17. Solids Treatment Overview

17.1 Why do we need to treat wastewater solids?

- Sludge is generated from the wastewater treatment processes - settled solids and scum from primary and secondary treatment processes
- This sludge contain organic compounds and also elements that are beneficial plant nutrients
- However, the organic solids in the sludge are not stable (i.e. they will decay) and include pathogens.
- Prior to disposal, sludge has to be treated – stabilized, so that its disposal or reuse does not pose a threat to public health.
- Sludge treatment is very critical as it is an expensive process and sludge disposal is subject to strict regulatory requirement.
- Even solids are only a small component of wastewater, the solids treatment and disposal account for a very substantial portion of wastewater treatment costs. Typically 40 to 60% of total wastewater treatment operations cost is attributable to sludge treatment and disposal.

NOTE: Solids removed during Preliminary Treatment, from barscreens and grit chambers are typically not treated as part of the solids treatment process. These solids are disposed off at a landfill

Typical solids treatment is comprised of the following three sequential steps:

1. **Sludge thickening**
2. **Sludge stabilization**
3. **Sludge dewatering**

17.2 Sludge thickening

Sludge thickening involves the removal of excess water from the primary and secondary sludge increasing the solids content of the sludge and reducing the volume of sludge to be treated in the sludge stabilization process. Sludge thickening reduces the volume of sludge that need to be handled in the sludge stabilization step thereby reducing treatment cost.

- There is an upper limit of the solids concentration that can be effectively treated (stabilized) as increasing the solids concentration reduces its ability to be mixed and pumped easily. Typically the sludge thickening process produces sludge with a solids content of less than 10%.

Benefits of thickening to the sludge stabilization process include:

- Improved performance due to a lower volume of sludge
- Cost savings in the construction of new facilities
- Reduction in energy requirements as less water has to be heated

Typical methods used for sludge thickening include:

1. Gravity thickener - more suitable for primary sludge
2. Dissolved air floatation thickener - more suitable for lighter, fluffier floc such as the secondary sludge.

17.3 Sludge Stabilization

Sludge stabilization process produces solids that are deemed safe for eventual disposal. Federal Part 503 rule establishes requirements for the final use or disposal of sewage sludge. The solids disposal methods may include: land application, as a crop/vegetation fertilizer, placed on a surface disposal site for final disposal and fired in an incinerator.

Biosolids is the term used for stabilized sludge which meets regulatory standards for beneficial reuse

Sludge stabilization process results in the following:

1. Reduction in amount of solids
2. Pathogen reduction
3. Odor reduction
4. Reduction in vector attraction

The main processes involved in sludge stabilization include:

- Digestion - Aerobic or anaerobic
- Lime or alkaline stabilization
- Composting
- Long term storage in lagoons
- Thermal processes
- Incineration

17.4 Sludge Dewatering

Solids stabilized using digestion process has only a small percentage by weight of solids -less than 5%. It therefore becomes necessary to dewater the stabilized sludge prior to hauling off-site for final disposal. Like thickening, the dewatering process does not treat the sludge. It increases the solids content to between 15 to 30 percent and the higher solids content of the stabilized sludge makes it easier to handle and reduces costs associated with elements related to accomplishing the end objectives with the sludge – land application, composting, drying, incineration or landfill.

Dewatering involves conditioning the sludge with a polymer and subjecting it to a physical process which include:

1. Belt Filter Press
2. Centrifuge