From: Neal Hartman [mailto:nhartman@lbl.gov]
Sent: Tuesday, July 24, 2001 3:24 PM
To: Murdock Gd Gilchriese; Eric C Anderssen; Thomas F Weber; Fred Goozen; Jon S Wirth; Tom Johnson
Subject: Cooling Fitting/Seal Test Regimen

Hi All,

Here is the test regimen that we agreed upon at the Atlas meeting in Cern, with a few changes that have been proposed by Eric Vigeolas. I will send again with any changes that occur in the near future.

Here is a summary of the fitting tests that we settled on at the meeting

last thursday, and some information I have calculated about system pump-down. First of all, following are the fitting tests we agreed on to qualify all seals in the pixel volume:

1.) He vacuum leak check (quanitative)
2.) 10 bar proof test (visual, assure that fitting doesn't mechanically explode, no more than 1 minute)
3.) 4 bar He pressurized leak check at 0 Celsius (quanitative)
4.) 1 bar He pressurized leak check at -35 Celsius (quanitative)
5.) He vacuum leak check (quanitative)
6.) Thermally cycle fitting assembly 50 times (20 to -35 C)
8.) Pressure cycle fitting assembly 50 times (1 to 4 bar)
9.) Repeat tests 1,3,4,5 (all quanitative, in that order)

Each potential seal type must have at least 10 specimens to run through the above sequence. If plastic seals are considered (as at LBNL) then an additional 10 fittings must undergo the same tests after irradiation,

in order to compare with the control group.

As for the test requirements, we arrived at the following numbers:
1.) Permanent connections (welds, etc.) vacuum leak check to 1e-7 atm-cc/sec He.
2.) Seal leak rates under vacuum are 3e-5 atm-cc/sec He.
3.) Seal leak rates at 4 bar are 1e-4 atm-cc/sec He.

In order to determine if the system conductance is high enough to pump down to initial vacuum (before introducing C3F8), I calculated a *rough estimate* of the conductance and pressure for given fitting leak rates. I assumed 10 fittings per circuit, equal leak rates for all fittings,

and a lumped global system conductance (meaning that all pipes and sizes

are considered, but they are all lumped into one series conductance or resistance). This may be an optimistic estimate, so I am currently in the process of making a more exact calculation. I have attached a preliminary graph of my estimates, which shows that for the leak rate we

propose for seals (3e-5), we will arrive at a minimum system pressure (in the capillary) of more than 175 microbar. I am unsure if this is acceptable, so I would like some feedback on your thoughts. I will circulate more info as soon as I do some more exact calculations, however, I will not be back in the US until next week to do this.

Please, if you have comments, don't hesitate to share them.

Regards,
Neal

Enclosed: P vs Leak Rate Chart.pdf