

Advantages of Top Drive Moving to Casing Running

Dick Heenan, Tesco Corporation

RIG CREWS HAVE faced the same problem as long as there has been rotary drilling. The driller trips out to change the bit and is running back in the well. The bit hits a section of tight hole and refuses to go down. The driller can work the pipe up and down, or he can engage the slips and rotate, but he can't do both.

He can't circulate the string, unless he goes through the time consuming process of picking up the kelly, and subsequently racking it back. Even then, he is still limited in how well he can ream (or back-ream).

Today's driller is more fortunate, if he has a top drive. Now, if the hole is tight, he can screw in the top drive at the touch of a button and simultaneously rotate, reciprocate, and circulate the drillstring, all at the same time. Reaming the drillstring to bottom has become much easier.

Unfortunately, until recently the same capability has not been available when running casing. The casing string is made up with tongs (similar to the drillstring) and if the casing string won't go to bottom under its own weight the driller has the same options, he can rotate or reciprocate the string, but not both.

If the driller needs to circulate the string, he has either to pull and lay-down a joint of casing, and pickup one with a circulating swedge, or send a man up the derrick in a "riding belt" to install a swedge with the casing up to 40 feet up in the air. This is a difficult and dangerous process, one that is not permitted in many jurisdictions.

THE SYSTEM

Tesco's Casing Drive System (CDS) offers a new way to run casing more efficiently and safely. The CDS fastens directly to each joint of casing, providing full tensile, torsional and circulating capability. This brings the benefits of top

drive drilling to the casing running process. The driller can rotate and reciprocate the casing string through the full working height of the derrick.



The Casing Drive System is installed directly into the rig's top drive drilling system after the drillpipe elevators, links and saver sub are removed. The CDR replaces power tongs, casing elevators, stabbing board, elevated work platform for tong operations, and fill-up tool.

He can circulate the string by simply turning on the mud pumps from the driller's console. The time and risk associated with installing a circulating swedge are eliminated.

The Casing Drive System is a development of Tesco's Casing Drilling™ process.

The key components in the system are a hydraulic actuator and an internal or external grapple assembly (depending on the size of the casing).

The CDS is set and released by the driller. It supports the full weight of the casing string, thus eliminating the need for casing elevators, and also transfers rotation and torque from the top drive, eliminating the need for power tongs. A cup packer seals passively against the inside diameter of the casing string, permitting circulation of drilling fluids at pressures equal to those used for drilling operations.

LESS IS MORE

The CDS is installed below the client's existing top drive and replaces all of the following equipment:

- Power tongs (and hydraulic power unit),
- Casing elevators,
- Stabbing board (and the man in the derrick),
- Elevated work platform for tong operation,
- Fill-up tool.

Eliminating this equipment speeds rig-up, decreases transportation cost and reduces space and weight on the rig, which is particularly important for offshore or remote applications.

More importantly, the system is inherently safer by eliminating the most dangerous portions of the casing running operations.

For example, industry statistics¹ show that 10% of all rig injuries occur as a result of falls from elevated work platforms.

The Casing Drive System eliminates the need for a man balancing on a stabbing board to position the casing and latch

the casing elevators. Because there are no traveling elevators, the casing stump can be set at a convenient height (typically 4 ft) above the floor, so stabbing of the casing joints can be done by workers securely positioned at floor level instead of balancing on an elevated work platform. Make-up torque is provided by the top drive, under the control of the driller, eliminating another potential source of injury, the hydraulic power tongs.

HOW IT WORKS

The drillpipe elevators, links and saver sub are removed, and the Casing Drive System is installed directly onto the rig's top drive (whether contractor owned or rented). Tesco's system is designed to operate with Tesco's top drives, but can be interfaced with most other top drive models.

Through the CDS, the top drive provides the rotation and torque to make-up the casing connections. The controls on the top drive allow it to be preset to deliver a fixed maximum speed and makeup torque.

Because of the high horsepower of the top drive (compared to the power tong system), the casing is made-up in one smooth motion, rather than stopping to change gears as the joint approaches final make-up. This significantly decreases the risk of galling the threads, and subsequent connection failure

A description of one operating cycle of the casing running process best illustrates how the Casing Drive System operates on the rig. The casing string is set in the slips and the CDS is at floor level:

- The driller extends the CDS single joint links and elevators over the casing joint in the V-door, lowers them, and the floormen latch the single joint elevators on the casing. (Remotely operated hydraulic elevators are under development).
- The driller raises the blocks, the casing swings over well center, and the floormen position the casing single over hole center. No stabber is required in the derrick. (The top drive and link tilt system centralizes the casing.)
- The driller lowers the blocks and Casing Drive System. The stabbing guide on

the CDS centers the tool in the casing as the single joint elevators slide down the casing body.

- The driller hydraulically sets the trip and torque grapple of the CDS inside the casing (or outside on smaller sizes). (The CDS can now support the entire string weight and full makeup torque.)
- The driller engages the top drive to make-up the casing to the preset torque. (Torque and rotation can be monitored and recorded from the top drive.)
- The slips are released and the joint lowered into the well. (The rig pumps can be engaged to fill the casing, and if desired to circulate while the joint is being run.)
- As the joint reaches the floor, the single joint elevators are released and the links extended hydraulically to receive the next joint of casing.
- At floor level, the slips are set and the CDS released. (A safety feature prevents release with weight on the grapple.)

A BIGGER HAMMER

For situations where the CDS alone is not sufficient to get the casing to bottom, there are other options. Technology developed for Casing Drilling can also be applied to conventionally drilled wells. Casing was not primarily designed for the stresses imposed by drilling (or extensive reaming).

Through experience gained during Casing Drilling, both in the lab and field, Tesco can model the anticipated stress and fatigue loading imposed on a rotating casing string to ensure these are kept within safe working limits during reaming.

For difficult situations (for example, holes with severe doglegs), proprietary torque rings can be inserted in standard API casing connections to increase their strength and fatigue resistance.

Operators can choose to run a Casing Drilling Landing and Lock Collar (profile nipple) at the bottom of the casing string as an "insurance policy".

This profile remains in the string, unused and invisible, unless it is needed.

If there are severe hole problems (for example, massive sloughing) and it is

impossible to get the casing to bottom by rotating and circulating with the CDS, there is another option.

The operator can call out a suite of Casing Drilling tools, convey them to the bottom of the casing string and latch them in the profile nipple, either on drillpipe or wireline, and then ream to bottom with the benefit of a full drilling assembly.

Accessories proven in years of Casing Drilling service can also be applied to casing running where needed. These include rugged centralizers, hard faced wear bands and specially designed casing shoes.

This combination of technology virtually guarantees the casing can be run to bottom.

1. AHRE Occupational Injuries & Diseases – Drilling of Oil & Gas Wells (1997-2001)

Casing Drilling is a trademark of Tesco Corporation. 