



Two newly purchased units of the latest Invacare Oxygen Conserver (model IOC100P) were received and tested using the Inspired Technologies Clinical Oxygen Dose Recorder.

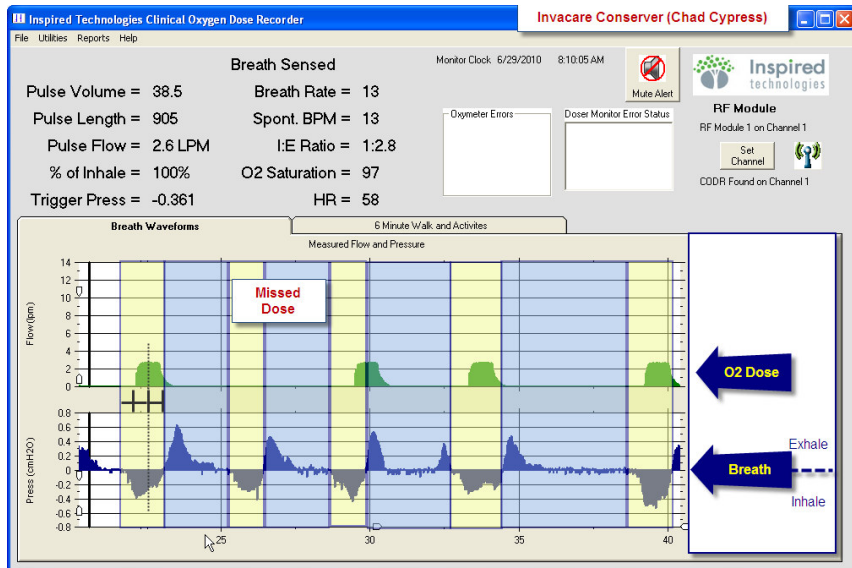


General Observations:

- The device is a fixed pulse unit, giving a bolus of approximately 32 ml on each breath on a 2 setting.
- The device gives a low flow, long bolus. In theory, it gives a 2 -3 LPM flow for about 1 second. This correlates to a 1 second inhale (20 BPM @ 1:2 IE ratio).
- The bolus does not change as the breath rate changes. On the positive side, the bolus volume does not change. The negative is that the bolus is still about 1 sec long; it is late in the inhale and extends to exhale.
- While the bolus at 2 was approximately 32 ml, at least half of this is given at the end of the inhale and often in the exhale.

Detail:

Figure 1: Dose Screenshot – Invacare (Cypress) @ low breath rate (18 BPM)



Notes:

Graphs show breathing on bottom graph and oxygen dose on top graph.

Breathing shows inhale as negative pressure and exhale as positive pressure

Inhale is shaded in yellow. Exhale is shaded in blue.

Breath-by-breath data is shown at top left.

So, what do we see in Figure 1? The flow on this unit is a bit higher than normal at 2.8 LPM and the valve stays open for 900 msec, or 0.9 seconds. The dose volume is very consistent (green boluses all look same). In the first breath,

1. I've shown divided into thirds so that we can see what portion of the oxygen is delivered in the first 2/3 of the inhale. You can see in this dose that approximately 1/2 of the oxygen is delivered in the last 1/3 of the inhale (wasted oxygen) and some is delivered in exhale.
2. On the second inhale, no oxygen was delivered. This was a missed dose and is caused because the inhale did not reach the trigger threshold. Notice that the unit takes -0.35 cmH₂O to trigger. This is why the dose occurs in the middle of the inhale, or not at all. Shallow breathers will not be able to trigger this device.
3. On the third inhale, notice that the dose is now all given at the end of inhale and during exhale. This is actually worse than a missed dose as it is all wasted. Doses such as this are depleting the cylinder while giving oxygen when it can not be used.

- The fourth inhale is similar to the first, and is likely as good as you can get with this device. The dose is almost all within the inhale, but still loaded at the back half of inhale.

Figure 2: Dose Screenshot – Invacare (Cypress) @ moderate breath rate (24 BPM)



As the breath rate increases, the inhale is getting a bit shorter.

Notice now that the bulk of the dose is delivered at the end of inhale and during exhale. (Highlighted in red).

This is putting out a significant amount of oxygen, but will not keep the patients saturated.

Notice that the sensitivity is now showing -0.50 cmH₂O as the inhale curve is steeper. Again, the device is triggering late in the inhale.

Pulse length is still 0.9 seconds, 2.8 LPM. Bolus does not change, but does not fit.

In general, this device has a high trigger pressure and as such, does not trigger at the beginning of inhale. When it does trigger, it simply turns on a valve for a fixed period of time at a fixed flow rate. This causes the unit to start the oxygen far into the inhale rather than at beginning and then delivers the oxygen at the 2nd half of inhale and into the exhale. This device is generous in its bolus size, but gives the oxygen during periods where it can not be used. It would appear that the effective oxygen is perhaps 1/2 of the dose volume in the best case (19 ml) and likely 1/3 of the dose volume as breath rate climbs (13 ml).