1L35_hydrogen_leak_test_20100402_final.pdf

04/02/2010 @ 0820: Assume operating pressure <= 20 psig; pressurize lines to 25 psig (125%) and test for gross leaks; none found. Estimate total enclosed volume of low pressure side < 200 CC; estimate total enclosed volume of high pressure side (regulator inlet) < 10 CC.

04/02/2010 @ 0850: pressurize regulator, gas lines, MFC to 25 psig hydrogen gas; close cylinder valve; 2100 psig remaining on regulator inlet.

04/02/2010 @ 1555: gas line pressure = 25 psig; regulator inlet = 2150 psig.

04/03/2010 @ 1000: gas line pressure = 25 psig; regulator inlet = 2100 psig.

Assume pressure drop on regulator high side << 50 psig;

Estimated leak rate << 30 SCC over 25 hour period; or << 0.02 SCCM.

Edward Baker 04/03/2010 @ 1130

Bob, please note:

I think the pressure increase noted at 1555 on 04/02/2010 on regulator inlet was due to ambient temperature fluctuations, and that there was no essential change over the 25 hour test period. That would give a leak rate of zero (or so small that we can't measure it).

Ed

ARGON
HYDROGEN
COMPANY
VICTOR

Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Baker, Edward

From: Baker, Edward **Sent:** Fri 04/02/2010 15:10
To: Sabatini, Robert
Cc: Piper, Arthur J; Baker, Edward; Camino, Fernando
Subject: 1L35 hydrogen supply system
Attachments: SBMS_flammable_gas_system_20100402.pdf(32KB)

04-02-2010

Bob,

I've brought in a hydrogen cylinder and installed in the service galley for 1L35 system and started leak checking. There are no gross leaks, so I'm now doing a leak down test similar to what we did with Jim Ciston on the Titan. Fernando said to use 20-psig as the operating pressure (although my feeling is it will probably be closer to 10), so I've pressurized the regulator and lines up to and including the MFC to 25-psig. The supply side of the regulator is at cylinder pressure (obviously), but the cylinder valve is closed. So far, after 6 hours, the system looks tight. I'll let it go overnight. I chose to use the hydrogen (instead of nitrogen, or even helium) because it may leak out of systems that hold the denser gases. Also, this lets us check the regulator and associated flex line and fittings.

I reviewed the relevant section(s) of the SBMS and have attached a copy in PDF format.

Let's go down the list:

1) Non-sparking tools: I have an aluminum bronze 1-1/8" combination wrench that fits the CGA fitting nut. I have never seen this used (or thought it necessary) on a brass fitting, however. But we do have one. As for hand tools Fernando might use, the best non-sparking tools are still (in my opinion) BeCu. The problem here is BNL's insistence on classifying these as beryllium because they contain more than 0.1% and requiring that pesky inventory – it's probably worse now, but I don't really know. I disposed of all the BeCu tools I had in Physics precisely because of this. You have to decide what you will require of Fernando on this point.

2) Cleaning oxygen systems: doesn't apply here.

3) Back flow / flash arrestor: I have these, but didn't install one here – Fernando will not be using oxygen (or any other oxidizers) with this system. There is no provision for adding any, either.

4) Flammable gas / Oxidizer cylinder separation: Same here. I suppose someone else *could* install an oxygen cylinder somewhere else in the service galley (within 20-feet), but we can evaluate that when it happens.

5) Using acetylene cylinders: doesn't apply here.

6) Process piping conforms to ASME B31.3: I've gone round and round with Mike Gaffney on this in the past. We still don't have a copy of the specification unless you want to buy it. I tried getting a copy from Mike but it seemed we were speaking different languages. I ***did*** succeed in getting him to say 316SS tubing is fine for hydrogen service – we use 316SS tubing exclusively for the delivery system. Fernando may use short sections of plastic tubing at his endpoint. I have not added an additional relief yet (didn't want to add another potential leak) – the relief valve on the regulator is factory set at 300-psig. From my past experiences with MFCs that should not be a problem. We still need information on the MFC (maximum flow rate, minimum flow rate when closed, failure mode, etc.) so when we get that we need to verify 300-psig on the inlet is within the design parameters. I can add an additional relief device if required.

7) Leak testing system: covered above in opening paragraph above.

8) Grounding and bonding: I will add a grounding strap to the rigid tubing in the service galley. If you want an additional one in the lab we can add it, but my personal feeling is it's not necessary.

9) Fire protection: That's up to you and Artie.

10) Posting as "NO SMOKING": Building already is no smoking area, but if additional posting is required, that's also up to you and Artie.

I'll let you know how the leak test turns out. Assuming it's OK, I'll produce something similar to Jim Ciston's notes.

Regards,

Ed

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Step 8	If flammable or oxidizing gas is used, the supervisor, or line management designee, is responsible for implementing the following additional requirements: • Using only non-sparking tools when working with flammable compressed gas; • Cleaning oxygen systems with oxygen-compatible materials free from oils, greases and other contaminates; • Installing back flow/flash arrestor equipment where flammable and oxidizer gases are used in the same system; • Ensuring flammable gas is separated from oxidizers by either (a) 20-ft or (b) an approved non-combustible barrier (minimum of 5-ft high having a ½-hour fire resistance rating); • Using acetylene cylinders valve-end up to minimize the possibility of solvent being discharged. Never use "Pure" copper pipe or fittings on acetylene systems, as dangerous oxides may form internally, causing an explosion; • Ensuring flammable systems conform to ASME B31.3, Process Piping; • Leak testing the system using air or nitrogen prior to be place into service; • Grounding and bonding all lines and equipment; • Ensuring portable fire extinguishers or other fire protection or suppression system are available; • Posting areas as “NO SMOKING” areas.