

OreBind™ Technology for Coal Slurry Cells Helps Eliminate Permit Issues For Coal Mine Operator

BACKGROUND

A southern West Virginia coal producer faced periodic preparation plant slow/shut downs due to the periodic lack of sufficient tailings slurry cell capacity. This mismatch in available operating time resulted from poor solids compaction and slow dewatering of fine refuse slurry as waste solids were pumped from the plant to an existing permitted slurry cell impoundment. This issue hampered the customer's ability to keep pace with the mining activity as well as stay in compliance with their permitted waste solids volume limit of 20 acre feet per slurry cell.

Faced with these operating challenges as well as potential monetary penalties and restrictions, mine management considered the alternatives available, including the following:

- Possible permit modification to increase the permissible impoundment area, as well as an individual cell area increase. This process promised to be very lengthy, time consuming and without an assured result. There was considerable concern that the permit modification might prove unobtainable.
- A minimum \$300K - \$400K capital investment in the purchase and installation of one belt filter press, followed by a significant increase in associated operating costs for manpower, filter maintenance and chemical cost.

CUSTOMER IMPACT



ECONOMIC RESULTS

Reduced energy consumption compared with the proposed alternative of operation of a twin belt filter press.



\$140K/yr in trucking cost, \$40K/yr. in manpower, \$20K/yr. in maintenance cost. Total = \$200K/yr.

An approximate 5% increase in coal preparation plant availability.



\$1MM/yr. savings based on 2 hours additional availability per week for 24 week period throughout year (\$20,000/hour)

Extended impoundment life
More rapid water release/recycle

\$160K/yr. savings based on manpower and equipment costs needed for impoundment extension. (\$4,000/week x 40 weeks).

\$20K/yr. in penalties levied as a result of exceeding permitted impoundment space due to cells dewatering/drying too slowly to keep pace with the need for new cell construction.

Knowing that Nalco Water had expertise in the issues that needed to be addressed, the customer asked for input and guidance on how to address their needs.

KEY CUSTOMER OBJECTIVES

- Limit the refuse disposal footprint in slurry cell impoundment area through improved solids compaction and more rapid dewatering of refuse solids.
- Reduce the total cycle time for filling, drying, covering, and building new cells above the old.
- Continue to operate within the existing slurry cell impoundment permit while keeping pace with the mine and preparation plant production rates, thus avoiding periodic plant shutdowns to currently needed to allow slurry cell dewatering to “catch up”.

PROGRAM DESIGN

Nalco Water sales engineers and an Industry Technical Consultant (ITC) met with the customer to discuss ideas of how best to address and solve the issues. Nalco Water proposed an OreBind technology program which utilizes a new generation of specially formulated “settling stable” polymers known as POL-E-Z® Liquid Flocculants as well as PARETO mixing technology. POL-E-Z rapidly inverting polymers are well suited for remote locations where traditional mixing systems (polymer make-up skids, mix tanks, tank mixers, metering pumps, and power requirements) are limited or simply not available. POL-E-Z polymers, in conjunction with structured coagulants are introduced into refuse thickener underflow slurry just prior to slurry entry into cell. The amount of post-injection in-line mixing and the addition sequences for injection are site-specific and predetermined by bench testing prior to implementation. The entire mechanical assembly is built to be portable, allowing a cell to be completely filled with rapid-drying, fast compacting solids from several entry points. In addition, the portability of the system makes it possible to move OreBind make-up units from cell to cell with minimum of effort to accommodate maximum flexibility.

OreBind-treated refuse solids thicken and agglomerate almost immediately, resulting in rapid free water drainage away from solids. Quick solids compaction and dewatering means far less space and time are needed for disposal at this customer’s a facility. Additionally, up to 40 percent of the total volume is released as free water, normally within a few minutes of discharge. That water is then available for immediate recycle back to the plant or as make-up at the slurry cell, so the potential for an accidental release of solids into the surrounding environment is virtually eliminated.

PROGRAM RESULTS

Nalco Water worked with the customer operating personnel to implement OreBind technology using pre-selected POL-E-Z polymer technology and Cat-Floc® structured coagulant. The environmental and financial results were immediate.

- Reduced disposal space needed for refuse fines through rapid solids compaction and water release.
- Eliminated the need for a new or expanded disposal area
- Reduced overall cycle time needed for filling, drying, and new cell construction by 50 percent.
- Minimized the risk of cell rupture or failure.
- Helped assure continuous slurry cell operation while maintaining permit compliance.
- Reduced labor and refuse fines handling and disposal costs.
- Eliminated the need for belt press capital investment and associated maintenance costs.
 - OreBind-associated chemical cost is comparable to chemical cost for a vacuum belt filter
 - OreBind technology program equipment cost was < US\$20,000



Figure 1 - Lab tests are first conducted to confirm the required chemical dosages as well as the volume and clarity / quality of water liberated by via the OreBind technology program. Above are examples of the lab test results.

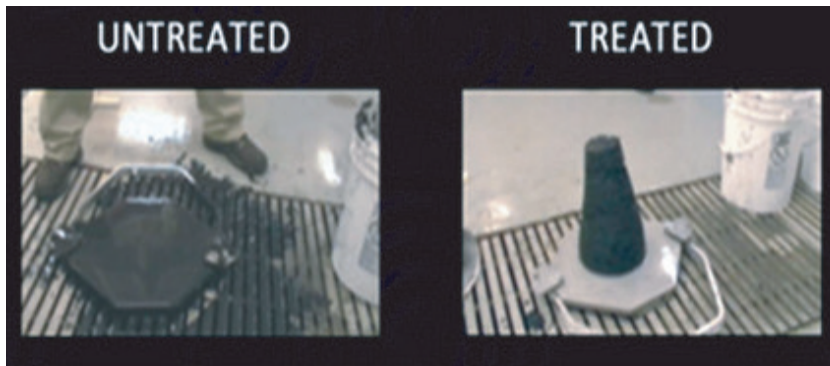


Figure 2 - Untreated coal refuse slurry (above left) is typically low in solids and highly fluid, as evidenced by the rapidity of slurry solids runoff. As laboratory tests for “slump” characteristics have shown, OreBind treated slurry is far more manageable (center and above right). Treated slurry solids set up rapidly and release water far more quickly, facilitating more rapid recycle of impoundment space / slurry cell capacity

BENEFITS OF OREBIND TECHNOLOGY

OreBind Technology is a unique approach to a growing industry problem. Use of OreBind technology may allow a coal producer to significantly reduce discharge volumes and speed the dewatering cycle while:

- Minimizing the impact of increasing regulatory pressure as well as the delays in permit expansion.
- Avoiding potential capital expenditures and operating labor costs for slurry filtration to decrease disposal volume

CONCLUSION

The OreBind technology program integration has allowed refuse fines disposal to typically keep pace with plant production rates and virtually eliminated this customer’s refuse fines disposal issues. The customer now operates well within the permitted slurry cell impoundment area. Additionally, the company avoided the need to approach regulatory agencies for permission to increase their impoundment capacity. Furthermore, the customer has been able to avoid the significant capital equipment cost of a belt filter press as well as the associated operational and maintenance costs.

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