Odds and Ends of Commissioning Barrel 4

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Outline

- Temperature Sensing
- Dew Point Sensing
- Backup Power Requirements

Temperature Sensing

Temperature Sensors are 100 Ω Platinum RTD's, with accuracy of $\approx$0.1 C.
On bulkheads:

- 10 RTD's per bulkhead, 2 per layer.
- The RTDs are mounted at $\pm 90^o$ with respect to cooling input lines
- Interlock on temperature
  - If 2 or more RTD's read high (T > 15 C), we will probably need to turn off power to the given bulkhead.
  - If 1 RTD goes high, we probably need to look at other information to determine if there is a problem.
    - Did the temperature go high instantaneously? If so, it's probably a malfunctioning RTD.
    - Look at pressure drop across the bulkhead. Significant cloggage would result in an increased pressure drop, in which case we would shut off power to the Bulkhead.
    - Check leakage currents in ladders. Higher bulkhead ledge temperature results in higher silicon temperature. This will increase the leakage current.

At face of COT

- 1 RTD mounted with each RH sensor for measuring dewpoint.

Dew Point Sensing

- We want to avoid condensation on the cooling pipes at the face of the COT.
- Plan to have 2 RH sensors (per end) mounted next to the SVXII cooling pipes (along the COT face).
- They will be part of the Interlock system
  - Cannot turn on SVXII unless $T_{\mathrm{coolant}} > T_{\mathrm{dp}}$.
- When/if we need to pull the plug to access COT electronics:
  - Turn off SVXII.
  - Warm up SVXII to $\approx 0 - 5^{\mathrm{o}}$C.
  - Require $T_{\mathrm{coolant}} > T_{\mathrm{dp}}$. When the COT baggy is sealed, use dew point in baggy. If baggy is opened, we should probably use collision hall dew point.

Backup Power

Every effort should be made to keep SVXII cool for it's entire life, particularly after radiation.

$\Rightarrow$ Cooling system must operate during power outages.
$\Rightarrow$ Interlock system must operate during power outages.

- When power outage occurs, we are assuming a relatively short power outage (hours, not days)
- Interlock/controls will probably be on Uninterruptable Power Supplies.
- Higher power devices will probably feed off backup generator.

During power outage:

- All valves must have proper power-off state (normally open or normally closed). That is, they fail safe.
- Recirculation pump kicks in, and circulates the cold water/glycol already in the system.
- Solenoid valves to bulkheads fail OPEN.
  - The water/glycol takes $\approx$6-8 hours to warm up to 5 C
- Cooling system must be a closed system when power is lost.
  - Vacuum line will have a "normally closed" valve
  - Pressure in system will rise slowly, until vacuum pump is reasserted (and valve opened).

We would like to have backup power available in three places:

1. First floor near the Interlock Racks
2. In the Alcove in the Assembly Hall - Deisel Generator

3. At the detector for solenoid isolation valves (110 VAC)

Low voltage power lines for field devices (transmitters) will need to be routed from the 1st floor to the detector and the Alcove. They will probably not go through the cable tray.

Power Consumption Estimates

Power from 1st Floor (near Interlock Racks) to Devices near detector (UPS, Deisel)					
Item	I & V	Power (W)	#Needed	Total I (A)	Total Power (W)
Flow-Orifice w/PDT	4-20 mA 24 V	0.5	20	0.4	10
Leak Monitor PDT	4-20 mA 24 V	0.5	20	0.4	10
Ctrl Valve - Prop. Solen.	0.6 A 24 V	14.4	24	14.4	346
Return Solen. Valve*	0.2 A 110 VAC	22	20	4.0	440
Return Solen. Valve Relay	10 mA 24 Vdc	0.24	20	0.2	5
30^o Vacuum TC Gauge	4-20 mA 24 V	0.5	20	0.4	10
Supply Pressure	4-20 mA 24 V	0.5	4	0.08	2
Return Pressure	4-20 mA 24 V	0.5	4	0.08	2
Bypass Ctrl Valve	4-20 mA 24 V	0.5	4	0.08	2
Humidity sensor	0.1 mA 5 V	0.5 mW	4	0.4 mA	2 mW
Subtotal	-	-	-	20	827

Power Consumption Estimates (continued)

Power from 1st Floor (near Interlock Racks) to Alcove - Low Power (UPS)					
Item	I & V	Power (W)	#Needed	Total I (A)	Total Power (W)
Pump Remote ON/OFF	10mA 24 Vdc	0.24	2	0.02	0.5
Pump - ON Status	12 mA 24 V	0.24	2	0.024	0.6
Supply Solenoid Valve	10mA 24 Vdc	0.24	2	0.02	0.5
Return Solenoid Valve	10mA 24 Vdc	0.24	2	0.02	0.5
Level Transmitter	4-20 mA 24 V	0.5	2	0.04	1
Pressure Transmitter	4-20 mA 24 V	0.5	2	0.04	1
N_2 Ctrl Valve	4-20 mA 24 V	0.5	2	0.04	1
Vacuum Ctrl Valve	4-20 mA 24 V	0.5	2	0.04	1
Vacuum Pump - Contactor	10 mA 24 V	0.24	2	0.02	0.5
Vacuum Pump - Status	12 mA 24 V	0.24	2	0.024	0.6
Gas Flow Meter	4-20 mA 24 V	0.5	2	0.04	1
Electrical Conductivity	4-20 mA 24 V	0.5	2	0.04	1
Test Section Fluid Heater	10mA 24 Vdc	0.24	2	0.02	0.5
Sterilizer - Remote On/OFF	10mA 24 Vdc	0.24	2	0.02	0.5
Sterilizer - Power Status	12 mA 24 V	0.24	2	0.024	0.6
Deionizer Ctrl Valve	4-20 mA 24 V	0.5	2	0.04	1
Chiller Remote ON/OFF	10mA 24 Vdc	0.24	2	0.02	0.5
Chiller Pump ON Status	12 mA 24 V	0.24	2	0.024	0.6
Chiller Compressor ON Status	12 mA 24 V	0.24	2	0.024	0.6
Chiller Power ON Status	12 mA 24 V	0.24	2	0.024	0.6
Remote Setpt Enable-Relay	50 mA 24 V	1.2	2	0.1	2.4
Remote Setpt	4-20 mA 24 V	0.5	2	0.04	1
Alarm #1	12 mA 24 V	0.24	2	0.024	0.6
Alarm #2	12 mA 24 V	0.24	2	0.024	0.6
Alarm #3	12 mA 24 V	0.24	2	0.024	0.6
Supply Pressure	4-20 mA 24 V	0.5	2	0.04	1
Return Pressure	4-20 mA 24 V	0.5	2	0.04	1
Bypass Ctrl Valve	4-20 mA 24 V	0.5	2	0.04	1
Supply Solenoid Valve	10mA 24 Vdc	0.24	2	0.02	0.5
Return Solenoid Valve	10mA 24 Vdc	0.24	2	0.02	0.5
Ctrl Valve - Prop. Solen.	0.6 A 24 V	14.4	6	3.6	86.4
Subtotal	-	-	-	4.3	110

Backup Power in Alcove in Assembly Hall - High Power (Deisel Generator)					
Item	I & V	Power (W)	#Needed	Total I (A)	Total Power (W)
Vacuum Pump	110 VAC		2	-	2000
Recirculation Pump	3-phase?		2	-	1500
Overhead light			1	-	100
Subtotal	-	-	-	-	3600

Power Consumption Estimates (continued)

Backup Power for First Floor in Interlock Rack (on UPS?)					
Item	I & V	Power (W)	#Needed	Total I (A)	Total Power (W)
575 Crate	6 A 110VAC	660	2	12	1320
505 Crate	3 A 110VAC	330	2	6	660
Overhead light			1	-	100
Fix Dynamics PC	5 A 110VAC	500	1	5	500
Subtotal	-	-	-	-	2580
Backup Power for Counting Room (Deisel Generator?)					
Item	I & V	Power (W)	#Needed	Total I (A)	Total Power (W)
Fix Dynamics PC	5 A 110VAC	500	1	5	500
Overhead light			1	-	100
Subtotal	-	-	-	-	600
Total	-	-	-	-	7717

Should add ≈50% contingency onto these estimates.
Power consumption estimates include both SVXII and ISL.

* These solenoid valves are only needed in the case that the flow to a bulkhead needs to be stopped because of a very large leak.