Wellbore Integrity SOLUTIONS

Operational Efficiency Gains in Well Abandonment: One Trip Solution for Conductor and Wellhead Recovery

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Agenda

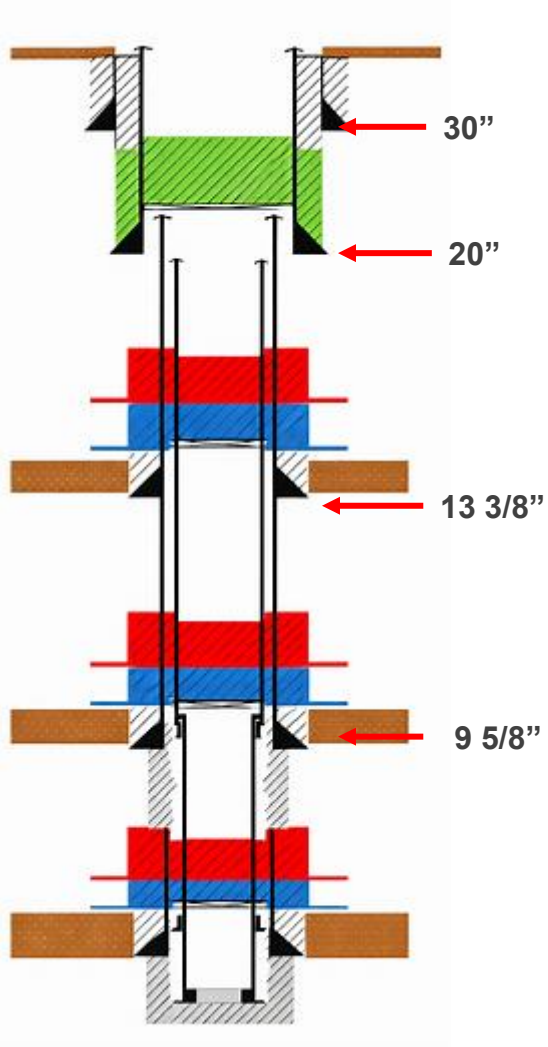
- Introduction
- Efficient Cut and Recovery Technology
- Design Methodology
- Wellhead and Conductor Recovery Performance
- Case Studies
- Next Steps?

Introduction

- Casing cutting and pulling is a key operation during the P&A phase
  - Wellhead Removal – Subsea
  - Conductor Recovery on Surface – Platform

- Requirement of Dual, Triple or Quadruple casing cuts

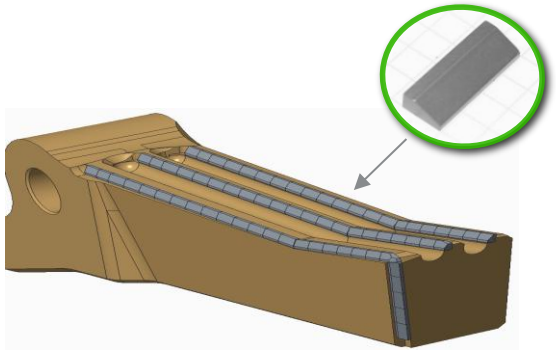
- Developed a one trip system and methodology for Wellhead and Conductor Recovery
  - Small rig spread which can allow operational flexibility
  - Limited rig up time
  - Cost efficient vs other techniques

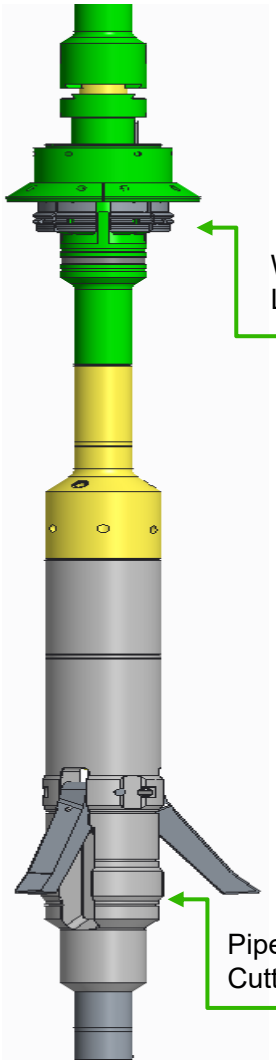


ProLatch - System

- Comprises Wellhead Latch System and Multi String Pipe Cutter
- Robust Pipe Cutter designed to sever single, dual, triple or quadruple casing conductor strings in **1 trip**
- **TruEdge** insert Knives designed to improve cutting performance by more than **50%**
- Cut and Recover Subsea Wellheads in a **Single Trip.**
- Latch System **reduces** surface **vibration** & **assurance** of free casing prior to POOH
- Ability to interact with a combination of casing and wellhead types

TruEdge inserts





Conventional Methods

Triple String Severance

- Typical Method #1: Section Mill + Pipe Cutter
  - Section Mill 3 to 5 feet pocket in 13-3/8” Casing
  - Perform 20” x 30” Cut
  - Potential 3 - 4 trips if the operation is performed on a Semi-Sub

- Typical Method #2: Pipe Cutter
  - Cut 13 3/8” x 20” dual cut first
  - Complete 30” cut separately
  - Requires accurate space-out for success
  - Eccentricity adds more complexity and added risks

WIS - One Knife Approach

TruEdge Inserts

- Cutter design was identified as a key enabler to performance improvement
- Cutter design (geometry) originally developed for Section Milling
- New knife design with TruEdge inserts layout

ONE Knife Length Approach

- Reduce the length of window produced during the cut
- Eliminate extra milling requirement from multi trip approach

Verify the Cut before POOH

- Utilize the ProLATCH System allows assurance for a successful cut

Parameter Management

- Adapted a new methodology for parameter management

North Sea P&A Performance

Subsea Performance

- Subsea campaigns with concentric casings
  - Single trip success rate is 100%
  - Subsea Wellhead Recovery: 13 3/8” x 20” x 30”

Platform P&A Performance

- Challenging eccentric casing from installation
- 90% of the jobs were completed in a Single Trip

Casing configuration	No. of Jobs	Fastest Cut time (hr)
20” x 30”	7	1.3 Hours
13 3/8" x 30“/35”	4	2.5 Hours
13 3/8" x 20” x 30"	28	2.75 Hours

Case Study – Heavy Wall Conductor Cut & Wellhead Recovery in North Sea

Challenge

- Improve efficiency of Subsea Well Abandonment and ensure Wellhead Recovery in a single trip

Solution

- A 3-Row TruEdge insert-based knife design was developed for the Heavy Duty 16” cutter
- A parameter roadmap for the Heavy Duty 16” Pipe Cutter

Results

- Successfully cut 20” x 35” conductor and recovered subsea wellhead in 1-trip
- Saved an extra trip along with 50% improvement in cut time (2.5 hours)

Case Study - Conductor Cut & Wellhead Recovery in North Sea

Challenge

- Triple Casing string cemented back to the surface
- All strings to be cut and wellhead to be recovered in the same trip

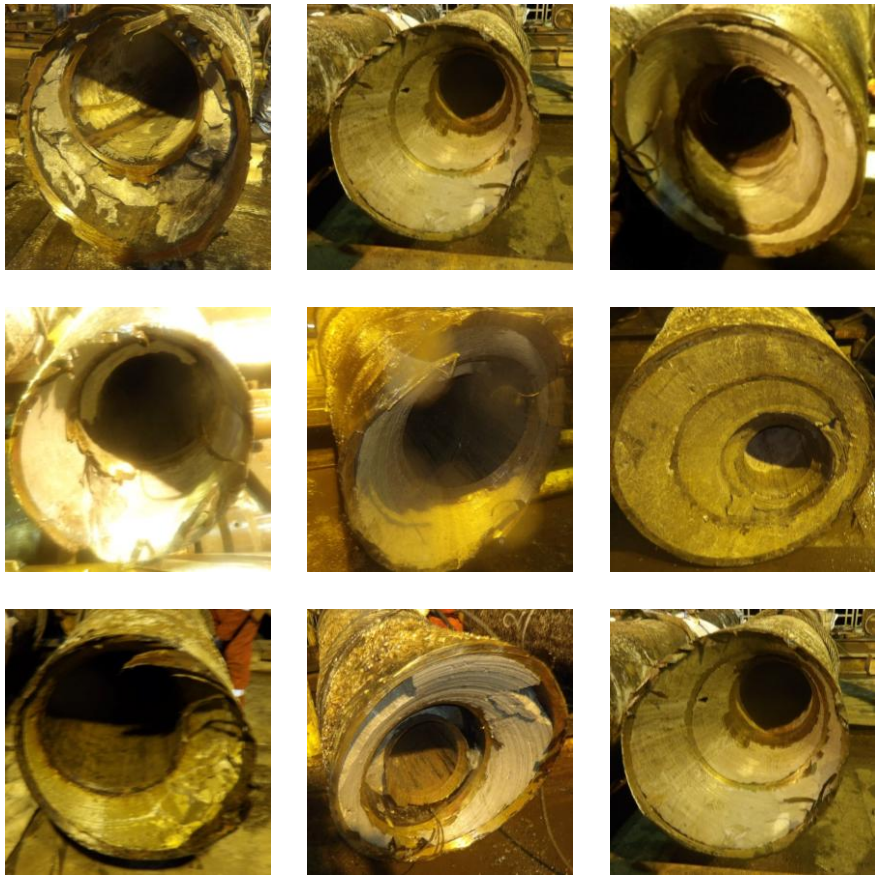
Solution

- A new TruEdge 50” sweep knife design was designed to be run with the 11-3/4” cutter

Results

- Successful triple cut of 13-3/8” x 20” x 30” completed and wellhead recovered in a single trip
- Cutting Torque was under 7k ft-lbs throughout
- 6 hours to complete cutting

Case Study – Platform Conductor Recovery Campaign in North Sea



Challenge

- 36x Well Conductor Recovery
- Uncertainty in cement presence in annulus, with base plan for triple cut

Solution

- 11 ¾” Pipe Cutter with TruEdge Knives & ProLATCH System
- Parameter Road Map

Results

- Consistent cut performance with triple cuts as little as 2.75 hours cut time
- Continuous Improvement on Knife Design & Road Map

What Next? Quad String Cutting – North Sea

Challenge

- Quad Casing Strings back to the surface
- Uncertainty of cement in annulus
- All strings fully eccentric

Solution

- A New TruEdge 42” sweep knife design was designed to be run with the 8 ¼” Pipe Cutter
- Established **Parameter Management** from the learning from triple cuts

Results

- Successfully completed Quad cut of 9 5/8” x 13-3/8” x 20” x 30” in **One Trip**
- 4hrs 45 Mins of Cutting Time

Questions?

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Wellbore Integrity Throughout the Life of the Well