OT System Status

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EP-DT-FS
Activities

Done
- Profibus and pneumatic connections
- PLC running
- Compressed air supply (mixer N2 purge) with Festo filter
- Mixer WinCCOA remote control
- Buffer pressure test
- Test setup dismounted

On-going
- Piping
- Ageing test

To do
- Electrical connections
- Install volume chambers
- Some inside-racks piping
- Missing parts
Pressure in the Mixer
Maintenance Procedures

Many components in a Gas System

- Manometers
- Rotameters
- Connections (profibus, pneumatics, electrical, etc...)
- Bubblers
- Filtres
- MFCs
- Manual valves, Electro valves, Solenoid valves, Pneumatic valves, Non-Return valves, Safety valves, Multiway valves, etc...
- Pressure Transducers (and other sensors)
- Pumps
- Mixer tubes, purifier columns, flow cells, etc...

Each can face specific problems and requires different care.
Manometers

• Some manometers didn’t read 0: a check was needed to verify if the line was pressurised or they were broken and have to be replaced. May need recalibration of the zero.
Rotameters

- Also, some rotameters have some problems: it looks like they have some different liquid inside (maybe oil from the bubblers?).
P&ID not up-to-date

- Very old drawings
- Some part missing or physically present but not mentioned in the P&ID
- For the missing parts it’s difficult to understand if we have some spare ones
- Need to update the P&ID
- Need to improve spare parts management (e.g. space parts inventory)
Maintenance policies

Maintenance could consist of replacements, actions, cleaning, etc.
Experience based or sporadic maintenance difficult and unreliable.
Maintenance procedures needed to help operations and make the system reliable. It could also be useful to give an idea to newcomers of all the components and about the complexity of the systems.

Maintenance could be:
• Corrective (after failure)
• Scheduled (on statistical or historical data)
• Preventive on condition (i.e. sensors)
• Pro-active (new design)
Maintenance procedure development

Steps

• Identify the various functional parts of the machine (e.g. certain part of a certain rack)
• Identify for each component the possible failure modes
• Analyze the overall effects of eventual failure
• Identify the best maintenance technique accordingly.
<table>
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<th>Checklist Desk after discussion of 09/07</th>
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<tr>
<td><em><strong>Mixer in RUN system ON</strong></em></td>
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- Mixer chassis check the led with pressing button
- Check the tescom gauge to see if they are set correctly and compare to the PT reading PVSS (0.1 bar difference acceptable)
- Check the setting of each line to be set to the DMFC calibration pressure and make sure that line with the smallest concentration needs to have the highest pressure
- Look at the pressure gauge PI-1009 and compare to the PT-1009 reading on PVSS
- If the difference is higher turn the 3 way valve to exh to check where there are 0 mbar
- Check the setting of PICV-1502 pressurizing the top of the zimmerli PCV-1007

| ***Mixer in STOP system ON or OFF*** |

- Check the tescom gauge are not going up to the network pressure with comparing the pressure gauge on the wall
- Check the safety valve sticker if there are still up to date
- Turn the 3 way valve HV-1011 to vent and make sure that PI-1009 go to 0 mbar
- Check that all DMFC are going to 0 l/h
- Close all the manual valve after the DMFC to allow the check of the DMFC
- Dismount all the DMFC’s for checking the calibration
- Block 1 by 1 all the outlet pipe where you dismount the DMFC to check the risk of leaking electrovalves
- Leak test flammable gas. Small leak but it depends on the gas (SF6 cheap and polluting)

| ***Mixer to restart system ON or OFF*** |

- Put back DMFC’s at their original position
- Open the manual valve after each DMFC’s (low flow and high flow)
- With the 3 way valve HV-1011 to vent try to restart mixer in run mode
  - **Open mode:** leak test with 1000 bubbles
  - **Close mode:** test with valve in exh HV-5014 close
- Make sure 3 DMFC are stabilizing
- Try the same as step 17 with the DMFC’s for high flow
- Close the 3 electrovalves to see, if the flow is going down to 0 l/h to see if there is a leak