TOC Monitoring for Airport Water Management Across Seasons Requires Versatility & Automation

APPLICATION NOTE

Summary

Application – Monitoring airport water quality is critical for detecting load changes, treating variable loads, diverting heavy streams, and allowing for potential reuse/recycling to meet efficiency and compliance goals

o De-icing runoff management poses a significant challenge to managing contaminants, wastewater, and discharge

o Water management is critical for areas that experience drought and variable rainfall where reclaim is often necessary

Challenges – Water security, discharge compliance, site access, salts, harsh environment, glycol, tire wear

TOC Range – In: 2,000-5,000 mg/L; Out: 5-50 mg/L

TOC-R3 Benefits – Robustness against tough operating conditions, ease of use and low maintenance

1. Wide Range Detector: designed for accuracy & precision in low (0-200 mg/L) & high (200-20,000 mg/L) range

2. Uptime: remote monitoring and rapid leak detection to allow for real-time alerts

3. Low Cost of Ownership: few consumables & minimal reagent ideal for remote locations & contribute to reduced maintenance costs

Background

Airports use, manage, and discharge water throughout their facility. Key factors that determine how the water is treated to comply with discharge permits include location, weather, volume, and contamination level. Some of the biggest challenges that airports face are: (1) managing water that contains deicers and anti-icers used during winter months and (2) reducing/reusing water for cooling in warmer climates. Whether treating onsite or separating industrial from sanitary waste, a constant consideration is how to reduce loading to local municipalities and ultimately the environment. Improved strategies for handling water use at airports can lead to reduction in water use, resilience with regards to risk, and opportunities for potential reuse.

Challenge

Many contamination challenges stem from the activity of deicing/anti-icing aircraft and runways, a process that releases glycol, urea, and acetates. Additional contamination can result from fuel spills or leaks, firefighting foams, and cleaning chemicals. These compounds and their byproducts have known toxic effects on local ecosystems including eutrophication and oxygen depletion. Therefore, airports are increasing their efforts to monitor and control discharge of these contaminants. Since these compounds are also all organic, total organic carbon (TOC) monitoring offers an effective and efficient way to manage these concerns.

Many airports must comply with regulations which are often written to meet BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) limits. When compared to BOD (which takes five days to complete) and COD (which takes two hours to complete but uses toxic chemicals), monitoring TOC is the preferred method because it is a fast and direct method of tracking organic contamination in real time without the use of hazardous chemicals.

Figure 1: Airplane de-icing at night

An additional challenge airports face related to water monitoring is identifying where, what, and how often airport runoff needs to be measured – and then ensuring the monitoring program can efficiently handle these needs. Generally, high-risk locations are priority for monitoring, but any discharge into a waterway or surrounding groundwater also needs to be monitored for compliance. The treatment of airport runoff could include separation and glycol recovery, preliminary treatment like biological reduction of organics, and/or onsite treatment. Some areas experiencing water stress need to expand onsite treatment to provide water for reuse. Many airports with monitoring programs have shown that real-time instrumentation offers a significant reduction in treatment costs, discharge pollutants and associated penalties. Methods such as BOD and COD do not provide the necessary speed and efficiency to support quick decision making. With real-time monitoring, contamination can be tracked effectively, and decisions can be made using data that drives efficiency of treatment.

Figure 2: Workers cleaning airport truck

Solution

Monitoring organics in real-time using online TOC analyzers has shown significant value for airports across the globe. An instrument that can meet the needs of this industry must be robust, reliable, and responsive. The Sievers* TOC-R3 utilizes simple and effective high temperature, catalyst-free combustion that provides greater uptime, flexibility, and automation. To be effective for these monitoring applications, the analyzer must first be able to establish a consistent baseline in the low range of detection for normal runoff, fuels, and discharge concentrations. Second, it must be able to rapidly detect a sharp change into the high range of detection to separate, divert, or treat the significant variation in contamination. In cases where the loading is high, the TOC-R3 can dilute the sample and use automated rinsing to clean the system. The TOC-R3 measures organics traditionally with NPOC (Non Purgeable Organic Carbon) or TOC modes and can monitor VOC (Volatile Organic Carbon) for cooling or TN (Total Nitrogen) for discharge.

Conclusion

Airports need to find more efficient and effective ways to use, manage, and discharge water. They face challenges with weather events, increased regulation, and greater demand for both reduction and reuse of water. Monitoring runoff allows for smarter diversion, separation, and proper treatment to discharge safely to the environment. Real-time organics monitoring captures the contaminants of concern including glycols, urea, and other chemicals associated with deicing/anti-icing, cleaning, and firefighting. Using a proper instrument with robust oxidation, reliable operation, and responsive data, airports can improve water management to achieve higher efficiency, sustainability, and compliance.

Figure 3: Sievers TOC-R3 Online TOC Analyzer

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