Enhanced Protection Features Provide Safe and Efficient Operations

Introduction
Halliburton hydraulic workover (HWO) snubbing technologies provide a flexible and cost-effective alternative to conventional drilling and workover rigs, whether it’s for drilling, repairing, re-entering or completing a well. Ideally suited for the most technically demanding operations including HPHT, both onshore and offshore, our HWO/snubbing units and associated technologies can keep your well producing at optimum rates, typically at daily operating costs much lower than those for standard drilling or workover rigs.

More than 75 years ago, it was Halliburton that first successfully “SNUBBED” a work string into a well under pressure. This early entry into the market, along with steady research and development efforts, has enabled us to provide the safest and most up to date HWO equipment to the industry today. Continuing in this line we designed the first quick rig unit for our customers in Continental Europe.

Experienced Personnel
Full-time HWO specialists perform the workover operations. These specialists bring a wealth of knowledge to each job and are able to tailor the operation to meet the specific job requirements, a capability that extends through the full range of Halliburton services provided through a single point of contact. Our experience helps to control the risks encountered during workover operations. And it helps to protect your investment and enhance safety. So, when you’re approached by someone who offers the “lowest cost” workover, it pays to remember that there are better ways to save money while reducing risk. Experience is an indispensable resource no matter how simple or complex a workover job may be.

Quick Rig Unit
Hydraulic workover (HWO) units are self-contained, portable, running and pulling systems that provide an economical means of performing routine well maintenance for land, inland waters and offshore installations.

The function of the quick rig unit is to insert or remove pipe while the well is under pressure. The quick rig unit is designed to arrive at the site with all of its components connected. The entire unit stays assembled for fast rig-ups with one crane lift. The rig-up time can be reduced by as much as 25% compared to a traditional workover rig.

Our latest design was engineered with a slip interlock system to prevent accidental opening of both slip bowls at the same time. This safety feature provides protection against mechanical failure, power loss, low operating pressure, obstructions and operator error.
Protection Features

Slip Interlock System
- The new slip interlock system is designed to prevent accidental simultaneous opening or partial opening of both slip bowls
- Mechanically detects whether or not each of the two slip bowls is in its fully closed position by means of hydraulic / mechanical sensors
- Detects whether or not there is full close pressure applied to each of the two slip bowls by means of a hydraulic sensor
- Prevents the opening of a slip bowl unless the other slip is in its fully closed position and has full close pressure applied to it, i.e. both conditions must be met before opening of the other slip can commence

Position Detection
- Fails to a safe condition in the event of mechanical failure of position detector, i.e. plunger jammed shut, detector stem broken off
- Fails to a safe condition in the event of slip closure / jam on a mechanical obstruction, or failure to fully close on pipe, i.e. tool joints

Pressure Detection
- If the slip circuit pressure is adjusted too low, the system fails to safe
- If power loss occurs, the system prevents opening of the slip that is closed on the pipe, even if valve handle positions are changed while the power is lost
- Operator error: the slip bowl control interlock system is designed so that one slip bowl is closed on the pipe at all times

Data Acquisition System
Data acquisition specifications:
- Monitors in basket and data container
- Pipe weight indication
- Well pressure
- Pump flow / pressure
- Tank Levels
- Rotary torque / rpm
- Safety container for data storage

Escape system
- Enclosed slide system
- Bergambt certified
- Quick escape from basket and easily accessible
- Landing area at safe distance from unit
- Bergambt certified
**European Quick Rig Snubbing Unit**
- Minimized lifting when rigging up
  - Fewer pinch points
  - Less crane movements
- Reduced heights
  - Safer operation
- Fixed slip interlock system - smaller chance for connection failures

**BOP System**
- DNV-OS-E101 / API 6A Certified
- Pre-assembled BOP stack
  - One single lift
  - Minimized pinch point exposure
  - Reduced heights

**Work Basket**
- Designed for maximum working space
- Lead operator console placed for maximum overview
- Assistant operator console at front side for safe pipe handling
- Protected work area with tarpaulin

**Proven Quick Rig Unit Applications**
- Running and pulling gravel pack completions
- Running and pulling completions under pressure
- Drilling extensions or cutting windows for laterals both in overbalanced and underbalanced conditions
- Any underbalanced applications where jointed pipe is to be moved under pressure
- Sand washing with fluid or foam
- Unloading with nitrogen or foam
- Fishing lost wireline tools and parted tubing or drillpipe
- Washing perforations and acidizing
- Resetting weight on packers
- Squeeze cementing or cutting a cement plug
- Running and pulling production or kill strings
- Installing packoff overshot and respacing tubing if it becomes parted
- Pulling and rerunning tubing due to damaged joints, collars, and subsurface controls
- Drilling cement and bridge plugs, and milling
- Downhole cleaning services
- Gaining control of blowouts
HWO Tension Table
Due to the imposed weight caused by rigging up an HWO unit directly on the wellhead, we have implemented the use of a hydraulically operated jacking system that allows the weight of the HWO unit, BOPs and any pipe in the well to be transferred back to the support structure.

Quick Rig Unit Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>400K</th>
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<tbody>
<tr>
<td>Minimum Bore</td>
<td>11.12 in</td>
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<tr>
<td>Number Cylinders</td>
<td>Two</td>
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<tr>
<td>Cylinder ID</td>
<td>9.00 in</td>
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<tr>
<td>Rod OD</td>
<td>6.50 in</td>
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<tr>
<td>Operating Pressure</td>
<td>3000 psi</td>
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<tr>
<td>Standard Lift</td>
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<td>No-Load Speed</td>
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<td>Regenerative Lift</td>
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<td>Snub Load</td>
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<td>No-Load Speed</td>
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<td>Stroke</td>
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