

USE OF STEEL BOURDON TUBES IN DURAGAUGE[®] PRESSURE GAUGES

Stainless steel has relatively poor spring properties, but has generally good corrosion resistance. However, chlorides can cause pitting corrosion, and above 140°F, stress corrosion cracking (SCC). Chlorides are a common contaminant in petroleum and many other process industries. In spite of this, the incidence of reported stainless steel tube failures, due to pitting or SCC, has been relatively low. Chlorides are usually found in the aqueous phase of media; i.e. salty water. The water by itself would cause general corrosion if steel were used.

Pitting corrosion and SCC are localized corrosion mechanisms which can rapidly perforate a thin wall stainless steel bourdon tube under certain conditions. Steel can also be subject to localized attack. For example the pit which usually forms under a rust nodule. Some customers may be familiar with steel corrosion and believe failures can be predicted and anticipated. They may not have considered the relatively thin wall and high stress of bourdon tubes.

The “R” system Duragauge gauges have a stainless steel bourdon tube welded to a steel socket and takes advantage of the thick socket wall and low stress to provide satisfactory gauge life. Most refinery piping is steel and the gauge socket is considered to be merely an extension of the piping system.

The large percentage of oil refineries using stainless steel provides strong evidence that stainless steel usually provides better service life. We have seen refineries, who for years insisted they required steel, suddenly switch to stainless steel with a change in personnel or market conditions.

There appear to be three groups buying steel tubes today:

1. Those plants with a demonstrated real need for steel.
2. Those working with outdated specifications or valve specifications.
3. Plants with an instrument engineer who had a bad experience with stainless.

The last two might be converted to stainless steel if the right engineer can be convinced to change the specification or re-evaluate his media and gauge failure mechanisms.