

In mid 2003 AAS provided support for a clinical trial of Alfaxan CD as part of that work we tested anesthesia machines in 12 veterinary hospitals. All anesthesia machines failed leak (pressure) tests and requiring various levels of repair. If the machine does not hold pressure (ie leaks), it will be more difficult to maintain anesthesia and waste gas pollution will occur.

## Four Steps to Trouble Shooting

### Step 1 - O<sub>2</sub> supply test

Frequency: 3-6 monthly

Problem: loss of cylinder O<sub>2</sub>

Solution: saves \$\$ on loss of O<sub>2</sub>

O<sub>2</sub> supply includes the oxygen cylinder, regulator, high pressure oxygen hose/connections, the flowmeter valves and O<sub>2</sub> flush valve (turned off). Connect the machine to the O<sub>2</sub> cylinder in the usual manner. Turn the O<sub>2</sub> flowmeter valve off and turn the O<sub>2</sub> cylinder valve on. Then turn the cylinder valve off and mark the pressure (needle position) on the regulator gauge using autoclave or electrical tape. (see Figure 1) The gauge pressure should not drop by more than 1000 kPa (1 graduation) in 1 hour. Generally requires workshop service to resolve.

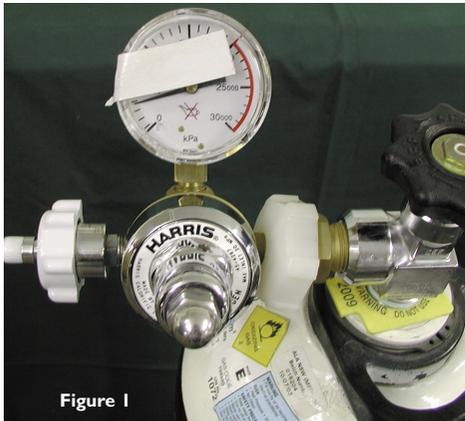


Figure 1

### Step 2 - flowmeter output test

Frequency: 3-6 monthly

Problem: Inadequate delivery of inhalation anesthetic - patients wake up.

Solution: predictable anesthesia; saves \$\$ on loss of O<sub>2</sub>

This requires an empty 1 or 2 litre breathing bag attached to the common gas outlet. (see figure 2) Turn on the flowmeter valve to 2 litres/min. and use a watch to time how long the breathing bag takes to fill. 2 litre bag should fill in 1 min. Will require workshop service to resolve.

### Step 3 - Pressure testing flowmeter, vaporiser and O<sub>2</sub> flush valve

Frequency: monthly

Problem: WAG pollution and inadequate delivery of inhalation anesthetic. Leaking vaporisers cost \$\$.

Solution: more predictable anesthesia, better air, happy people.

Use the O<sub>2</sub> flush valve to fill the breathing bag to full distension or 20 cm H<sub>2</sub>O if you have a pressure gauge (figure 4). Observe for 1 minute. The pressure should not drop. Leaks may be caused by poor connections, O<sub>2</sub> flowmeter seal leaks (see figure 3), vaporiser faults etc. Will require workshop service to resolve.

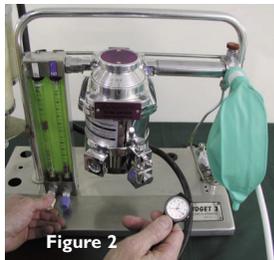


Figure 2



Figure 3

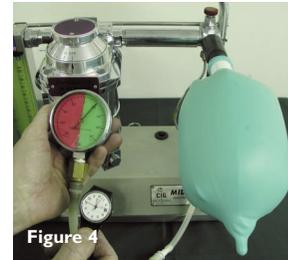


Figure 4



Figure 5



Figure 6

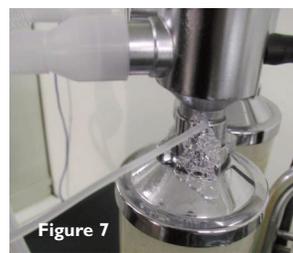


Figure 7

- b. Turn on the O<sub>2</sub> supply & check the pressure gauge level
- c. Check the O<sub>2</sub> flowmeter is off and the indicator reads zero

### Step 4 - Patient breathing circuit pressure testing

Frequency: daily

Problem: WAG pollution (considerable) and variability in anesthetic depth.

Solution: more predictable anesthesia, better air, happy people.

Change the CO<sub>2</sub> absorbent before starting if half the canister is exhausted (or 100 mls of Anesthetichas been used in the vaporiser). Check the vaporiser fluid level and fill. Occupational exposure to WAG is minimised by filling vaporisers at the end of the work day.

#### TEST

- a. Install a clean breathing bag and breathing hoses
- b. Turn on the O<sub>2</sub> supply & check the pressure gauge level
- c. Check the O<sub>2</sub> flowmeter is off and the indicator reads zero
- d. Close the pop-off (pressure relief) valve on the absorber (Figure 6)
- e. Turn the vaporiser on to 1%
- f. Occlude the patient ET tube connection (Y-piece connection) as shown in figure 5
- g. Turn on the O<sub>2</sub> flowmeter to ensure the bag fills normally, then turn it off
- h. Press the O<sub>2</sub> flush valve to fill the circuit until the pressure gauge manometer reads 20 cm H<sub>2</sub>O (breathing bag distended - figure 5)
- i. With no more gas flow, pressure should not drop more than 5 cm H<sub>2</sub>O / 30 sec
- j. With the patient ET tube connection still occluded, relieve the pressure in the circuit by opening the pop-off valve (figure 6). This also tests the scavenging system patency. Do not relieve pressure by releasing the patient ET tube connection, because this may result in CO<sub>2</sub> absorbent particles entering the inspired limb of the breathing circuit.

## Anesthesia Problem Solving

Problem	Solution
No O <sub>2</sub> through flowmeter	Check O <sub>2</sub> cylinder
Machine fails pressure test	Check all high pressure hose are connections Check that the pop-off valve is shut Check tightness of absorber canister connections Check rebreathing bag and circuit hoses Check that vaporiser fill/drain port is closed Try pressure test with vaporiser in off position
Patient is not anaesthetised	Check Anesthetic level in vaporiser & dial setting Check O <sub>2</sub> supply & flow meter settings Pressure test machine
Rebreathing bag does not inflate	Check O <sub>2</sub> flow meter settings Check that the pop-off valve is shut - for active WAG scavenging, check for excess negative pressure
Rebreathing bag over inflates	Pop-off valve may be closed or non-functional

### Common Sites for Leaks in the patient breathing circuit include:

- Holes in hoses or bags (replace)
- Hose and bag connections
- Inspiratory/expiratory valve connections
- Pop-off valve left open

Leaks that are not obvious can be located by using soapy water to produce bubbles at leak sites during pressure check (figure 7). Dilute dishwashing liquid in a syringe works well.