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DRYING AND PROCESSING BIOSOLIDS

What are biosolids?

Biosolids are nutrient rich organic materials from wastewater treatment facilities. In other words, biosolids are treated sewage sludge that have strict regulatory requirements prior to reuse. Through physical, chemical and biological processes, solids are removed from the sewage treatment facilities' wastewater, treated and sanitized to be recycled into biosolids and repurposed as fertilizer and biofuel. Approximately 50% of biosolids are recycled for agricultural purposes, but employed on only 1% of the agricultural land in the US.

How are biosolids processed?

Biosolids are developed from treated domestic wastewater. Prior to the cleaning of the wastewater, harmful contaminants are removed in a pre-treating process. The solids are removed from the wastewater, pH levels are increased to eliminate odor and sanitization processes control pathogens.

The removal of water from biosolids is important in producing a solid product that can be used to produce fertilizer or biofuel. The first step of the process, dewatering, removes the liquid sludge from the wastewater and converts it into a solid product. Drying technologies are then used to elevate the temperature of the wet solids to remove the remaining water by evaporation. These high temperatures also serve to kill remaining pathogens as determined by regulatory requirements. Drying biosolids has little effect on the nutrient content of the final material, making it suitable for agricultural fertilizers. Once heating and drying processes are completed, the biosolids pellets should be cooled to a thermally stable temperature prior to storage, packaging and transport. Biosolids that have not been effectively cooled are at risk of auto-ignition, fires and explosions.

What type of technologies are used to dry biosolids?

Direct dryers use hot air or gas in direct contact with the product to increase the temperature of the wet solid, thus drying the product by evaporation. Examples of direct contact dryers are rotary drums or belt dryers. A heat supply such as a furnace produces the exhaust gas that is fed directly into the drum where it comes in contact with the product, heating it. The exhaust gas can be recycled and used in this process again, increasing energy efficiency of the operating system. In the case of a belt dryer, the dewatered solid flows along a slow moving belt, exposed to hot air produced by the furnace, drying the product as it moves along the belt.

Solar drying is an alternate biosolid drying process that uses energy from the sun and a greenhouse enclosure to heat and dry the moisture from the wet solid. The enclosed structure prevents external elements such as rain from adding moisture back into the solid, however cloud cover, humidity, temperature and wind speed can all affect and delay the drying process.

What type of technologies are used to cool biosolids?

To accomplish safe storage and packaging of biosolids, the temperature need to be stabilized to prevent decomposition, smoldering and auto ignition. An innovative technology that is proving effective in cooling biosolids to a thermally stable final temperature are indirect heat exchangers. With this technology, the cooling agent does not come in direct contact with the biosolids, rather it is cooled by conduction. The indirect heat exchanger uses a vertical, enclosed unit with hollow, stainless steel plates running parallel within the unit. The product is fed from the top of the unit between the plates. Cooling water runs within the hollow plates, countercurrent to the flow of the solid. As the solid flows downwards, it is cooled by conduction. The biosolids is discharged to a final temperate that is suitable for storage and transport.

What are the benefits of indirect heat exchangers?

For biosolids, indirect heat exchangers have significant energy consumption savings, as large quantities of hot or cool air are not needed to heat or cool the biosolid product. Energy efficiency can be improved up to 90% using this type of technology. The slow, controlled movement of the product down between the plates guarantees a stable and even final output temperature of the product. As direct contact between the product and the thermal heating agent does not occur, there is no bacterial contamination to the product. This same mechanism also results in virtually zero emissions, eliminating the need for additional air handling equipment. Finally, as this indirect heat exchange technology has a vertical orientation, the footprint is considerably smaller than traditional methods. The modular design is also optimal for capacity increases and existing facility retrofits.

Conclusion

With an increasingly global outlook on sustainability and environmental responsibility, the need for energy efficient technologies and innovative solutions has never been greater. With increased demand for organic foods and a call for less chemical fertilizers, the efficient, safe and effective processing of biosolids will only continue to grow. Employing the use of technologies that improve energy efficiency, reduce emissions, and result in a superior final product will help to create more sustainable processing methods for biosolids.

To learn more about the Solex Indirect Heat Exchanger and how it can be used in biosolids processing, visit: www.solexthermal.com/heat-exchanger-applications-and-industries/biosolids/