

Zirconia mud pump liners offer longer service life

MUD PUMP LINERS made of zirconia ceramic can offer lifetime cost savings, significantly longer service, better performance and safer operation than sleeves made of more commonly used chrome iron or alumina ceramic, according to data developed by manufacturers.

PISTON WEAR

The special hardness and exceptional wear resistance of zirconia translates into longer service from the urethane and rubber pistons that move at high speeds and under tremendous pressure inside the mud pump liners. With true bores and zirconia liners honed to a fine 4 RMS finish, piston wear/consumption can be reduced by as much as 75%, according to **Carpenter Advanced Ceramics (CAC) and C&C Equipment Specialists**.



Zirconia mud pump liners come in a variety of sizes and wall thicknesses.

Comparative costs of normal average piston replacement are dependent upon replacement frequency. All pistons cost the same, about \$125 each, however, the cost gaps widen with the differences in replacement frequency.

Pistons used inside chrome iron liners had to be replaced twice a month for three years, for a total cost of \$9,000. Pistons inside the alumina liners were changed once a month, or 36 times in three years, at a cost of \$4,500. Pistons stroking inside zirconia liners had to be replaced only 12 times in three years, at a cost of \$1,500.

Self aligning rods are either recommended or required with alumina ceramic liners. Self aligning rods are used to assure that pistons run perfectly straight inside the pump. Imperfect alignment could result in a side load, for example, that could cause a crack.

The choice of alumina for a mud pump liner adds a one-time cost of about \$1,000 per cylinder, and represents the difference between higher-cost, self aligning rods and the lower-cost, standard rods that suffice with both chrome liners and zirconia liners.

LABOR AND RIG DOWNTIME

The costs mentioned above do not include labor or rig downtime costs, which are expended numerous times as parts or equipment replacement are needed. The costs cannot be forecast in event of breakdowns, emergencies or that are mud pump liner-related.

Steve N Thompson, CAC Manager/Oil & Gas, recognizes that rig supervisors are best equipped to estimate costs for parts and components replacement by applying prevailing hourly labor rates and hourly cost of lost productivity from pump or rig downtime.

“If it takes two hours of skilled labor to break down a pump, remove and replace the liner, then re-assemble the pump,” Mr Thompson said, “that process could be very costly in three years of routine operation for a platform running two to four triplex pumps.

“Factor in a surprise or two, a serious accident, or multiply by a fleet of 50 to 100 drill rigs and you are looking at an expense that could run into hundreds of thousands of dollars.”

OTHER CONSIDERATIONS

All drilling operations require a plentiful and continuous flow of water to minimize heat build up that could burn up pistons and/or cause bore wear. Use of a zirconia liner does not require any alteration of the driller’s existing lubrication system, unlike an alumina liner that requires a larger water supply.

If the contractor’s water system is marginal, a change in piping or a water system re-design may be needed at an

expense of possibly tens of thousands of dollars.

Safety is enhanced on drilling rigs when liners are made of zirconia because the crew is spending less time repairing mud pumps. That is especially important on offshore rigs where space is limited and environmental conditions such as wind, rain, snow and a pitching platform can make such work hazardous.

Mud pump liners have to withstand severe operating conditions during drilling operations. They circulate up to 200 gpm of water and slurry at pump pressures as high as 7,500 psi. The circulated mud contains a large volume of abrasive, corrosive contaminants. Lost circulation material containing peanut-like cedar fiber particles is very abrasive. Further, temperature of slurry returned to the pump can increase in the range of 88°C-149°C (190°F-300°F) as drilling penetrates deeper, making the mud mixture even more abrasive and corrosive.

Mud pumps in some rigs operating in the mining industry have to deal with a mixture of salt water and sand, which is both corrosive and abrasive. In one min-



A piston hull with a zirconia ceramic sleeve that fits inside the piston.

ing installation, the drilling contractor reported increasing the service life of his mud pump liners from 100 days to more than one year by switching from the traditional chrome iron to the newer zirconia ceramic. ■