TE-PUFPLUS Hi-Vol One-Point Flow Check Data Form

Site Information

Full Site Name: Burns Harbor - Port of Indiana

Site Abbreviation: BHP Sampler Serial No.: 1006

Field Technician Name: Kate Haile & Katie Healy Date: 8/12/21 Time: 12:05 CST

Site Conditions & Sensor Checks *allow Temperature/Pressure standard to acclimate for 10 minutes before reading*

Temp/Pressure Standard Make/Model: Delta Cal DC1

Temp/Pressure Standard Serial No.: 179112 Temp/Pressure Standard Certification Date: 2/2/21

$T_{amb\ transfer\ standard}$ (°C) 29.7 $T_{amb\ PUFPLUS}$ (°C) 29.4 ($T_{amb\ transfer\ standard} - T_{amb\ PUFPLUS}$)= 0.3 °C

Is the PUFPLUS Temperature sensor within ±2°C of the Transfer Standard? YES NO (circle one)

$P_{amb\ transfer\ standard}$ (mmHg) 743 $P_{amb\ PUFPLUS}$ (mmHg) 745 ($P_{amb\ transfer\ standard} - P_{amb\ PUFPLUS}$)= -2 mmHg

Is the PUFPLUS Pressure sensor within ±10mmHg of the Transfer Standard? YES NO (circle one)

- If both of the above are YES, sensor check is complete. Proceed with flow check.
- If either of the both is NO, use the TE-PUFPLUS Operator's Manual to troubleshoot and retry the sensor check. If the issue persists, add a calibration point to the faulty sensor as described in the SOP in Section 10.2.3. Note that a calibration was done here:

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Calibration Orifice/Manometer Information

Orifice Make/Model: Graseby/Nash Orifice Serial No.: 62K

Orifice Slope "$m_{orifice}$": 10.46067 Orifice Intercept "$b_{orifice}$": -0.16706

Orifice Certification Date: 2/4/21

**if using a "U" tube manometer, write "U-tube" in Make/Model and leave the other spaces blank*

Manometer Make/Model: Dwyer 475 Mark III Manometer Serial No.: 007947

Manometer Certification Date: 2/4/21

One-Point Flow Check Procedure

**flow check is to be performed after the 5th scheduled sample run of each month*

1. Set up the sampler as if performing a flow calibration with certified orifice and manometer. No sample media should be inside the module. Attach the orifice tubing to the manometer instead of the AutoCal sensor.
2. Turn on the hi-vol's motor at 0.225 m^3/min for 10-15 minutes:
   a. In the PUFPLUS Interface select "F3" for "Setup", navigate to "Diagnostics" and select "Ent", navigate to "MTR Control" and select "Ent", navigate to "Qsys" and select "Ent", navigate to "MTR Setpoint" and select "Ent", enter 225 (units are liters/min) as the setpoint and select "Ent".
3. Record the Manometer Pressure.
   $P_{Manometer}$ (inH_2O) 5.0
4. Calculate the Manometer flow rate using the following equation:
   $$Q_{Manometer}\left(\frac{m^3}{min}\right) = \frac{1}{m_{orifice}} * \left(\sqrt{P_{Manometer} * \left(\frac{P_{amb} * 298K}{760mmHg * T_{amb}}\right)} - b_{orifice}\right) = 0.2257$$
   **T_{amb} should be in degrees Kelvin: T_{amb} (°C) + 273 = T_{amb} (K)*
5. Calculate the percent difference between 0.225 m^3/min and $Q_{Manometer}$:
   Percent Difference = 100(1 − ($Q_{Manometer}$ ÷ 0.225))* = 0.3 %
6. Is the Percent Difference ≤±10%? YES NO (circle one)
   a. If YES, flow check is complete.
   b. If NO, use the TE-PUFPLUS Operator's Manual to troubleshoot and retry the flow check. If the issue persists, the sampler will need to be recalibrated. Contact the Project Leads.