WEF MA - thickening factsheet - july'19
Words: 774

Thickening and Dewatering 101
WEF Releases 10 Thickening and Dewatering Factsheets

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Recently, the Solids Separation Subcommittee of the Water Environment Federation Residuals and Biosolids Committee began development on 10 factsheets focusing on biosolids thickening and dewatering. This preview examines the first set that have been released. Titled, *Thickening and Dewatering*, *Polymer/Flocculants 101*, and *Solids Capture in Dewatering Processes*, these factsheets can be downloaded by visiting www.wef.org/factsheets.

Thickening and Dewatering

In the wastewater treatment process, solids get separated via settling in primary and secondary clarifiers and need to be further processed before moving down the treatment train. Thickening and dewatering of solids helps reduce the volume of the material in the system. Less volume benefits utilities by enabling smaller downstream facilities, which reduce energy and operating costs.

Thickening typically occurs after solids have been discharged from clarifiers but before digestion or storage. Depending on the facility and characteristics of the solids, various types of equipment can be used to thicken the solids, including (but not limited to) gravity thickeners, centrifuge thickeners, and rotary drum/screw thickeners. After thickening, the solids can range from 2% to 8% solids concentration and still can be pumped throughout the facility.

Dewatering typically occurs after biological and digestion processes and further removes water from the solids slurry. This process produces a material that can be transported for disposal or beneficial use. The solids cake that is produced from dewatering is typically 15% to 40% solids and acts as a solid — that is it no longer can be pumped.

The benefits to dewatering are similar to those of thickening: Reducing the total volume of material reduces transportation costs and the size of equipment (incinerators, digesters, drying beds) needed downstream. Dewatering typically is done using belt filter presses, screw presses, centrifuges, and other dewatering specific equipment.

Polymer/Flocculants

To maximize thickening and dewatering efficiencies, polymers and flocculants often are used. These chemicals help clump, or flocculate, solids together and make water easier to remove.

Polymer comes in three forms: dry, solution, and emulsion. Dry polymer consists of 90% active polymer and requires a more extensive process to dissolve and activate it before use. Solution polymer, also called Mannich, is a viscous polymer with only 4% to 8% active ingredient. Its low activity and difficulty in pumping has caused it to be less used in today's water resource recovery facilities. Both polymers must be activated and diluted on-site to between 0.1% and 1% active solution before using. The dilution process must be followed meticulously to prevent damaging the polymer and reducing its efficiency, and, thus, leading to a greater polymer demand, which increases costs.

Emulsion polymer is a pumpable polymer of gel emulsified in hydrocarbon oil with 2% to 55% activity. Due to its pumpability, it often is delivered to the system in-line, although its ease of use and higher activity come with a higher cost when compared to dry polymer.

Solids Capture

Integral to optimizing biosolids efficiency and costs is paying attention to solids capture. This parameter is the amount of solids that are discharged, based on the percentage of solids in the feed. While the industry standard is 95%, on-site performance can get as low as 60%.

Low solids capture means a significant portion of solids are being returned to the head of the facility with the extracted water. By increasing solids capture, you reduce costs associated with re-treatment, prevent excess wear and tear on equipment, and help improve overall facility performance.

Solids capture percentage can be determined using an equation (outlined in the factsheet, *Solids Capture in Dewatering Processes*) that incorporates sludge flow, washwater and polymer water flow, discharge cake, feeds solids and filtrate, or centrate solids. Establishing a baseline enables improvement to be measured.

To improve solids capture, a step-by-step approach is advised. First, identify all settings and parameters used in the dewatering process (feed solids, flow rate, cake solids, polymer flow, etc). Then, change one setting at a time; let it reach steady-state, and evaluate the effect on solids capture.

More Information Available

Thickening and dewatering biosolids is an intricate topic. This article only touches on a few of the important considerations with polymer/flocculants and solids capture. For a more in-depth discussion of these topics and more, visit www.wef.org/factsheets to see all of the thickening and dewatering factsheets as well as factsheets on many other topics.

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