PYRITE REDUCTION IN LARGE SIZED COAL VIA HEAP LEACHING

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Conventional coal preparation removes bulk inert materials, i.e., stone and free pyrite. Additional pyrite removal requires further size reduction and cleaning at increased cost. A passive and inexpensive process to remove pyrite from coal by biologically mediated heap leaching was studied. This process has been tested by the Bureau of Mines in large scale (9 to 21 metric ton) heap leaching systems, using indigenous bacteria, and allowing natural acids and oxidants to accumulate in the recycled lixiviant. Fifty percent of the pyrite was removed by heap leaching run-of-mine stoker size, Pgh. #8 coal from Phillipi, WV. A second test using conventionally cleaned and sized (.65 cm x 1.9 cm), Pgh. #8 coal from Powhatten mine, OH, removed about 12% of additional pyrite. With this coal, 32% of the pyrite was removed in large column studies, and 97% was removed when it was ground to less than 100 microns. A third test with a relatively low sulfur, run-of-mine Pgh. #8 coal from Pershina mine, McDonald, PA realized a 7% sulfur reduction. The effectiveness of heap leaching is apparently related to the size of the coal and the dispersion of pyrite within the coal matrix.

CASE STUDY: MAKING DRINKING WATER AND TABLE SALT FROM COAL MINE DRAINAGE IN POLAND

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Massive amounts of water are discharged from Polish mines each day: an estimated 2.5 million liters per minute, or 3.6 billion liters per day. About 60% of this drainage can be used for drinking, agriculture or industry. The rest, 1.4 billion liters per day, are saline waters that drain directly to rivers and cause substantial damage to Polish water resources. The largest amount of salty drainage is pumped from 18 mines located in southwestern Poland, in the upper courses of Poland's two main rivers, the Vistula and Odra. More than 3.6 million mt of salt was released to the Vistula in 1991. Mine drainage to these rivers is harmful to plant and animal life, causes corrosion and eliminates economical use of the rivers along their entire 400 km stretch through Poland. The drainage problem also intensifies the severe lack of drinking water. To combat this problem, a large environmental project has been built near Katowice which eliminates highly brackish wastewater discharge from two coal mines: Debiensko and Budryk. All drainage from the two mines is desalinated in a reverse osmosis plant followed by two evaporators and a salt crystallizer. The result is zero liquid discharge to the Odra river from these two mines, eliminating 280 mt per day of salt discharge. Approximately 14.4 million liters per day of mine drainage is treated in the desalination plant at Debiensko. The plant recovers about 9.8 million liters per day of drinking water and process water, 4.5 million liters per day of distilled water and 250 mt per day of pure sodium chloride for sale as table salt and other uses. The plant started up in the fall of 1993.

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