UTEX

KING COBRA

Oil Resistant Element (ORE)

APPLICATION & IN-FIELD PERFORMANCE EVALUATION

In the world of surface mining equipment, hard metals are the norm. To manipulate earthen material and extract mineral-rich ore, steel is the material of choice for most vertical drilling applications.

Modern vertical mining drills must consistently and reliably break through layers of dense rock to locate and liberate desired resources, a task that calls for the use of specialized drilling equipment suited to the site geology.

This equipment typically includes a drill bit, a drill stem, drill collars, rotary table, and a drilling rig—most of which is composed of tempered steel alloys. The drill bit is used to cut through the rock, while the drill stem and collars provide stability and support. The rotary table helps the drill bit move in a circular motion and the drilling rig supplies the necessary power and control.

Application

Caterpillar's model MD6380 was the drilling rig being used by Operadora de Minas Cananea (Cananea Mine Operator) at the Cananea Mine located in Sonora, Mexico.

The MD6380 drilling rig is specifically suited to metallic ore mining applications, and in this case, the equipment was being used to mine for copper ore. In the two instances we are examining, the drill mast of the MD6380 was equipped with one UTEX 28" King Cobra shock subassembly installed between the motor above the pipe and the drill bit located down-hole.

UTEX's King Cobra shock subassembly consists of a windowed housing unit with four integrated plate steel lugs secured by a series of bolts received on both the top and bottom of the ORE—Oil Resistant Element—a field-serviceable rubber insert which acts both as an axial and torsional shock absorber as well as an air and oil pressure gasket. (continued on back)

The Role of Rubber

Even though steel excels in providing unmatched strength, stability, and durability for mining equipment, axial and torsional shock vibration caused by the drill can cause damage to drive heads, masts, and other connected equipment. This damage can result in unsafe operating conditions, system downtime, and significant operational expenses.

And so, just as a car relies on tires to dampen the vibration of driving, so too do mining rigs rely on rubber-assisted shock subassemblies like UTEX's King Cobra to mitigate vibration-related damage without sacrificing drilling efficiency.

This whitepaper examines the application and performance of two, 28" UTEX King Cobra shock subassemblies each fitted with an ORE (Oil Resistant Element) insert composed of Smoothdrill™ rubber compound.

The results of this examination illustrate the unique ability of UTEX products to withstand even the harshest mining environments while providing outstanding equipment protection.

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Application (cont.)

The key to the ORE's ability to perform in this way is its integrated molded lip ring. This unique feature allows for stability of downpipe air pressure without restricting the natural movement of both sides of the drill mast.

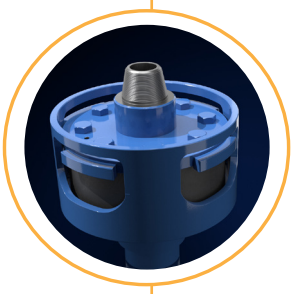
It's important to note that all mining drill shock subassemblies include component parts that are designed to fail over time. This is similar to the necessary feature of brake pad wear on an automobile. Given enough operating hours, even the strongest shock subassembly will fail.

King Cobra/ORE Warranty vs. Two Failure Events

Every UTEX King Cobra housing and included ORE element are warranted to perform without failure for 2,000 hours.

In the two failure events we are examining in this whitepaper, we see how far in excess of this warrantied lifetime the ORE element can perform without failing.

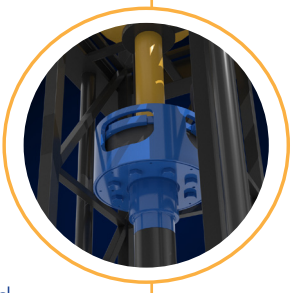
KEY FINDINGS #1



In event #1, the upper surface of the ORE element developed a tear near one of the plate steel lugs.

This failure occurred at 4,665 hours, which represents a 133% outperformance against the warrantied operating period of 2,000 hours.

KEY FINDINGS #2



In event #2, the ORE element exhibited total compositional failure resulting in significant deformation and destruction of the rubber insert.

This failure occurred at 3,834 hours, which represents a 91% outperformance against the warrantied operating period of 2,000 hours.

Conclusion

Mining equipment operators expect specific material performance commitments from the suppliers they use. Drill mast shock subassemblies are no exception.

This whitepaper has examined two cases where surface mining equipment was adequately protected from axial and torsional vibration damage using UTEX' King Cobra shock subassembly and integrated ORE shock absorption element well in excess of the equipment's warrantied period of operation.

Key Takeaway #1:

In the two cases shown in this whitepaper, UTEX's King Cobra shock subassembly paired with the integrated ORE shock absorption element exceeded the 2,000-hour warranty provided by the manufacturer.

In both cases, the Smoothdrill™ material designed to fail did so only after outperforming the warrantied period of operation (2,000 hours) by at least 90%.

Key Takeaway #2:

In addition to a long operational lifespan, the King Cobra shock subassembly is engineered not only to provide excellent protection for drilling equipment; it also includes a unique 'alarm' feature when the drill mast is either over-torqued or when the ORE element is failing or has failed.

This alarm is a very loud 'ping' sound that comes from the plate steel lugs as they make contact with the reinforced walls of the King Cobra housing windows. This alarm provides advance notice of potential system failure before more significant damage can be caused and is a feature unique to the King Cobra product.

To learn more about the King Cobra shock subassembly, the ORE element, and other UTEX products, visit **www.UtexInd.com.**

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