

## Section 5 Fats, Oils and Solvents

Fats, oils and solvents are complex molecules containing carbon, hydrogen and oxygen. Occurring frequently in nature, they are classed as hydrocarbons and derive from animal, vegetable and mineral origin. Animal fats are rich in cholesterol and are harder to degrade than vegetable oils that are rich in phytosterols. Hydrocarbons range from small to longer carbon chain length and this is reflected in the ease to which they are degraded. Lower numbers in the carbon chain are readily degraded, while the higher numbers are slowly decomposed (refractory compounds). Under the OECD Guide-line 301 F "Ready Biodegradability: Manometric Respirometry Test", Kerosene degrades by 58.6% over 28 days in an activated sludge inoculum, compared to 84% degradation of rapeseed oil over the same period.

Fats, oils and solvents can have a negative impact on wastewater treatment facilities. They are hydrophobic, floating on water and blocking the air/water interface. Furthermore they exert a high oxygen demand as they decompose and release large amounts of by-products such as volatile fatty acids (VFAs). These are often toxic and can promote *Nocardia* type filamentous growth where plants operate at high levels of mixed liquor suspended solids (MLSS).

Fats can be emulsified through chemical addition and can also be biologically decomposed. Emulsification solubilises these compounds and is therefore used sparingly in pipelines and lift stations. In wastewater treatment facilities, enhancing the biomass with specific lipase producing bacteria is often a worthwhile exercise. In SBR systems and anaerobic systems, the addition of metal salts will bind toxic VFAs.

Polymer addition can also be used in a Dissolved Air Flotation system at the head of a plant to improve fat recovery.

In Grease Retention Units with low levels of oxygen, bacterial treatment can remove >80% of solidified fats, oils and grease (FOG) without significant elevations in FOG discharge levels.

## **Solvents and Petroleum Distillates**

Solvents are usually present in pharmaceutical effluent. They occur when pharmaceutical compounds are dissolved and separated using water and solvents of different specific gravities. After the “active” ingredient is extracted from a solvent, most is recovered through a solvent recovery system (SRS) and the washings and residues (still bottoms) are sent to the effluent treatment plant. From time to time, solvent spills occur and cause shock loadings that can quite easily kill biomass in the wastewater. Alcohols can also exert a high COD loading; 1g of methanol has a COD of 1.5mg. Where spills occur, activated carbon or zeolite can be used to mop it up. To allow the plant to recover, specific hydrocarbon bacteria can be added along with extra nitrogen and phosphorous to obtain a sufficient carbon: nitrogen: phosphorous ratio.