# Continuous Spectral Absorption Coefficient (SAC) and Total Organic Carbon (TOC) measurement of airport wastewater

**Advantages**

- **Improved prevention of surface water pollution by means of continuous monitoring of wastewater during winter operation**
- **Cost reduction due to targeted feed of polluted wastewater to the treatment plant**
- **Continuous documentation at the transfer points to the treatment plant and the receiving water body**

**UVAS sc Sensor**


**astroTOC™ UV TOC Analyzer**

*Strict requirements are placed on the drainage system in an airport particularly for winter operations. Runways, taxiways and aprons must be kept clear of snow and ice to ensure smooth flight operations. At low temperatures the wings of the aircraft are also sprayed with agents that prevent the formations of ice. The substances used are acetates for de-icing runways and glycols for de-icing the aircraft.*

*From a water pollution prevention standpoint, these agents must not be added to water in high concentrations; however they can be completely broken down in a treatment plant. For this reason, an advanced drainage system with a suitable pollution loading measurement is a prerequisite for addressing increasingly severe environmental requirements.*

## Background

Surface water pollution on airport land is caused by two factors:

- *De-icing of aircraft wings and taxiways*
- *Kerosene or oil spillage*

If the surface water is polluted, an alarm is triggered and the sluices in the drainage system are set so the water does not enter the receiving water body. In both cases the related alarm is triggered manually, as the winter team requests de-icing and the fire department is alerted of a kerosene spill.

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## Characterizing the wastewater using summing parameters

The pollution of the wastewater is normally described using summing parameters such as the Chemical Oxygen Demand (COD) the Biological Oxygen Demand over 5 days ($BOD_5$), the Total Organic Carbon (TOC) or the Spectral Absorption Coefficients (SAC).

SAC is a measurement of dissolved organics using UV absorbance, compensated for solids and turbidity. Experience shows that the parameters behave similarly such that correlations between the individual summing parameters can be determined for specific wastewater.

The graphic in Figure 1 shows the pollution curve for the wastewater from an airport in Europe in February, measured by the laboratory analysis of the COD (collected sample) and as continuous UV absorption.

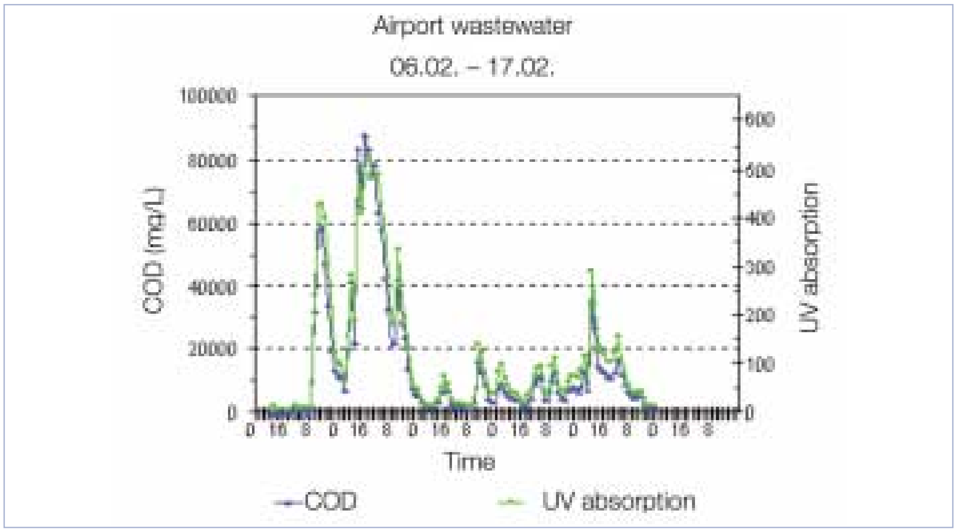


*Fig. 1 shows the pollution curve for the wastewater from a European airport in a winter month.*

## Objective of the drainage

To avoid unnecessary pollution of the surrounding water, it is necessary to collect the wastewater mixed with de-icing agents in a collecting tank and to feed it to a treatment plant.

A mixture of unpolluted and polluted surface water must be prevented. Polluted water is only allowed to be sent to the treatment plant at the rate that the plant can process the waste. The disposal of unpolluted water causes unnecessary costs for the airport.

## Drainage system model

A complex drainage system with sluices is required for draining areas with differing levels of pollution separately.

The Cologne Bonn Airport uses the drainage system in Figure 2. This airport is divided into four drainage areas and two plant areas. The water is fed directly to the receiving water body or the municipal treatment plant and comes from the following drainage areas: apron, two take-off and landing runways, and paved areas around the terminals. The plant areas I and II are responsible for the actual drainage.

In plant area I, the four drainage areas and a large fuel separator, precautions are taken to prevent the feed of the polluted wastewater to the receiving water body in case of a surge in pollution. Two measuring stations each include a UV absorption measurement performed with the Hach UVAS sc Sensor,

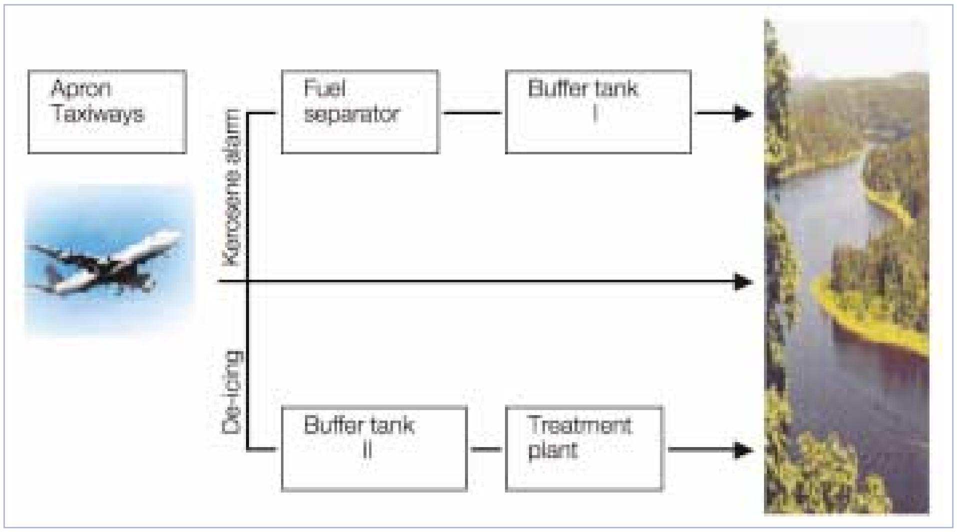


*Figure 2: Drainage scheme at Cologne Bonn Airport*

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a conductivity measurement, and a flow measurement. If aircraft or paved areas are de-iced, the winter team triggers an alarm that results in the sluices in the drainage system being set to feed the wastewater to the buffer tank.

Only when a previously defined amount of water has flowed through the drain and the UV absorption measurement and the conductivity measurement are below a set point, are the sluices automatically reset such that the unpolluted water is fed to the receiving water body again. This process ensures that there is no de-icing agent left on the paved areas.

In the case of a kerosene or oil spill, after the fire department has triggered an alarm, the water is fed through a large fuel separator. Once the water has been freed of kerosene and oil has passed through buffer tank I, it is fed to the receiving water body. For safety, the TOC of the water is also measured.

Plant area II is comprised of buffer tanks I and II. When the winter team has triggered the alarm because the wastewater has been polluted with the de-icing agent, the sluices are set so that everything is fed to the large buffer tank II. Buffer tank II is used for the intermediate storage of the wastewater. Large amounts of airport wastewater cannot be sent to the municipal treatment plant for capacity reasons, so the polluted wastewater is sent in batches from the tank to the treatment plant.

If an alarm is not triggered, the water flows into the receiving water body before buffer tank II. The TOC is also measured at this transition point.

## Conclusion

This drainage concept ensures that polluted wastewater does not re-enter the receiving water body, and that the water body is protected. Only the wastewater contaminated with de-icing agent is fed to the treatment plant for clarification, saving the airport a significant amount of money. The volume of wastewater is minimized, reducing the charges for wastewater disposal.

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