

**TECHNICAL UPDATE - TU-9003**

**SUBJECT: Orbital welds in seamless or welded stainless steel tubing used in Dekoron Unitherm Bundles**

Seamless and welded metal tubing is manufactured in various lengths based upon the material, the method of production and the typical use.

For example, a seamless or welded Type 316 stainless steel tube manufactured to ASTM A-269 may be available in coil lengths from 350 feet ( 107 meters) to 1000 feet ( 305 meters), depending upon the manufacturer. A tube produced from alloy C-276 manufactured to ASTM B-622 may only be available in 17-24 foot ( 5-7 meter) straight lengths.

One method used to create longer continuous lengths when needed by the application is to join the tubes using a technique called orbital welding.

Orbital welding techniques are similar to those used to produce welded tubing. The tubing is cut off square and flat for proper welding. The weld is performed in single or multiple passes using an electric arc welder in an inert atmosphere. The tube can then be drawn to size and annealed, or spooled for shipment.

Orbital welding methods and equipment have improved considerably in the past few years. But, there are still some concerns regarding the use of this technique in traced tubing bundles. The major concerns include: changes in material structure or chemistry due to the welding; corrosion at the weld site; and quality control of the weld.

Changes in the structure or chemistry of the tubing material at the weld site can occur due to the high temperatures used in welding and the variations in the tube material and the welding process. These changes can lead to loss of strength or ductility in the weld zone. The change in structure can also lead to corrosion in the weld area.

Pitting corrosion or stress corrosion cracking in austenitic stainless steels can be accelerated due to stresses created by the welding process. The preferential attack in the weld zone of properly welded stainless steel tubing has been well documented. If orbital welding is performed as a final operation, the welding stress is not relieved by an annealing operation, and will remain in the tube. This would increase the chances for corrosion in the weld. By far the most concern for this process, however, is in the overall control and inspection of the weld.

Existing inspection techniques may or may not detect an improper weld. Hydrostatic tests may be performed at a pressure low enough that the weld will pass, yet fail in operation. Most other tests cannot be performed on the weld without destroying the tube. An improper weld may leave a crack or lip on the ID of the tube that cannot be detected by normal means. We have seen instances in the past year where improper welds were shipped to the end customer. In one case, the weld was only 50% of the tube wall thickness around the entire circumference of the tube.

There is an additional factor that would affect tubing used for analyzer applications. The orbital welding technique creates a small ridge on the tube ID. This ridge can trap particulates and moisture in the gas stream, creating problems with the analysis.

Because of these concerns, Unitherm does not allow orbital welds in any tubing used in our Preinsulated and Traced Tubing Bundles.

We will continue to evaluate this technique as it improves. If it rises to the level we feel suitable for our applications, we will at that time look at incorporating it.