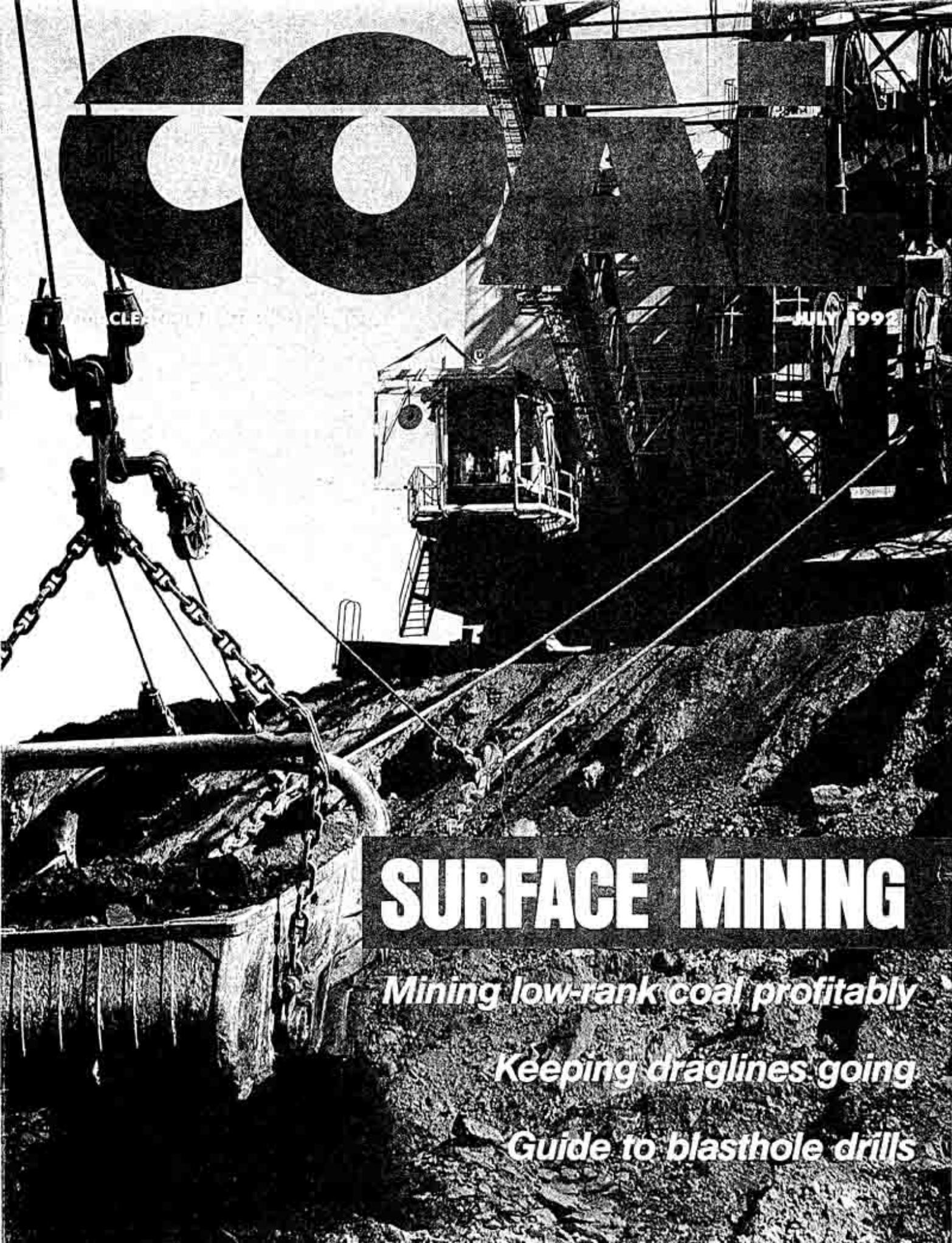
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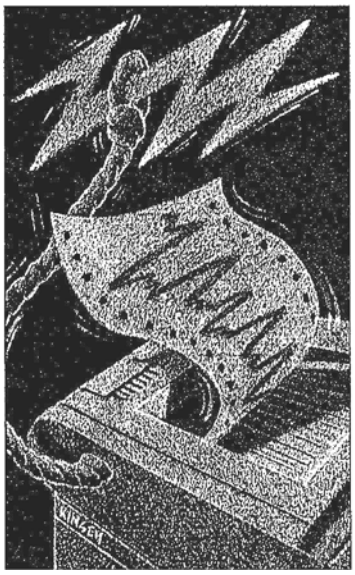
SURFACE MINING
Mining low-rank coal profitably
Keeping draglines going
Guide to blasthole drills

# Using the Earth's currents to cut drilling costs



Traditionally, the accepted method for exploration has been borehole drilling. Borehole drilling has been the only practical means of both collecting sub-surface coal samples for analysis and providing hard data on depth and thickness.

Through advanced research in the science of tellurics, a new geophysical tool has been developed that could reduce the need for boreholes. De pending on the project, a telluric survey could save 50% to 75% of a mine's drilling budget. The technology is based on a branch of science dealing with the Earth's electric field, better known as electrotellurics.

Telluric currents, induced by pulsed currents in the upper ionosphere, flow as electrical currents in the Earth's crust. The currents generate an electromagnetic wave that descends vertically below the surface. The wave front strikes layers of contrasting conductivity, such as coal shale interfaces, creating a new electromagnetic field, which propagates vertically. At the surface, a lateral wave is formed, which moves horizontally. The re-radiations from all depths can be detected by an electric-field strength sensor.

Since its 1920 discovery, several scientists have attempted to harness telluric currents using different techniques. Finally in 1984, the first electrotelluric receiver was introduced for commercial applications. Electrotelluric data can be graphed in a format similar to downhole logs, and defines both the depth and thickness of specific coal beds at independent stations. The number of survey stations required for a given project is a function of acreage, spacing and geologic complexity. Today's field equipment is compact and portable.

Electrotelluric-survey capabilities extend beyond just strike and dip. Other more exotic applications include the ability to detect coal bed rolls and faulting, as well as sandstone channels and old works. For more information contact Geophysics International in Dallas, Texas at 972/242-9183.

## Vibracoustic coal prep

Bulgarian researchers have been experimenting for some time with incorporating vibracoustics into several different phases of coal preparation. With the recent turn of events in the European Community, perhaps some of these processes will be taken from the lab to the field. Vibration has been an integral part of beneficiation for quite some time. Screening, vibrating tables and, more recently, vibrating sieves are a few examples of vibratory technology in use.

Researchers at the vibracoustical laboratory claim that they have improved several processes by adding in the vibration factor. Using an immersible vibrating shaft, cutoffs have been improved in heavy-media, flotation and thickener stages. The best results were recognized in the secondary flotation stage, but with a different device-a vibrating plate placed in the bottom of the cell.

Looking at other vibrating aspects, the laboratory has been experimenting with reverse stratification in jigs, and attaching vibratory devices to cyclones and spirals. Using a frequency of 2 to 26 Hertz and an amplitude of 1 to 10 millimeters (mm), scientists have achieved reverse stratification in a 5-liter experimental cell. The laboratory has also found promising experimental results working with vibrating frequencies that range from 25 to 50 Hertz and amplitudes from 0.5 to 1.0 mm in the horizontal plane applied to cyclones and spirals.

The scientists are trying to reduce or displace the water consumed in coal preparation processes with the improved efficiencies derived from vibratory devices. Perhaps as capitalism sets in, the coal industry will see some new inventions like the roto-vibration dehydrator. For more information contact Dr. Stoytcho Stoev, Vibracoustical Technologies Laboratory, Mining & Geology University, Sofia 1756, Bulgaria.

## Pulverized coal replaces coke

The pulverized coal injection (PCI) test facility, recently commissioned at the Canada Center for Mineral and Energy Technology (Canmet) in Ottawa, will investigate the combustion properties of various coals under simulated blast furnace conditions. By simulating the velocity of incoming hot air, furnace temperature and the geometry of the combustion system, the test facility will study degasification, percent burned material, and the structure and reactivity of oxygen with partially com busted solids. Coals that bum most completely are best suited for PCI

PCI technology replaces part of the coke used in the blast furnace with pulverized coal. In PCI systems, the coke rate has been cut by up to 40% since the 1970s. The test facility is a milestone that will gauge the potential of lowsulfur western Canadian coal for making a supercoke that has high mechanical strength, improved reactivity and size properties appropriate for reduced PCI coke rates.

The program has also developed a computer model of the blast furnace process to evaluate the theoretical suitability of various coals for PCI, and to predict blast furnace performance sensitivity to input parameters.