

Maintenance

Poor Quality Water Ruins HBFWs

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The quality of the water used in water based hydraulic fluids (HWBFs) can adversely affect the operation of longwall mining. Hydraulically-powered shield supports operate on hydraulic fluid that usually contains 5% oil and 95% water. With such large volumes of water, the mine invariably has to take its supply from an underground creek or well on the property.

Two problems can arise when untreated water is used to dilute concentrated hydraulic fluid: It may not be compatible with the chemicals in the concentrate, and it may contain microorganisms that can be harmful to the fluid. These two conditions, singly or combined, can cause the HWBF to deteriorate and eventually cease to function. When this happens the longwall supports will have to be shut down.

After Hemscheidt America, Inc., experienced a decrease in the hydraulic fluid function of its shield supports at one mine, it engaged Biosan Laboratories to design an experimental procedure to determine the best fluid for that mine's water supply.

The lab soon found that the quality of the mine's water was so bad that it reacted negatively with many of the hydraulic fluids tested, and that the water's microorganisms contributed to the breakdown of the HWBF. The latter problem was resolved by finding the most effective biocide for the mixture of fluid and water. (A biocide is a chemical additive that controls the growth of microorganisms.)

Water samples from Colorado, Utah, and Virginia mines were tested against one dozen hydraulic fluids and six biocides. Each combination of water, concentrate and biocide was evaluated for the following criteria.

■ **Physical stability:** The fluids were

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examined for two months and changes in appearance, such as clumping, precipitation, or discoloration, were noted.

■ **Effective microbial control:** The fluids were monitored once a week for eight weeks to measure the extent of microbial contamination.

■ **Corrosion protection:** Samples of copper, brass, iron and zinc were immersed for two months and examined for degree of corrosion.

Test results confirmed that water quality greatly affects the stability of HWBFs, and, not surprisingly, each mine water required a different combination of fluid and biocide for maximum stability.

There's a simple test that can be made on site to establish that a fluid is compatible with the water. Make enough 5% oil to 95% water fluid to divide into three samples of a few ounces each. Put one sample in a refrigerator (34 F to 40 F), one at room temperature, and one in a warmer, between 85 F and 90 F, temperature.

If at the end of one week precipitation has occurred or the fluid has split in any sample, the fluid concentrate is probably incompatible with the water.

Even if the fluid is chemically compatible with the water, there may be biological incompatibility caused by microorganisms in the water. Many manufacturers of fluids incorporate a biocide in their concentrate, but you cannot be sure it is efficacious or at sufficient strength for your water supply.

Tests for the effectiveness of a biocide can't be made easily on the job, so you should have a laboratory determine which biocide and at what strength is best for your mine.

When you achieve the optimum water-fluid-biocide combination, be sure to check the concentration regularly and maintain its level. Testing kits are available that enable the user to see when microbial growth is becoming a problem. ■