Best Practices: Right Way / Wrong Way

To ensure reliable analyzer performance sample transport lines require thought and the implementation of some key practices as described below:

Sealing of Insulation: The most important installation practice for a preinsulated tubing or any insulation is to insure that the insulation is dry. Wet insulation acts as a conductor, drawing heat from the source to condense into moisture. Instead of keeping heat in the tube it is actually conducting it away from the tube causing potential "cold spots" which can drop below the desired dew point. Moisture in the insulation will also allow for "leaching" of chlorides, which causes stress cracking of stainless steel tubing. The ends of the tubing bundle are particularly vulnerable. The use of heat shrink boots is recommend for sealing both ends.

Routing of Tubing: Sample transport tubing should be a continuous run from the sample take off point to the analyzer in order to eliminate any joints/fittings that will create "collection points" of samples thus deteriorating true sample flow/composition.

When series electric heaters such as MI cable are used as heating source it is important that the exact length of run be determined before installation to eliminate excess bundle being coiled. If the length is too short the sample point/analyzer will have to be moved closer together.

When bending the tubing bundle it is important to not exceed the manufacturer's red stated limit. O'Brien Analytical TRACEPAK® has a unique design which allows for an 8" (203mm) bending radius. This should not be automatically assumed for other manufactures or you may kink the process tubing.

Support of Tubing: Tubing bundle should be supported to eliminate sag in the installation – every 6ft (1.8m) on horizontal runs and 15ft (4.5m) on vertical runs. Make sure that the supports do not compress the outer jacket as this will create cold spots in the bundle and could cause damage to the jacket and/or heat tracer. When supporting tubing bundle in a cable tray, care should be taken to keep bundles from touching each other. The gaps will provide for thermal expansion and heat dissipation.

Tube Selection: Selection of appropriate process wetted tubing is important to insure reliable and accurate analyzer performance. Use of electropolished tubing is recommended for moisture applications. Teflon tubing may be acceptable for some process analyzers where sample permeation and/or CO migration will not be a problem. 316L SS is the most commonly used tubing but selection will be dependent on metallurgical compatibility. Seamless tubing should be selected whenever possible to eliminate the accelerated corrosion activity around the "heat effected zone" of the weld. In some cases the use of a fused silica lined SS tube will be recommended. Corrosion resistance, cleanliness and other environmental conditions are criteria to be considered for tube selection (see Tube Selection insert).

When electing to use steam heat consideration should be given to using a 1/2" (13mm) tracer size as reduced pressure drop of steam will allow for longer single runs of tubing without need for "trapping stations". The application of 1/2" (13mm) tracer with 50 psi steam will maintain 100°F (38°C) (13mm) dew point for 300' (91m) compared to 90' (27m) if 1/4" (6mm) tube is used.

Tube Preparation: Tubing should be cut and deburred to ensure that an appropriate connector fitting can be applied. Tubing should be cleaned of particulate and/or other contaminants before sampling begins. TC (thermocouple cleaned) or CFOS (clean for oxygen service) should be considered. Insure that when insulation is cut back for tube-end preparation that reinsulation is applied to eliminate cold spots. It has been documented that a gas sample can lose 100°F (38°C) in 1" length exposed tubing.

Jacketing: Most commonly used weatherproofing jackets are PVC (Polyvinyl Chloride) and TPU (Thermoplastic Urethane). While PVC is most prevalent, care should be taken with installation at temperatures below -10°F (-23°C) the compound becomes brittle and while difficult to bend, is also more likely to crack which will allow for water ingress.

In some cases the use of colors for the jacket will enhance line identification. Markings on the bundle should always be considered to insure appropriate line recognition.

Heater Selection: Use of Zone heaters requires that nodes be properly identified and connections be made to insure continuous heater sections. A "cold zone" can allow for condensation to form. Series heaters cannot be cut but must be installed in one continuous length. Exact measurements are required when selecting this heating mode. Self regulating heaters are limited on high temperature output and the resulting dew point that can be maintained. Total system requirements should be considered before making heater selection.

O'Brien Analytical is the recognized industry leader in best practices for proper stack gas, process, and sample conditioning connections: instrument enclosures and explosion-proof heater sizing, circuit length design, temperature control as well as terminations, weatherproofing and power supply are all areas where O'Brien provides the total solution.

When series heater MI cable is used as heating source it is important that the exact length of run be determined beforehand to eliminate excess bundle being coiled.

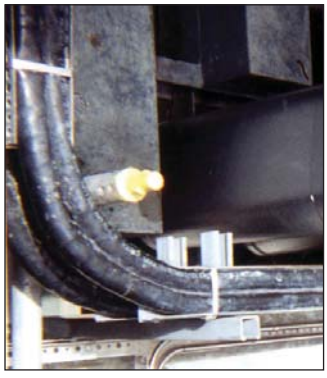
The ends of bundles should be sealed to prevent moisture from causing chloride stress corrosion of the stainless steel tubes.

The ends of the tubing bundle are particularly vulnerable. Ends should be sealed to prevent moisture from causing chloride stress corrosion of the stainless steel tubes.The use of heat shrink boots are recommended.

Best Practices: Right Way / Wrong Way

Wrong Way:

✗ Leaving several inches of tubing exposed at the end of a tubing bundle leaves the entire system open to freezing. Stainless steel tubing can lose more than 100°F (38°C) per inch if not insulated and traced.



✗ When supporting tubing bundle in a cable tray, care should be taken to keep bundles from touching each other. Supports and hangers must have a large surface area and be designed so they can not be overtightened to crush the tubing bundle.

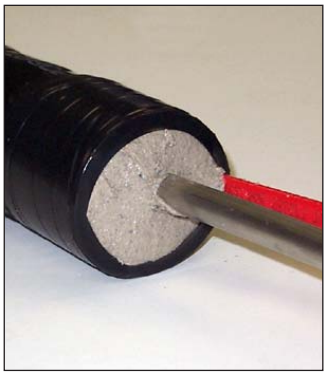
✗ Unsealed bundle ends, splices and terminations allow moisture to be absorbed by the insulation. Wet insulation degrades the bundle two ways: by reducing the insulating properties and secondly by releasing water soluble chlorides which may contribute to chloride stress corrosion of stainless steel process tubes.

✗ When using MI heater cable or other heaters that cannot be cut to length accurate measurements of the sample line length are critical. Sample bundle must be installed so that there is a continuous slope toward the sample system.

Right Way:

✓ Bringing the insulated tubing bundle in to the cabinet through a weatherproof entry seal to maintain the integrity of insulation and heating in tubing bundles.

✓ O'Brien's TRACEPAK® has a unique design which allows for an 8" (203mm) bending radius.



✓ Weatherproof seals must be installed at each end of the tubing bundle. Select the end seal kit designed for the maximum exposure temperature.

✓ Use a cut-to-length heater whenever possible. This improves the chances of having a successful installation. The actual length is determined during installation and cut from long continuous reels to minimize scrap.

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