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Wastewater Solutions

Novozymes BioRemove™ 4270

Application Sheet

BioRemove 4270 is a blend of beneficial microorganisms for application in municipal anaerobic digesters with significant fat, oil, and grease (FOG) buildup. BioRemove 4270 contains microorganisms which have been selected for their ability to work in anaerobic environments and metabolize FOG into smaller volatile acids and carbon dioxide. BioRemove 4270 can help prevent grease buildup and improve digester efficiency.

Benefits

The buildup of FOG in municipal anaerobic digesters can severely impact the efficiency of solids destruction and methane generation. FOG is primarily composed of large water-insoluble triglyceride molecules. These triglycerides are made up of a glycerol and three fatty acids (most commonly palmitic, stearic, and oleic acids). While many naturally occurring microorganisms have the ability to produce extracellular enzymes to cleave the fatty acids from the triglyceride, not many organisms have the ability to further break down these fatty acids.

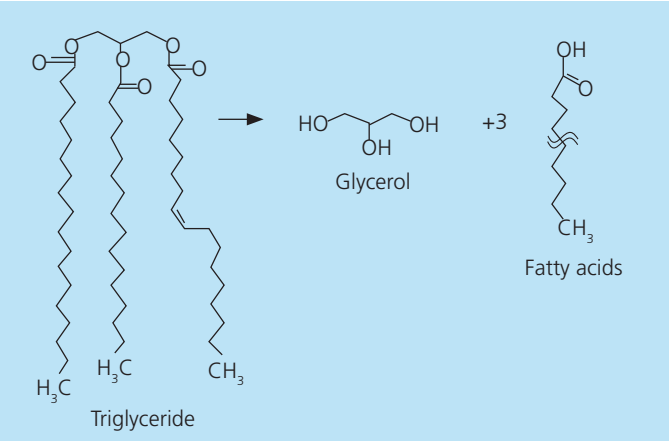

Fig. 1. Structure of a triglyceride.

Due to its insolubility, FOG will often accumulate in the digester, creating a greasy scum layer. This scum layer can eventually harden and prevent adequate mixing and gas transfer. This can result in large clumps of grease and foam returning in the supernatant, damage to rake arms, and the loss of gas-bound solids. If FOG is only partially hydrolyzed, an accumulation of short-chain fatty acids can accumulate, causing foaming. This foaming is believed to be caused when an imbalance in the microbial community (similar to high F/M) promotes the generation of biosurfactants. Biosurfactants cause foaming as biogas bubbles become entrapped. Foam layers and grease caps can often reduce the digester capacity by up to 20%, which decreases efficiency and increases operating expenses.

The addition of BioRemove 4270 to anaerobic digesters helps improve digester performance by degrading FOG and its fatty acids, thereby reducing scum and foam and increasing the capacity in the digesters. BioRemove 4270 also simplifies operations by reducing downtime for FOG removal and cleaning.

Performance

The loss of efficiency in an anaerobic digester is common due to the buildup of grease and scum. A municipal treatment plant started experiencing large fluctuations in volatile acid contents and overall treatment performance. An investigation of the digester found that nearly one third of the volume of the digester was not being utilized due to a massive grease cap. The facility attempted to break up the digester cap without success.

Novozymes was contacted and recommended the addition of BioRemove 4270 with BioAid 5535. Over 45 days, approximately 360 dry metric tons of solids was digested. The anaerobic digester contents dropped from 20% total solids to less than 1.5%. Effluent volatile solids also dropped from nearly 57% to 26%.

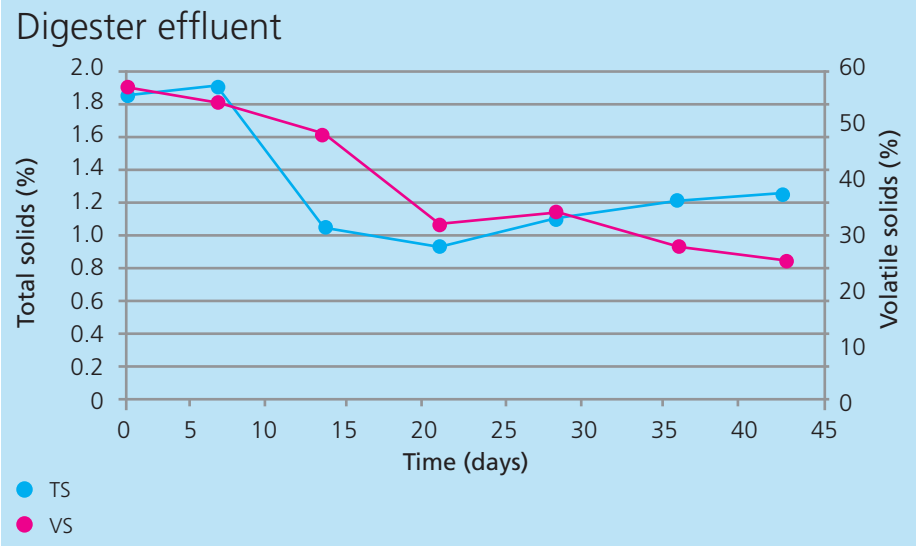

Fig. 2.The reduction in solids allowed the digester to be fully operable in less than 60 days without any additional costs due to physical solids removal, saving the facility nearly USD 750,000.

Recommended use

BioRemove 4270 can be used for multiple applications, including daily dosing to maintain anaerobic digester efficiency, increased dosing during high FOG loading or upsets, and seeding during plant start-ups. Volatile acids and alkalinity should be monitored during the addition of this product to ensure sufficient pH balance.

BioRemove 4270 is added daily directly to the sludge feed or to the anaerobic digester. The microorganisms in BioRemove 4270 perform within the pH range 6.0–9.0, with an optimum near 7.0. Wastewater temperature affects activity, with an approximate doubling in maximum growth rate for each 10 °C (18 °F) increase in temperature to an approximate upper limit of 40 °C (104 °F). This product is not recommended for thermophilic digesters where temperatures reach 50 °C (122 °F).

The dosage rate for BioRemove 4270 is dependent upon the volume of the biological reactor, sludge retention time, organic loading rate (OLR), and the rate at which FOG accumulates in the system. During the initial seeding period, an increased dosage is used to quickly establish the microorganisms in the system. When the microbial community is properly developed, regular dosing is necessary to maintain an accelerated level of biological activity and to continue to minimize upsets.

Product characteristics

BioRemove 4270 is available as a dry tan powder.

Safety, handling, and storage

Store in a cool, dry place. Avoid inhalation of dusts. Wash hands thoroughly with soap and water after handling. Avoid contact with eyes.

Novozymes Biologicals FR
Phone: + 33(0) 1 30 15 28 40
Parc Techno. des Grillons
60, route de Sartrouville – Bât 6
78232 Le Pecq Cedex
France
wastewater@novozymes.com

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