Downstream Advantages of Biological FOG Abatement

Beyond helping prevent backups and SSOs, microbial solutions reduce treatment burden and simplify discharge compliance at WWTPs.

In municipal wastewater collection systems, the presence of Fats, Oils, and Grease (FOG) represents a persistent challenge with far-reaching consequences. Commonly discharged from residential, commercial, and industrial sources, FOG poses a significant threat to the integrity and functionality of sewer infrastructure. The primary issue stems from the propensity of FOG to congeal and accumulate within sewer lines, gradually forming stubborn blockages that impede the smooth flow of wastewater.

According to the EPA, the buildup of FOG is responsible for 47% of sanitary sewer overflows (SSOs). These FOG-induced SSOs can prompt the EPA to levy costly consent decrees and other actions. FOG also presents a range of other potential challenges for collection system operators:

- Residential backups and the attendant liability for property damage,
- Surface overflows, which threaten public health and disrupt traffic,
- Odors prompting public complaints,
- Waterway pollution, necessitating beach closures and other limits on recreation and commerce, and
- Extensive consumption of capacity and resources to address FOG.

Fortunately, cities have a range of solutions at their disposal to prevent and remedy FOG accumulation, including hydraulic (jetting), mechanical (pigging), chemical, and biological/microbial cleaning methods.

Of these, the latest solution to earn widespread adoption—microbial FOG abatement and prevention—has demonstrated high performance and a range of unique advantages when used in collection systems. Moreover, the biology of microbes can benefit downstream wastewater treatment plants (WWTPs) in specific ways.

Tiny Microbes, Big Impact

Beneficial microbes play a pivotal role in efficiently digesting and breaking down grease within a municipal sewer system. Specifically, certain strains of bacteria, both aerobic and anaerobic, are adept at producing enzymes that target complex FOG molecules. In an aerobic environment, bacteria utilize oxygen to metabolize FOG, producing byproducts like carbon dioxide and water. Anaerobic bacteria, on the other hand, thrive in environments with limited oxygen, and they break down FOG through fermentation, generating simpler compounds like methane and carbon

dioxide. Enzymes secreted by these microbes catalyze the hydrolysis of triglycerides into fatty acids and glycerol, facilitating the subsequent digestion by bacteria. This microbial degradation process transforms FOG into more manageable and environmentally benign substances, mitigating the risks of sewer blockages, overflows, and associated environmental and operational challenges within the municipal sewer system.

When dosed into a sewer, microbial solutions serve three primary purposes:

- *Remove:* They digest FOG that has accumulated, restoring the flow characteristics of the pipe.
- *Prevent:* They colonize clean pipes to digest FOG before it accumulates on pipe walls.
- *Dispose:* They biologically metabolize FOG, leaving no adverse waste products to manage.

By contrast, mechanical and hydraulic cleaning methods dislodge FOG, but they don't solve the problem of disposal. Rather, dislodged grease must be handled at the WWTP, or vacuumed out downstream and landfilled. Likewise, mechanical and hydraulic methods do not prevent future FOG deposits.

Chemical methods dissolve grease, solving the disposal problem, but they don't prevent future FOG deposits. Also, they introduce chemistry into the effluent stream that may pose an additional burden on downstream treatment and/or discharge permitting.

Benefits Onsite, Benefits Downstream

As a biological solution, beneficial microbes offer the ability both to treat *and to* prevent FOG—allowing municipalities to be both responsive and proactive in their approach.

Microbes require only periodic dosing, and are then able to work in an independent and sustained fashion. This reduces both the frequency and duration of field work. As a result, municipalities can reduce their field crews' total exposure to traffic, reduce traffic disruptions for the community, and save on the many resources consumed by alternate methods (water, fuel, truck hours, crew hours, traffic control).

Impact by Cleaning Method	removes FOG	prevents FOG	disposes of FOG
hydraulic (jetting)	●		
mechanical (pigging)	●		
chemical	●		●
biological/microbial	●	●	●

Both state and federal regulations in the United States often require or strongly recommend the use of biological treatment for wastewater. The Environmental Protection Agency (EPA) sets national standards and guidelines for wastewater treatment under the Clean Water Act (CWA). While the CWA does not explicitly mandate the use of biological treatment, it establishes effluent limitations and water quality standards that often necessitate the use of biological processes to meet these standards effectively.

States then develop their own regulations and permits based on federal guidelines. Many state environmental agencies require wastewater treatment plants to use biological treatment as part of their overall treatment process. This requirement is based on the effectiveness of biological treatment in reducing organic pollutants, pathogens, and nutrients from wastewater.

Additionally, biological treatment is widely recognized as an environmentally sustainable and cost-effective method for treating sewage and wastewater. It aligns with the goals of reducing pollution and protecting public health and the environment, which are central tenets of state and federal environmental regulations.

Future-proof Performance

With the ability not just to remove FOG, but to dispose of it and to prevent future recurrence, beneficial microbes are gaining rapid adoption in sewer maintenance programs. And by simplifying downstream treatment processes and discharge compliance, this biological approach supports the increasingly stringent environmental imperatives championed by the EPA.