Hall B Gas Controls Report

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DSG Controlled Gas Systems

1. DC Supply and Mixing System (DC)
2. LTCC Sector 5 C4F10 Test (LTCC)
3. HTCC CO2/N2/Air Purge (HTCC)
4. SVT N2 Purge (SVT)
5. MVT Mixing System (MVT/FT)
Hall B Gas Controls: System Locations

Hall B Gas Shed
- DC Gas Mixing and Regional Supply

Space Framee L3
- DC
- SVT
- HTCC
- MVT/FT

Hall B End station

Forward Carriage
- LTCC
Daily gas controls checks to verify operation of controls software.

Expert Screen checks to ensure all mass flow controller loops are running.

Check controls tabs.

- DC Supply and Mixing flows and pressures.
- SVT flow.
- HTCC flow, pressure, and moisture.
- LTCC flow set point, valve position, flow, differential pressure.
- MVT flow.

Gas controls expert GUI
DC Gas Mixing and Regional Supply Controls

DC Gas Controls Tab
DC Supply and Mixing System

- Regional Supply (Flow set by Hall B Mech)
  - R1 flow (9Lpm) (low alarm at 1Lpm)
  - R2 flow (18Lpm) (low alarm at 5Lpm)
  - R3 flow (39Lpm) (low alarm at 9Lpm)

- Differential pressure
  - R1/2 (~0.06 iwc)
  - R3 (~0.100-0.120 iwc)
  - High alarms at 0.17iwc.

- Low CO2 alarm is 90psi.

- Mixing system tank pressure controls
  - Pressure (60-80psi)
  - Flow (120% or 80% times demand)
Flow (set by DSG at 0.1 Lpm)

- Ensure gas is flowing
  - if mfc valve is less than 100%, solenoid valve open.
- Flow starts below pressure set point (currently 1.74iwc)
- Flow stops at deadband of set point + 0.02iwc.

Differential pressure vs. Ambient

- Observe behavior.

C4F10 Tank level

- Daily usage ~0.5Kg/day
  - Usage varies with detector response to ambient pressure.
- Total usage 115kg (75kg to fill, 40kg used)
- 35kg remaining in tank.

S5 Diff. Pressure vs. Amb. Pressure with flow and C4F10 level.
LTCC Daily Gas Usage

<table>
<thead>
<tr>
<th>LTCC Sectors</th>
<th>daily avg. flow (L) since 11/08/17</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>37.41</td>
<td>N2</td>
</tr>
<tr>
<td>5</td>
<td>33.03</td>
<td>C4F10</td>
</tr>
<tr>
<td>6</td>
<td>614.46</td>
<td>N2</td>
</tr>
</tbody>
</table>

*Sectors 1,3, and 4 have been removed or bypassed.*
SVT and HTCC Purge Systems

❖ SVT Flow
   ❖ Flow should match demand on controls GUI.

❖ HTCC
   ❖ Flow should match demand on controls GUI.
   ❖ Differential Pressure (~0.1iwc)
   ❖ Moisture (< 100ppm)
MVT/FT Mixing System

Mixing system mode

Automatic
- Mixture (Ar/C4H10/CF4 and Ar/C4H10)
  - Bounces between high (150%) and low (50%) multipliers of the demand flow.
  - Demand flow is set automatically by MVT supply software (75sccm and 150sccm are typical).
- Tank pressure (5 to 15 psi)

Manual
- Flow is set by manually by MVT staff.
Issue: 3/14 Space Frame Gas Outage

- Hall B Mech. Group disconnected SVT MFCs after consulting with SVT manager.
- DSG was not notified.
- Sub VI controlling all space frame MFCs timed out.
- Affected systems: SVT, MVT mixing, DC regional supply, HTCC MFCs were offline
  
  No gas from 8:15am to 11am.

- DSG notified by SVT detector manager, that SVT had no gas flow.
- DSG reinitialized the space frame cRIO.
- Gas was restored to all systems.
Issues: Lessons Learned and Preventative Measures

- Instructions on proper procedure to shutdown any portion of gas control was passed to the Hall B gas community.

- Controls for the DC MFCs moved to the Gas Shed cRIO.

- MFC control will be broken down on the three cRIOs by detector, thus minimalizing the effect of a future unplanned outage.

- DSG recommends that system managers purchase individual cRIOs to provide independent control of their systems.
Conclusion

• Gas system training for Hall B Mech. conducted

• DSG reviews status daily to ensure the system is functioning properly.

• Gas system controls functioning very well.
The End