

## **THE TROUBLE WITH TUBING FITTINGS**

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September 2006

Over the years, there have been many industrial mishaps due to inadequate design, poor operating procedures, lack of timely inspection, and untrained maintenance personnel.

One of my pet peeves has been small-bore piping. Here are some examples of the things that I have seen when working on job sites.

### **“Near Miss” with H<sub>2</sub>S**

In the Bay Area, several process plants that operate well above 1500 PSIG. At one of these installations, the High Pressure Separator interface level transmitter (displacer type) was not functioning. A second transmitter (differential pressure type) was installed. The new transmitter was connected directly into the process using ½” 316 tubing (heavy wall) and compression fittings.

When the process isolation valves were unblocked and the transmitter was activated, I saw the maintenance mechanic place a wrench on the nut of the compression fitting. Realizing the danger of a leak of either the H<sub>2</sub>S rich liquid or the high-pressure hydrocarbon contents, I stopped him. After retreating to a “safe” area, I asked the mechanic what he intended to do and what training he had received. Obviously, this mechanic lacked the understanding of how much danger both of us were in.

When checking the original level displacer, we found a piece of wire blocking the torque tube movement. This was the work of the same mechanic.

### **Missing Ferrule**

On a multi-pass crude furnace, it was desired to balance the passes and measure each individual pass flowrate. Each pass was equipped with a new orifice plate and differential pressure transmitter. The orifice flanges were fitted with isolation valves, with the impulse lines being stainless tubing with compression fittings.

During start-up, a loose tubing fitting caused a fire at the furnace and the plant had to be shut down. The cause of the leak was traced to a poorly made-up compression fitting. One of the ferrules (two ferrule system) was missing. The assembler must have stubbed-in the tubing and tightened the fitting.

The skill of the tubing fitters should have been checked before being allowed to perform this work. After the fittings were made-up, they should have been disassembled and inspected. A flaw in the fitting would have been discovered at that time.

## **Air Tubing Leak**

An Air Operated Valve (AOV) was modified with an external solenoid valve. New air supply lines were installed using ¼” plastic tubing and “stub-in” type fittings. After several months in operation, the AOV failed to cycle. The process could not be run resulting in lost revenue.

The problem was traced to a tubing fitting that failed to grab the ¼” plastic tube. The air tubing is inserted into the fitting and the fitting holds the tube. Removal of the tubing requires depressing a plastic retainer into the fitting.

On the failed fitting, the retainer was missing and the tube was held in by friction only. A simple tug test by the installer would have prevented this failure.

## **Miscellaneous**

There are too many cases (to list) of equipment substitution in the field. With tubing fittings, missing ferrules are common, use of a wrong metallurgy (i.e. brass or steel) happens, followed closely by incorrect assembly procedure. In high-pressure applications, the uses of thread sealer in contrast to thread lubricant are common issues. Stainless Steel threaded surfaces can gall when assembled. Once galled, obtaining a good seal is difficult.

## **Conclusion**

There are many safeguards utilized in the construction of industrial pressure vessels and piping. Design review and proper selection of equipment and materials are critical. The “Instrument Spec” covers installation details past the “first” isolation valve. In addition, the trained mechanic and use of appropriate inspection methods can minimize risks of process leaks and equipment failure.