LHe fill procedure using a QT dewar

Print this **checklist** and have it with you while proceeding with the following steps:

Magnet_LHe_Fill_Checklist.docx

Magnet_LHe_Fill_Checklist.pdf

Previous Version
Magnet_LHe_Fill_Checklist.docx
Magnet_LHe_Fill_Checklist.pdf

Preparation:

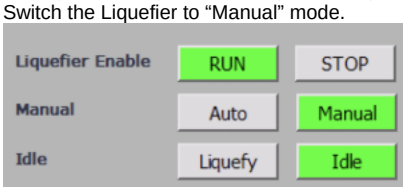
1. **About ~3 hours before the fill**, select the Dewar (A or B) to perform the fill (based on the current available LHe levels).
2. Set the “Dewar Set Pressure” to **3 psi** on the QT HMI Liquefier A/B screen’s “Settings” page.
3. Check the outside gHe pressure and make sure it is below 90 psi. If it's equal, near, or above, then relieve its pressure down to ~80 psi.
4. Check The cave for insulation on cryostat with fans.
5. Open the Connect to the “Cryo Control Panel” on the cryo-computer, or connect to the Cryo Control Computer (via VNC: see Polarized Target System for SpinQuest at FNAL for the instructions)
6. Monitoring screens during the fill
   a) "Transfer-Line Cool Down" : During the pre-cool
   b) "LHe Transfer": During the fill

Procedure:

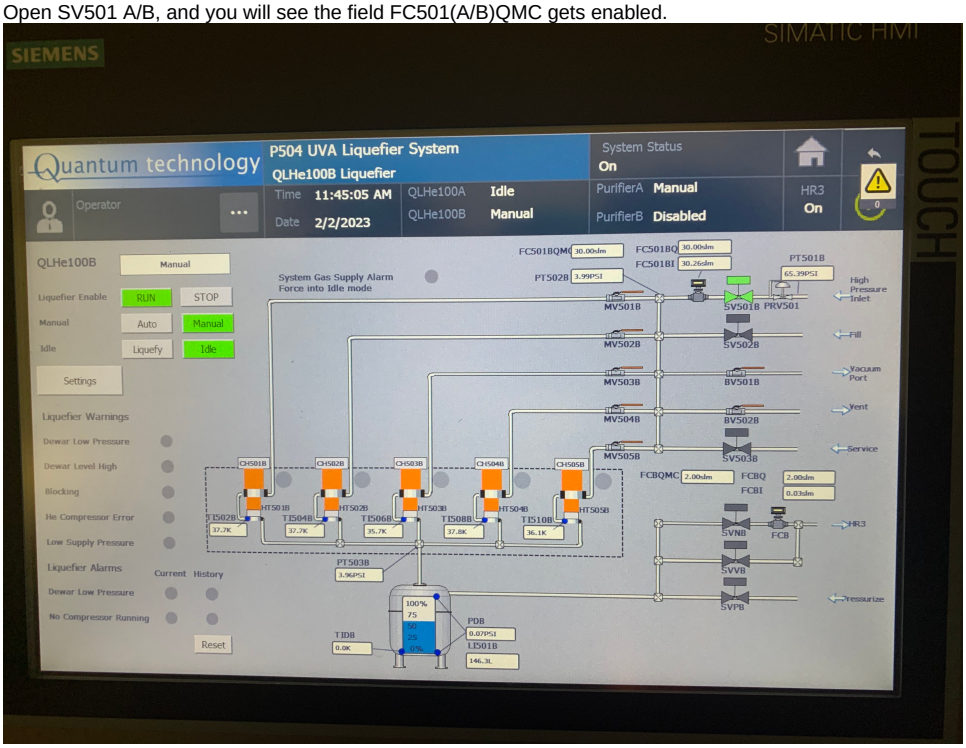
Liquefier Manual Mode Fill

1. tart pre-cool phase: Open VPC Open VJV(A/B) Monitor TX1, TX2, TX3
   a) Charts of TX1, TX2 & TX3: https://e906-gat1.fnal.gov/data-summary/e1039/target-par-preset/cool_down.php
   b) TX1 goes down below 100 K in 10 If not, there may be a problem with the transfer line. If this is the case, then **don’t proceed**. Close VJV(A/B) and leave VPC open to boiloff an LHe trapped in the transfer line.
2. After ~10mins:
   a) Open the Magnet Return flow, by changing the flow mode to "OPEN" on the "**vi**" on the Cryo Control Panel, and
   b) Open VJVT on the HMI screen.

3. After ~2mins: Close VPC and monitor magnet pressure.
4. After a couple of minutes, you will observe that the magnet pressure drops down suddenly and stay around ~1.4-1.5 psi (this indicates that LHe is flowing to the magnet after the pre-cooling of the last part of the transfer line).
5. Switch the Liquefier to “Manual” mode.



6. Open SV501 A/B, and you will see the field FC501(A/B)QMC gets enabled.



7. Set the flow on FC501(A/B)QMC to 60slm and monitor the Dewar pressure on PT503 A/B and set the flow down to 35slm and keep adjusting it until Dewar pressure is close to 5psi, and leave it with that flow.
8. Keep monitoring the liquid amount and the pressure at https://e906-gat1.fnal.gov/data-summary/e1039/target-par-preset/transfer.php.
9. Fill the magnet until the level shows ~45%.
10. Stop the fill if the level reached ~45% or any sudden change occurred during the transfer indicating a problem. Open VPC Close VJVT Close VJV (A/B)
11. Navigate to the liquefier page on the HMI screen and close SV501(A/B) Switch the Liquefier to "Liquefy mode", and then set back the “Dewar Set Pressure” to 5 psi in its “Settings” screen.
12. Change the mode of the Magnet Return flow from "OPEN" to "AUTO" on the **THCD_401_Main.vi** , and then click the "Automation" toggle switch.
13. Make sure that you leave the VPC open, to capture all the boil-off from the transfer line until it is warm (check TX1).
14. Check the cave for insulation on cryostat because we are not allowed to use heat tape yet (to the date).

After the fill:

1. Calculate the transfer efficiency of the transfer using https://e906-gat1.fnal.gov/data-summary/e1039/ (see the following screenshot as an example), and write an elog entry on UVA elog.
    a. https://e906-gat1.fnal.gov/data-summary/e1039/target-all-auto.php?hh=2&DLLiqA0_Liquefier%2BA%2BPV_LI501&DLLiqB0_Liquefier%2BB%2BPV_LI501&Cryo%2BLevel_Magnet%2BLHe%2BLiter
2. Get the parameters from the following link and save to a .csv file and upload to this folder: https://myuva.sharepoint.com/:f:/s/as-physics-poltar/EgobRQW36kREh2PaniByVSYBBpd93dpoUaayUJtI4YMSmA?e=aEf8bw

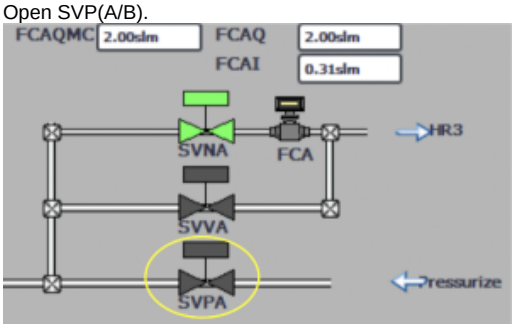
Parameters for LQ_A: https://e906-gat1.fnal.gov/data-summary/e1039/target-par-table.php?Y0=2023&M0=01&D0=22&h0=22&m0=12&s0=00&Y1=2023&M1=01&D1=22&h1=23&m1=30&s1=00&par0=DLLiqA0_Liquefier+A+PV_PT503&par1=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_Magnet+Dewar+Pressure&par2=DLLiqA0_Liquefier+A+PV_LI501&par3=Cryo+Level_Magnet+LHe+Liter&par4=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_FMR&par5=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_TX1&par6=Cryo+Temperature_Cooldown+Line+TX2&par7=Cryo+Temperature_Cooldown+Line+TX3

Parameters for LQ_B: https://e906-gat1.fnal.gov/data-summary/e1039/target-par-table.php?Y0=2023&M0=01&D0=21&h0=19&m0=49&s0=00&Y1=2023&M1=01&D1=21&h1=20&m1=50&s1=00&par0=DLLiqB0_Liquefier+B+PV_PT503&par1=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_Magnet+Dewar+Pressure&par2=DLLiqB0_Liquefier+B+PV_LI501&par3=Cryo+Level_Magnet+LHe+Liter&par4=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_FMR&par5=DLSystem0_Helium+Supply+and+Return+Manifolds+PV_TX1&par6=Cryo+Temperature_Cooldown+Line+TX2&par7=Cryo+Temperature_Cooldown+Line+TX3

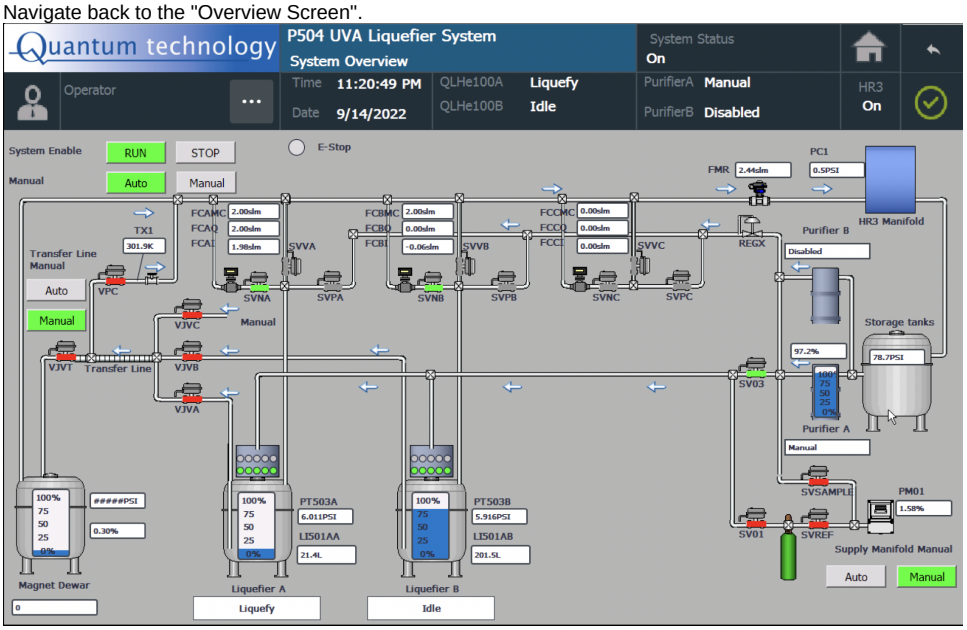
Previous procedure:

1. Set the liquefier to "Manual" mode.

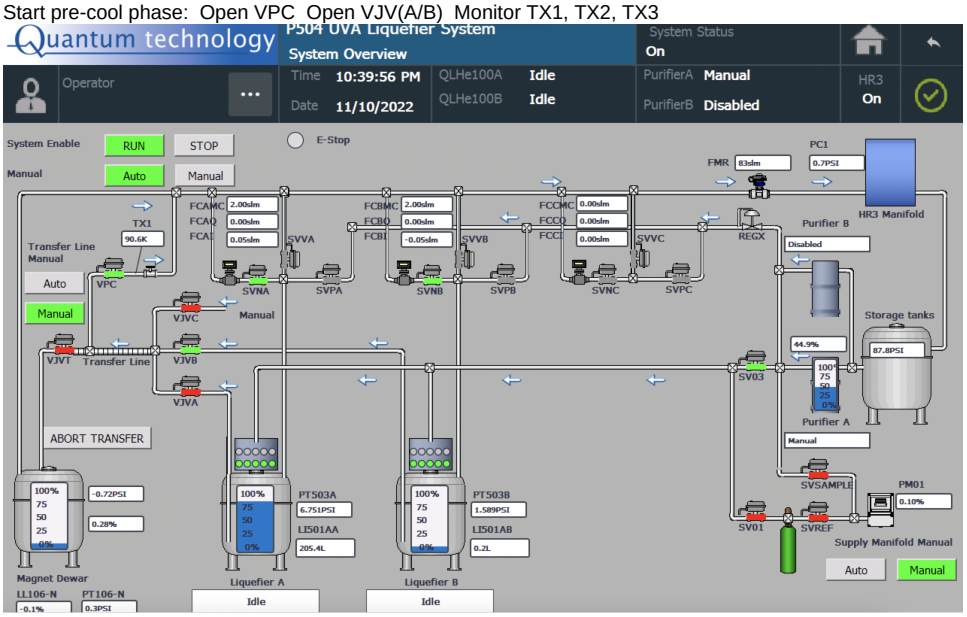
2. Navigate to the liquefier page on the HMI screen.
3. Open SVP(A/B).



4. Navigate back to the "Overview Screen".



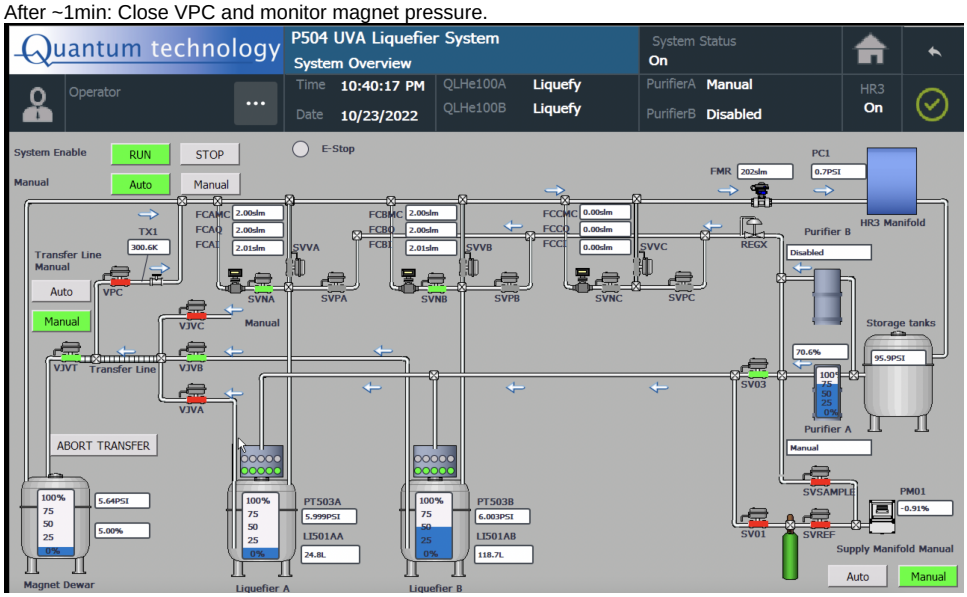
5. Start pre-cool phase: Open VPC Open VJV(A/B) Monitor TX1, TX2, TX3



   a. Charts of TX1, TX2 & TX3: https://e906-gat1.fnal.gov/data-summary/e1039/target-par-preset/cool_down.php
   b. TX1 goes down below 100 K in 5 minutes. If not, there should be a problem.

6. After ~8mins:
   a. Open the magnet-bypass valve (i.e. the black hand valve right next to the magnet flow controller),
   b. Open the Magnet Return flow, by changing the flow mode to "OPEN" on the "**THCD_401_Main.vi**" on the Cryo Control Panel, and
   c. Open VJVT on the HMI screen.

7. After ~1min: Close VPC and monitor magnet pressure.



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** Note: If the REGX green hand valve is fixed **(check with Target Expert on Shift)**, then do not change it: just proceed with step #10 *****
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> If you need to change the pressure difference between the magnet and the Dewar then use the REGX all the time to maintain the pressure difference that you need (eg: ~4psi)

8. After a couple of minutes, you will observe that the magnet pressure drops down suddenly and stay around ~1.4-1.5 psi (this indicates that LHe is flowing to the magnet after the pre-cooling of the last part of the transfer line).
9. Fill the magnet until the level shows ~44%.
    a. Keep monitoring the liquid amount and the pressure at https://e906-gat1.fnal.gov/data-summary/e1039/target-par-preset/transfer.php.
10. Stop the fill if the level reached ~44% or any sudden change occurred during the transfer indicating a problem.
    a. Open VPC
    b. Close VJVT
    c. Close VJV(A/B)
11. Navigate to the liquefier page on the HMI screen and close SVP(A/B) Switch the Liquefier to "Liquefy mode".
12. Wait for 1-3 minutes until the magnet pressure (on the HMI screen) goes down to 1 psi.
13. Close the Magnet bypass hand valve.
14. Change the mode of the Magnet Return flow from "OPEN" to "AUTO" on the **THCD_401_Main.vi** , and then click the "Automation" toggle switch.
15. Make sure that you leave the VPC open, to capture all the boil-off from the transfer line until it is warm (check TX1). — We need not check TX1 but let VPC open, correct?