

SERVICING A SEIZED OXFORD MINIATURE VAPORISER

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The Oxford Miniature Vaporizer (Penlon Ltd) is widely used, suitable for drawover use and very popular in the developing world. It is simple, robust, and can be used to deliver almost any volatile anaesthetic agent, mostly used with halothane.

Like any piece of equipment, it needs servicing from time to time. As with much apparatus, keeping it clean is one of the best ways of looking after it. This article deals with the problem of accumulation of materials inside the vaporizer, which make it increasingly difficult to move the control pointer.

It is inevitable that some dirt and dust from the atmosphere gets drawn into the vaporizer during normal use; you may be able to reduce this by fitting a dust filter on to the air entry point of your breathing system, but make sure it is a coarse filter with low resistance, as the patient has to breathe through it. However clean the air, over the course of time, residues from the anaesthetic agent will accumulate inside the vaporizer, and it is these sticky residues that are the main problem. They consist of substances added by the manufacturer to the anaesthetic agent in order to protect it from undergoing chemical change. Halothane is the most reactive of volatile anaesthetics, and has the largest amount of preservatives and anti-oxidants added to it. (An OMV used only with isoflurane will be a lot less sticky than one used with halothane).

If your vaporizer is getting stiff, a 'quick-fix' is to insert a bung on the inlet side of the OMV, turn the vaporizer on to its side and pour in some ether, methylated spirits or halothane whilst moving the pointer to and fro. If you put another bung on the other side you can give the vaporizer a good shake without spilling liquid. Leave the vaporizer to stand for 5 minutes before emptying. If you are using the ether or halothane perform this procedure outdoors to avoid inhaling the fumes. Empty the fluid out of the vaporizer and blow it through with air for 10-15 minutes.

This is only a short term solution - in order to clean out the sticky residues properly, there is no alternative but to partly dis-assemble the vaporizer and clean it by hand. The instructions below are taken from the manufacturer's service manual. Do not start unless you have had some training, and ideally have had a trained person demonstrate the process in front of you.

Let's assume you are confronted with an OMV on which the pointer control is either very sticky, or completely stuck.

Before you start, find a clear, well-lit space to work in. Sweep the floor first, and it will then be much easier to find any small items that you accidentally drop. Spend five minutes looking carefully at the vaporizer, comparing it with the pictures below, and identifying the parts. Have a pencil and paper so that you can draw what you see as you work - this will make it much easier when you have put things back together. Have a small dish or saucer to store parts like screws that can roll away and get lost.

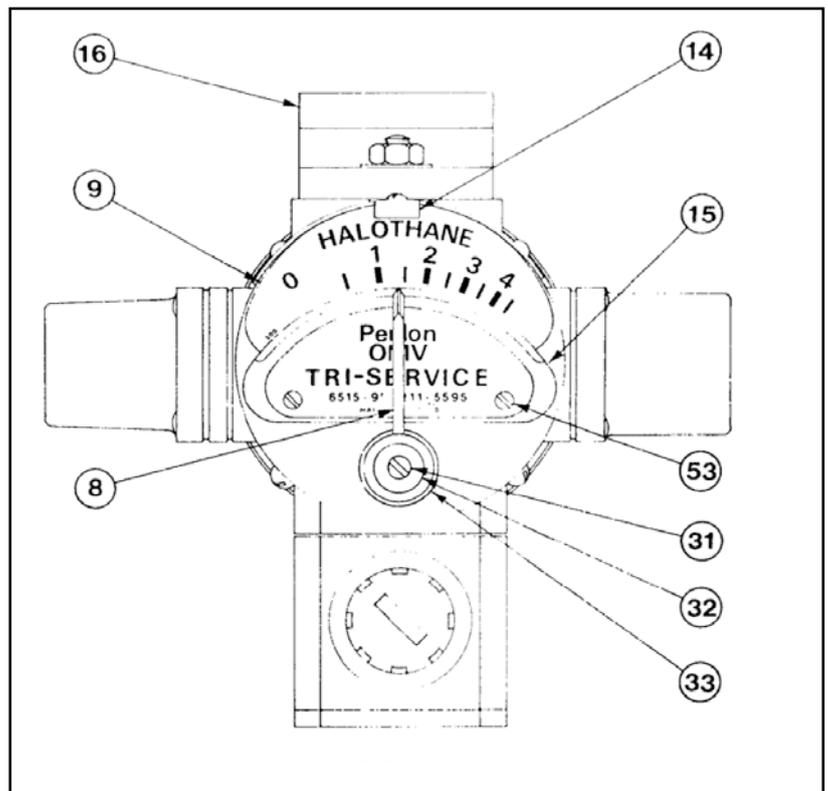


Figure 1

What you have to do:

Most air going through the vaporizer passes straight across the top, but a small, variable amount is diverted into the vaporising chamber. The by-pass tube has holes at the bottom, which are partly or totally occluded by the metal cylinder (slider) that slides from side to side under the control of the pointer. Sticky residue between the cylinder and the by-pass channel makes it hard for the cylinder to move inside the channel. You have to take the cylinder out, clean it and the inside of the by-pass tube, and put it back. You do not need to do anything inside the vaporising chamber itself. No special tools are needed - just a set of small screwdrivers. The whole procedure can be completed in about half an hour.

1. Remove the pointer by unscrewing the screw (31) and washer (32), then lift off the pointer and the washer beneath it (33). Remove the scale, which is held in place wither by a clip (shown) or 2 small screws. Note the engraved 'degree' scale underneath the halothane scale - you will need to refer to this later.

2. Remove the lid - take out 2 screws (53) on the top and 3 around the edge of the lid, and carefully lever the lid off the body.

3. Once you have removed the lid the vaporiser will look like this. Put the pointer back on for a moment, and observe how the cog and rack transmit movement to the sliding cylinder in the by-pass channel. The vaporiser pictured below has a right-to-left flow (which is normal for draw-over use) but some exist with a left-to-right flow, and these have an extra cog wheel mounted on a plate. Identify which sort of vaporiser you have - the principles of working on them are the same.

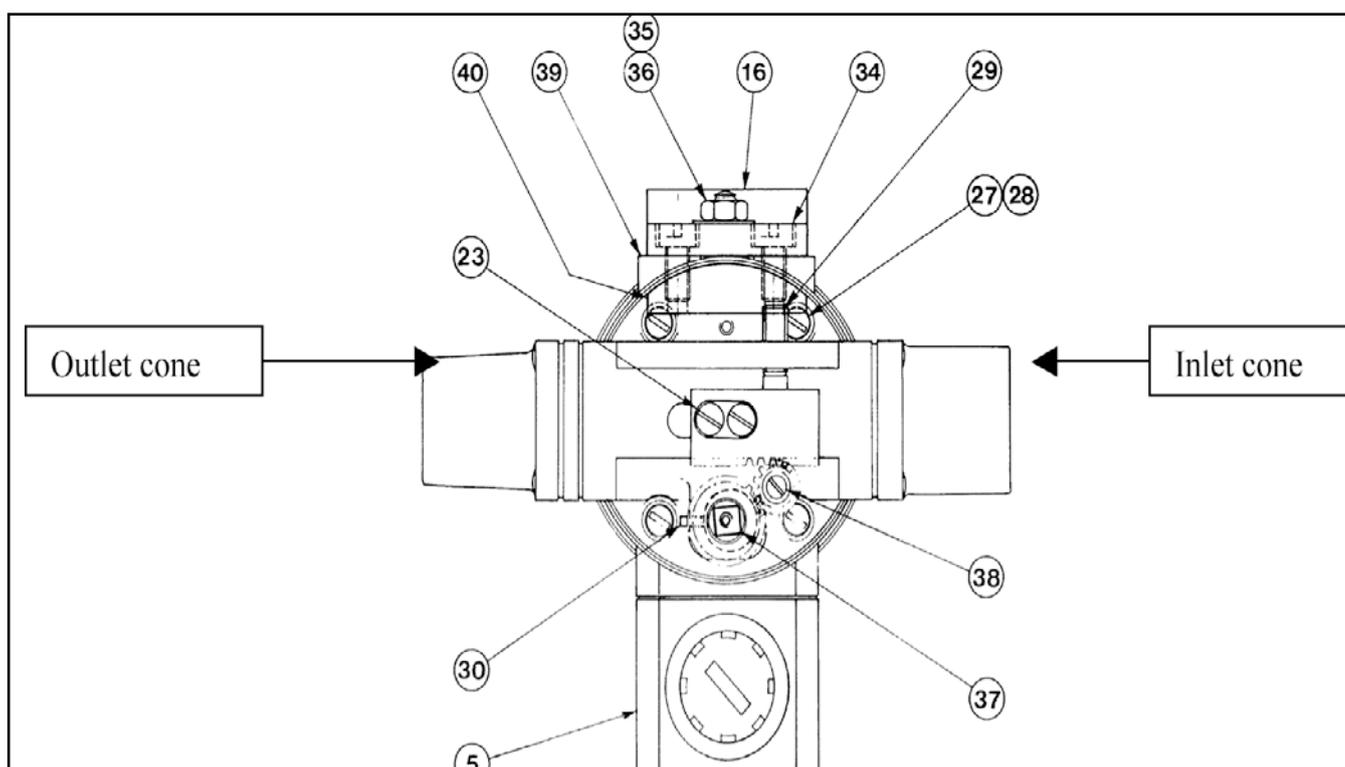


Figure 2

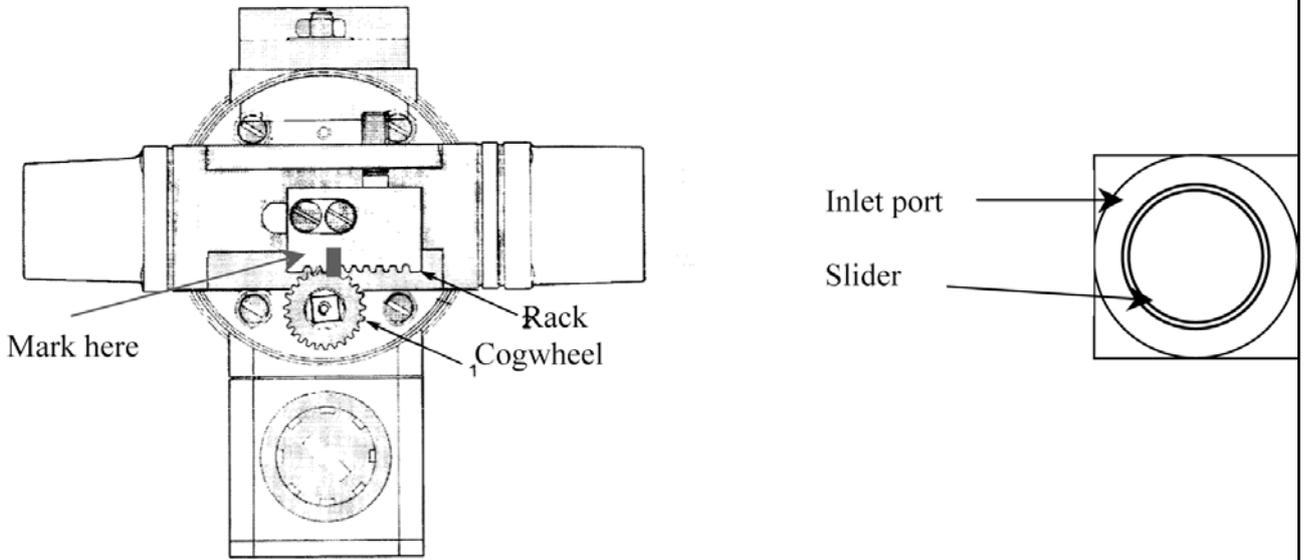
4. Dismantle the regulator assembly:

Remove the inlet & outlet cones (4 screws each (25 % 26) and obturator assembly (19).

Notice that the obturator can only be fitted to one end of the vaporiser, because of the small locating pins on the vaporiser body.

5. Remove 2 screws (23) securing the rack (20). First make a mark across the point where the cogwheel and rack teeth meet (this will help you to reassemble). Lift off the rack and spacers. Retain the plastic sleeves inside the spacers. Note the relative positions of the ports and the direction of the internal cone of the slider.

Figure 3



6. Remove the slider valve by pushing from the outlet end of the regulator housing. If it is stiff, use a piece of wood or plastic to push it, so as not to damage the metal surfaces. If you cannot move the slider, apply some penetrating oil around the edge inside the bypass channel. Do this with the vaporizer on its side, so the oil can sweep down.

7. If you do not have penetrating oil, use a 50:50 mixture of sewing machine or bicycle oil and ether. Leave the vaporiser like this for 2 hours - if it still will not move, apply more oil at the other end. Notice as you take it out that there is a right and a wrong way to put the slider back ! Check the picture below to see how the inside of the slider relates to the obturator.

8. Soak the assembly in ether or alcohol to dissolve deposits, then wash the slider valve using cleaning liquid and a soft cloth. NEVER use abrasives such as sandpaper. You may use metal polish ("Brasso") to remove stubborn dirt, but make sure you remove all polish residues.

9. Before re-assembling, lubricate the moving surfaces with a VERY small amount of "Vaseline" (petroleum or petrolatum jelly). Do not use oil or other lubricants as they dissolve in halothane!

10. Re-assemble the regulator assembly by reversing step 5. Check the correct location of ports, direction of cone, and reassemble with spacers and crews, lining up the marked teeth on the rack.

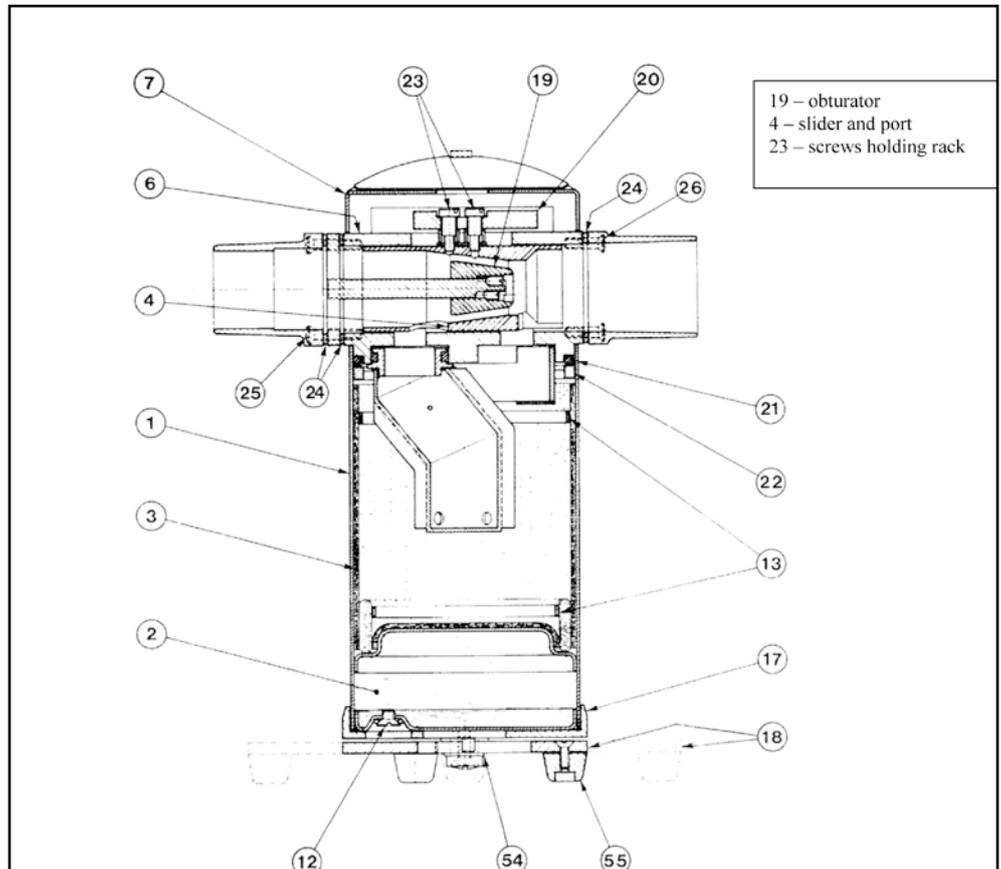


Figure 4

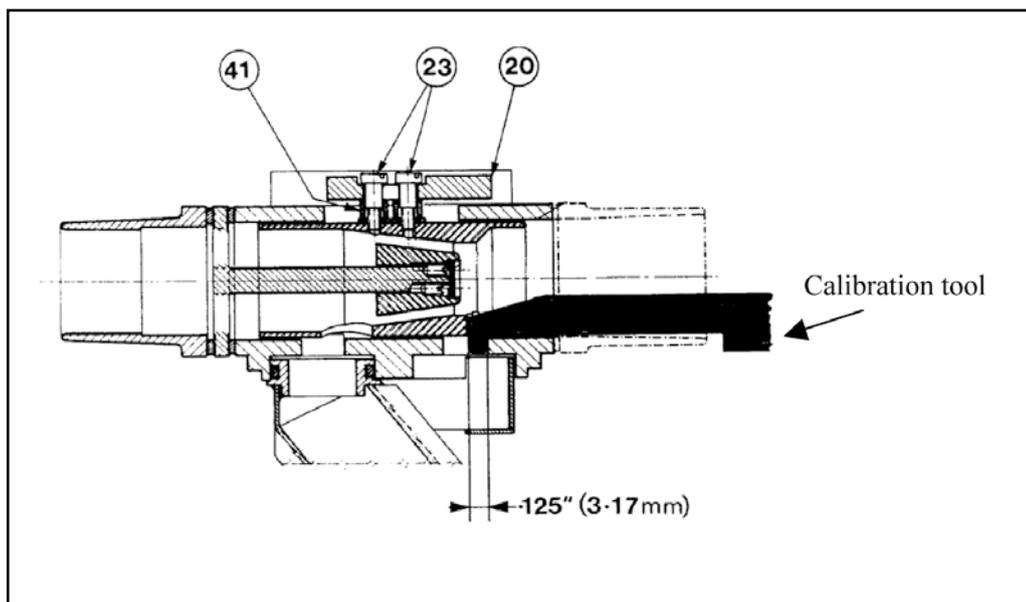
11. Reset the vaporiser The relative positions of the slider and pointer may have moved. To reset you will need a special gauge, which you can obtain from the manufacturer, but if you have a vernier gauge, hacksaw, and file it is easy to make your own from a piece of thin metal sheet:

Figure 5: Setting Gauge.



(Measurements in inches. $1/8$ inch = 0.125 inches = 3.175mm)

12. If you have marked the cog/rack as suggested in step (5), you can miss out the rest of this step, as you can realign them accurately in their original positions, and go to step (14). Otherwise, before replacing the lid, loosely reattach the pointer to check that the cog and rack are in roughly the right positions. The pointer should have a range of movement corresponding to where the scale will go. Now replace the lid and check the exact setting using the special tool. With the pointer set at maximum concentration, insert the calibration tool at the air inlet and let it slide along the 'floor' of the passageway until it drops into the port leading down to the vaporising chamber.



13. Gently turn the concentration pointer "down" until the sliding valve lightly grips the tip of the gauge. The pointer should now be at 35° as shown on the scale engraved on the top of the vaporiser. If not, you have not replaced the pointer or cog in the right place, and will need to readjust it. The mark you made in step 6 should help you avoid this error.

If the pointer does not point at 35°, you need to re-align the cog and rack - if you are one 'tooth' out, the pointer will be 7.5° away from 35°, if 2 cogs, 15° away etc.

14. Complete the re-assembly of the vaporiser lid, scale, pointer and mountings. The lid screws are particularly fiddly and short, so use a suitable small screwdriver and be very careful not to cross-thread them.

The complete Penlon workshop manuals for both the EMO and OMV vaporisers are on the "Anaesthesia Resource 2" CD which is available free of charge from "TALC" (www.talcuk.org). Unfortunately due to a technical error the OMV manual is not accessible from the "index" page of the CD, but you can find it easily by carrying out a search/find command for "OMV".