WEATHERFORD

INTEGRATED PROJECT MANAGEMENT

WFT overview

Khakim Ma Lyan Tsay
PLM ALS & COMP

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ӨНДЕУ МАРКЕТИНГ

Weatherford

Our people is our most important assets

Health, Safety & Environment Objectives

Our objectives are no accidents, injuries or losses, by care for the individual health and safety.

The ”Zero Mind Set” Philosophy

Zero harm to people or to the environment
Zero accidents or losses

Global Footprint

Local service touch. Global network clout.

- Head office in Ireland
- Region Main Office in Moscow
- 900+ service bases in 100+ countries
- 98 manufacturing facilities
- 16 Research, development and training facilities

Strong Local Presence

- Over 500 employees
- High local content [94% HC]
- More than 10 established product lines

- Strategic market for Weatherford
  - New base development in plans
  - Increased commitment and focus

- Joint Venture for core analysis
  - ~4mm USD in investments in SCAL and CAL

- 9 locations
  - Aktau
  - Atyrau
  - Aksai
  - Aktobe
  - Almaty
  - Astana
  - Tengiz
  - Zhanazhol
  - Zhanaozen

Weatherford® LABORATORIES

Weatherford : Core Businesses

FORMATION EVALUATION
Focus on Unconventional

Complete reservoir evaluation and characterization technology and services (excluding seismic):

- Laboratory Services
- Wireline (specific sensing & specific conveyance)
- Logging-while-Drilling (unique sensing)
- Advanced Mudlogging
- Petroleum Consulting

WELL CONSTRUCTION
Focus on Well Integrity

Flagship portfolio for securing well integrity
(excluding OCTG and cement):

- Tubular Running Services
- Managed Pressure Drilling
- Drilling with Casing
- Cementation Products
- Liner Hangers
- Solid Expandables

COMPLETION
Focus on Reservoir Completion

Differentiated completion portfolio:

- Open Hole Completion Systems
- Multifaceted Zonal Isolation Capability
- Sand Control Technology
- Latest Generation Completion Technology
- Engineered Chemistry

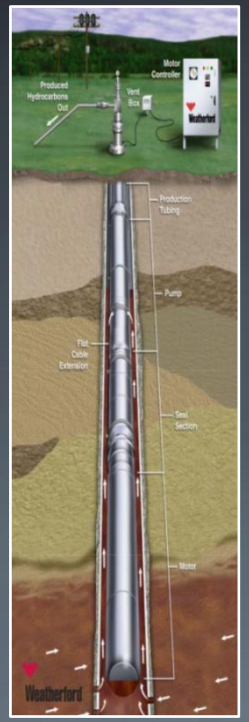
PRODUCTION
Focus on Decline Rate

Leading provider of integrated Production systems:

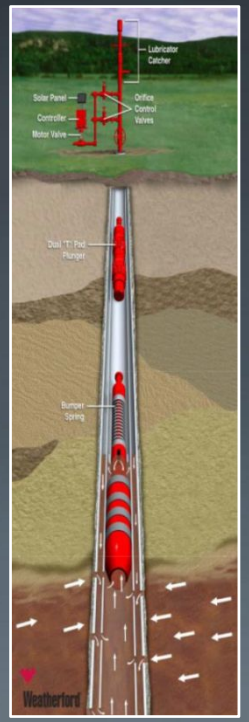
- Artificial-Lift Systems
- Production Optimization – all forms
  - Control Systems
  - Flow Measurement
  - Reservoir Monitoring
  - Software

Production Optimization Consulting

WEATHERFORD is the ONLY supplier of All Lift Technologies



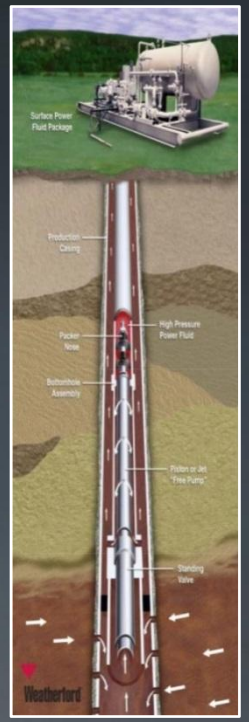
ES pump



Plunger Lift

Rod Lift

Gas Lift



Jet pump

PC pump

Lift Technology Screening Values

	Gas Lift	Foam Lift	Plunger	Rod Lift	PCP	ESP	Hyd Jet	Hyd Piston
Max Depth	18,000 ft *5,486 m*	22,000 ft *6,705 m*	19,000 ft *5,791 m*	16,000 ft *4,878 m*	8,500 ft *2,591 m*	15,000 ft *4,572 m*	20,000 ft *6,100 m*	17,000 ft *5,182 m*
Max Volume	75,000 bpd 12,000 M^3/D	500 bpd 80 M^3/D	200 bpd 32 M^3/D	6,000 bpd 950 M^3/D	5,000 bpd 790 M^3/D	60,000 bpd 9,500 M^3/D	35,000 5,560 M^3/D	8,000 bpd 1,270 M^3/D
Max Temp	450°F 232°C	400°F 204°C	550°F 288°C	550°F 288°C	250°F 121°C	482°F 250°C	550°F 288°C	550°F 288°C
Corrosion Handling	Good to excellent	Excellent	Excellent	Good to Excellent	Fair	Good	Excellent	Good
Gas Handling	Excellent	Excellent	Excellent	Fair to good	Good	Fair	Good	Fair
Solids Handling	Good	Good	Fair	Fair to good	Excellent	sand<40ppm	Good	Fair
Fluid Gravity (°API)	>15°	>8°	>15°	>8°	8°<API<40°	Viscosity <400 cp	≥6°	>8°
Servicing	Wireline or workover rig	Capillary unit	Wellhead catcher or wireline	Workover or pulling rig	Wireline or workover rig		Hydraulic or wireline	
Prime Mover	Compressor	Well natural energy		Gas or electric		Electric	Gas or electric	
Offshore	Excellent	Good	N/A	Limited	Limited	Excellent	Excellent	Good
System Efficiency	N/A	N/A	N/A	45% to 60%	50% to 75%	35% to 60%	10% to 30%	45% to 55%

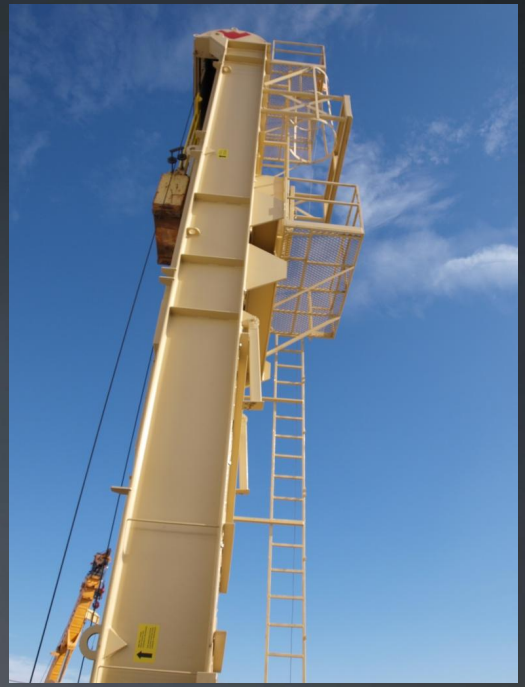
Considered to be one of the oldest form of Artificial Lift…….

Weatherford Pumping Units

- Broadest pumping unit offering in the industry
  - Conventional
    - Ampscot® and Maximizer®
  - Enhanced geometry
    - Maximizer II & III
  - Specialty units
- Pumping unit services group maintains and repa units

Rotaflex Long Stroke Pumping Unit

- First successful long stroke pumping unit
  - 288”, 306”, 366” stroke lengths
- Deep, deviated, high failure-rate, high production-rate wells
  - 40-60% reduction in rod reversals
  - Increased life of subsurface equipment
- Used in place of large conventional pumping units, electric submersible, or hydraulic subsurface pumps
  - 20-50% reduction in electrical costs
  - 100% mechanical design, low maintenance requirements



Specialty Pumping Units

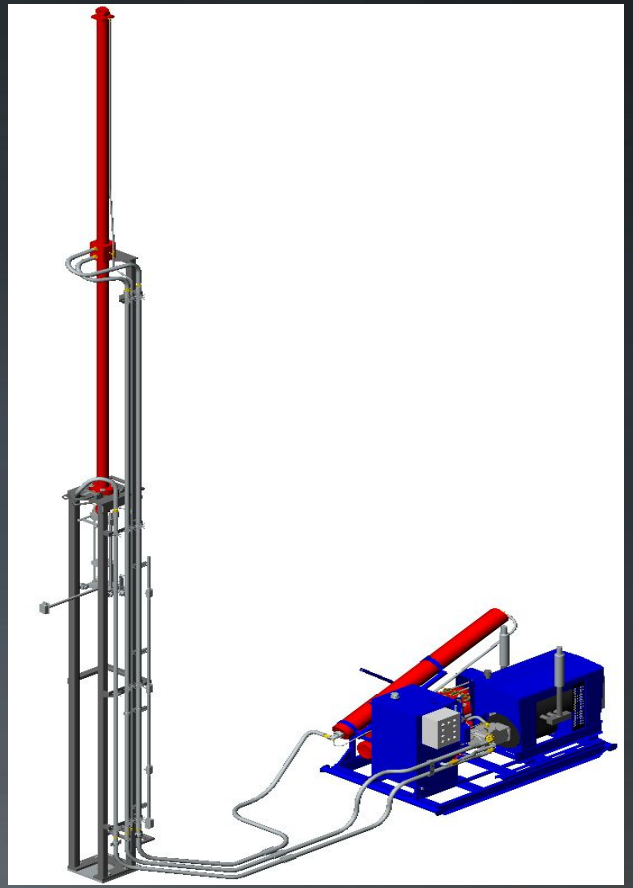
Strapjack – Low Profile

VSH2 – Nitrogen-over-Hydraulic

Portable Pumping Unit

VSH2 – What is the VSH2 PU

- Reciprocating rod pumping unit
- Strokes conventional sucker rods or tubing in a continuous pump to surface application
- Uses nitrogen-over-hydraulic technology
- Uses a direct drive pump mount
- Electric or gas operated
- Minimal set up and maintenance costs

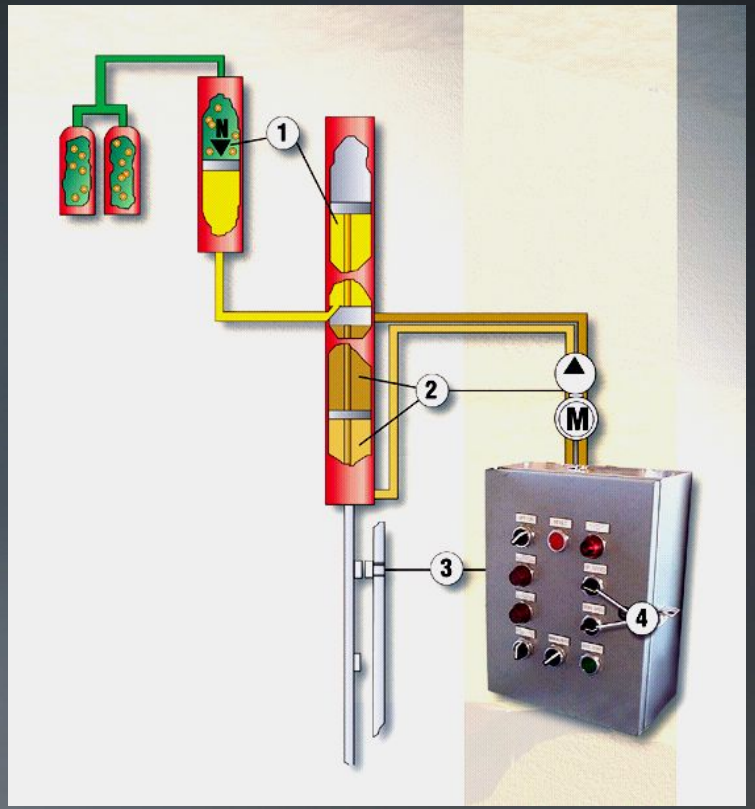


VSH2 – Why is it different

- Greater rod loads requiring less horse power
- Unit has three moving parts
- Change SPM quickly (dial mounted on control panel)
- Stroke length is adjustable from the ground via sliding rods
- Wider range of applications – tubing or rods

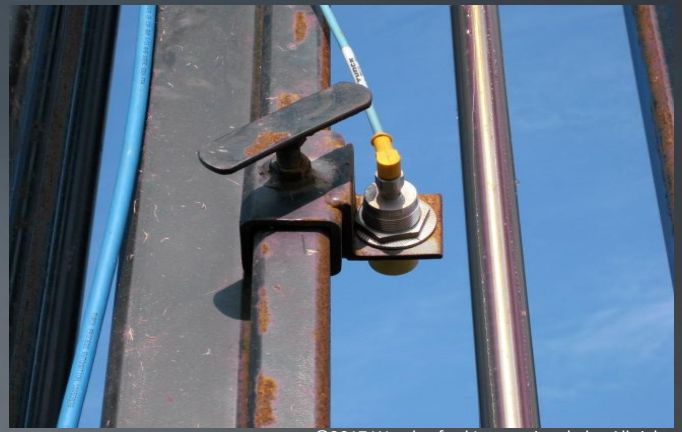
VSH2 – Theory of Operation

1. Nitrogen gas pushes on the accumulator piston. Hydraulic fluid is forced into the upper stage of the cylinder and pushes up on the cylinder piston
2. The Servo Valve routes pressurized fluid from the pump, to the lower stage of the cylinder. This cycles the cylinder rod up and down, using less horsepower as nitrogen furnishes approximately two-thirds of the lifting power.
3. The proximity switches activate the Electric Displacement Control that operates the Servo Valve, changing the direction of the stroke.
4. SPM can be changed by merely turning the knob up or down on the control panel switches.



VSH2 – Nitrogen-over-Hydraulic PU

- Three Sizes - 60”,120” & 150.”
- SPM - 0 to 7.5 (depending on unit size and peak polish rod load)
- PPRL - 20,000 - 40,000 lbs.
- SPM changes with the turn of a dial
- Adjustable stroke lengths from the ground



What is COROD® Continuous Rod?

- Registered name for “Continuous Sucker Rod”
- Superior alternative to conventional sucker rod with couplings every 25ft
- Over 47 years of manufacturing, applications and service

Current COROD® Continuous Rod Installations

Installed in 25,000+ wells worldwide

Deepest Well on Record: 14,028 ft (4,276 m)

Why is COROD® Continuous Rod a Solution?

RRP/ PCP Applications

1. Deep wells
2. Slant wells
3. Deviated wells
4. Horizontal wells
5. Vertical wells

+

Product Advantages

1. Only two threaded connections
2. Reduced contact loading
3. Reduced rod stress and fatigue
4. Larger annular space
5. Lighter in weight
6. Reduced environmental impact

=

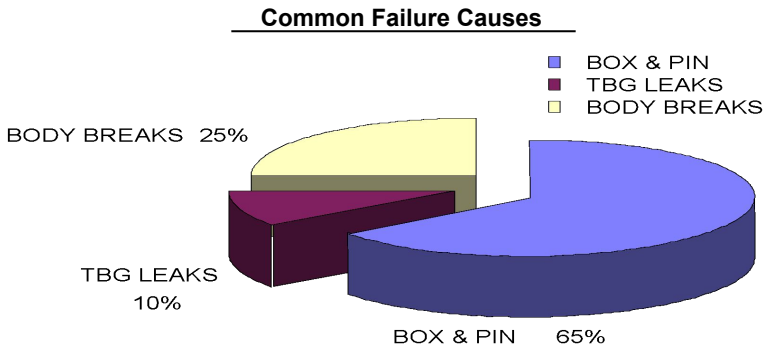
Reduced System Capital & Expense Costs

&

Improved Overall System Efficiency

Product Advantages

1. Fewer Threaded Connections
   - *COROD* continuous rod only requires two couplings, regardless of well depth
     - less human handling provides better reliability.
   - Most common sucker rod failures are pin-related
     - Under or over-tightened joints promote fatigue failure
     - Manual joint tightening can yield poorer control of proper ma e



Average number of connections in a 1,000m (3,280 ft) well

COROD® Continuous Rod □ 2

Conventional Sucker rod □ 100

Less Connections = Less Failures

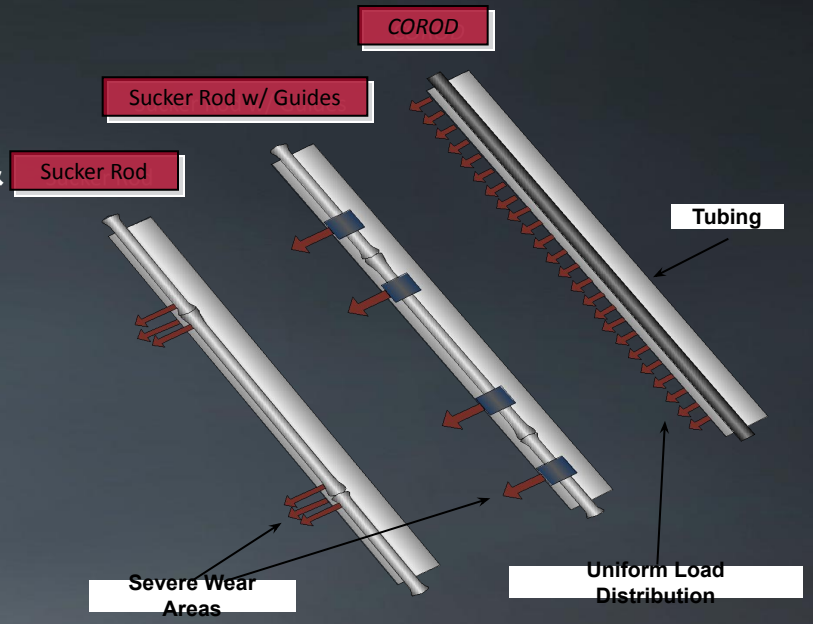
Product Advantages

2. Reduced Contact Loading
   - Concentrated contact loads cause tubing & rod wear
   - Under identical conditions, the distributed contact load with COROD® continuous rod compared to conventional sucker rods is:

50-75x LESS

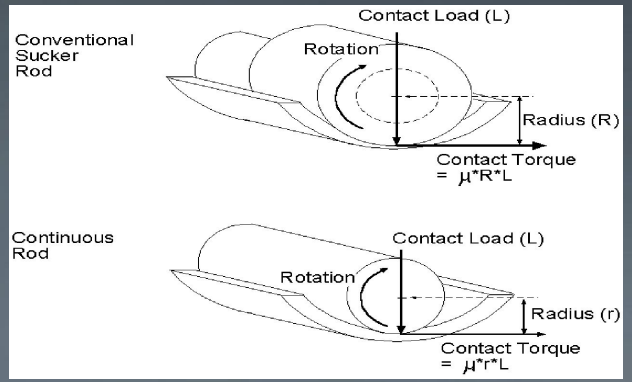
150x LESS

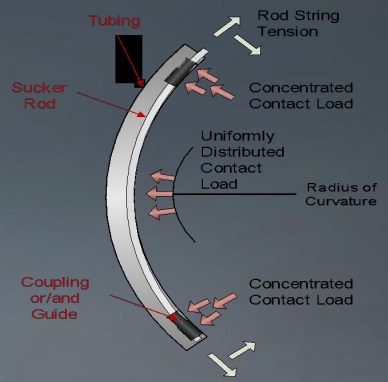
(For Semi-Elliptical *COROD*)

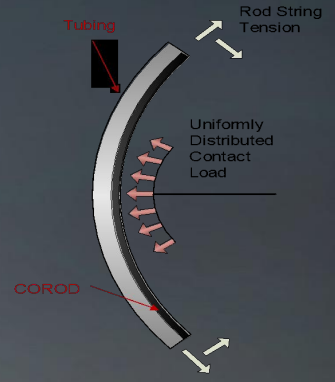


Product Advantages

3. Reduced Rod Stress and Fatigue
   - Bending stresses are magnified near rod-coupling connections due to the higher stiffness of the coupling relative to the rod body (Lubinski)
   - Curvature is magnified up to ten times at the connections in conventional sucker rods
   - *COROD* continuous rod's uniform diameter ensures that rod curvature equals wellbore curvature

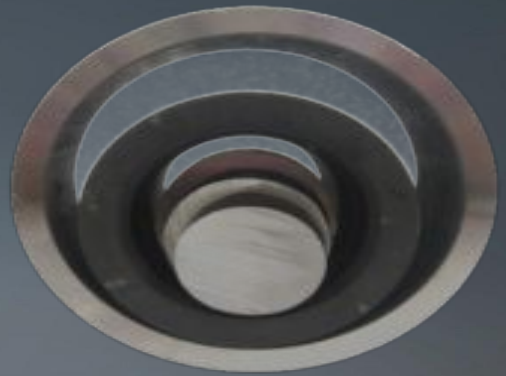






Product Advantages

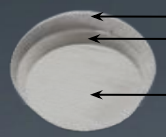
4. Larger Annular Space
   - Reduced pressure losses
     - *COROD* continuous rod reduces pressure losses typically by 50% to 75% in comparison to conventional sucker rods and allows the option for lower lift, less expensive pump
     - Full decentralization of the rod and lack of couplings changes the flow from a turbulent to laminar state by 25%-50%
     - In RRP applications you will gain an increase in production due to the elimination of the coupling-piston effect



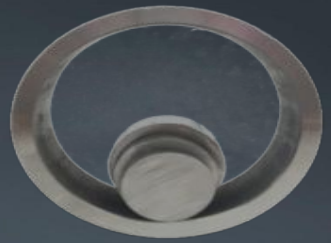
Product Advantages

4. Larger Annular Space

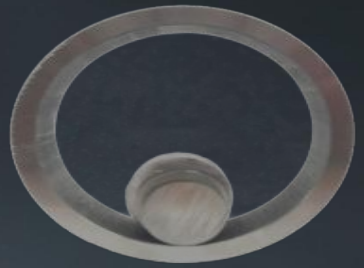
- COROD® Continuous Rod



2 3/8 Tubing

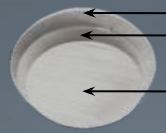


2 7/8 Tubing

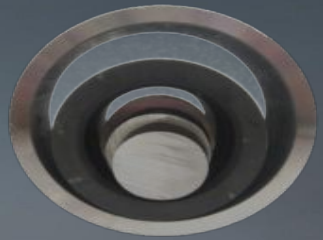


3 1/2 Tubing

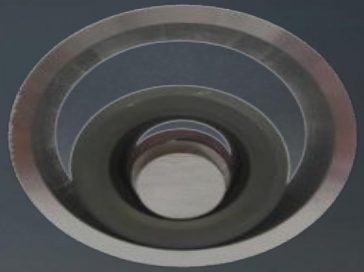
- Conventional Sucker Rod



2 3/8 Tubing
7/8” SH Coupling



2 7/8 Tubing
1” SH Coupling



3 1/2 Tubing
1” FS Coupling

Product Advantages

5. Lighter in Weight = Lower Loads
   - *COROD* continuous rod strings are lighter than conventional sucker rod strings of equivalent length
     - Reduces weight on the service unit
     - Lower power usage

Length of Rod String	Type of Rod String	
	1" Conv. Sucker Rod w/ Couplings	COROD® 1" DR
1,000m / 3,280 ft	4,313 kg / 9,508 lb	3,970 kg / 8,754 lb

Conventional sucker rods = **8% heavier** than *COROD* Continuous Rod

COROD® Continuous Rod Properties

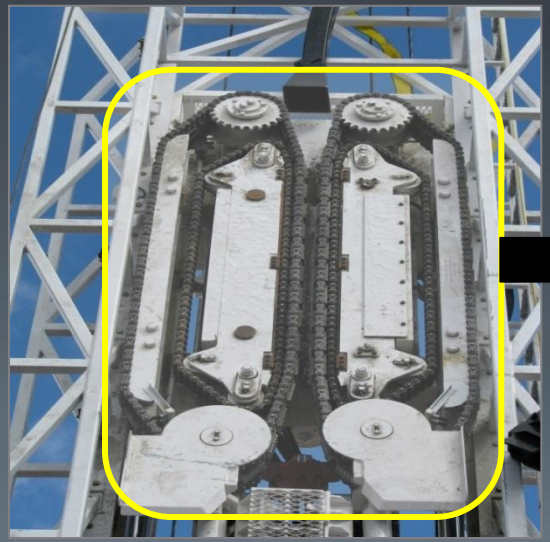
Grade Available	Material	Minimum Tensile Strength (psi/MPa)	Minimum Yield Strength (psi/MPa)	Maximum Hardness (HRC)	Torque (min)	Torque (max)
D DR	1536M	115000 790	85000 590	28	500 ft-lbs	1490 ft-lbs
DE DE	4120M	115000 790	90000 620	28	500 ft-lbs	1490 ft-lbs
W	4320M	115000 790	90000 620	28	955 ft-lbs	1490
SE SE	4120M	140000 965	115000 792	36	900 ft-lbs	2000
W	4320M	145000 1000	120000 825	38	700 ft-lbs	2000 ft-lbs

Mobile Gripper™ Unit (MG™)

- Compact, truck-mounted rod injector with integral hydraulic pov
  straightener, and a portable forge welder (PFW)
  - The picker “passes” the injector to the workover rig or flush
- Compatible with any service rig or flushby unit
- Can be equipped with the *COROD* Calibration System for exte
- Built for night-time operation
- Specifically designed for rapid deployment and safe operation
  - In typical operating conditions, the *MG* rigs in or out in 30 m
  - Trips rod up to a rate of 30 m/min (98.4 ft/min)
- Quick connect guide system
  - Assembly time is 5 minutes
- Ergonomic, practical design
  - Minimizes pinch points and risk of injury
- Personnel Requirement
  - 1 Operator

The Gripper

- The basis of all COROD® continuous rod service operations



Mobile Gripper™ Unit

Mobile Gripper™

Corig™ Unit (COROD® Rig)

- Applications
  - All *COROD* continuous rod service work
  - Fish broken sucker rods/polish rods
  - Insert rod pump or PCP pump change
  - Polish rod change
  - Stuffing box change
  - Service PCP drives
  - Shifting sliding sleeves
  - Tool deployment

- Personnel Requirements
  - One operator
  - One rig assistant

Thank you

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