

System integrators, end users or OEM, generally use stainless steel tubing to interconnect various part of a GC system. From sample and carrier inlet through column, valves, flow or pressure regulator and finally detector. Tubing is omnipresent. Tubing are, obviously connect to fitting.

Everybody recognize the importance of high quality tubing. Special coating is also available to inert the internal surface of the tube. The inner surfaces of tubing reduce analyte absorption and peak tailing. A lot of energy is spent to achieve this high level of chemical inactivity. Polishing could also be done to improve inner surface finish, improving purging time and coating effectiveness. On the other side of the tubing, i.e. the outside diameter great deal of attention is spent to avoid longitudinal scratch or surface porosity.

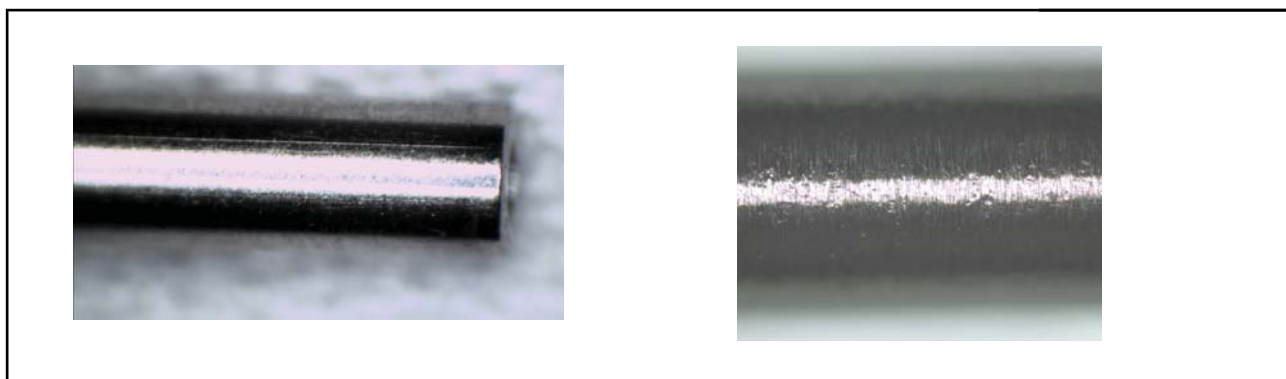


Figure 1

Figure 1, show the obvious problem cause by such imperfection on the outside surface of tubing.

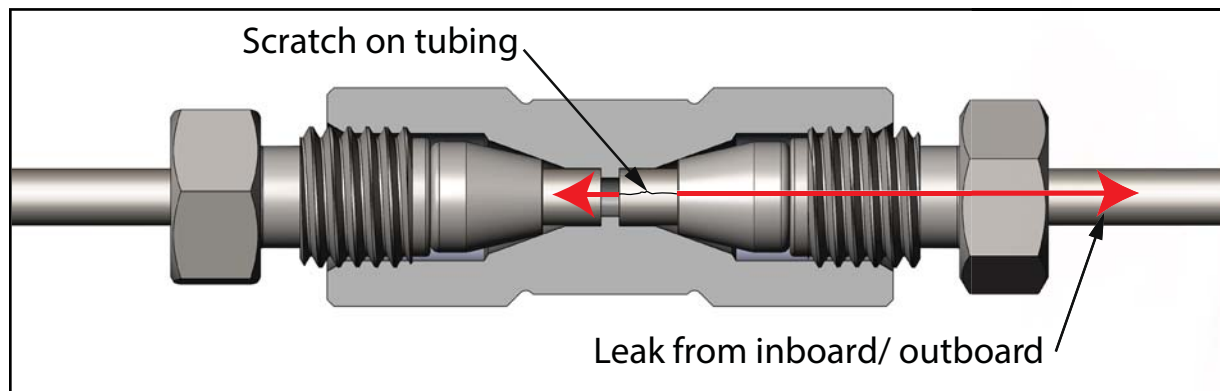


Figure 2

Leak, i.e. outboard or inboard will occur through the path provide by these imperfection, show in figure 2. In all interconnection between fitting, valves, detector and column there is tubing involve. Tubing are most of the time connect to an interface with

the help of a ferrules and nuts. If not, tube welding is required.

In all case, the tubing is a part of the fitting connection system, whatever is the fitting type or model.

While everybody agree on the importance of the degree of cleaning, inertness of tubing and the absolute necessity to have leak proof connection through fitting and add to this, the prime importance to work with GC valves that as no cross port leak, it is paradoxal to realize that, very little is done to maintain the high level of integrity upon system assembly.

Indeed, for cost consideration many integrators use mechanical means to cut their tubing to the desired length. Using mechanical means to cut tube of 1/32", 1/16" or 1/8" O.D. will invariably lead to a valve failure or at the minimum reduce system performance.

As a valve and fitting manufacturer, we can confirm that valves that fail before their specified number of actuation under a define operating parameters, fail because particles contamination, that come from bad tubing manipulation. Of course we assume the use of particles filter, on various gas inlets and column end connections.

Fitting union that doesn't seal when specify nut rotation torque is use, don't seal because of damage tube surface finish.

Furthermore , cutting tube mechanically are the cause of dead volume inside a fitting union, show in Figure 3. The following figures will show what are the most common mechanical cutting procedures we have encounter by visiting customers or responding to customer calls.

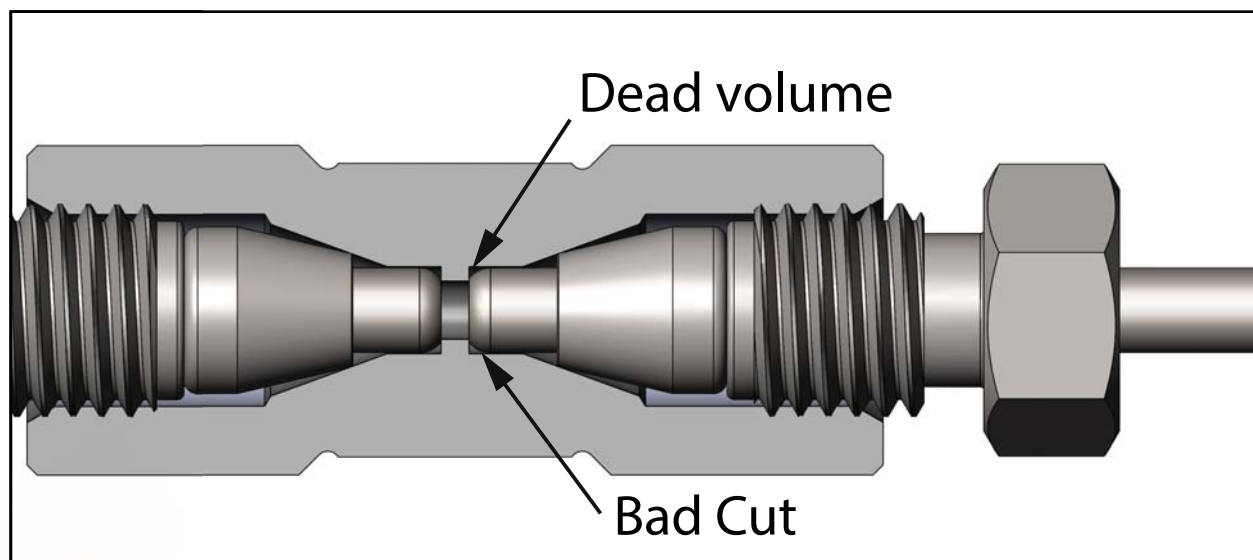


Figure 3

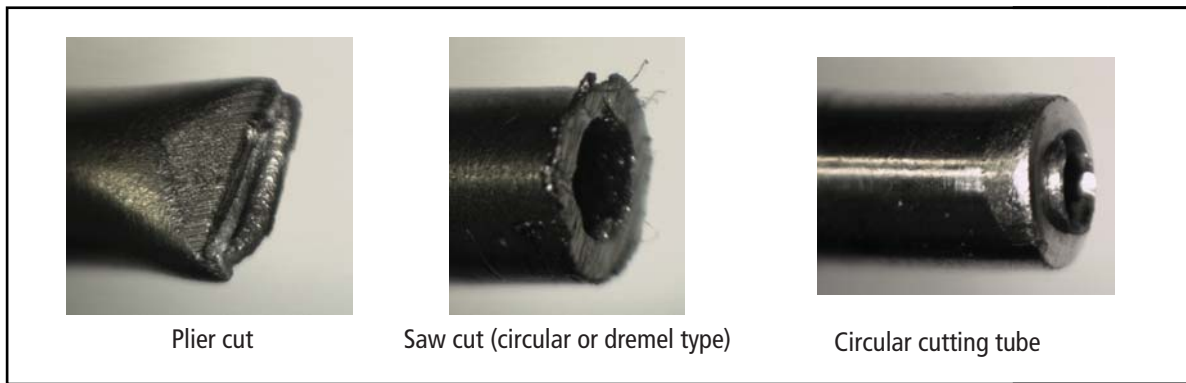


Figure 4

As show in figure 4, cutting tube with mechanical means have serious drawback.

- Plier cause deformation of the tube. The tube is no more round, but oval.
- It pinches the end of the tube. Using a plier with small internal diameter tube, close or reduce the opening.
- Using a saw generate a lot of particles.
- Circular cutting tube cause scratches on the outer diameter of the tube. The final cuts have a sharp edge.

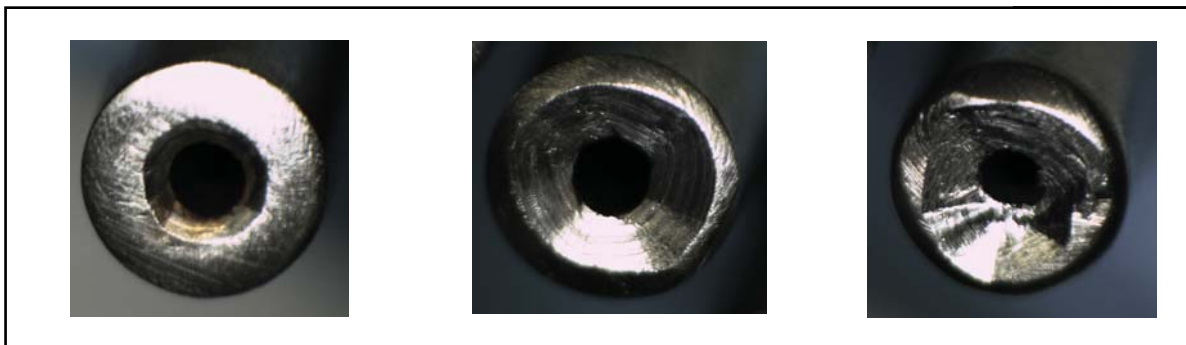


Figure 5

Figure 5, show the butt end cutting tube cause such problem of restriction inside the system.

Most of the time, the users will attempt to improve the result of the cut, i.e. the tube end, by using sand paper or a file.

Whatever of the above technic use, the butt end of the stainless steel tube is no more stainless, but become an active surface, available to react with low level of impurities. Low level sulfur compound will be affected, as well as many other, like O₂. The repeatability of the system will suffer mainly if tubing is use at elevated temperature. Hydrogen could also diffuse axially into the tube wall.

In order to protect and maintain fittings, valves, and analytical system performance, perfect cut tubes with straight butt ends must be used. Tube butt end surface finish and passivation are of prime importance. Tube will seat properly in the fitting and will not expose reactive surface.

Furthermore, there will no particles generation. This will damage valves, column and detector. Only tube cut with EDM (electric discharge machine) or ECM (Electrochemical machining), must be use. After the cut, tubing is cleaned with a propriety process and tube end passivated to eliminate surface activity. Add to this, the tube maybe further process by coating the inner surface to eliminate surface activity. This is mandatory when working with low level impurities, or corrosive chemical compound. Precut tubing is available in various lengths from AFP. From 10 cm to 2 meter. Ones need only to select a tube just a little longer than required to make the connection and made a loop or "S" shape to compensate for the extra length. It is faster and safer, and most important doesn't void your valve warranty.

**See our product literature for our coated tip and non-coated tubing.
See also our product literature about our lip seal fitting.**