



Monitoring airport de-icing fluids with the BioTector TOC analyser: Schiphol Airport, Holland.

INTRODUCTION

The de-icing and anti-icing of aircraft and airport runways is required by the Federal Aviation Administration (FAA) to ensure the safety of passengers. However, when performed without discharge controls in place, airport de-icing operations can result in environmental damage. In addition to potential aquatic life and human health impacts from the toxicity of de-icing and anti-icing chemicals, the biodegradation of propylene or ethylene glycol (i.e., the base chemical of de-icing fluid) in surface waters can greatly impact water quality, including significant reduction in dissolved oxygen (DO) levels. Reduced DO levels can ultimately lead to fish kills.

Aircraft de-icing fluids can vary in concentration and composition, depending on the local temperature and weather conditions. These fluids typically contain ethylene or propylene glycol, water and additives that combine to remove accumulated ice and snow from aircraft surfaces. Additives may consist of corrosion inhibitors, flame-retardants, wetting agents, identifying dyes, and foam suppressors. While the glycol concentration can vary from between 30% to 70%, a glycol concentration of 50% is typically used.

To reduce the amount of de-icing fluids used, airport wastewater can be collected and processed to recover and recycle the glycol. Alternatively if no recovery system is in place, or if the concentration of glycol is too low to make recovery economical, the water can be discharged to a treatment plant.

USING THE BIOTECTOR TO AID IN GLYCOL RECOVERY.

The TOC in airport water can vary from under 40mg C/l to over 240,000mgC/l, and this can present a challenge for TOC analysis.

- If the TOC is below 40 mgC/l, it may be possible to discharge the water from the airport without treatment.
- If the TOC is over 40 mgC/l but under 15,000mgC/l, then the water generally has to be treated prior to discharge from the airport.
- If the TOC level is over 15,000mg C/l (and this represents a glycol level of about 0.5%), the water can be sent to a glycol recovery system where the glycol is recovered economically.

The BioTector TOC analyser, by using its three-range capability can be programmed to analyse samples in all these three ranges.

In addition to the large range required, other parameters also have to be considered.

- The analyser should be capable of operating on samples containing salts, particulates and oils without filtration.
- The analyser should have large bore tubes, as samples with a high glycol concentration also have a high viscosity.
- The analyser should not require any specialized maintenance, and should function without maintenance for long periods.

The BioTector TOC analyser was designed and built to meet these challenges:

- The patented 2-stage oxidation method used in the BioTector TOC analyser is not affected by the presence of salts, and can handle particulate matter up to 2mm in diameter. Additionally, it can handle samples with TOC concentrations as high as 240,000mgC/l without damage.
- The BioTector has large bore tubes, typically with an ID of 3.2mm. This allows even high viscosity samples to be successfully transported to the analyser, injected into its reactor and analysed. Tests have shown that samples containing 50% glycol can be sampled from a distance of >5 meters and from a depth of >2 meters is under 2 minutes.
- The BioTector uses its reverse cleaning function to keep its sample lines clean. This is a process where the spent acidic fluid from the reactor is used to clean the sample lines. Additionally, this process eliminates any memory effect in these sample lines induced by rapidly changing TOC concentrations. The BioTector remains on-line all the time, regardless of sample conditions.

Finally, as it is desirable to have the TOC analyser located close to the source of water requiring analysis as possible, a special BioTector model was designed and built which was only 750mm high, allowing it to be installed in almost any location in the airport.



The special low profile BioTector designed for Schiphol airport, the largest airport in Holland, where currently 5 BioTector TOC analysers are installed.