Subject: Re: Cooling System Meeting Summary
Date: Tue, 24 Jul 2001 15:19:12 -0700
From: Neal Hartman <nhartman@lbl.gov>
Organization: Lawrence Berkeley National Laboratory
To: Eric Vigeolas <vigeolas@cppm.in2p3.fr>
CC: Marco Olcese <Marco.Olcese@ge.infn.it>, Stefano Cuneo <stefano.cuneo@ge.infn.it>, Jocelyn THADOME <Jocelyn.Thadome@cern.ch>, Eric C Anderssen <ECAnderssen@lbl.gov>

Hello All,

Sorry it has taken me so long to reply, but I have been traveling and have just now returned to the US. I have a few comments about Eric's remarks below. First, I have no objection to eliminating some of the intermediate tests in order to make the sequence shorter and easier. However, I believe that we must perform pressure tests before doing the thermal and pressure cycles, in order to be sure that the seals are working initially. Therefore, I propose the following compromise:

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)

I think it is important to include vac checks after each stage of testing, since that is the easiest way to make sure that there has not been some sort of "catastrophic" leak. I also agree that -50 C is too low, but it should be -35 C, since that temperature may be seen transiently during C3F8 injection.

Please respond with any comments you may have about the compromises that I have presented.
Thanks alot,
Neal

Eric Vigeolas wrote:

> *Dear Colleagues,*
> *>*
> *I have a few comments concerning the test sequence which was agreed for the*
> *seals and joining qualification.*
> *>*
> *I do not agree with the thermal cycles which are foreseen from 20 to -50°C,*
> *while the operating temperature will be -25°C. So I guess that the thermal*
> *cycles should be done between 20°C and -25°C (-50°C will not be easy to*
> *reach.....).*
> *Moreover in order to eliminate the repetition of tests, I would require to*
> *not repeat the tests 1,3,4,5 after the thermal and pressure cycles. Why*
> *don't we do the tests 3,4,5 after 6and 7 ones? I would propose this sequence*
> *more simple for the user, and as efficient as before for the fitting*

> qualifiaction:
>
> 1) He vacuum leak check
> 2)10 bar proof test
> 3) Thermal cycles 50 times (20to -25°C)
> 4) Pressure cycles 50 times (1 to 4 bar)
> 5) 4 bar He pressurized leak check at O °C
> 6) 1 bar He pressurized leak check at -35 °C
> 7) He vacuum leak check
>
> SImplier as efficient, this is my thought.
>
> Cheers
>
> Eric
>
> ----- Original Message -----
> From: "Neal Hartman" <nhartman@lbl.gov>
> To: "Marco Olcese" <Marco.Olcese@ge.infn.it>; "Stefano Cuneo"
> <stefano.cuneo@ge.infn.it>; "Eric C Anderssen" <ECAnderssen@lbl.gov>; "Eric
> Vigeolas" <vigeolas@cppm.in2p3.fr>; <georg.lenzen@cern.ch>; "Jocelyn
> THADOME" <Jocelyn.Thadome@cern.ch>
> Sent: Monday, July 16, 2001 1:14 PM
> Subject: Cooling System Meeting Summary
>
> > Hi All,
> >
> > 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 -50 C)
> > 7.) Repeat tests 1,3,4,5 (all quanitative, in that order)
> > 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*
> >