

# BUGS EAT THEIR WAY THROUGH A FATTY PROBLEM

Until recently, mechanical methods have been used to clear blockages in sewerage systems caused by fats, oils and greases. But not everyone agrees. A different school of thought is biting into traditional thinking.

**B**uild-up of fat, oil and grease in sewerage systems has become a big problem in many cities around the world, resulting in sewer overflows, health and environmental issues, and costly remedial works.

The problem can often be sourced to commercial kitchens, such as those in fast-food restaurants, where in some cases discharges directly enter local authority sewers without treatment.

Various means are used for dealing with this, including installation of grease traps and water jetting of sewer lines, but a solution that has become more prevalent in recent times is the use of bacteria to consume and disperse the fat, oil and grease – or FOG.

US-based company Environmental Biotech uses a technology known as bio-remediation to clear blockages caused by FOG in sewerage systems. Vegetative bacteria micro-organisms are injected into the system to feed on fat, sugar and starch wastes. The company has undertaken projects in several countries for a range of customers including hospitals and McDonald's restaurants.

Managing director Aziz Tejpar says bio-remediation is not new – it is nature's way of breaking down waste – but all applications do not necessarily work.

"It is important to ensure that the right bacteria are selected for individual jobs – that is the key to success with this technology.

"The cost of pump-outs and spillage clean-

ups can be substantial for water utilities and individual companies, so it is better to follow a preventive rather than a reactive strategy with FOG problems.

"We take a fully integrated approach when managing drainage systems. This includes a thorough inspection of the customer's drainage system and its effectiveness, analysing the type, volume and frequency of waste being discharged to the system, then selecting the appropriate form of bacteria and dosing method.

"Dosing is controlled by a timer to release the live bacteria into the system at an appropriate point, such as through a grease trap in the premises. Fully trained technicians carry out regular inspections of the site once dosing has commenced to ensure its effectiveness and to replenish the bacterial solution.

"Bacteria can be injected into the system up to 12 times a day, and the reservoirs containing the bacteria are replaced every 14 days. The hydrocarbon-based fats are digested by the bacteria and reduced to carbon dioxide and water, thereby ensuring that wastewater flow through the drain lines is not impeded.

"The food service industry is the largest contributor to FOG-related sewer blockages, so our bio-remediation technology is now benefiting restaurants, hospitals, schools, factory cafeterias and prisons, as well as food processing and manufacturing. Because Environmental Biotech operates on a global



level, frozen bacteria can be quickly air couriered to mobile service units operating in various countries."

In the UK, Environmental Biotech has been carrying out bio-remediation trials over the past four years in conjunction with Anglian Water, the largest water authority in England and Wales, and the Water Research Council. This includes a trial to clear FOG from an 18" (45cm) sewer in Baddow Road in Chelmsford, Essex, where about 20 food outlets are located and there is a history of sewer blockages, overflows and odor problems.

Gary Collins of Anglian Water says the trials were conducted with the co-operation of local businesses in adopting preventive drain line management, including the installation and effective operation of grease traps to reduce the amount of FOG entering the sewerage system.

"Sewer blockages are 75% FOG driven, so it was pointed out to the food business operators that significant cost savings can be achieved through the use of an appropriate preventive system. Reactive measures, such as high-pressure water jetting, can be very expensive.

"The next step was for Environmental Biotech to introduce the bacteria to the sewer to eat the FOG. The company then monitored the project. Sewer blockages are down by 50% following the use of bio-remediation, and the big benefits have been a reduction in odor complaints, costs and pollution, together with an improvement in the general

reliability of the sewerage system.

"This technology has been used to effectively clear large sewer mains and pumping stations throughout Essex and also installed in kitchens to remove FOG. There are now plans to roll it out more generally across the Anglian Water service area."

Tejpar says there are several biologically based solutions to FOG on the market but they have had mixed results.

"Many of the enzymes, surfactants and solvents just move the FOG further down the drain line where another blockage can occur, whereas our two-phase bacterial technology provides a lasting solution. This technology is used by a growing number of food outlets, including McDonald's restaurants."

UK McDonald's building services manager Tim Bedford says the company takes its environmental responsibility seriously, including minimizing water consumption and improving the quality of wastewater discharged.

"We have adopted different biological treatment systems and products to combat the effects of FOG in our wastewater discharge. They have been used in isolation or in conjunction with grease traps/FOG separators with varying degrees of success.

"Over recent years we have introduced the Environmental Biotech system to more than 100 restaurants in the UK. These restaurants have seen a dramatic improvement in the quality of wastewater entering the drainage system. The system itself is unobtrusive and



Blocked drains and sinks like can be the cause of many environmental and health issues and result in costly remedial works.



1. An ETG aerator at work. The company says gene coding is now being adopted in Australia, and a national Standard for additives to grease traps is being considered.

2. US-based Environmental Biotech managing director Aziz Tejpar says bio-remediation is nature's way of breaking down waste.

3. The ACO programmable automated bio-chemical dosing system complete with stainless steel mounting frame and 5L of bio-chemical activator.

4. UK-based ACO Building Drainage technical manager Peter Jennings.

5. Environmental Technology Group (ETG) chief technical officer David Lee.



can be installed quickly and easily."

Australian-based company Environmental Technology Group (ETG), which also provides services in Hong Kong, Singapore, China and Malaysia, uses non-pathogenic waste-digesting bacteria to provide a continuous cleaning action in waste disposal systems.

ETG chief technical officer David Lee says regulations relating to the use of bacteria to deal with FOG blockages in sewerage systems vary from one water utility to another in Australia, but gene coding is now being adopted, and a national Standard for additives to grease traps is being considered.

"By using a biological growth formula, the effectiveness of those strains of bacteria that have been identified as best suited to a specific waste stream can be improved. Combinations of species often provide a more powerful and complete degradation of specific pollutants than individual strains applied alone.

"This is because the byproducts of one species often serve as food for another species. Only a correctly balanced formula of

bacterial strains can use this synergistic effect to completely break down pollutants to non-toxic products such as carbon dioxide, water and sulphate.

"Our biological treatment populates the wastes that accumulate inside drain pipes, and the enzymes produced by the bacteria break down grease and other organic matter, enabling the bacteria to fully digest the pollutants.

"Specific formulas are designed to solve specific problems in sewerage systems. As a FOG blockage is reduced, the bacteria die off or reproduce less often so that the population naturally tailors itself to the pollution level.

"This is the technology of the future and is being successfully used by water utilities in Australia and other countries to clean sewerage systems. Savings of 50% on energy costs for aeration can also be achieved, and this will escalate as the cost of energy increases."

The Jay R Smith Manufacturing Company in the US produces a range of grease interceptors designed to prevent blockages caused by FOG

in sewerage systems. Consultant Max Weiss has reservations about the effectiveness of adding bacteria, enzymes or surfactants to clean a grease interceptor or wastewater collection system.

"Engineers painstakingly design grease waste piping, determine the optimum interceptor type for the application, size it to the facility peak flow, and argue the design selection and sizing criteria with code officials - all of which is at significant expense.

How ironic it is then to expend more money and time to select, purchase and implement use of a product designed to flush the collected grease from the interceptor?

"Grease interceptors and collection systems are not suitable environments for complete beta oxidation of polar hydrocarbons. There is a decided difference in the process and outcome of supplying an additive to a conventional system and seeding even the same additive to an engineered bio-reactor.

"Grease interceptors, whether effecting separation and retention of FOG by

hydromechanical means or gravity alone, are storage devices functioning via differing densities and viscosities of the two substances, FOG and water. Alteration of the physical or chemical characteristics of either substance, or both, such that emulsion is more likely to occur, will logically result in reduced retention of FOG.

"Simply dumping an additive down a drain will not produce the desired result of reliably and permanently altering the FOG molecule so that it no longer is capable of surface adhesion and thereby causing a blockage and subsequent system overflow. Long-term storage (30 days or more), and/or use of additives, increases the deleterious effects of FOG in the drainage system.

"Proper interceptor sizing, installation and maintenance, or application of an engineered FOG disposal system such as a bio-reactor, are better methodologies for FOG abatement. FOG problems are increasing, the molecule is becoming more complex, emulsifying cleaners are more effective, at least temporarily, and

there are no 'quick fixes' in sight."

UK-based company ACO Building Drainage provides a range of drainage services including installation of FOG separators and biological or enzyme-based dosing units.

Technical manager Peter Jennings says the company has extensive experience with both technologies, having supplied a range of biologically dosed systems for more than 15 years in the UK, and EN compliant units in Europe for more than 20 years.

"The Building Regulations for England and Wales make provision for some control of FOG at the wastewater source. These regulations require commercial hot food premises to be fitted with a separator complying with BS EN 1825 or other effective means of grease removal, which can be taken to include emulsifying enzyme dosing units with or without a grease trap unit.

"It is interesting to note that while the Scottish Building Standards require facilities for the separation of FOG in non-domestic properties, they also recommend that

emulsification agents not be used, as they can cause problems downstream.

"Biological or enzyme-based units are commonplace in the UK. For the specifier, the main consideration is to what degree these competing technologies differ in performance and cost - short and long term.

"The biological process is heavily dependent on temperature, availability of oxygen and food, all of which relate to retention time in the grease trap. Once out of the trap and in the drain, the variability of these factors may reduce efficiency." ☉

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