FOG
Fats, oils and greases

Treating FOG using bioadditives in grease converters and their alternative uses, by **Keith Davis**, former technical adviser to a community liaison group of residents affected by the building of Wellington's Moa Point Wastewater Treatment Plant.

In 2008-09 a problem began to appear with FOG build up in the wet well of Wellington's Moa Point treatment plant's inlet pumping station.

Not only was there a problem with the build up of odorous FOG that had to be physically tankered away but there was also interference with the station's pump control systems.

This warranted further investigation as the build-up of FOG coincided with the introduction of proprietary FOG interceptors termed grease converters using a technique of adding bioadditives that would break down the collected FOG mass into carbon dioxide and water.

The following is a summary of what was found after an investigation was carried out as to just how well the grease converters operated and if they meet suppliers' claims.

While there have been improvements made regarding the bioaugmentation process of recent times the following facts and opinions may be useful to those who use or are interested in the process.

Bioaddtives and bioaugmentation

Bioadditives can be best described as a mixture of bacterial cultures together with a range of nutrients plus lipase to act as a starter.

The bacterial cultures produce more lipase, the essential element that by the process of hydrolysis breaks the FOG into its two basic compounds, fatty acids and glycerol. Whether or not carbon dioxide and water were the likely end products was to be determined.

There are a number of FOG formulations on the world market, many of which can be added directly to the waste flow or to the 'grease converter' and consisting of lipase, selected bacterial cultures and nutrients.

What the investigation found

Much of the FOG was not 'treated' due to lack of contact and mixing with the bioadditives.

Chemical analysis showed that the bacterial cultures had brought about hydrolysis of some of the FOG resulting in a drop in pH due to the fatty acids being produced.

The findings did not support the commercial claims that carbon dioxide and water were the main end products of the bioaugmentation process.

FOG cannot be readily acted on by bioadditives action unless it is well dispersed into the FOG mass where it can be broken down to produce fatty acids and glycerol (a full explanation is available on request). As the FOG contents are acting in an anaerobic environment no further action is likely to take place.

Commercial claims appear to have been based on data supplied by the bioadditive manufacturers whereby patent application data showed that all tests were carried out under carefully controlled laboratory conditions of contact time, mixing, temperature, pH and oxygen availability, using a respirometer.

Such conditions being far removed from that found in a grease converter where there was no control over contact time, mixing, temperature, pH and availability of oxygen. As a result, the end products were those found, fatty acids and pH as low as 4.5.

Issues raised

Local authorities may be concerned with the low pH values in effluents from grease converters and what controls or treatment and what conditions could be imposed on the discharger.

The VFAs are miscible with water and are weakly dissociated. They show up as pH values as low as about 4.5 and being so weak are unlikely to present any major problems in terms of corrosion in the sewer network.

There are three options available. Simply ignore low pH values where there is substantial flow in sewer, require the effluent to be neutralised or amend trade waste bylaws to exempt FOGs and grease converters from pH control.

Once the effluent is mixed with the main-stream waste flow there should be sufficient buffer available to

A grease converter in action.

accommodate the discharge from a grease converter.

If neutralisation is to be preferred then the cheapest and safest agent would be sodium carbonate but this introduces more costs, management and maintenance problems.

If an authority has seawater intrusion into the wastewater network, the fatty acids could aid the reduction of sulphate in the seawater to produce hydrogen sulphide which in turn could be oxidised, under aerobic conditions to corrosive sulphuric acid.

Improved grease converter performance

The key to the success of bioaugmentation, at least to the end of the hydrolysis stage of treatment, is the keeping of the organism's lipase mixture in contact with the FOG at all times. This is best done by some form of mechanical mixing but would be impractical in most cases and defeats the purpose of FOG water separation which needs quiescent conditions to be effective.

It is understood that some improvements to tank design have been made over the last year or two and these changes may not be enough to maintain continuous contact between the bioadditives and the FOG. Continuous contact is the key to the success of the process as it has the potential to minimise blockages in wastewater disposal systems.

Commercial entities may need to give further thought to improve the hydrolysis of FOG wastes.

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Alternative uses for bioadditives

Bioadditives have a role to play in the clearing of blocked drains and for general purpose cleaning of sewers and pump station wet wells provided that the intimate contact problems can be overcome. It has recently been noted that 'bioadditive sticks' for kitchen use have come on the market.

Used prudently the bioadditives may minimise the risk of blockages in wastewater treatment systems or as a clean-up tool involving FOG spillages that cannot be dealt with by any other means.

It is suggested that a technical group be set up to further enhance FOGI design and operation as well as bioaugmentation and alternative uses for bioadditives in today's environment where FOG blockages in wastewater systems appear to be on the increase. **WNZ**