

DuPont™ Krytox®

performance lubricants

DuPont™ Krytox® fluorinated synthetic lubricant reduces maintenance labor and materials costs up to 75% in high temperature applications at Phelps Dodge Mining Company

Today's metals processing equipment functions in the harshest environments. Components frequently operate at temperatures in excess of 177°C (350°F) and are often put through high temperature heating and cooling cycles. Combined with the presence of sulfuric acid, this creates conditions that quickly render even the best equipment useless. Failed bearings and damaged shafts and rollers can be commonplace.

Even with meticulous maintenance schedules and procedures, unscheduled downtime often results in a considerable cost to companies. Consequently, maintenance crews and mechanics continually search for new and improved ways to maximize equipment life and thus minimize downtime.

The Phelps Dodge Mining Company, Phoenix, Arizona, was faced with these problems in three different situations. Instead of simply refining their changeover process, Phelps Dodge sought to extend the time between changeovers.

“The cast bar in our ‘bar prep’ area is about 954°C (1750°F),” states Terry Williams, a rod mill mechanic at Phelps Dodge. “When we switched over from a competitive brand to Conoco products, our rep suggested that we try a new grease, Krytox® fluorinated synthetic lubricant made by DuPont. I began testing Krytox® in part of the bar prep area because of the constant bearing failures we were experiencing. The results were so impressive that I was able to convince management that we should increase the test to include the entire area.”

Case 1: Converter drag chain idle bearings

The drag chain idle bearings operate at temperatures in excess of 177°C (350°F) and work in the presence of sulfuric acid. Standard grease breaks down in this environment. The normal life for those bearings was six to eight days with “EP 2” grease.

To minimize downtime, the bearing life needed to be extended. One solution was to use special graphite material bearings. These new bearings relied on dry film lubrication and were more than double the cost of standard bearings. The graphite bearings would last 12 weeks and then had to be replaced. Because Krytox® XHT is specially designed to operate in environments of extreme heat and is inert to virtually all harsh chemicals, Phelps Dodge decided to give it a try.

The graphite bearings were switched back to the standard bearings. The standard bearings were then hand packed full of DuPont™ Krytox® XHT-AC grease. The grease fittings were removed and plugged. The bearings were installed on May 15, 2001, and all of the original bearings are still in service today.

The target life of the Krytox® XHT-AC repacked bearings is now one year when relubrication is done at six-month intervals. Savings related to the use of DuPont™ Krytox® stems from the use of standard vs. graphite bearings, reduced frequency of bearing replacement, a savings in maintenance labor costs, and a reduction in unscheduled downtime.

“The standard bearings are about half of the cost of the graphite bearings, and our unscheduled downtime is about one quarter of what it was before using Krytox® XHT-AC,” notes Williams.

Case 2: Pickle line roller assembly

With the pickle line roller assembly, heat is no longer the main concern. The roller bearings run in the presence of an alcohol solution, which is used to pickle the copper rod and remove oxides. It is this alcohol solution that causes standard grease to break down.

As part of a scheduled maintenance program, the bearings, rollers, and shafts needed to be changed every four weeks. Once the grease breaks down, however, the

bearings fail, and, in turn, the shaft and rollers are damaged beyond repair. Bearing failures also resulted in unscheduled repairs at least twice a year, as the damaged bearings caused defects in the rod.

This problem called for grease that would not break down in the alcohol solution. Phelps Dodge turned to DuPont™ Krytox® XP 2A6, which contains inert additives and won't be washed away by the alcohol solution.

In October 2000, the bearings were replaced with ones hand packed with new Krytox® XP 2A6 grease. After four months, only one bearing needed replacement, reports Williams. There were only a total of six sets of bearing failures at the end of the first year. That's down from 50 in previous years. Fewer bearing replacements meant fewer damaged shafts and rollers. This meant less unscheduled downtime and approximately 75% savings in maintenance labor and materials.

Case 3: Cast bar prep bearings

The cast bar prep side and top roller bearings, located just 14 in from the cast bar, are not only exposed to temperatures reaching 204°C (400°F), but are cooled using an oil and water emulsion. The high temperature heating and cooling cycles, coupled with the oil and water wash, breaks down conventional grease.

Because of the speed at which the grease would break down, a maintenance program was established in which the bearings, rollers, and shafts needed to be changed every four weeks.

The roller bearings were packed with DuPont™ Krytox® XHT-BDX, which is non-melting for high temperatures and offers better adhesion to the substrate. "The side rollers are in constant contact with the cast bar and have

experienced only a total of four bearing failures since May 15, 2001. Twelve of the original bearings are still in service. The normal life of those bearings was six to eight weeks with 'EP 2' lubricant," notes Williams. Historically, Phelps Dodge would have replaced over 180 bearings each year in this section.

The target life with Krytox® XHT-BDX is six months for the side rollers and longer for the top and bottom rollers. The lubrication interval has also been reduced from daily to monthly.

The only problem that Williams foresees with using DuPont™ Krytox® would be accidental contamination with standard grease. However, this can easily be avoided through education or by using different grease fittings on the bearings. "I see unlimited potential for using Krytox® in many other areas of our operation," says Williams.

Sidebar

- Most petroleum products begin to degrade before 99°C (210°F) and cease turning at temperatures just below -18°C (0°F).
- DuPont™ Krytox® XHT fluorinated synthetic lubricant grease is available with useful temperature ranges up to 360°C (680°F) for continuous use, with spikes up to 400°C (752°F) when used in proper metallurgy with periodic relubrication.
- DuPont™ Krytox® lubricants contain only carbon, oxygen, and fluorine. Because hydrogen is not present, these products are nonflammable. They will not burn or support combustion, even in 100% liquid or gaseous oxygen.
- DuPont™ Krytox® performance lubricants are not only resistant to oxygen, but are inert to virtually all chemicals used in a variety of industries.

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