

ChemScan[®]

PROCESS ANALYZERS

©2002, Applied Spectrometry Associates, Inc.

www.chemscan.com

ChemScan[®] Application Summary #53 Aircraft Deicing Fluid (Glycol) Analysis

Synopsis of Issue

Airport operations are caught in a dilemma. FAA regulations require application of strict de-icing and anti-icing procedures during cold weather. Only ethylene or propylene type glycol products certified by the SAE and approved by the FAA may be used. In addition, airports affected by snow or freezing rain also practice runway de-icing and anti-icing, typically using ethylene glycol and urea solutions. While these products are effective for de-icing and anti-icing, they can produce tremendous environmental problems.

The BOD₅ concentrations of de-icing solutions range from 400,000 mg/l to over 1,000,000 mg/l. According to a recent article appearing in Water Environment & Technology magazine, the de-icing fluid volume required to de-ice one typical large passenger jet is equivalent to the daily domestic wastewater generated by 5000 people.

Airport runoff containing significant concentrations of de-icing fluids cannot be discharged directly into the environment and can easily overwhelm treatment plant capacity if discharged into sanitary sewers.

Some airports have responded to this challenge by installing special collection and storage systems (tanks or ponds) to contain glycol contaminated runoff collected from de-icing pads and runway drainage systems. These airports either attempt some form of recycling/reuse or discharge collected de-icing fluids slowly during warmer weather. In either case, glycol concentration into and from the storage system can vary depending on the exact products used, product viscosity, dilution factors related to weather conditions and other chemicals in the runoff (melted snow, rain water, fuel, urea, etc.).

ChemScan Application

The ChemScan Process Analyzer can be used to measure the concentration of ethylene glycol, propylene glycol or combinations of the two in contaminated runoff water that also contains a mixture of other typical airport surface contaminants. See Figures 1 and 2 for ultraviolet absorbance signatures of several dilute concentrations of de-icing products.

Once calibrated, the ChemScan system can provide regular automatic monitoring of de-icing fluid concentration in the intake to storage facilities and in the effluent from

storage or recycling facilities in order to regulate discharge rates or to verify recycle product concentration.

A manifold system is available to accommodate multiple sample points. The manifold can be easily reprogrammed to accommodate seasonal operations, or the entire ChemScan system can be taken off line for a period of time and returned to service without the need to recalibrate the system. Automatic zeroing and cleaning options can provide stable on-line results with minimal maintenance attention.

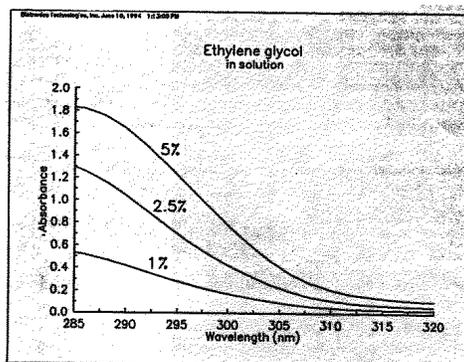


Figure 1

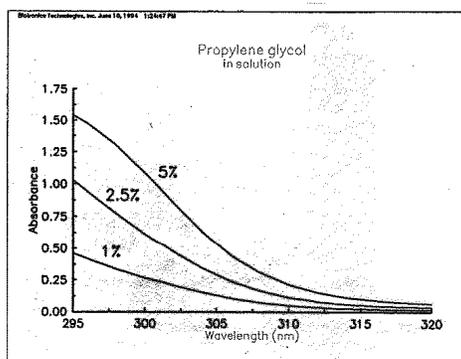


Figure 2

ChemScan Process Analyzers can accommodate samples with up to 150 mg/l or total suspended solids and turbidity of up to 60 NTU. Samples that contain debris capable of plugging samples lines or that contain high solids and turbidity may require screening, settling or filtration prior to analysis. Ultrafiltration is not required.

System requirements are as follows:

1. Sample pump (or pressurized line) for each sample point.
 - a. 10 to 40 l/min, continuous duty, suitable for high solids if filtration is required. The majority of flow through the filter may be returned to process or drained to waste. Pump selection is a function of sample characteristics and distance from the sample point to the filter.
 - b. 1 to 5 l/min intermittent duty if filtration is not required. 0.5 l/min if a filtered sample must be pumped to the analyzer.
2. Roughing Filter for each high solids/turbidity sample point. The filter must produce a representative sample with less than 150 ppm solids and NTU of less than 60.
3. Manifold System for management of multiple sample lines. A manifold is required if more than one sample point is being monitored.
4. Automatic Zeroing and Cleaning Option. Zeroing of the instrument and chemical cleaning of the flow cell windows can be initiated manually but we recommend an automatic system for maximum reliability and minimum maintenance attention. Deionized water is used for zeroing and a 5 to 20% acid solution is used for chemical cleaning.
5. ChemScan Process Analyzer. The analyzer is capable of performing glycol analysis using pattern recognition algorithms built from 30 or more site specific calibration samples.