High-torque top drives enhance drilling in shallow, long-reach horizontal and deep vertical wells

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WHEN DRILLING SHALLOW extended-reach horizontal wells such as steam injection wells to produce heavy oil sands in Alberta, Canada, use of a top drive drilling system is not only a requirement, it’s necessary to have the highest torque available. Some of the wells can be only 1,500 ft total vertical depth (TVD), but they can also be several miles long at virtually 90° from vertical.

Drilling contractors do not necessarily need the high hookload capacity that was part and parcel of high-torque top drives of the past. The top drive’s rated weight capacity doesn’t have to be high due to the horizontal nature of the wells, but high-torque capacity is a must.

Shallow, long-reach steam-assisted gravity drain (SAGD) wells in Alberta demand high torque, and the additional torque of the EXI top drive provides the capability to mitigate downhole problems, including the ability to backream at higher torque. On the other hand, when Ensign Energy Services drills deep vertical wells in Wyoming, it helps to have the high torque available, as well as the higher hookload capacity, for deep wells.

The simplicity of the electrical, electronic, hydraulic and mechanical systems allows for easy maintenance and repair when required.

HXI, EXI DEVELOPMENT

TESCO Corp recently designed enhanced top drive drilling systems rated for 250 tons and 350 tons but with high torque capacities of 24,000 ft-lb and 30,000 ft-lb, respectively. They were not designed specifically for horizontal drilling applications but with horizontal drilling performance criteria in mind.

The company’s new 250 HXI 700 hydraulic 250-ton, 700-hp top drive boasts 24,000 ft-lb of torque, and the 350 EXI 600 electric 350-ton, 600-hp top drive has 30,000 ft-lb of torque. The EXI model fills a gap in the company’s range of top drive offerings: It did not have a 350-ton system. The 350 EXI 600 was introduced in summer 2007.

Tesco’s 350 EXI 600 top drive drilling system is a 350-ton, 600-hp unit with 30,000 ft/lb of torque for long-reach horizontal wells.

The company’s previous 250-ton top drive model (250 HMI) has a torque rating of 19,000 ft-lb, limiting the horizontal reach of wells due to its lower torque rating, which limited the capability to free stuck pipe. Also, the 250 HMI cannot drill with 5-in. drill pipe because the torque requirement for that size pipe in horizontal wells can be up to 25,000 ft-lb. The 250 HXI 700’s integrated pipe handling features include elevator tilt link, 54-in. extend/retract for making mousehole connections, and 360° pipe handler rotation. The grabber will accommodate tool joints from 3-in. to 8 ¾-in. OD. The unit’s design also integrates the swivel, gearbox and pipe-handling spool to result in a small and compact design. The 350 EXI 600 is a fully portable
design with many of the same pipe-handling features as the 250 HXI 700.

The top drives’ footprints are small, but the units are slightly longer (taller) than the company’s other models due to the integrated automatic pipe-handling features. However, they can be installed in older land rigs with shorter derricks and masts with little or no modification. Ensign installed a 250 HXI model top drive in its Rig 18 (132-ft mast) for Canadian land drilling operations. Ensign also ordered a 350 EXI model for its newbuild Rig 51 that will drill horizontal wells in Gabon. Rig 51 is a 106-ft telescopic double ADR 400.

NEARLY 100% UP-TIME

Ensign has a 14-year history with Tesco top drives and is familiar enough with its track record to utilize the company’s top drive prototypes on its rigs. In fact, Tesco’s first portable top drive model was installed in 1994 on Ensign Rig 4. Ensign also worked with the company to prototype the 250 EMI 400 in December 2005 and the 250 HXI 700 in October 2007.

A new ADR (automated drilling rig) for Ensign Canadian Drilling also features an EXI model top drive. Rig 126 is a pad rig that can drill single, double or triple stands and is capable of self-moving in that it can “walk” from well to well. It is contracted to drill long-reach horizontal wells in the challenging Canadian heavy oil market where high torque is required. Top drive up-time has exceeded 98% since installation in October of 2007, according to TESCO.

The company installed its second 350 EXI 600 on Ensign United States Drilling Rig 89 in Wyoming in October 2007. This has enabled the rig to drill vertical wells of almost 15,000 ft with high rate of penetration (ROP). The average ROP was in excess of 42 ft/hr for the three wells drilled since the EXI was installed. Average up-time for the top drive was over 99% during this period, resulting in significant savings for the operator.

Ensign Canadian Drilling’s Rig 126 is working for EnCana in Foster Creek in northern Alberta, Canada. It is an automated drilling rig and has recorded more than 98% up-time on the EXI model top drive.