

TOC Monitoring in Airports for Storm Water Runoff and Surface Water Effluent

Problem

Even during normal operations, airports can be sources of major environmental water pollution. Spillage of kerosene or jet fuel, maintenance of aircraft and ground vehicles, exterior washing, and fueling operations can lead to high levels of contaminants in water runoff. In winter, aircraft de-icing chemicals can escalate from 20 mg C/L to 240,000 mg C/L in minutes. It can be a challenge to monitor, control, and treat the industrial water appropriately.

Solution

The Hach® BioTector B7000i Total Organic Carbon (TOC) analyzer is the ideal tool to optimize aircraft de-icing and anti-icing fluid (ADAF) operations, meet environmental regulations, maintain constant discharges, and manage glycol recovery. The BioTector analyzer provides reliable and accurate measurement regardless of weather or sample conditions and can be interfaced with airport networks to provide real-time data.

Benefits

TOC analysis is the most cost-effective, accurate, and timely method for the measurement of organics in water. Hach's reliable TOC monitoring offers operational savings through controlled release of contaminated water to the wastewater treatment plant (WWTP), helps eliminate legislation fines, and optimizes glycol recovery. The Hach BioTector B7000i delivers fast and accurate analysis with minimal maintenance.

Background

Due to the significant number of flights taking off and landing each day, airports have the potential for substantial environmental impact resulting from normal operations. Environmental organizations have strict discharge permits that regulate the TOC, BOD, and COD concentrations that can be discharged during a specific window of time. To comply with the environmental regulations, airports must carefully monitor storm water runoff and surface water effluent to ensure the levels of contaminants are acceptable before releasing the water back into the environment.

Monitoring of stormwater runoff and surface water effluent at airports presents several challenges. Drainage systems are typically located many feet below the surface. Seasonal water levels and contaminant can vary significantly, as can contaminant content, especially during winter when de-icing and anti-icing agents are used.



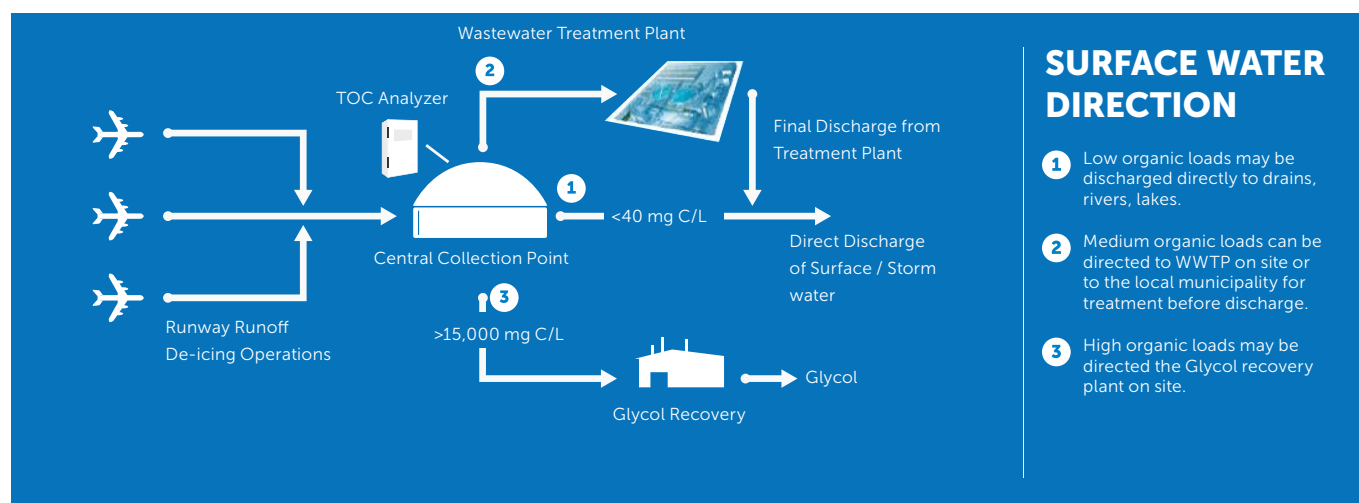
De-icing of an airplane

APPLICATION NOTE: TOC MONITORING IN AIRPORTS

In the winter, de-icing and anti-icing of the aircraft and airport surfaces is necessary to ensure the safety of passengers. However, the aircraft de-icing and anti-icing fluids that are used are harmful to the environment. These include ethylene glycol and propylene glycol, as well as dioxane, formamides, acetaldehyde, and many other additives. During taxiing and take-off, typically between 20% and 40%, and at times as high as 80%, of fluid can be lost during the de-icing and anti-icing process. The runoff of these spent fluids can be difficult to manage, and is the primary source of pollution cited in wintertime permit violations. The snowmelt and stormwater result in run-off water containing high amounts of organic contaminants, which can pollute the groundwater in and around airports.

Airports can employ a variety of methods to manage wastewater, including collecting and processing it to recycle or recover glycol, treating it on site, discharging it to a treatment plant, or using a combination of these methods.

Using a field-proven TOC analyzer to measure TOC, BOD, and COD in storm water run-off, surface water effluent, and during the wastewater treatment process is an effective method to ensure compliance with environmental regulations.



SURFACE WATER DIRECTION

- 1 Low organic loads may be discharged directly to drains, rivers, lakes.
- 2 Medium organic loads can be directed to WWTP on site or to the local municipality for treatment before discharge.
- 3 High organic loads may be directed the Glycol recovery plant on site.

Illustration 1. Airports are replacing their BOD and COD meters with TOC analyzers to help efficiently determine whether surface water can be discharged, or if it must be processed through the wastewater treatment plant or sent to the glycol recovery plant.

TOC Monitoring at Airports

Airports must manage and treat a vast amount of industrial wastewater. This wastewater can include industrial waste, sanitary sewage, storm water runoff, and surface water effluent. In the winter, de-icing and anti-icing processes create additional challenges due to the glycol compound used, as ADAF operations can produce water with a TOC range that varies from less than 20 mg C/L to 240,000 mg C/L within a matter of minutes.

The Hach BioTector TOC analyzer is an effective, reliable water monitoring system. The BioTector TOC analyzer has the ability to provide real-time monitoring, and measurements give reliable and accurate information that can be used to drive operational decisions.

Many airports are replacing their BOD and COD meters with TOC analyzers due to the faster TOC analysis response, coupled with greater accuracy. The Hach BioTector analyzers can provide BOD and COD results after correlation. This correlation has been extensively tested and proven in the field in partnership with a number of large, international airports in the US and EU. The Hach BioTector B7000i analyzers have obtained MCERTS certification confirming reliable and accurate TOC measurements.

Measurement Options

| | TOC | BOD | COD |
|---------------------|------------|--------|---------|
| Analysis Cycle Time | <7 minutes | 5 days | 2 hours |
| Accuracy | ±3% | ±20% | ±5% |
| Correlation | 1 | ~2 | ~3 |

Table 1: TOC is a cost-effective, accurate, and timely test of organics in wastewater. The table illustrates the speed and accuracy associated with measuring TOC when compared to BOD or COD.

Challenges with De-Icing & Anti-Icing Agents

A number of challenges can arise when monitoring the contamination resulting from ADAF. One of these challenges is the variability in total organic carbon levels, which can range from typically 20 mgC/L to 240,000 mgC/L. Hach's BioTector B7000i TOC analyzer (Measuring range: 0 - 20,000 mg/L) measures low levels of organics accurately, and is also able to detect high levels of organic load without problems.

Another challenge is that glycol is a very viscous substance and can stick to the walls of sample tubing on analyzers. This can lead to incorrect measurements that are reading too high or clogging, and this can eventually lead to downtime. False measurements, inadequate responses, or failure due to maintenance could cause the airport to miss their discharge window, an expensive scenario. The Hach BioTector B7000i incorporates a peristaltic pump that can handle high-viscosity samples and can operate with optional samplers where the sample needs to be taken from a certain distance and depth.

The BioTector Solution for Airports

The Hach BioTector TOC analyzers provide reliable and accurate measurement, even in harsh environments and difficult applications. TOC analysis is important for airport applications, because the carbon concentration of the sample stream will determine whether the water is directed to surface water, sent to a wastewater treatment plant, or sent to the glycol recovery plant. The Hach BioTector B7000i analyser for airport applications incorporates three ranges to allow correct measurement of the carbon concentration at the corresponding measuring ranges. The analyzer can signal and switch between low and high analysis ranges automatically without any issues. The analyzer delivers trouble-free sample handling, and performs well on installations where wastewater has a high viscosity and contains glycol, grease, oils, salts, and particulates.

The Hach BioTector B7000i uses a powerful Two-Stage Advanced Oxidation (TSAO) process designed for fast analysis cycle times. All parts of the analyzer that come in contact with the sample are automatically cleaned during every measurement cycle, and without the need for an external cleaning agent. The analyzer measures high and low TOC levels accurately without any carryover issues.

Key Benefits of the Hach BioTector B7000i

- Superior reliability – Typically 99.86% uptime
- High dependability – Unique two-stage advanced oxidation technology handles even the most challenging applications involving oils, greases, salts, sludge, and particulates
- Intelligent design – Self-cleaning technology and oversized tubing eliminates filtration and prevents clogging and sample contamination
- Minimal maintenance – No calibration or service required between the 6-month service interval
- Low cost of ownership – Provides a quick payback with cost savings in waste reduction and optimized processes



The Hach BioTector B7000i offers reliable online TOC monitoring in airports, allowing operators to monitor contamination in storm water runoff and surface water effluent, and to lower overall operating costs.

Conclusion

Airports are under pressure to more efficiently manage industrial wastewater. Using a liquid management system, they must analyse storm water runoff and surface water effluent, to determine whether it is clean enough to be released into the environment, or whether it needs to be processed through a wastewater treatment or glycol recovery plant.

The winter season, with higher levels of rain and snow, brings increased de-icing and anti-icing activity that overloads airport drains and water management systems. Fast, accurate, and online TOC analysis is required to measure fluctuating levels of contaminants in airport wastewater so operations personnel can make faster, better, and more informed decisions regarding where to direct the water.

The Hach BioTector TOC analyzer is an optimum tool to enhance and control ADAF operations, to ensure environmental compliance, and to direct the water to the appropriate channel – whether it is to be released into the environment, or into a water treatment process or to the recovery plant. Online TOC measurement is essential for day-to-day airport operations. The Hach BioTector B7000i is internationally acknowledged to provide reliable and accurate measurements that can be used with confidence.

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