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Norris Conference Centers -
City Centre, Houston, Texas
ShaleTechConference.com

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Remote Wireline Connectors

More Frac “Pump On” Time and Improved Safety

Mike Spence

Sr VP Business Dev

Reel Power Oil & Gas, Inc

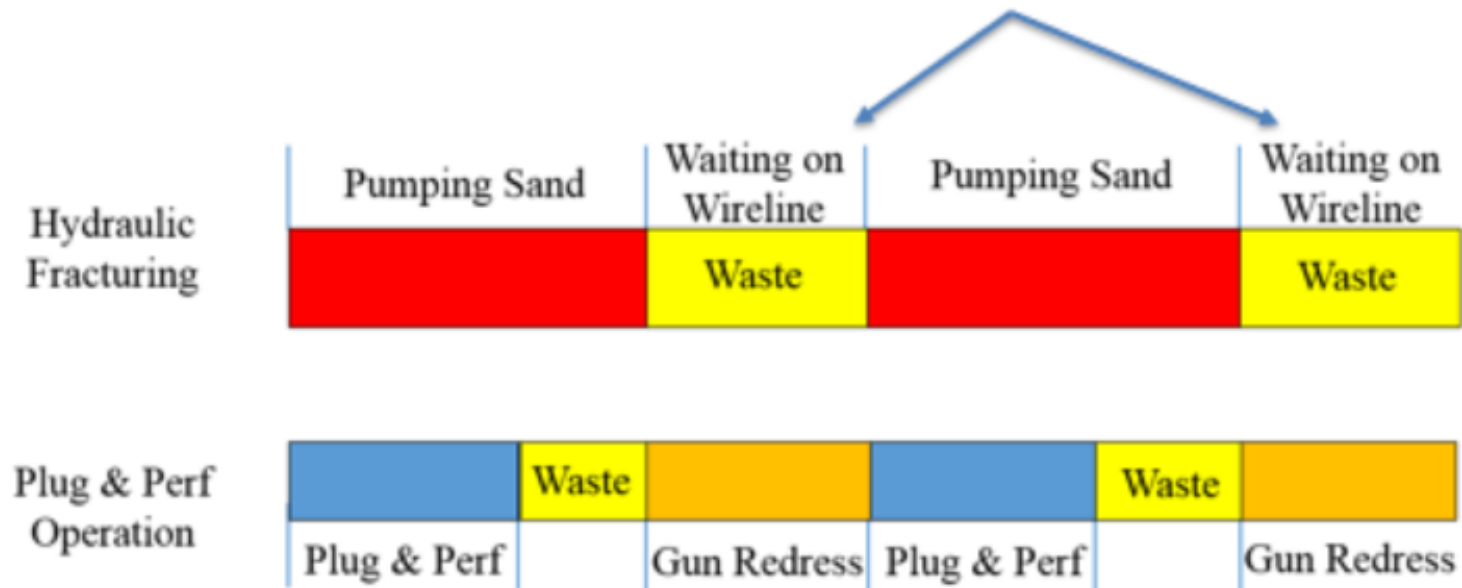
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Improved Completion Efficiency – Defining Value Adding Time

Value Adding Time

Value is added to the asset by pumping sand and fluid into the formation, generating the fracture network in order to produce hydrocarbons

Goal is to maximize value adding time by reducing waste

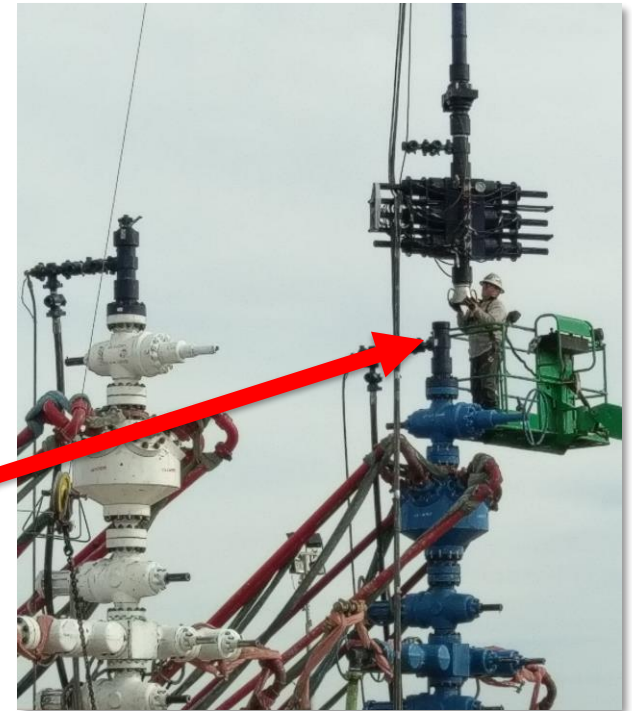


Connecting Lubricator – A Hazardous Task

Hazard Related to manually connecting wireline lubricator

- Dropped objects
- Working from heights
- Restricted mobility
- Hand placement
- Large overhead loads
- Manlift hydraulic failure
- Crane communication
- Dropped wireline tools
- High wind on manlift
- Collision with equipment
- Driving over hoses
- Transferring fluids

Need to remove the man
from the operation



Improved Safety – Remote Connection Upgrade

Original Lubricator Connection Method



Manually Connected by Man in Manlift

Upgraded Lubricator Connection Method



Remotely Connected by Company Man – Outside of Red Zone

Implementing a remote connector will **eliminate personnel hazards** related to lubricator operations and **improve completion efficiency** by moving the wireline redress outside the critical path of value added frac operations

Product Development - Field Trial



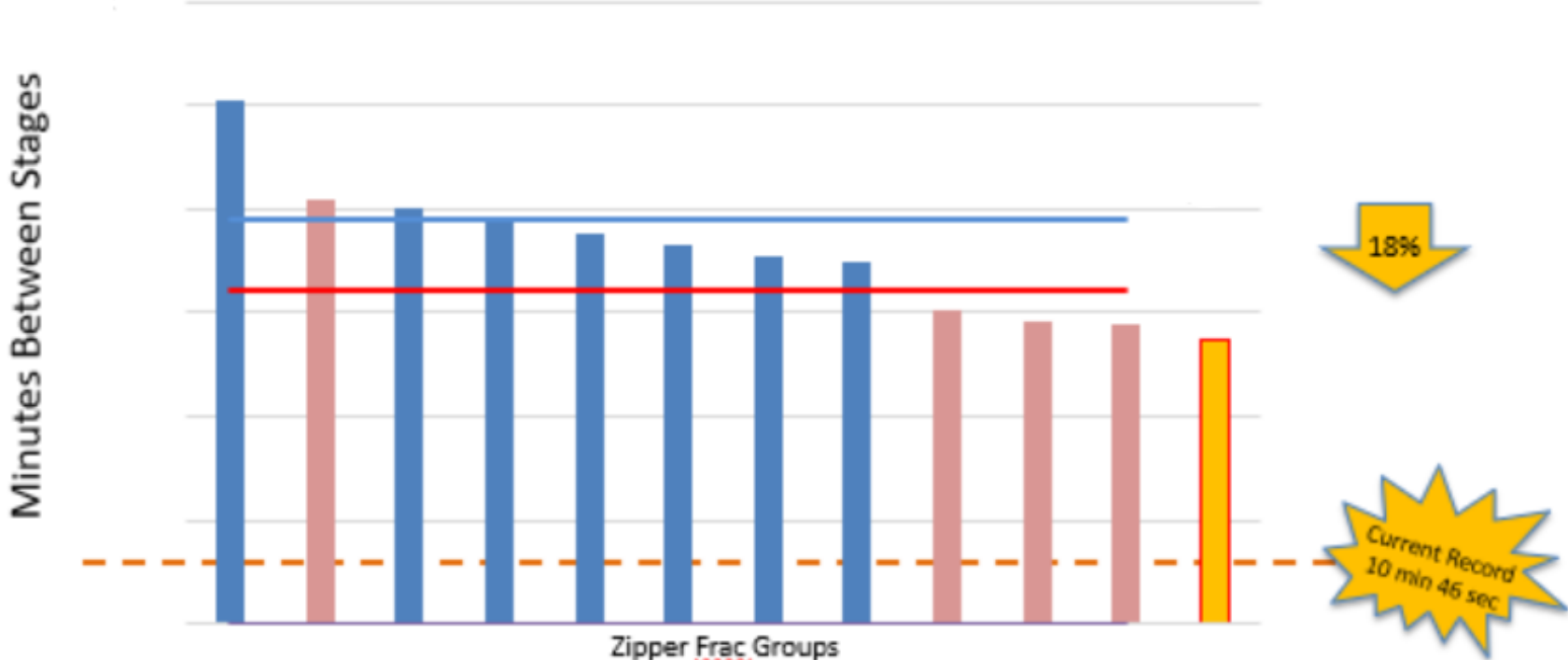
- South Texas Frac Trial from Feb. 2018 thru June 2018
- 1,597 connections made with Gen 1 system
- Remote connector system with pressure interlock & cellular communications

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Improved Completion Efficiency – Technology Step Change

✓ 1 Additional Stage/Day ✓ Decreased Costs ✓ Reduced Safety Hazards

Time Between Stages for 2018 Completions



2018 Average Colored by Operation Type

- Current Job
- Remote Lubricator Connection
- Conventional Lubricator Connection

Information provided by Leading Operator

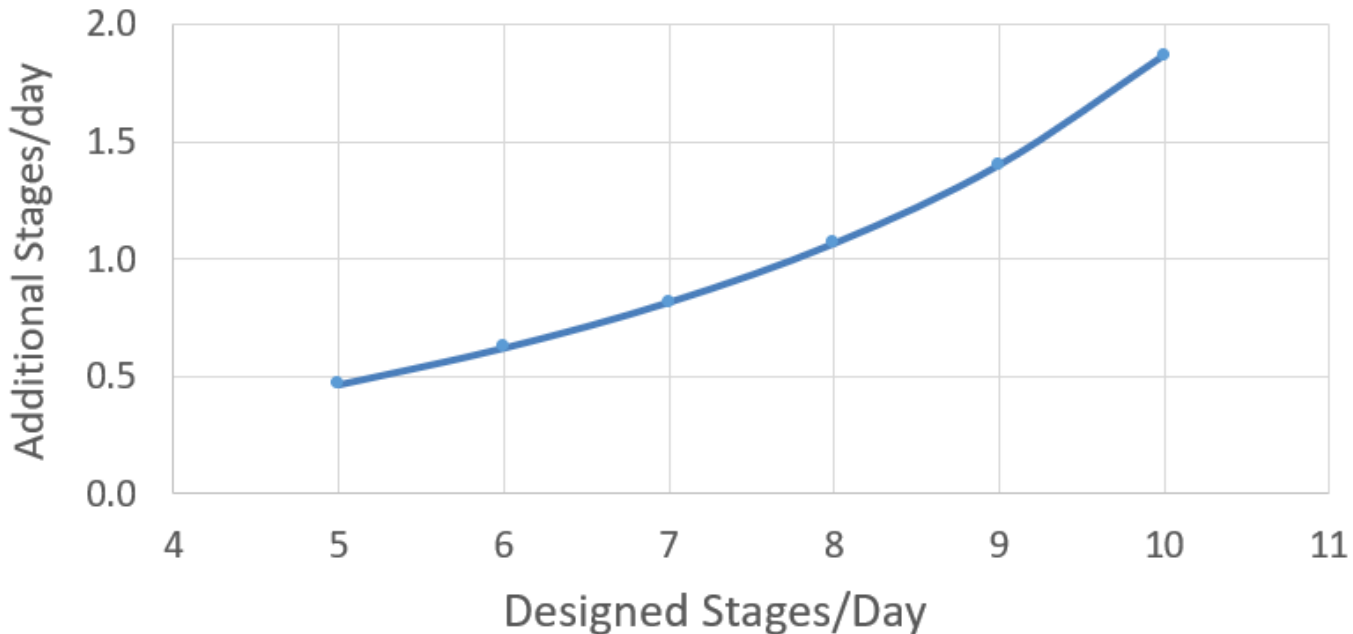
Improved Completion Efficiency – Technology Step Change

✓ 1 Additional Stage/Day

✓ Decreased Costs

✓ Reduced Safety Hazards

Additional stages as a Result of Remote Connector



\$500k Net Annual Savings per operation

based on 40 wells with 40 stages/well, \$50k/day spread rate

Information provided by Leading Operator

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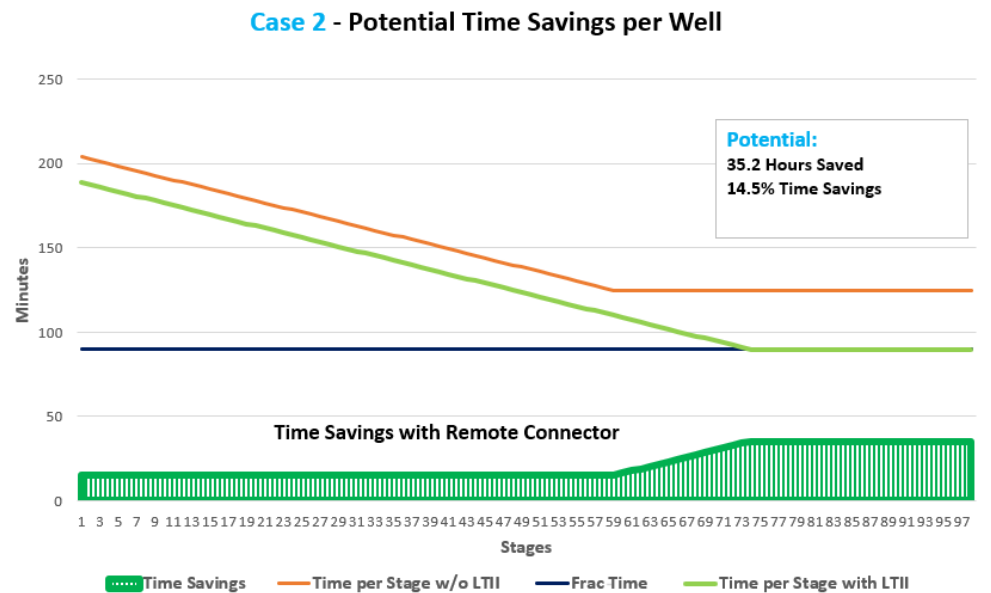
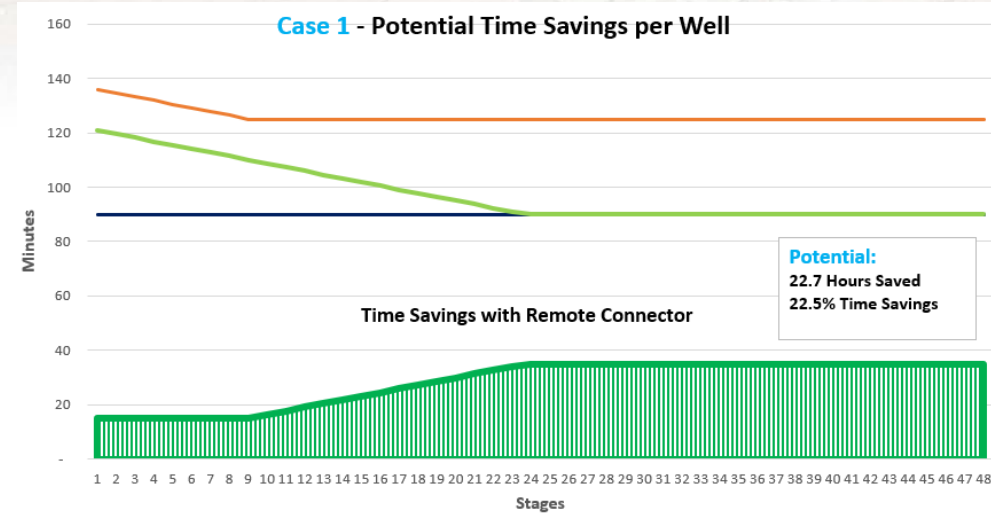
Potential Savings - Effects of Longer Laterals

Well Data Inputs

	CASE 1	CASE 2	UOM
Kick Off Point	6,500	6,500	FT
Landing Depth	7,250	7,250	FT
Total Depth	15,500	24,000	FT
Lateral Length	8,250	16,750	FT
Wireline Vertical Speed (Max)	450	450	FPM
Wireline Horizontal Speed (Max)	250	250	FPM
Frac Pumping Time per Stage	90	90	MIN
Stage Spacing	170	170	FT
Total No. of Stages	48	98	
Time for Pressure Test	10	10	MIN
Time to Reload Guns	20	20	MIN
Basket Time (Manual Connect)	5	5	MIN

Outputs

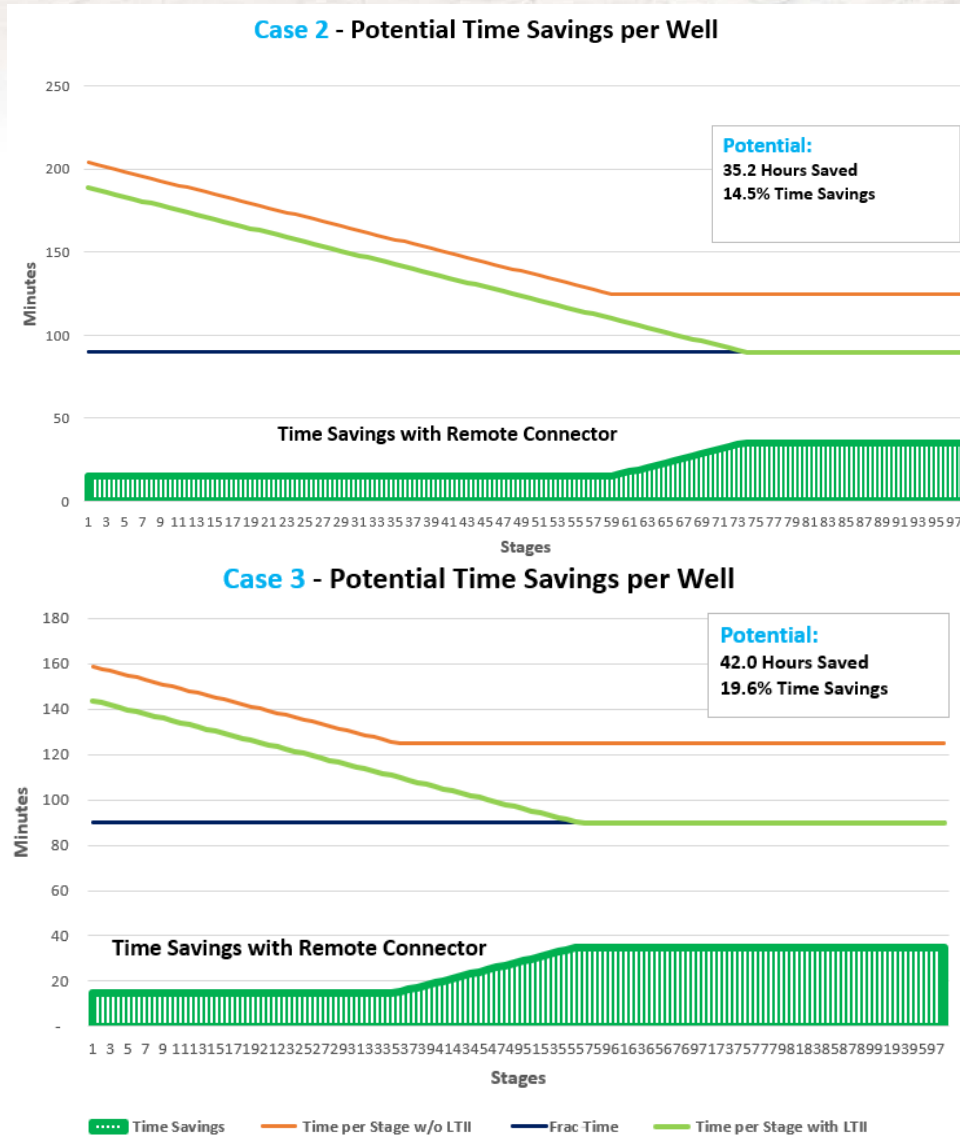
TOTAL JOB TIME SAVINGS	22.7	35.2	HRS
TIME SAVINGS PER STAGE (AVG)	28.4	21.6	MIN
TOTAL POTENTIAL TIME SAVINGS	22.5%	14.5%	



Potential Savings – Faster Wireline Speeds

Well Data Inputs	CASE 2	CASE 3	UOM
Kick Off Point	6,500	6,500	FT
Landing Depth	7,250	7,250	FT
Total Depth	24,000	24,000	FT
Lateral Length	16,750	16,750	FT
Wireline Vertical Speed (Max)	450	550	FPM
Wireline Horizontal Speed (Max)	250	350	FPM
Frac Pumping Time per Stage	90	90	MIN
Stage Spacing	170	170	FT
Total No. of Stages	98	98	
Time for Pressure Test	10	10	MIN
Time to Reload Guns	20	20	MIN
Basket Time (Manual Connect)	5	5	MIN

Outputs	CASE 2	CASE 3	UOM
TOTAL JOB TIME SAVINGS	35.2	42.0	HRS
TIME SAVINGS PER STAGE (AVG)	21.6	25.7	MIN
TOTAL POTENTIAL TIME SAVINGS	14.5%	19.6%	



New Product Develop – Design Goals & Solutions

GOALS

- 1 Safe To Operate
- 2 Easy, “foolproof” Operation
- 3 Remote Field Service
- 4 Minimize chance of downtime

SOLUTION

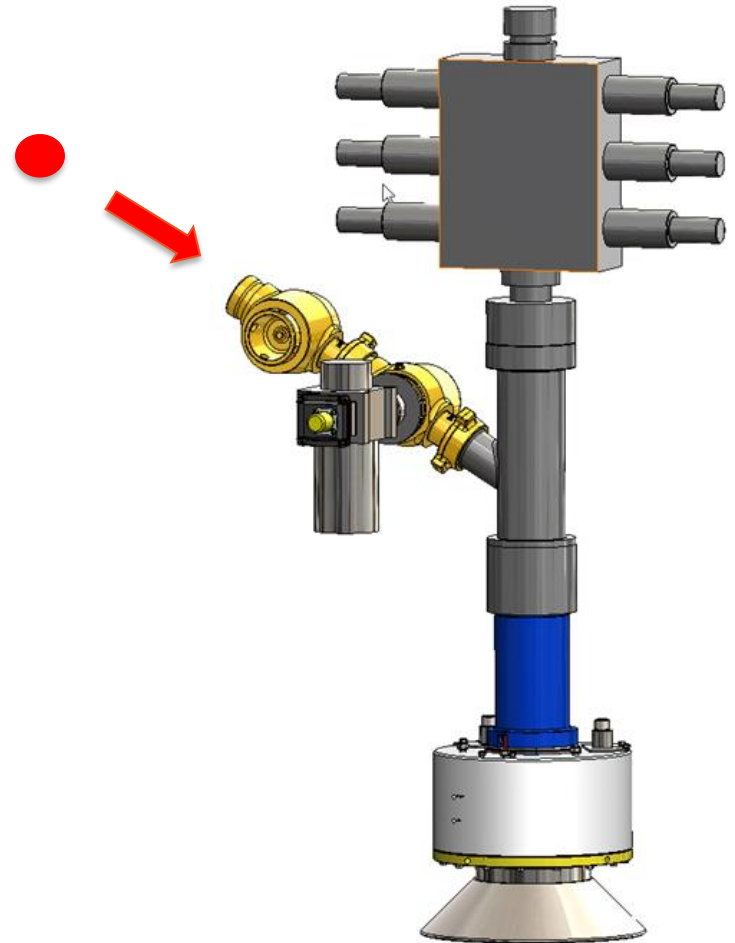
- 1 Safety
 - Pressure Interlock
 - Fail safe design
- 2 Simple to understand and operate
 - Simple Keyed Lock & Unlock
 - Plug & Play – Simple set-up with minimal tools
- 3 Direct access to system from factory
 - Track performance and gather preventative maintenance
 - Remote diagnostics
- 4 Redundancy On Location
 - Redundant Control Components
 - On-site spare connectors & components

Additional Efficiencies - Other Opportunities

- Greaseless wireline & faster wireline speeds
- Remote Night Cap
- Remote Ball Drop
- Remote Valve Lubricators/Greasers
- Zipper Frac Manifold
- Frac Fueling Automation

Remote Ball Drop - Drop Balls Out of Danger Zone

- For operators that drop a ball every stage
- Product Developed to work in unison with connector
- Actuate once connector on wellhead
- Double containment through ball drop
- Uses existing controls



Remote Nightcaps - Hydraulic Crown Valve Recommended Practice



Remote Connector
Night Cap

Hydraulic Crown
Valve Night Cap

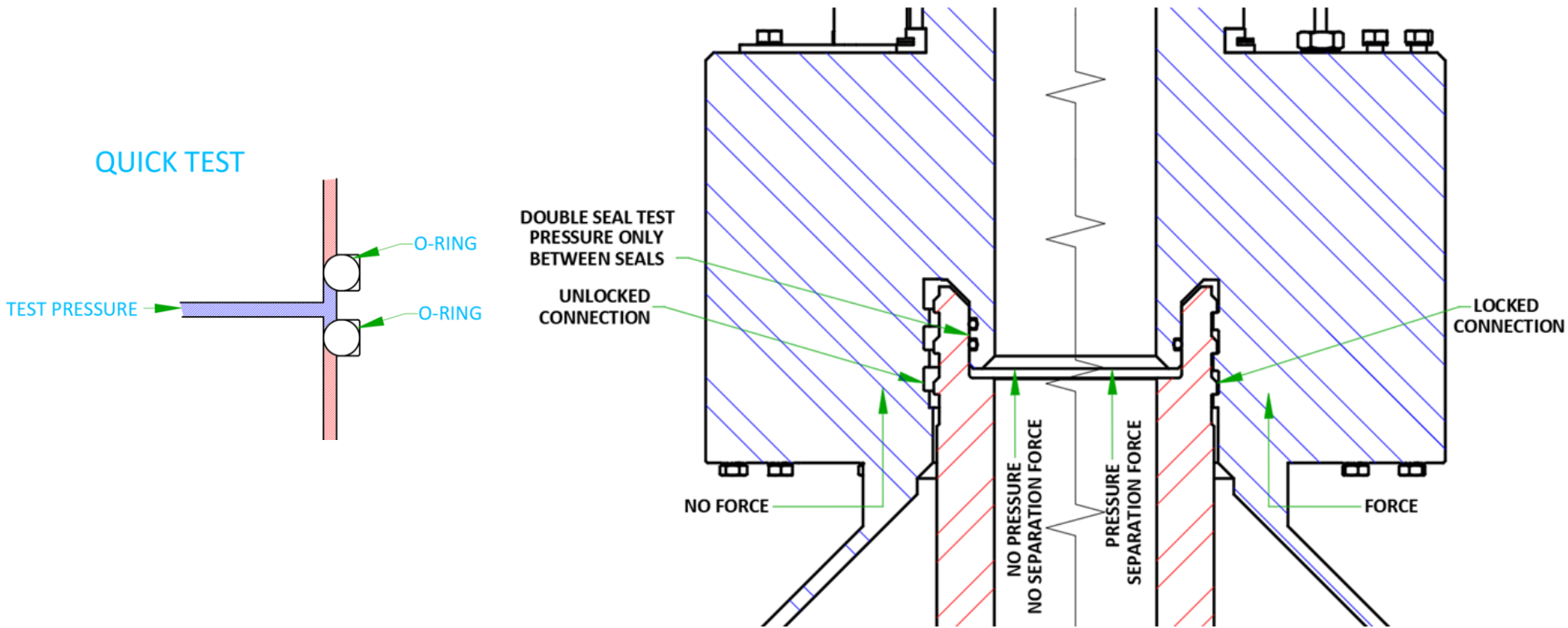


Hydraulic Valves –

- Faster, More Efficient
- Less Expensive
- Actuated Outside of Pressure Zone

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Quick Test Sub - Not Recommended Practice for Remote Connectors



- Quick Test Only Tests the Seals
- Lubricator Test Outside of Critical Path
- **Recommended Practice** – Test Seal & Connection



BOP Hot Stabs - Connector



BOP
Accumulators



Raw Water Systems



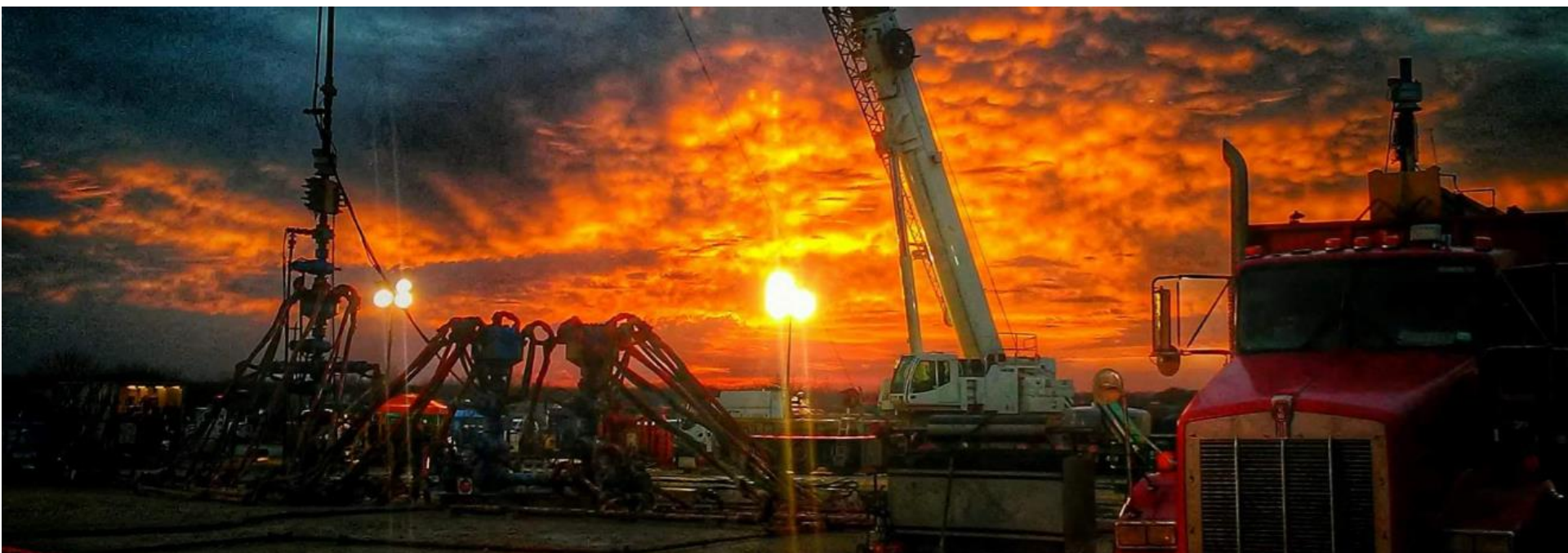
Deepwater BOP
Control Reels

REELPOWER

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Questions? Comments?



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