

**TECHNICAL UPDATE - TU-5013**

**SUBJECT: Cleaning Plugged Sample Lines on Dekoron Unitherm Analyzer Umbilical Bundles**

From time to time the samples lines in analyzer umbilical bundles may become plugged with ash, sediment, dirt or flue solids, causing a shut down of the analyzer system. The following is a discussion of possible cleaning methods to be used with Dekoron Unitherm analyzer umbilical bundles.

We discuss several methods that may be used in different applications. It is the responsibility of the end user to determine if any of these methods can be used safely in this application. Dekoron Unitherm provides these only as suggestions and assumes no responsibility for any damage to the umbilical bundle or surrounding equipment from properly or improperly following these methods.

The end user must be certain to follow all local safety rules and regulations regarding use of pressurized lines, solvents, fluid handling and drainage, personnel protection, and any other local, state or national code or regulation that may be involved in the following procedures.

Blockage in sample lines usually takes one of two forms, either a total blockage due to loss of probe heater, inadequate or missing probe filter, unusually high moisture content in the flue stream, and similar problems, or a partial blockage due to any of the previous and high sample dew point or high solids content. We will list possible solutions to both cases below.

### **Full Blockage**

Sample lines will generally collect solids and ash at any bend. The tighter the bend, the more apt for a block to form. If the block is not too tight, it can be blown clear with shop air. For this procedure, de-energize the bundle and disconnect the sample lines at both ends. Connect the sample line to a source of clean, dry air, nitrogen, or other inert gas.

Secure the discharge end so that any solids will not create a hazard and the end of the tube will not whip around. A good practice is to have the tube discharge into a clean container or bucket with a cloth cover or into a cloth bag. This will allow you to collect any particulates or solids for later study. Care should be taken that the pressure used does not exceed the safe working pressure of the sample line tubing. The maximum working pressure allowed depends upon the tubing size, material and temperature. PFA sample lines have a maximum working pressure around 200 PSIG at room temperature, falling to 40 PSIG at a tube temperature of 400°F. FEP sample lines start at 150 PSIG at room temperature and fall of to 30 PSIG at their maximum temperature of 300°F. If you have any doubt on the composition of the tube, contact your Dekoron Unitherm representative.

If the block clears, move on to the next section.

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If not, check for the block in the first bend coming out of probe. This can be done visually or with the help of a stiff wire or electrician's snake. Take care not to jam the wire or snake into the inner wall of the tube. If the blockage is in the first bend, it can generally be cleared with the help of the stiff wire or by flexing the bundle to break up the plug. It can then be blown clear.

If the blockage is not in the first bend, check the other bends in the probe area. Be sure to check the bend where the bundle is routed down the stack. This bend is generally tight, and the sharp drop in temperature from the probe area to ambient makes it prime area for tube blockage. Flexing the bundle in this area may help to break up or loosen a blockage, which can then be cleared out.

Sometimes the blockage is so heavy or thick that it cannot be removed mechanically, and must be moved chemically. The fluropolymer tubes used in Dekoron Unitherm bundles are resistant to all but the strong acids and bases. Typical cleaning compounds and mild acids should have no effect on the tubing material. The end user may have the best idea of the type and strength of chemical needed to dissolve the blockage. Again, care must be taken to follow all safety rules for the chemicals being used. **Dekoron Unitherm does not recommend pressurizing a line filled with cleaning compound.** A list of chemicals used successfully by end users in the past includes: household detergent in water, Alconox and Liqui-Nox cleaning compounds, chlorinated solvents, tap water, safety solvents, mild acid solutions, and mild base solutions. Each compound was successful for that particular application, but may not be useful in all instances. The end user must also insure that the chemical is completely removed after the cleaning process. Any trace chemical left in the tube may damage delicate analyzer equipment or skew the readings. Once the chemical dissolves the blockage, we recommend flushing the line with de-ionized water, then blowing the line dry with dry nitrogen.

**Steam lances and steam cleaning are not recommended for sample lines.** Steam lines generally exceed the pressure rating of the fluoropolymer tubes for the temperature of the steam. For example, a 50 PSIG steam line operates at a temperature of about 300°F. The pressure rating of the sample lines used in Dekoron Unitherm bundles is less than 50 PSIG at 300°F.

### **Partial Blockage**

Partial blockage of sample lines is evidenced by a drop in sample flow rate with an increase in sample vacuum. This may not be an immediate problem, but can result in degradation of readings and premature failure of the sample pump. Partial blockage can generally be cleared by blowing down the sample line. As before, care must be taken to insure the safety of those involved in the procedure and insure that the equipment and sample line is not damaged. Use the procedure outlined under full blockage above.

Occasionally, the end user would like to remove liquid residue and trace chemicals from the sample line. This can be accomplished with a chemical wash-down. As with a blockage, a number of different solutions and chemicals have been successful in past applications. It is the responsibility of the end user to determine what chemicals meet the needs of his particular unit.

One method used for a wash-down is to remove the sample line from the analyzer and fit it with a valve or cap. A shut off valve is recommended for any caustic or corrosive material. The sample line is de-energized and allowed to cool. Then the sample tube is filled with the cleaning solution from the probe end. The sample line volume is about 1 quart per 100 feet of line for a 3/8"OD x .062" wall tube and about 1 pint per 100 feet for a 1/4"OD x .040" wall tube. The cleaning solution is allowed to sit in the tube for about 1 hour, then drained into a proper receptacle at the analyzer end. This may be repeated to provide better cleaning.

After completing the cleaning wash, the tube should be flushed with de-ionized water and blown dry with dry nitrogen.

Safety cannot be overstressed in these procedures. Personnel protection is a must when handling cleaning chemicals. Safety glasses or goggles will probably be required by the local authority. Gloves and aprons may also be required, depending on the cleaning chemicals used. All safety precautions listed on the cleaning solution must be followed, and the solution must be disposed of properly. If there is any question on the use of any chemical for this application, the final word lies with the end user and the plant or local safety authority.