Innovative casing drive system may help improve safety for crews working from heights

By Warren P Schneider, TESCO Corp

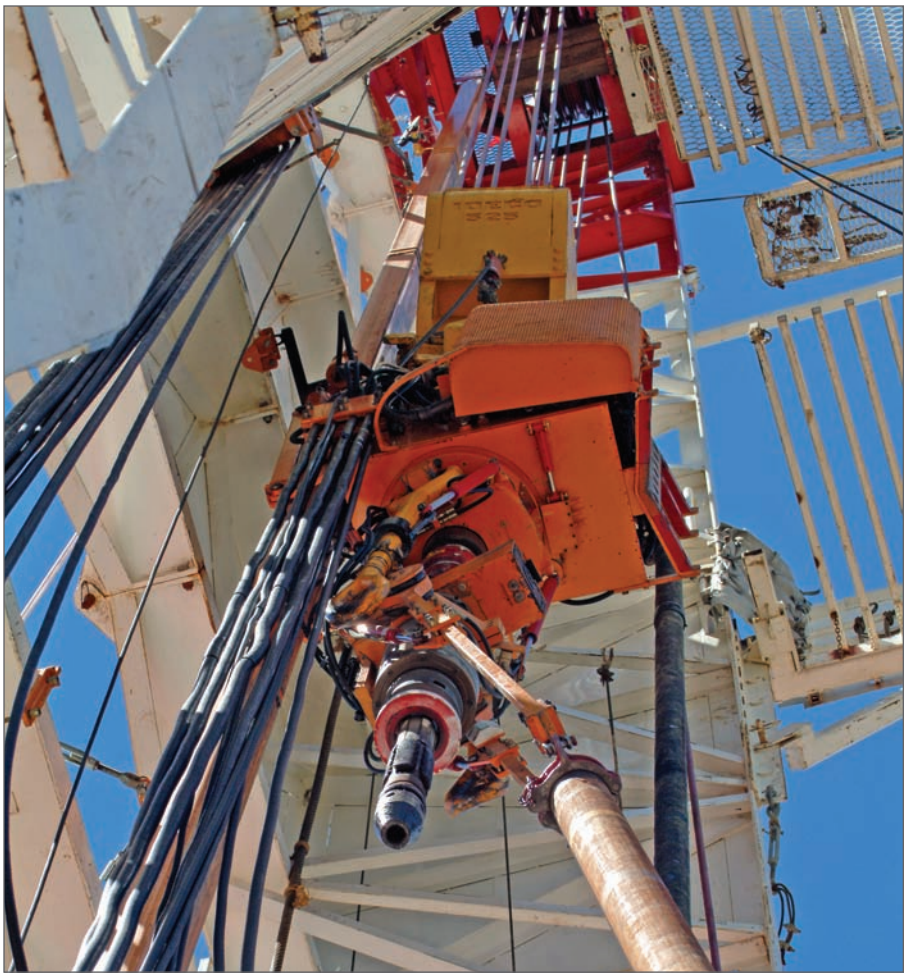
SAFETY STATISTICS INDICATE that the number of fatalities experienced during drilling and related rig operations doubled from 2002 to 2003. Since then, the number of fatalities has remained near that level. Conversely, that means the number of fatalities has not decreased.

Among the most dangerous occupations of the rig crew are derrickmen and floormen. Derrickmen are not only in danger of falling but also of being injured or killed by equipment in the derrick, especially when a top drive drilling system is being used in new rigs with tight clearances in the mast. When casing is being run with conventional technology and a casing crew stabber, the same risks apply. Contractor and casing crews on the rig floor are sometimes in danger from falling objects or from slipping and falling, either while on the rig floor or from a work platform while running casing or during other operations.

The **TESCO** Casing Drive System (CDS) eliminates the stabber position in the derrick, as well as the power tong and tong operators, substantially reducing risk of injuries and fatalities. The system also increases casing running operational performance and reduces cost. CDS eliminates the stabber, fill-up tool, power tongs and tong operators, elevated platforms on the floor and a significant amount of equipment handling to rig up for running casing.

SAFETY STATISTICS

According to 2002-2006 IADC accident statistics, men in the derrick accounted for about 15% of lost-time incidents (LTI) on average. They also accounted for about 14.5% of recordable incidents during the same period. By location, this position accounted for more than 7% of LTIs and nearly 7% of recordable incidents during the five-year time frame. For these types of incidents, slipping and/or falling from a different or the same level accounted for more than 19% of total LTIs and recordable incidents during 2002-06. Many of the LTIs and recordable incidents were the result of more manhours worked. The same can be said for the rise in fatalities, which more than doubled from 15 in 2002 to 31 in 2003. The number of fatalities stabilized somewhat from 2003 through 2006, when the industry posted 31, 28, 23 and 29 fatalities, respectively.



The 12-ft Casing Drive System from TESCO Corp is rated up to 500 ton and makes up directly to the saver sub under any modern top drives.

Of the 28 fatalities reported in 2004, 25% were the result of accidents to rig crew members working at heights, including seven derrickmen. Floormen accounted for another 25% of fatalities. The number of fatalities declined to 23 during 2005, but seven derrickmen, translating into more than 30% of the total. Five floormen were killed that year. In 2006, total fatalities rose to 29, including six derrickmen and eight floormen.

An important caveat is that IADC statistics do not record fatalities, LTIs and recordables for third-party personnel, such as casing crew members. Fatality and injury information about casing crews are not centralized like IADC statistics, but informal information suggests that the addition of fatalities, LTIs and recordable events would significantly and adversely affect these statistics. The evidence of the risk associated with conventional casing running personnel is well illustrated by the higher worker's compensation insurance rates associated with job positions in these companies.

SYSTEM PROCEDURE

TESCO's casing running service uses its proprietary CDS with the top drive, which provides the power to apply rotation and torque to the casing. The CDS provides the ability to pick up joints of casing from the V-door with the Link Tilt system, convey the casing into the derrick, stab the casing into the stump and make up the connection without a stabber in the derrick. The CDS has been

used successfully on vertical wells and high-angle extended-reach wells onshore and offshore.

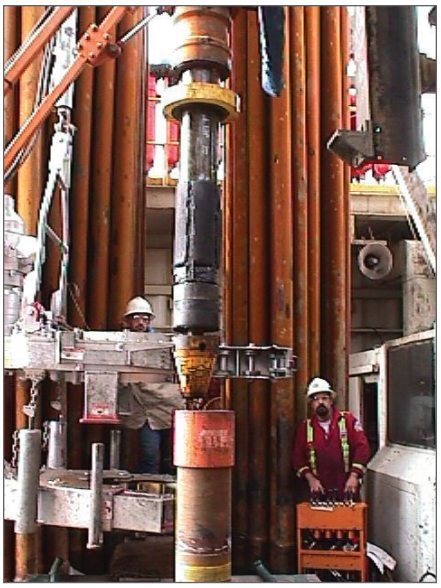
The system requires only two people during operations — the driller and a CDS operator. During the procedure, the joint of casing to be run is positioned in the V-door by conventional methods. As the driller lowers the blocks to run the joint that has just been made up, the CDS operator manipulates the Link Tilt and single-joint elevator to pick up the new joint of casing in the V-door. The CDS operator remotely latches the elevators on the new joint from the operator's console. The elevators open wide enough and have sufficient flexibility to latch onto the casing, even if it is slightly off center in the V-door.

The CDS is released from the stump in the rotary table, and the next joint of casing to be run is hoisted as the driller runs the blocks up the derrick. Once the joint is sufficiently raised, the CDS operator uses the Link Tilt to position the joint over hole center and the stump in the rotary table. The joint is stabbed, the CDS is lowered into the top of the joint and the CDS slips are activated. The Link Tilt and elevators include features that facilitate holding and positioning the upper end of the casing correctly for the CDS to be stabbed easily and aligning the casing with the stump in the slips.

The conventional method of running casing has changed little since slip-type casing elevators were introduced in 1924 and air and hydraulically powered casing tongs were introduced in the 1950s. Typically a casing crew of 4-6 people are required. They bring the running tools, rig them up and run the casing as a specialized operation. For running casing in deep wells, two crews may be needed. This process is sufficient for assembling joints of casing together. However, it provides no capability to rotate the entire string of casing hanging in the well and provides limited and inefficient procedures for circulating the casing while it is being run.

CONVENTIONAL CASING RUNNING

When running casing conventionally, a large amount of equipment must be taken to the rig and handled at the rig site. The rig floor on many rigs becomes crowded when casing running equipment is rigged up. Casing tongs often are operated from scaffolding set up on the rig floor as a work platform, which can potentially lead to falls from heights. Even if the platform is only a few feet higher than the rig floor, slipping and falling hazards exist. Additionally, a stabber is positioned in the derrick to help align and engage the elevators to the casing joint in the elevators and to prevent cross-threading. The overall result is increased potential for falls. This risk is growing as the clearances in modern rigs become increasingly tighter.



A TESCO casing drive technician assists the driller in stabbing the CDS into the next joint of casing. The casing running operation is completely automated.

There is also the potential for the stabber to become injured or killed as a result of being caught between equipment as the casing is picked up, made up and run. The potential hazard is evident in the previously discussed IADC statistics, including the number of fatalities associated with work in the derrick and on the floor.

A SAFER ALTERNATIVE

Only two people are required to rig up the CDS. Operators alternate on the controls so the operator is always alert to monitor the repetitive casing running process. Casing connections can be made up as quickly as drillpipe with the CDS, minimizing floor activity and increasing floor safety. This is particularly true when remotely operated slips are used with the CDS. The derrickman or stabber position is eliminated since the Link Tilt and elevators hold and position the upper end of the casing correctly for the CDS to be stabbed and aligned with the stump.

Additionally, tongs are eliminated from the rig floor because the torque is applied to the casing via the top drive. When the CDS system is used with TESCO power slips and automated elevators, the process becomes fully automated and human/pipe contact is eliminated.

ADDITIONAL BENEFITS

The CDS eliminates cumbersome primary and backup conventional casing running equipment such as large casing elevators, power tongs, elevated work platforms and casing fill-up tools.

It eliminates the stabber in the derrick, a high-risk position, and conventional casing running equipment with moving parts, pinch points and high tension cables. Temporary work platforms on the rig floor for power tong crews are eliminated.

It allows for a cleaner rig floor with fewer hands actually handling the casing. Overall, fewer workers are around the rig floor, and none are in the derrick, reducing overall exposure to potential accidents. Additionally, automation using complementary tools can eliminate all personnel contact with casing.

Floor safety is enhanced due to the CDS' internal or external gripping systems with a valve in all mandrels. The valve prevents mud in the top drive and the kelly hose from falling onto the rig floor during casing-running operations. This provides a safer work environment by preventing mud from dropping to the rig floor and onto operations personnel.

Floor safety is further increased as a result of the hydraulically operated Link Tilt, which can be operated from the hydraulic power unit or from the top drive. This eliminates floor personnel necessary to handle the casing at the V-door. It also eliminates the use and handling of cables on single joint elevators.

Another feature that protects from accidental dropping of casing during running operations is the hydraulic single-joint elevator weight-sensitive locking mechanism that locks out the hydraulic actuator and prevents single joint elevators from opening while a joint of casing is suspended in the air.

While running casing with the CDS won't completely eliminate accidents on a drilling rig, it can eliminate the potential for accidents in the two accident-prone areas where most injuries and fatalities occur – the derrick and the rig floor.