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# TESCO REDUCES MAINTENANCE COST THROUGH LUBRICANT UPGRADES

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*750 hp D4P 500T HS Top Drive at work in Japan.*

Tesco Services U.S. Division sells, leases and operates top drives for drilling rigs. The major components of a top drive are the diesel engine, the pump drive gear box, multiple gear driven pumps, and the top drive gear box. The competitive nature of our business demands that we provide highly efficient and totally reliable equipment at competitive prices. Additionally, the monetary penalties associated with unscheduled downtime on a drilling rig due to equipment failure can be substantial. This has not only fueled the development of many new and innovative products at Tesco but has also forced us to look for ways to improve reliability and lower operating costs. We recently found a way to accomplish both in a most unexpected way.

Through all my years of involvement in operating and maintaining equipment, my training and experience has taught me to habitually look for mechanical causes and solutions to machinery related problems. So when a salesman walked into my office one day claiming remarkable performance improvements were attainable simply by changing lubricants, I greeted the notion with extreme skepticism. That's a nice way of saying I didn't believe him. But the salesman continued to call on me and share information that ultimately made me decide to evaluate his lubricants.

I initially decided to see if we could extend the oil drain intervals in our engines. I selected a Detroit diesel 16V92, 1100HP 2-cycle diesel engine on an offshore installation in the Gulf of Mexico. We were using a major brand 40 wt. motor oil and changing it every 400 hours based on the advice of a maintenance consulting firm. At the next oil change, I changed to Royal Purple 40 wt. motor oil. Using oil analysis as a guide, we increased oil drain intervals incrementally until finally reaching 2500 hours on the oil. The oil samples looked

good, but because we were exceeding our comfort level, we standardized oil drain intervals on our 32 engines at 1800 hours with an oil filter change and cleaning of the spinner filter every 400 hours. This has saved us considerably on the cost of oil and labor for oil changes. Additionally, we recently sent two engines with 25,000 hours on them to the OEM dealer for service. The dealer called and asked if we were sure we had sent the right engines. They were spotless. The bearings and injectors were clean and had no measurable wear.

Near the end of this engine evaluation, we experienced an overheating problem on a brand new model top drive gear box operating on a land rig in

Louisiana. The Model 1100 HCI is a large, heavily loaded top drive that sees 45,000 ft./lbs. of torque. This unit was being lubricated with a major brand 85W140 (ISO Grade 460) EP gear oil and was operating at 260° F. Because we were already working with Royal Purple, we changed the oil to Synergy ISO 220 EP gear oil which lowered the temperature by 40° F to 200° F. We subsequently increased the head space in the gear box and changed the 1/2 inch vent to a 2 inch vent which has further lowered the temperature to around 175° F.

Based on this experience, we made the decision to change all of our gear boxes to Royal Purple Synergy gear oil. In the top drive gear boxes, we have seen average temperature reductions of 30° F in all gear boxes since making the change. We had previously added an oil port to each shaft coupling, increased the oil pressure and added oil coolers in an effort to improve reliability. This lowered operating temperatures by 10° F but made no difference in the failure rate. Because of the high cost of unscheduled downtime, all top drive gear boxes are recertified every 500 days, where all bearing are replaced and gears inspected and replaced as needed. Because gear failures were not a problem, it is hard to quantify the value of these temperature reductions.

However, in the drive gear boxes for the bank of Linde BPV130 positive displacement pumps, temperatures reductions averaged 50° F (from 180-190° F to 130-140° F) after replacing the SAE 40 motor oil with Synergy 220 gear oil (Note: equipment manual makes no oil recommendation). In 2001, we experienced 6 gear box failures despite our 500 day recertification program. The estimated cost of these failures was \$20,000 each. In the eighteen months since changing oil we have had zero failures. Based on previous history, this has saved us a substantial amount of dollars to date. Each pump holds 3 1/2 gallons of oil.

The Linde BPV 130 pumps (80 gpm/ea/max) are set up in banks of 2, 4 or 6 pumps. The hydraulic oil reservoir holds seven drums of oil. The established recertification interval for these pumps was every 4000 hrs at an average cost of \$8000.00 per pump exchange. However, the average number of hours to failure was only 2500 hours. In 2001 we experienced 60 pumps failures. The causes for failure varied from wear on the splined shafts and swash plates to total pump failure. The average cost per failure was \$2,000 each plus 2 hours of downtime at \$120/hr. The disparity between our recertification schedule and the actual service life of these pumps demanded that we make changes. The options being considered was to either halve the recertification interval or change to a new type of pump. Both options were expensive. Royal Purple suggested we first try a third option of upgrading our hydraulic oil from the major brand AW ISO 68 hydraulic oil (group II+ base oils) to Royal Purple's Marine Hydraulic Oil 68. Marine Hydraulic Oil is an ashless high performance oil that is extremely clean (ISO 4406/14/13/11), inherently biodegradable, and passes the EPA 600/4-90/027A toxicity test for marine life.

Upon changing oil, the first thing we noticed was that operating temperatures in the hydraulic motor gear drive dropped by an average of 50° F (180-190° F to 130-140° F). Furthermore, we have not had a single pump failure since changing oil 18 months ago. This is remarkable considering we were previously experiencing weekly pump failures. Certainly, many of these Linde pumps were near failure mode when we changed oil yet none failed thereafter. Changing to a new oil has eliminated all pump failures and enabled us to maintain our 4000 hr. recertification schedule.

Changing to Marine Hydraulic Oil also eliminated failures in the hydraulic motors on our top drives. In 2001 we had 20 pump failures at an average cost of \$8,100 ea. Since changing oil 18 months ago, we have had only had a few shaft seal failures.

I am happy to admit that this experience taught

this veteran of many maintenance wars a valuable lesson . . . Never overlook the importance lubricant selection plays in determining equipment performance and reliability. Tesco's experience can certainly serve as a lesson to everyone that performance can vary greatly between oils. Improved lubricant selection is saving Tesco an extremely significant amount of money in maintenance costs. Furthermore, our annual cost for lubricants has not increased over previous years despite having upgraded to oils costing significantly more per gallon. This is because the life of both the oil and the equipment have been greatly extended resulting in much less oil being purchased. Our increased equipment reliability on the job has also improved our reputation with our customers.



***P.T. Honeycutt has 29 years of Oil Field Experience. He has held positions as roughneck, driller, tool pusher, drilling superintendent, operations superintendent and is currently operations manager of Tesco Services Division U.S.***