

Power system upgrades can enhance performance

THE DRILLING AND oilfield service industry has developed a plethora of bells and whistles for today's drilling rigs, but if they don't enhance performance and add value to the drilling operation, they're of little practical value. Much of the recent emphasis has been upgrades of power and electrical systems.

"Steel is still steel," quipped **Jasbir Dhindsa**, President of **Tech Power Controls**, which focuses on optimization systems and on mechanical to electrical power conversions. "There is a high potential to upgrade from mechanical to electrical rigs. Also, there are numerous new drilling optimization systems that improve a rig's marketability to oil and gas companies." Currently the company is converting a **PEMEX** mechanical rig to an electric system.

The drilling slump of late '98 and '99 slowed the upgrade of drilling units, especially on land. However, several companies remain committed to improving their equipment. Mr Dhindsa cited **Helmerich & Payne IDC** and **Nabors Industries** as prime examples.

"These are forward-looking companies who want to increase the value to customers," he said, adding that this is a preferable long-term strategy to operating less efficiently and spending more time on each hole, even though that can generate more revenues on a dayrate basis.

Before the last crash, land contractors began adding third mud pumps, conducting high-pressure operations, horizontal drilling, using top drives and sophisticated mud systems. That process still has a ways to go, Mr Dhindsa said.

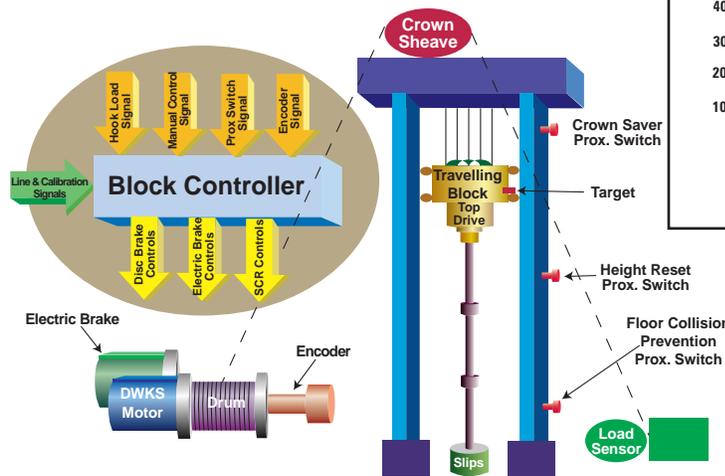
"All that increases the need for more power," he explained. "Many older rigs

don't have that. They need to upgrade or re-power their rig-power systems."

In addition, there is room for additional information and maintenance systems for SCR-equipped rigs, he said, using programmable controllers and touch-screen controls. These allow the driller and rig supervisors to easily and quickly pinpoint problem areas anywhere in the rig's electrical system.

MUD-PUMP SYNCHRONIZER

The touch screen is coming into its own on many pieces of up and coming



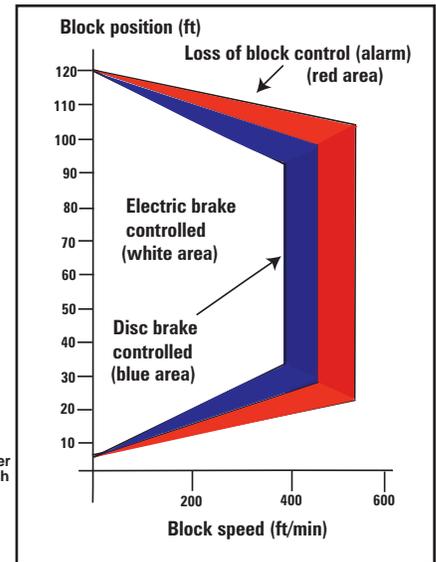
drilling-optimization equipment. For instance, TPC's mud-pump synchronizer features touch-screen controls. The touch-screen displays show actual standpipe pressure, pressure-limit setting, pump strokes, cumulated strokes.

The synchronizer targets the increased use of multiple mud pumps. The unit was designed to control pump speed and reduce pressure pulses by more than 60%, the company says. The controller also eliminates "beat frequency" pulses. This aims at enhancing pump and system component life.

The synchronizer is also equipped with a pressure limiter that allows the driller to set a maximum pressure on the standpipe. If the pressure limit is reached, the system automatically throttles back the pumps.

DIGITAL DRILLER

By the same token, TPC has adapted sophisticated control systems in other areas, such as its patented Digital Driller (Dynamic Autodrill). The system provides precise control of WOB with variance of 500 lb or less. This system for controlled drilling and coring applications uses the drawworks DC motor as a brake through the SCR to precisely



Block controller: This system is designed to enhance safety while minimizing block speed. Inset: Control profiles show use of disk and electric brakes on a block controller system. Courtesy Tech Power Controls.

control WOB, ROP and constant differential pressure, depending on mode.

DRILL PIPE UNWINDER

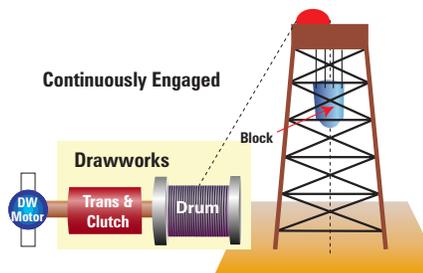
Another interesting "twist" in TPC's controller applications is its Drill Pipe Unwind Controller. This system comes into play if drill pipe twists and coils back, which can occur with the rotary or top drive turned off. TCP says its Drill Pipe Unwind Controller can control the pipe while unwinding it and preventing whip back. This minimizes the risk of breaking pipe connections. The system is designed to increase rig-floor safety and avoid failure of the SCR bridge.

A flashing light on the rig floor indicates to the driller that the controller is active. The driller can, if desired, bypass the controller with a single push button, TCP says.

SOFT TORQUE SYSTEM

The Drill Pipe Unwind Controller can also be provided with TPC's Soft Torque System, which the company provides under license from **Shell**, whose subsidiary **Shell Research** developed the technology. The soft-torque system applies a uniform torque to the drill string to reduce fatigue failures.

The operating premise is current feedback. As motor amperes relate drill-string torque and voltage to the revolu-



Digital Driller: TPC's patented Digital Driller uses the drawworks DC motor as a brake through regenerative SCR control to maintain precise control of WOB, ROP and Delta-P. The system is said to control WOB within a 500-lb variance. Courtesy Tech Power Controls.

tions per minute, the system senses the motor current and cuts torque fluctuations by varying motor speed, TPC says. The system, suitable for either rotary or top-drive systems, increases bit life and ROP by reducing uneven bit loading, the company says. Further, it reduces stick-slip oscillation and twist off with uniform torque. An alarm is provided for stuck-bit conditions, which are detected by monitoring the speed and torque of the motor. And because bit life is extended, tripping can be reduced, thereby enhancing efficiency.

TPC says the software accounts for parameters determining the resonance behavior of the drillstring and rotary system. The software uses the drillpipe size and length and bottom-hole assembly sizes. It controls the SCR drive characteristics to eliminate torsional vibrations. The hardware comprises a touch screen with a driller-friendly interface for establishing parameters and tuning the system. Current and voltage systems are wired into a PLC based controller at the SCR system. The SCR throttle is wired through the unit.

BLOCK CONTROLLER

Finally, TPC's block controller aims at enhancing safety while minimizing block speed. The system controls the speed and position of the block by regulating the electric-brake, disc-brake and drawworks controllers, TPC says.

The kinetic energy of the traveling block is monitored by sensing the block speed and hookload. The controller maintains the kinetic energy within the traveling block's safe operating limits. Block

speed and position are attained through an encoder and then cross-checked with proximity switches on the mast. The system can be set up by the driller to stop automatically at predefined positions with smooth control.

The block controller incorporates a digital controller, providing easy control and safety during tripping and drilling operations. A touch-screen console provides a user-friendly operator interface for set up, display and alarms. ■