

TECHNICAL UPDATE - TU-6019

SUBJECT: Fluoropolymer Tubing for Low Level Analyzer Applications

The analyzer industry has long been aware of issues regarding the use of fluoropolymer tubing in analyzer applications when analate levels are in the low ppm range.

Dekoron / Unitherm co-authored a paper at the Air & Waste Management Conference in 1994 reporting on permeation and adsorption problems in fluoropolymer tubing when used in low ppm monitoring applications. The report was aimed at monitoring problems in the new (at that time) low NOx burners, but is also relevant to the current problems seen with mercury monitoring systems.

NOx systems can easily solve the problem by switching to stainless steel sample lines, but the corrosive effects of the sample gas on stainless steel makes this option less viable for mercury monitors.

It appears from recent studies that some of the problems with fluoropolymer tubing may be linked to our efforts to keep the ID of the tubing clean during extrusion of the tube and fabrication of the bundle.

Currently, tubing is capped when extruded to prevent foreign contamination. This prevents the release of any gasses formed while the fluoropolymer was molten. These gasses then cool and are deposited on the inner walls of the tube, or absorbed back into the tubing.

We keep the tubing capped through shipment, storage, and fabrication. We typically open and pressurize the tube briefly during inspection, then cap it again.

When the tubing bundle is installed and heated, the deposits vaporize and mix with any sample gasses. If there is moisture present, the vaporized deposit can go into solution causing fouling.

Two methods for countering this problem have been gaining acceptance by our customers. One uses new tubing materials, the other a treatment of existing tubing. Ultrapure PFA tubing is used widely in the medical field and for semiconductor fabrication applications. This material does not appear to have the issue with deposits seen with standard PFA tubing. This may be due to the difference in the PFA compounds or the manufacturing method, or both.

Ultrapure PFA tubing is readily available in the sizes and lengths typically used in analyzers. It is, however, more expensive than the standard PFA.

Another method that has shown some success is to pretreat and clean standard PFA tubing. In this method, the tubing is heated above 185°C. A clean gas is drawn through the tube to remove any vapors that are generated. The tubing is then cooled and cleaned as if it was to be used for oxygen service.

This process is less expensive than using Ultrapure PFA, but does increase lead times. It should be noted that Dekoron / Unitherm does not approve or recommend either method, nor do we have test data showing the relative benefits of either solution. Dekoron / Unitherm has heard reports of success using both methods. It is the responsibility of the customer to determine which method, if either, will work in their application.