

## ‘Water is the Enemy’ for fuel storage systems



Figure 1: Microbial contamination led to corrosion and blockage of filters at this site 18 months after it opened



Figure 2: Bacterial sludge removed from a tank system as a result of water ingress

Combine two atoms of hydrogen with one atom of oxygen and you have yourself one of the greatest potential sources of cost and exposure for the petroleum industry. Water ingress in fuel storage systems more often than not leads to the growth of microbial bacteria. Too often we have seen the devastating effects of microbial contamination on product quality and tank health. If untreated it can potentially lead to significant equipment replacement costs, damage to brand reputation and/or loss of revenue.

Microbial contamination from water ingress almost always results in the corrosion of the metal parts of tanks and/or dispensing equipment and often leads to sludge in the tank. New tank systems are equally as susceptible as old systems. In actual fact, we have seen a number of new sites experience problematic levels of rust and sludge in their tank systems as a result of microbial contamination in as little as 12-18 months. We have also seen aggressive corrosion in as little as 90 days, where water was allowed to remain in the tank, resulting in the loss of an STP motor to the tank.

If not proactively managed and treated effectively, water ingress can lead to the need for costly replacement of pumps, filters, pipes, dispensers or even whole tank systems. In recent studies and lab experiments, microbial induced corrosion (MIC) on mild steel has been measured as high as 1mm per year, meaning that if left unattended and untreated, a new steel tank could be compromised in less than 7 years depending on wall thickness. Furthermore, rust debris and sludge in tanks and/or dispensing equipment can cause other significant problems such as dispenser filter blocking, malfunctioning pumps and ATGs, slow flow and/or errors with pre-set volume delivery, all of which can result in lost customers and lost revenue. Contaminated fuel has also been linked to reduced life of

engine parts and environmental pollution, creating additional exposure.

Water typically enters tanks via tank vent lines, faulty inlet caps or seals, tank/line integrity issues, tanker deliveries, significant rain events or even condensation inside the tank. Even where a vent cap has a pressure/vacuum valve, moisture enters the tank from the air when the tank's pressure balances due to sales. Microorganisms are usually present in most fuel types and can enter from a number of sources including via the soil or air, through additives, as well as from polluted wash water, contaminated pipelines or from the biofilm present on tank walls. Water however, creates the perfect breeding ground for microbial bacteria to rapidly proliferate. Diesel is particularly susceptible to microbial growth, particularly due to the reduction of allowable sulphur levels in the fuel. Other petrol grades are also at risk, especially with the introduction of ethanol blended grades, which attract a very specific type of bacteria that feeds on ethanol called acetobacteria.

Even in the best-kept tank systems microbial contamination can be a problem, making it especially important to maintain cleanliness, proactively monitor water ingress and quickly and effectively remove water where detected. The most effective way of removing water is to sweep the entire tank floor from multiple access points, not just a single point, and pump it into a holding tank to settle. This way any fuel can be easily removed from the holding tank and returned to the underground tank, meaning complete removal of water and very little loss of fuel.

Following removal of water it is critical to ensure the tank is cleaned of rust, bacterial sludge and foreign matter so that fuel quality is restored and underground assets are preserved. Filtration, conditioning and polishing of fuel further helps to eliminate contamination. Biocides can also play a role in restoring fuel integrity. A program to sample and test for water on a routine basis is highly recommended, with biocide treatments utilised on an 'as needs' basis to help ensure the longevity and health of the tank system.

When it comes to water ingress and microbial contamination, prevention is most definitely the best cure.

VP, Leighton O'Brien US Operations