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Some of the questions and enquiries that we have received recently seem, as they have in the past, to form a pattern. In this case, concerns about the use of PTFE tape as a thread sealant in compressed gas service and the provision of some form of protection to protect cylinders against suck-back contamination have been quite popular. Hence, and working on the assumption that others may have reservations over these two issues, I note the following:

1. PTFE TAPE

Past concerns over the use of PTFE thread tape as a sealant centred on the indiscriminate use of inappropriate grades of such tape in high pressure oxidant service (e.g. compressed oxygen). If you get the opportunity to have a look at an oxygen cylinder then, the chances are, that you will notice that where the cylinder valve has been screwed into the neck of the cylinder there appears to be white tape on the thread. To all the world this looks like PTFE tape. Bizarrely enough, this stuff looks like PTFE tape because it is PTFE tape!

In fact, if you take a look at this cylinder valve to cylinder body joint on virtually any cylinder then you'll notice the same type of taped joint making an appearance. Similarly, if you take a close look at your regulators, you may notice that where the pressure gauges have [for example] been screwed into the regulator body that, once again, PTFE tape has been used to create a gas-tight seal on the thread. Sadly, if your regulators do have taped gauge threads then it may well indicate that you have a pretty old piece of gas control equipment that's due or overdue for scheduled replacement - give me a call if you are unsure on this point.

Given then that PTFE tape has been and is used as a sealant for high pressure gases - including oxygen - what's the story? More importantly perhaps, why is the indiscriminate application of thread tape often 'snagged' on safety grounds?

As you may have spotted, in the examples given above, both the cylinder valve [inlet side] and the old style regulator gauge threads are TAPERED. In other words, the male threaded section isn't parallel but widens out along it's length. The female threaded section into which these are fitted is, however, parallel. Hence, as the joint is screwed together it gets tighter. This may be likened to a wedge being driven into an orifice. Once made, such a joint is very tight and, therefore, less likely to come unscrewed. Clearly though, for fluid service the joint must be sealed and this sealing must take place on the thread - there's no where else to do this. Quite typically then the male thread is wrapped in PTFE tape before the joint is made.

I have pointed out to many of you in the past that these examples may explain why the use of PTFE tape has become quite widespread on fittings that don't require an additional sealant; the classic examples being the inlet to the regulator and it's outlet to downstream equipment. In the U.K. the joint between the cylinder valve and the regulator will tend to be a parallel, compression fitting where a gas-tight seal is created by pushing a nipple into a cone (e.g. oxygen, nitrogen, hydrogen, etc.) OR by compressing two flat seats together and sealing on a 'face' by virtue of a suitable washer or gasket (e.g. carbon dioxide, nitrous oxide, certain special gases and special mixtures). Standard regulator outlet fittings are also of the parallel compression type. It is worth bearing in mind that excessive torque is NOT required on these fittings and if they show signs of leakage once they are made, that the leakage is most probably a result of something having become damaged (e.g. a scratched, corroded or pitted nipple) or that something is either missing or damaged (e.g. the sealing washer on a carbon dioxide regulator inlet). On manifold tail pipes or pigtails such leakage can, however, result from axial misalignment especially if the pigtail is too short or twisted.

Given the points outlined above, there is a place for the use of PTFE tape as thread sealant but this is NOT the place where it often turns up i.e. where it becomes an inappropriate solution to a problem and could be described as an unsound repair technique and in the event of accident or failure to danger being a consequence of incompetent or unauthorised repair.

The other important issue to bear in mind is that PTFE tape is available in a variety of different grades for different applications - some of these are degreased, lubricant free and others aren't. Given the hazards associated with high pressure oxidisers like compressed oxygen being brought into contact with hydrocarbon residues then it is no surprise that only suitable grades of PTFE are used with oxygen and that such tape must be applied to high standards with no loose strands being allowed to 'trail' into the gas-wetted path.

As cylinder filling pressures continue to increase it is getting harder and harder to find compatible polymers that will not oxidise, degrade or overheat on adiabatic compression (e.g. when a cylinder valve is opened). Bearing this in mind then, you'll notice on our modern [BS EN ISO 2503] regulators, which are rated for 300 bar inlet pressure service, that the old tapered threads have been replaced by parallel threads, where the seal is created on a metallic washer - NOT with tape!

2. SUCK-BACK CONTAMINATION.

Not surprisingly perhaps, long-standing concerns exist over the possibility of the back-feeding of contamination from gas systems leading, in turn, to contamination of gas cylinders &/or gas control equipment. Depending upon the circumstances, air could get into fuel gas systems leading to formation of explosive mixtures, moisture could get into the gas cylinder leading to internal corrosion and possibly catastrophic failure or even some form of unplanned and potentially violent chemical reaction taking place depending upon the service gas and the nature of the contaminant(s), etc.

Given the possible hazards, it is prudent to minimise the risk by ensuring that some simple precautions are always followed:

A. NEVER allow cylinders that are connected to drain to atmospheric pressure - keep around 0.5 barg in the cylinder and keep the cylinder valves closed in store whilst they await return to the supplier.

B. ALWAYS have a seperate storage area for 'USED' cylinders in order to minimise the likelihood of cylinders that may be at low or negligible internal pressures being accidentally connected to systems with higher internal pressures. Remember that only those cylinders with an intact tamper-evident seal on the valve should be treated as 'full'.

C. WHERE POSSIBLE fit a 'check' or non-return valve in order to ensure that flow in the opposite direction to the direction that is required can be avoided and contamination of cylinders and your gas regulating equipment can, therefore, be minimised or avoided. Where they have been suitably rated, non-return valves can be installed to guard against reverse PRESSURE as well as flow excursions (flashback arrestors are used to guard aginst reverse flame excursions and also incorporate non-return valves).

D. ALWAYS inform your gas supplier if you suspect that a cylinder may have been contaminated by back-feed - they'll need to know about the suspected nature of the contamination, the duration of the suspected exposure, etc.

E. ALWAYS ensure that regulators, etc are thoroughly checked for safety or, better still, replaced if internal contamination by back-feed has occurred.

AND FINALLY...

Given recent [geological] events in the Midlands and Manchester, the following safety tip on cylinder storage from the U.S.A. may be of interest:

'***In areas subject to earthquakes, extra care must be taken to secure cylinders.'***

Best regards, David Bayliss.

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