



**97-026 Rev B  
2 May, 2007**

## **VACUUM TROUBLESHOOTING FOR NOX ANALYZERS**

### **Scope:**

**This service note provides information on troubleshooting vacuum problems in API NO<sub>x</sub> analyzers.**

### **Background:**

**Vacuum problems in NO<sub>x</sub> analyzers can cause a variety of trouble ranging from flow and drift problems to noise and failure to respond. Common reasons for vacuum problems are charcoal packed too tightly, leaks in charcoal canister and dryer, and pump problems.**

### **Tools:**

- A. 2 each 9/16" or adjustable wrenches.**
- B. Vacuum gauge mounted on a tee.**
- C. 1/4" caps for blocking flow.**

### **Understanding Vacuum:**

**API uses the convention of Inches of Mercury Absolute, ("-Hg-A) for measuring vacuum. This is based on a perfect vacuum being 0"-Hg-A, and ambient pressure at sea level being about 29.97"-Hg-A. Because ambient pressure varies with altitude, trying to speak about vacuum in terms of gauge is difficult at best. The reason is that a pump which pulls 25"-Hg-g at sea level will pull only 23"- Hg-g at an altitude where ambient pressure is only 28"-Hg-A. To achieve a realistic idea of how good or bad a pump is, we use Absolute pressure as follows: Any vacuum applied (measured with a gauge) is subtracted from the ambient pressure. The difference is the pressure in inches of mercury absolute, ("-Hg-A). This procedure will use this convention.**

### **Procedure:**

- A. For M200, M251 and M252 the pump inlet has a tee on it. One side goes to the dryer the other to the charcoal scrubber, then to the analyzer. Disconnect the tube to the dryer and plug the tee.**
- B. Disconnect the tube to the scrubber and attach the vacuum gauge. With the Tee on the gauge plugged, (no flow entering pump), measure the vacuum. Calculate absolute pressure, (ambient pressure minus gauge vacuum). If the absolute pressure is more than 7"-Hg-A then the pump is defective and must be rebuilt.**
- C. Remove the cap from the vacuum gauge tee. Connect the tube from the charcoal scrubber to the vacuum gauge tee. Connect the tube from the other side of the**

**charcoal scrubber to the analyzer.**

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- D. Measure the gauge vacuum. Calculate the absolute pressure. If the absolute pressure is more than 1" higher than the reading in step C, the scrubber or tubing is likely to have a leak.**
- E. Remove the vacuum gauge and tee. Connect the charcoal scrubber tube to the pump tee. Disconnect the vacuum tube at the exhaust fitting of the analyzer and connect the vacuum gauge to the analyzer. Connect the vacuum tube to the tee on the gauge.**
- F. Measure the gauge vacuum. Calculate the absolute pressure. If the absolute pressure is more than 1" higher than the reading in step D the scrubber is restricting flow. You should replace the pads at each end of the scrubber and refill the scrubber with fresh charcoal. Do NOT pack the charcoal into the scrubber. After pouring charcoal into scrubber, tap lightly on outside of scrubber to settle the charcoal. Re-check the vacuum.**
- G. M200 and M252 users should remove the cap on the pump tee. Re-connect the dryer to the pump tee and measure vacuum as in step F. If the absolute pressure has increased more than .5" over the reading in step F, then the dryer is defective and should be repaired or replaced.**
- H. M200A and M200AH users should place a finger over the DFU filter at the inlet to the dryer while checking vacuum in step F. If the gauge reading changes more than .5" when you plug the DFU on the dryer, then the dryer is defective and needs to be repaired or replaced.**

