prior to successfully performing two cuts on 4.5" pipe in the well. Since then, tool evolution has continued and currently the Well Cutter® has successfully made up to six cuts in a single run, furthering safe, efficient operations.

MEC.OFF.QA.14.01.V1





OPENING A MALFUNCTIONING ISOLATION BALL VALVE

East Coast Canada a newly completed, offshore well required to have a straddle packer installed in the lower completion to isolate a potential leak path through a ported sub. However, the isolation ball valve was not responding to the hydraulic attempts to open it. Quickly mobilizing from St. John's, a Well Stroker® and Well Key® combination were run into the well where they latched the mechanism. After pulling several times it was determined that the valve would not open fully. A gauge run determined that it was sufficiently open to run the isolation assembly however, preventing a costly workover or sidetrack.

MEC.OFF.US.15.01.V2

CUTTING 7" CHROME TUBULAR USING THE NEW WELL CUTTER® 414

Based on the success of the first versions of the Well Cutter®, an explosive-free tubular cutting tool which can cut pipe in either tension or compression, creates a polished re-entry guide, eliminates the need for a polishing trip and doesn't generate any debris, a larger size tool was developed. In its inaugural run it was mobilized offshore North Sea where it successfully cut 7" 29# Cr13S-110 tubing at ~ 12,600 ft. Rig up to rig down was accomplished in only 13 hours and with only 10 tons pull the clean cut was quickly confirmed.

MEC.OFF.NO.14.03.V1



WORLD'S FIRST RLWI CROWN PLUG PULLING

In subsea wells with Horizontal Xmas Trees (HXT), two crown plugs are typically installed as primary and secondary barriers against reservoir pressure. During a Riserless Light Well Intervention (RLWI), slickline was unable to pull the upper crown plug despite hundreds of jarring attempts. The Well Stroker® was mobilized, rigged-up in the subsea lubricator and run through open water to the HXT. After anchoring and latching the crown plug, the Well Stroker®, in only 14 strokes, with its controlled, direct pull up to 60,000 lbs, accomplished what 347 slickline attempts couldn't; releasing the upper crown-plug.

MEC.SUB.US.14.02.V1

WELL STROKER® SAVES 30 DAYS AND BOOSTS PRODUCTION

A deepwater, offshore well was experiencing high gas-oil ratio caused by coning and breakthrough or re-injected gas. Diagnostics revealed that the high gas entry was from the top of an open hole gravel pack. A 525 ft long straddle isolation assembly was engineered and required deployment. Installation and assembly necessitated accurate depth control and a 'force with finesse' approach which was perfectly suited for Welltec's Mechanical Solution portfolio. Using the Well Stroker®, the job was completed safely, with no NPT in only 15 days; 30 days quicker than planned, shutting off the gas and increasing oil production multi-fold.

MEC.OFF.AF.13.01.V1



WELL CUTTER® SEVERS DRILL PIPE IN RECORD TIME

During a new well construction, offshore North Sea, the drill pipe became stuck in the hole when the Liner Hanger Running Tool (LHRT) refused to release. The Well Cutter® was called out for a ready on arrival (ROA) operation. Mobilizing the tool from a nearby rig, it was conveyed to the target depth by the Well Tractor®. In only 2 minutes and 50 seconds after the cutting began, the pipe was cut. With the advantage of providing a polished cut, the operator was able to move immediately to fishing the cut pipe, avoiding a polishing run.

MEC.OFF.NO.15.02.V1



WELL STROKER® XXS RESTORES WELL BARRIERS

When a plug partially set across the Xmas tree and blow-out preventer (BOP) in a well offshore Norway, effectively eliminated them as well barriers, a swift resolution was required. Conventional solutions failed due to insufficient pull force to release the plug and setting tool. The Well Stroker® XXS was quickly mobilized. With a pull force in excess of 60,000 lbs it was able to recover not only the setting tool and plug but also a slickline tool which had latched the fish but broke the weakpoint, remaining in the Xmas tree. The successful use of the Well Stroker® XXS saved the operator from prolonged exposure to this HSE risk.

MEC.OFF.NO.14.06.V1

OPENING SLIDING SLEEVES IN AN UPSIDE-DOWN COMPLETION WITH THE WELLTEC KEY®

An operator in Indonesia needed to shift two 4.562" sliding sleeves in the 5 ½" lower completion. But to do so, the toolstring needed to pass through a 4 ½" upper completion with a 3.688" restriction. Slickline was impossible but the Well Key® 325 Extended Reach was just the tool to be able to pass through the restriction yet still expand to reach the larger shifting profile of the lower completion. Conveyed on the Well Tractor® in combination with the Well Stroker® the Well Key® 325 successfully brought the well on-line, saving the operator from having to pull the upper completion.

MEC.OFF.IDN.14.01.V1

MORE CASE STORIES CAN BE FOUND AT
WWW.WELLTEC.COM/MECHANICAL SOLUTIONS

SPE PAPERS ON MECHANICAL SOLUTIONS

SPE – 173647 Crown Plug Pulling Performed as Riserless Light Well Intervention in the Gulf of Mexico – Overcoming the Challenges by Garry Andrews and Angel Luviano, Welltec®, presented at the SPE/ICoTA The Woodlands, 2015.

SPE – 173833 New Mechanical Pipe Cutting Capabilities on Electric Line - A Compilation of Case Stories from Norway by Jørgen Buch, Terje Skeie, Tommy Eikeland, SPE, Welltec®, presented at the SPE One Day Seminar, Bergen, 2015.

SPE – 173837 New Advances in Mechanical Engineering Enables Pulling Forces of up to 60,000 lbs. – Experience Gained from Offshore Norway Case Stories Jørgen Buch, Houssam Mourani and Dong Ngo, Welltec®, presented at the SPE One Day Seminar, Bergen, 2015.

IPTC – 17652 Mechanical Pipe Cutting in ERD Wells with Pipe Under Compression by Robert Macfarlane, Welltec®, Brian Schwanitz, Welltec®, Marco Aguirre, Baker Hughes, James Greenlee, Welltec®, presented at IPTC in Doha, 2014.

SPE – 14UNCV-167694 World's First Through-Tubing ESP Swap on Electric wireline in Highly Deviated Wellbores M. Kuck, SPE, Eni US Operating Co, Inc.; J. Albright and C. Blount SPE, Welltec®, presented at the SPE/EAGE European Unconventional Conference and Exhibition, Vienna, 2014.

SPE – 168271 Tubing Retrievable Surface Controlled Subsurface Safety Valve Floating Flapper Remediation B. Gary, Halliburton; C. Hosli, Shell; A. Luviano, Welltec®, J. Langley, Expro, presented at the SPE/ICoTA, The Woodlands, TX, 2014.

OTC – 25438 Improving Overhead and Reducing Time Consumption on P&A Operations with E-line, Explosion-free, Mechanical Cutter Tool by Christian Krüger, Abderrahmane Faraoun, Tommy Eikeland, Welltec®, presented at the OTC Houston, TX, 2014.

SPE – 163890 Electric-Line Pipe-Cutting Operation Optimizes Completion Removal, Offshore Russia by Howard Otten and Bill Connon, Sakhalin Energy; Alex McKay, Kirill Kirsanov and Moray McGillivray, Welltec®, presented at the SPE/ICoTA, The Woodlands, TX, 2013.

SPE – 163943 Retrieval of an Inflatable Plug Using Only Slickline and Electric-Line Technology by Ben Smith, SPE, Jeffrey Stricker, SPE, Kevin Reckert, SPE, Shell; Floyd Thibodeaux, SPE, Baker Hughes; and Angel Luviano, SPE, and Duane Kent, SPE, Welltec®, presented at the SPE/ICoTA, The Woodlands, TX, 2013.

IPA13-E-040 Application of E-line-based Electro Mechanical Hydraulic Tool Gas Lift Valve Change Out for High Angle and High Casing Pressure Well by Dody Cahyadi (ConocoPhillips) and Antonius Aji, Welltec®, presented at the 37th IPA Convention and Exhibition, Jakarta, Indonesia, 2013.

SPE – 154417 High-Angle Gas Lift Valve Removal and Replacement in a Single Run by Hayes Chow, Daniel Herrmann, John Condio (ConocoPhillips), Jeremy Albright, Leighton Burley and James Greenlee, Welltec®, presented at the SPE/ICoTA, The Woodlands, TX, 2012.

IPTC – 14585 A Pragmatic Approach to Enhanced Performance of Slim Mono-Bore Wells by Lam Fei Shiong, Welltec®, presented at the International Petroleum Technology Conference, Bangkok, 2011.

SPE – 121066 Technology with High Impact on ROI and Low Impact on HSE by Brian Schwanitz and Kristine Henriques, Welltec®, presented at the SPE Americas E&P Environmental and Safety Conference, San Antonio, TX, 2009.

SPE – 19182 Valve Contingencies Using Wireline Stroker and Tractor technologies by Brian Schwanitz, Welltec®, presented at the OTC, Houston, TX, 2009.

SPE – 123924 Milling of Permanent Bridge Plug Successfully Performed on Wireline by Stephen Stragiotti, Øyvind Andersen, StatoilHydro, and Ole Eddie Karlsen, Welltec®, presented at the Offshore Europe, Aberdeen 2009.

SPE – 113813 Deepwater Isolation Valve Contingencies Using E-Line Stroking Tool by Brian Schwanitz, Welltec®, presented at the SPE/ICoTA, The Woodlands, TX, 2008.

A close-up, diagonal view of a metal pipe. The pipe has a circular hole with a dark center. The surface of the pipe is textured, possibly from a manufacturing process like sandblasting. The background is a plain, light color.

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