

## Application: Anaerobic Digestion – Sludge Heating (Mesophilic & Thermophilic)

Municipal and industrial wastewater facilities are increasingly turning to anaerobic digestion as a reliable and sustainable solution to meet stricter environmental requirements. This biological process breaks down organic solids in wastewater sludge, typically in large vessels called digesters, with capacities ranging from 0.5 to 3 million gallons (2,000 to 11,000 m<sup>3</sup>). Depending on regulatory requirements and environmental goals, facilities can implement mesophilic digestion, operating around 96°F (36°C), or thermophilic digestion, operating around 132°F (56°C). Thermophilic digestion accelerates solids reduction and pathogen destruction due to higher temperatures but requires good temperature control and presents additional challenges, such as the risk of sludge burning at elevated process temperatures.



In both mesophilic and thermophilic processes, consistent heating is critical to stimulating

biological activity and accelerating digestion. Traditional heating methods, such as tube-in-tube heat exchangers, introduce a host of operational challenges:

- Scorch Sensitivity: These systems are prone to sludge scorching, leading to plugging, fouling, and operational inefficiencies.
- Increased Pressure Drop: The use of multiple exchangers significantly increases pressure drop, placing greater demand on pumps and increasing energy usage.
- **Complicated Temperature Control:** Their lagging temperature response makes accurate control difficult, compromising process stability.
- High Maintenance and Large Footprint: Tube-in-tube heat exchangers are large, difficult to install or relocate, and require regular cleaning and maintenance due to buildup—leading to increased downtime and operational costs.

## **PSX Heater Solution:**

The ProSonix (PSX) direct steam injection heater offers a more efficient and simplified solution for both mesophilic and thermophilic digestion. It disperses steam gently and uniformly at high velocities into the sludge, providing instantaneous heat transfer across a broad operating range. Thanks to its self-cleaning design, PSX heaters do not suffer from burn-on or scorching issues, eliminating plugging and fouling concerns. Additionally, PSX heaters allow for single-stage heating, simplifying the process and reducing capital costs.

The PSX heater can be mounted directly into the process piping in any orientation, reducing the need for dedicated floor space or complex infrastructure. By improving efficiency and maintaining precise temperature control to within ±1 °F, it enhances process stability, reduces energy consumption, and minimizes maintenance.

## ProSonix Direct Steam Injection – Key Benefits:

- **Reduced Energy Costs:** By lowering pressure drop (typically 2–3 psig) across the PSX heater, the demand on sludge pumps is reduced, leading to energy savings.
- Reduced Maintenance: The self-cleaning design and absence of hot surfaces eliminate plugging and fouling.
- **Precise Temperature Control:** Maintaining temperatures within ±1 °F ensures more uniform heating, improving process control and promoting biological activity.
- Lower Installation Costs: The PSX heater can be installed directly in the piping, eliminating the need for additional floor space or the complex removal and cleaning of tubes.