WaterWorld — Case Studies: Biosolids Handling

Vacuum System Handles Fine Alum Sludge

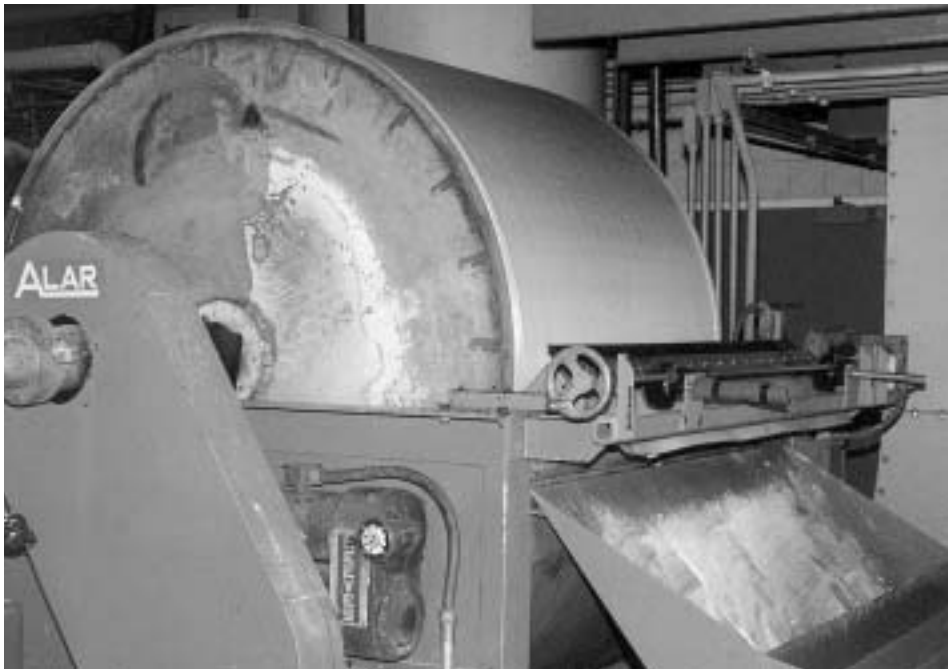
The Tewksbury Water Treatment Plant in northern Massachusetts is using a vacuum filtration/dewatering system to dewater up to 8,000 gpd of settled residuals produced during the clarification of 3 mgd of Merrimac River water with alum.

The residuals consist of low concentration (0.5 to 1.0 percent concentrate) of alum and sediment from the river water. During summer operation, the residual also contains potable activated carbon (PAC) that is added to improve the taste and odor of the treated water.

Prior to installation of the new dewatering system, the alum based residual was pumped to an adjacent city's wastewater treatment plant. On top of a base disposal fee, Tewksbury also paid surcharges in excess of $1,000 per day due to the suspended solids content of the discharged residuals.

Venturi Aeration, a Lowell-based environmental company, conducted sample tests on the residue for dewatering with an **Alar Auto-Vac Filtration and De-Watering system** after modifications by the firm. Samples produced as a result of those tests indicated that the system removed all particles larger than 0.5 microns (including the alum) and yielded a residue concentration of between 29 percent and 32 percent concentrate without using polymer. Filtrate water produced by the system has been approved for re-discharge into the headworks of the facility.

The **Auto-Vac** system is based around a stainless steel filter drum that is six feet in diameter and four feet wide. The drum's face has a stainless steel wire mesh covering that supports a fine woven polypropylene cloth. The filter cloth is used to trap diatomaceous earth (DE) on the surface of the drum. A vacuum inside the drum draws alum sludge onto the surface, where it is scraped off with a knife edge as it dries.



An Auto-Vac Filtration and De-watering System has been modified to handle fine alum sludge generated by the Tewksbury, Mass., water treatment plant.

The drum's central shaft is a hollow pipe and all of the air/water mixture is pulled by the vacuum through two rotating seals mounted on the ends of the shaft.

The drum rotates with its bottom half inside a vat. To start the dewatering process, the vat is filled with DE slurry and a vacuum is applied to the drum. As the drum rotates at about 2 rpm, the slurry is pulled onto the surface of the drum to build up a DE "precoat" of about 5 inches. The operator then squares off the drum by manually advancing the knife edge.

First the washdown water DE/residuals mixture from the previous day's run is filtered through the machine and dried, then the sludge pumps are turned on to pump the first of the alum residuals into the holding tank and start the run.

The cutting speed is mostly determined by variables such as alum residuals concentration, dewaterability and temperature. With each revolution of the drum, the stellite knife edge cuts off a thin ribbon of dried alum residuals and some DE. The freshly exposed DE is then able to filter more residuals as the drum rotates and plunges back into the holding vat.

As the drum face rotates under the surface, a layer of highly concentrated residual is formed on the surface of the DE. As the drum emerges, water on the surface is pulled into the DE precoat. Final drying is accomplished by air percolating through the alum residual until the knife edge trims it away. Filtration rates are determined by concentration, drum speed, temperature and dewaterability of the alum residuals.

As a result of the tests, a full-scale **Auto-Vac** unit was installed in September 1995. Tewksbury staff conduct filtration and dewatering processing three times per week and the operation is completed in approximately 11 hours. Operating costs and supplies per day average $90 plus de-watered solids disposal (approximately 1,800 pounds per day at $100 per ton). WW

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