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Mine Backfill

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WesTech has successfully utilized the **SuperDisc™ Disc Filter** in a pilot study to treat the effluent water from the Massachusetts Clinton Wastewater Treatment Plant to less than 0.1 mg/L of total phosphorous. The plant effluent is discharged into the Nashua River where phosphorus inhibits aquatic life by reducing oxygen levels through eutrophication. With an average daily flow of three million gallons per day, Clinton removes phosphorus through a conventional activated sludge system followed by chemical coagulation.

Mine Backfill

Mine backfill is defined as the material used to fill the cavities (i.e., stopes) created by underground mining. Backfilling can be a means to dispose of sludge and/or tailings which may contain hazardous materials and to reduce surface environmental impacts by storing tailings underground.

Alternately, backfilling with nonhazardous materials can allow for mining productivity improvements. To these materials are added a variety of fillers such as fly ash, coarse sand, or gravels along with a binder, such as cement, which is added to provide structural strength.

Conventional Flow Sheet

A vacuum disc filter, preceded by a high-rate thickener to reduce the hydraulic loading, is typically used to produce the “sludge” portion of the mine backfill. The filter cake is discharged to a weigh hopper, then to a batch mixing hopper or a continuous mixer where a measured amount of binder and other materials are added.

The cemented paste is then pumped via high pressure piston pumps below ground or distributed by gravity, depending on the specific site. Most backfill projects in the world use this conventional flow sheet with a vacuum disc filter because there is less water in the filter cake and, therefore, less cement binder required, which is a major operating cost of a backfill operation

Paste Flow Sheet

In underground mining, the WesTech Deep Bed™ Paste Thickener is an emerging option to the conventional solution of high-rate thickener/vacuum filter for paste backfill applications. There can be a number of factors which make paste thickening an attractive alternative. There are some backfill operations with shallow mines and long distance runs, making the pumping costs of a high-yield stress paste more attractive.

Because a paste is non-settling, the coarse particles do not have to be removed prior to thickening. Paste thickeners can eliminate the need for vacuum filters, which can be expensive to operate, and may not be feasible for high elevation mine sites. This also significantly reduces operator attention.

Alternatively, it is possible to use a Deep Bed™ Paste Thickener to feed a vacuum filter. This can reduce the size of the vacuum filter as the feed to the filter is more concentrated than that from a high-rate thickener. Another option would be to use a Deep Bed™ Paste Thickener in parallel with a filter. This option allows for the blending of the paste underflow with the filter cake.

The underflow from the paste thickener would be split, sending a portion to the vacuum filter. The paste thickener underflow and the filter cake would then be combined to obtain the desired moisture content for the backfill.