Clearing the "FOG"

Enzymes help cut through fats, oils and greases in septic tank, drain line and sewer applications

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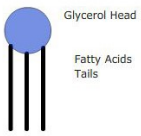
Fats, oils and greases, collectively they are called FOG. To wastewater treatment professionals, they usually mean trouble. There are many misconceptions in the marketplace about methods and products for dealing with FOG. A better understanding of biological treatment versus chemical treatment can help you make wise decisions on behalf of your customers and your business. The main reason FOG is troublesome is that it is not water-soluble, it eventually separates from water. Grease is lighter than water, so it floats to the top. If not treated, grease molecules combine to form a hard grease layer. Or, worse yet, the grease combines with other materials such as soap residue, paper, and solids. When this happens in a septic tank, a very hard crust can form on the surface of the water in the tank. If left untreated it could flow out to the drainfield and cause drainfield backups. In a plumbing system, grease traps, drain lines, and sewers can become clogged. Usually, an overload of FOG is what causes stoppages in flow.

Understanding Enzymes:

Enzymes are one kind of remedy for FOG problems. An enzyme is a catalyst (something that makes a chemical reaction go faster). They are not living cells like bacteria. Instead, they are a special kind of protein, and in a way, they behave like energy. Consider a cornfield. As corn grows into a mature plant, it produces corn oil and sugars. It does this by taking carbon dioxide from the air and water from the soil, then putting them together with the help of the sun's energy, in a complex process called photosynthesis. The sugars and oil become food products, which people consume almost daily. Eventually, the materials end up in the septic tank. How does nature convert the sugar and oil back into carbon dioxide and water? With enzymes. The reverse biological process happens with the enzymes providing impetus. Enzymes are not consumed in chemical reactions, they simply help the reactions along. For example, the starch digesting enzyme amylase, from barley malt, is used in the fermentation of beer. The fermentation process lasts for days, and the enzyme is active throughout. At the same time, an enzyme is slowly depleted as the reactions proceed, just as a battery in a flashlight wears down each time the switch is turned on. Batteries come in many sizes and strengths, and the same is true of enzymes. Some last just minutes, some last for days.

The Anatomy of Grease:

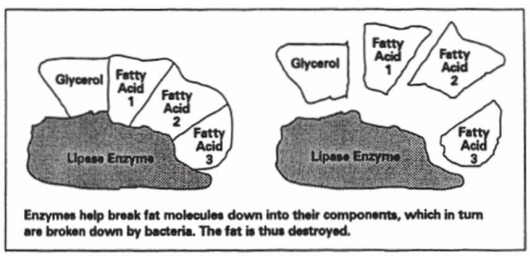
Enzymes can work effectively on grease. To see how, it helps to understand how grease molecules are put together. Fats, oils, and grease are in the group of chemical substances called lipids or triglycerides. They are composed of three parts fatty acid to one part glycerol. Of course molecules are tiny, one triglyceride molecule does not do much on its own. One fan sitting in Lambeau Field (home of the Green Bay Packers) would look inconsequential.



But add 75,000 fans doing "the wave," and you have what seems like one big living object. So it is with triglycerides. Once they begin to attach to each other, they can become a big grease clog. Service professionals report finding grease chunks the size of boulders in some larger grease traps. Fat molecules keep attaching to each other until something disrupts the process. For example, if hot water is poured on a chunk of grease in a drain, some of the outer molecules will dissolve off and become free-flowing again. But as the temperature falls farther down the line, the grease molecules come back together. The grease has not been reduced only repositioned. Many things can cause grease to break apart. Chemical drain openers cause reactions that can increase the temperature. Other chemicals, called solvents and surfactants, can actually dissolve grease molecules. But once these chemicals wear off, or the temperature drops, the grease molecules combine again.

How Enzymes Attack:

Enzymes attack grease in a much different way. The enzyme lipase actually attacks the grease molecule and destroys the connections between its components. The lipase enzyme breaks the molecules into the three fatty acid units and the one glyceride unit. These have no way of connecting with other grease molecules to form hard grease deposits. At this point, the bacteria present will start to feed on the fatty acids and the glycerides, converting them back to their basic components of carbon dioxide and water. Therefore, some of the grease is actually eliminated. How much depends on many factors, pH, temperature, and how long the process goes on. Even if bacteria do not completely

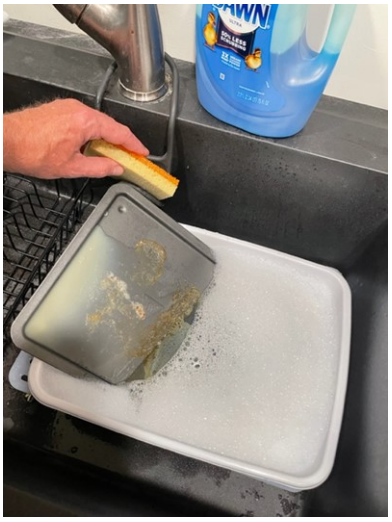


Enzymes help break fat molecules down into their components, which in turn are broken down by bacteria. The fat is thus destroyed.

consume the fatty acids and glycerides, they will not reform into grease molecules or grease clogs. This is the biggest misconception about enzymes. Many claim that the grease is just pushed further down the line to form a problem elsewhere. Although this may be true with some cleaning methods and chemicals, it is not true of enzyme and bacteria treatments. Once the enzyme lipase has destroyed the connections, the grease will not form again down the line. In fact, the enzymes help the wastewater treatment process by starting biological treatment far upstream. The uneaten fatty acids and glycerides will remain water-soluble and will flow with the wastewater to the final treatment location. This is not to say that enzymes are a cure-all. For example, some wastewater treatment plants cannot handle high loads of water-soluble fatty acids and glycerides. But most treatment plants would rather have those substances than untreated FOG. This bioremediation process using enzymes and bacteria is done everyday by huge municipal wastewater treatment plants all over the world.

Solvents and Surfactants:

The way enzymes work is far different from the way solvents and surfactants work on grease. In simple terms, a solvent turns hard grease into a liquid state without changing its actual character. It does this by temporarily breaking the bonds of molecules (not the fatty acid and glycerides of the molecules) so they dissolve in water. The water then carries the grease downstream until the solvent wears off, at which point the grease reforms. Surfactants (short for “surface active agents”) emulsify two substances together so that they look like one. When a surfactant is used on grease in water, it does not break the fat molecules into pieces but instead separates them from each other so that they mix with the water. The best example of this is the Dawn dish soap commercial that starts by showing a thin layer of grease on top of dishwater. When a drop or two of the detergent is added, the grease magically “disappears.” The dish soap is a surfactant. What you don’t see is that the grease layer returns when the surfactant wears off. Wondering what they use to clean waterfowl that have been caught up in oil spills? You guessed it soaps and strong surfactants. One reason restaurants have trouble with grease in their drain lines is because their dish and laundry cleaners are high in surfactants. The broken up fats in the water are able to bypass the grease trap, move downstream, and cause grease blockages. Solvents and surfactants are not the same as enzymes they only change how the grease looks and feels. Enzymes actually change the character of the grease into water-soluble components, which will never reform as grease anywhere downstream. Surfactants can be beneficial in that they help enzymes work. Enzymes and bacteria only work on the surface of a substance. When a surfactant is used, more surface area is exposed. A surfactant will turn a chunk of grease floating in water into many droplets. This gives the enzymes and bacteria more surface area to attack and digest the grease.



Choose the Right Tool:

There are many methods and many products for dealing with FOG. Each used in the right conditions can do the job correctly. Most wastewater treatment plants use some form of biological treatment to clean the water of organic material, including FOG. Biological treatment involves both enzymes and bacteria. Enzymes help provide the bacteria with food. Although enzymes are not magic, they are biological facts of nature that can be valuable allies in the war against grease.