

The Over Pressure Valve (OPV) - Basics

The Over pressure Valve (OPV) also known as an Expansion Valve, is an often neglected, but very important part of your machine. Vibration pumps produce around 15-18 bar unregulated, depending on type. This is far too high for best espresso extraction. Unfortunately, far too many machines, have totally unregulated pumps (these tend to be at the cheaper end of the market). However some of the more expensive and popular models also have no real ability to regulate pressure or a fixed OPV, which cannot be adjusted.

The OPV is used as a relatively crude method of pressure regulation, but it is effective if you have a decent OPV fitted on your machine. Let's get one thing straight right from the start; the manufacturers don't often say (in fact I have not ever seen it stated) that you can regulate pressure down to 9 bar on their vibration pump machines. This is something that has come about from interested enthusiasts seeking better results from their machines. This is important as when reading this article you should understand that although some OPV valves are better than others, it does not mean these manufacturers are producing machines that are "faulty" or "substandard", when they contain an OPV that is not perhaps as good as others. If the OPV does the job and regulates pressure to whatever the manufacturer presets it to at the factory....then its meets the specifications they publish. If you want a machine that can be regulated down to 9-10 bar, you need to understand the limitations of some of the OPV valves fitted to various machines.

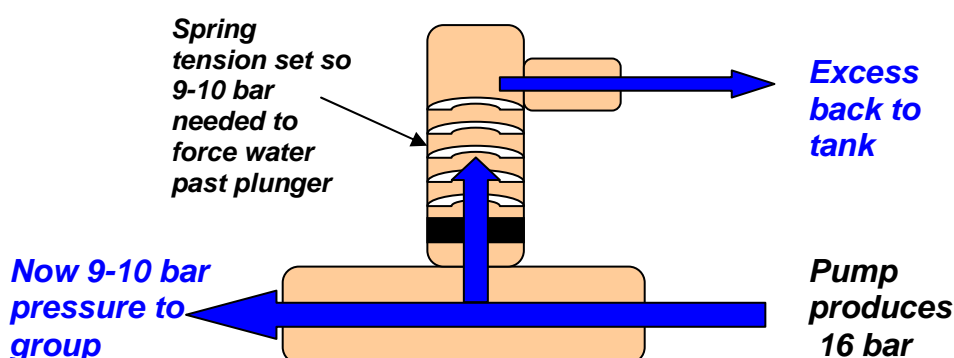
I hope that the various manufacturers do read this in a positive way, as many machines could probably benefit from better quality OPV valves, especially considering the important, but often overlooked role they have and their relatively cheap cost

I only use 3 OPV valves in this example, but they are broadly typical of the majority of valves out there. There are a couple of others not included in the article, because I can't get hold of them. Should anyone want to send me one free, I will be happy to include it in the article.

How does the OPV Valve work

It's very simple, there is device (a plastic ball, rubber pad on brass piston or similar), pushed by a spring (the tension on the spring can be adjusted) against an exit hole in the OPV. The exit hole normally has a tube routing excess water back to the tank. The water from the pump is able to exit the machine via the hole in the OPV valve, as long as it has sufficient pressure to overcome the device used to block the OPV exit hole.

Simplified Diagram of OPV valve



3 OPV valves



These from left to right are old Expobar fitment, Current Expobar fitment and Izzo Vivi (I am fairly certain it's the same one fitted in the Andreja Premium). **The OPVs improve in quality and ability to regulate pressure from left to right.**

Now in the words of crocodile Dundee, when comparing the Vivi OPV valve to the others: **“you call that an OPV”..... “this, is an OPV”**. It's a lot bigger and heavier, even more impressive when you consider the others have a T piece built in to the OPV, the Vivi one fits on to a T Piece.



OPV Valves - Dissassembled



Here we can clearly see the rubber pads on the ends of the brass plungers. The OPV far left uses a plastic ball, which can be seen in the next picture

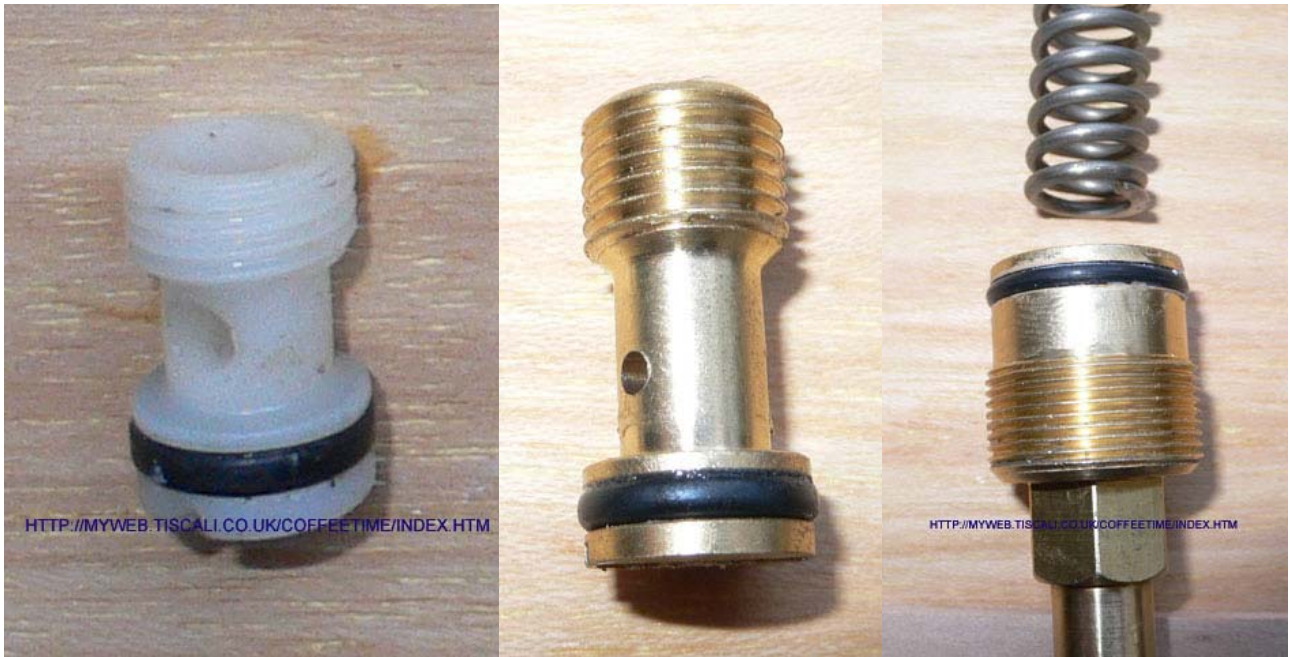


The plastic ball doesn't really inspire confidence as a sealing device. It's actually pressed against a rubber seating held by a brass bush. I didn't bother pulling it out.

Note the differences in size of the internal mechanisms!

Also see how the springs in the first two very similar OPVs are very different with one obviously more powerful than the other. The one second from the left also has a much higher flow rate. The Vivi one has a very high flow rate indeed and is very adjustable.





These shots of the plungers again from left to right show the different OPV valves. The manufacturer making the very high quality product (far right), lubricates the O-ring seal (evident in the picture). I may be being unfair to the manufacturers of the other OPV valves, but I could see no evidence of lubrication on the O-rings. I would actually recommend that before fitting the middle OPV, the O ring is lubricated with a bit of Vaseline, or lip salve. This will aid sealing and prevent damage when adjusting.

So how is this important in your machine? To answer that let's go back to the line up of OPV valves.



If you have the type on the left, your going to struggle to adjust it much below 11 bar (remember the pressure gauge on your machine may not be accurate, always check with an independent gauge). The type on the left is actually fitted on a lot of espresso machines. Because it has a weak spring, unscrewing it to its maximum, normally means that the spring hardly exerts any pressure. This causes it to let by (a bad thing as you will see later). In addition the Nylon adjuster carries an o-

ring that just doesn't seem to seal as well and this means the OPV itself is very likely to leak after adjustment (because water that gets by the poor sealing of the valve can get past the O ring, **even if you put it back to its previous position (screw it in again)!** I think a strictly "don't mess with it" OPV.


The Middle one (which I stress is now the standard Expobar fitment on the Brewtus II and presumably other models of Expobar in the UK). This is great, not as high quality as the Vivi one, but it can be adjusted happily down to 9-10 bar. The adjuster is near its limit with a new pump, and I always adjust these things to just under 10 bar anyway.

The last one....well if I had an OPV valve on my machine....this is the one the mechanical engineer in me would want...one only has to look at it to know that it's a superior product and very adjustable...nuff said!

I have always said that the Izzo Vivi "hides its light under a bushel" and it does have some really nice quality internals, in the same way as the Quick Mill Andreja Premium, which I am almost certain uses the same high quality OPV.

So how does this translate back to real world effects/problems on your machine? This is best illustrated by an example post from the Coffeetime forum. The Expobar Brewtus II is referred to in this example.....**but I stress, this can happen to any machine fitted with the same type of OPV valve, because the groups thermosyphon is fed either from the brew water boiler or the HX unit.**

<p>Paul L</p> <p>Joined: 14 Nov 2006 Posts: 13 :</p> <p>Items</p>	<p>Brew Pressure Modification edit quote X IP</p> <p>It's been an exciting few days with the Brewtus II. Getting together with Dave saw us restore the steaming power as mentioned in another thread. I've been continuously about the pressure during extraction since I moved from the Pavoni Europiccola to the Brewtus and started getting to know the E61 HX machines in their various forms (Brewtus twin-boiler and vibe, Dave's Izzo alex HX and rotary, the others in wide use out there).</p> <p>I don't miss the limitations of my Pavoni but I couldn't bring myself to sell it so it resides it my Mother's and I make capps from it when I visit. It gives an interesting counterpoint on taste and all the reading I did in the months I had it home suggested it did pull shots at 9 bar even if only for part of the lever cycle before the pressure fell away.</p> <p>Rightly or wrongly, I have assumed the brew pressure is it's one-trick pony in giving that buttery and sweet taste that defines a Pavoni - portafilter sneezes, too cold, too hot, gushers, chokers and gasket horror stories notwithstanding.</p> <p>Dave and I have spoken about the brew pressure of rotary and vibe machines and associated OPVs a few times. We tested my Brewtus a short while ago. The gauge is consistently over-reading (but easy to mentally adjust for) and we found that it worked at around 12 bar. Users world-wide it seems adjust the standard OPV but it does not appear to be a design that was intended to be adjusted and indeed sellers such as BellaBarista specifically say in their guide and owners manual to leave it alone. One wonders if this is what leads to all the off-set adjustments and other tinkering that sees the sellers get so frustrated with Brewtus owners.</p> <p>When Dave and I next got together (and with BB's permission) we fitted a different and allegedly better OPV which is a better casting, a longer and better manufactured thread with brass screw adjustment rather than the previous nylon one, a stronger and longer internal spring and a larger high pressure water inlet (is that right Dave?). I believe that these are the new standard fit although I would not want to be quoted on it or whether this is exclusive to BB or Expobar in general.</p> <p>I understand OPVs can sometimes screech and sure enough this one screeched immediately after fitment but it dissipated over the pull of very few shots and so has not been a problem. My extractions are now consistently at between 9 and 10 bar.</p> <p>Any difference? Yes, a really pleasing difference. The extraction has a fuller, more developed taste across the same varieties of beans and more sweetness. I would not describe it as that unique Pavoni butteriness but the taste is now up there where it should be. Now it's up to me to master the single basket and keep working at that grind, dose, tamp and shot quality.</p> <p>Many thanks to Dave and to BB for their help with this.</p>
<p> 07 Dec 2006 02:07 pm</p>	<p>profile PM email</p>

<p>davec Site Admin</p>  <p>Joined: 14 Nov 2006 Posts: 45 : Location: South of London (J10 of M25)</p> <p>Items</p>	<p>Brewtus II pressure mod edit quote X IP</p> <p>The Brewtus II is a nice machine although can have it's peculiarities. Generally though any problems are easily fixed. I have discussed some of these peculiarities with Bella Barista, hence the improvements in current machines being shipped and a stock of the new type OPVs. It's something that has been on the agenda for some time.</p> <p>The 3 main areas are:</p> <ol style="list-style-type: none">1. The OPV valve. Until very recently the machines came equipped with an OPV valve that exactly did the job Expobar needed and by design wanted it to...regulate pressure to below 15 bar. Trouble was it wasn't very adjustable and messing about with it could also cause it to leak (very small leak but leak nonetheless). This was probably why they faced it in the opposite direction of the adjustment hole, to prevent people messing with it. All new machines in the UK now come with a different (improved) OPV Valve
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So people trying to adjust pressure down to 9 bar (which you can't with this particular OPV valve), were opening it too far, this caused it to leak. As it sits in the Brew water circuit (pump, steam boiler HX, Brew water boiler), there is always some positive pressure in this circuit due to the HX water in the steam boiler being around 128C. This allowed the brew water circuit to "push" water back past the leaky OPV and the main brew boiler would drain down by 5mm or so. Because the inlet/outlet in the main boiler is right at the very top (including the thermosyphon feed to the group)...the group goes cool when this happens. It's probably the main reason many Brewtus II owners increase the temperature offset, to help cool brew temps!?

You can tell if you have the old not very adjustable OPV. If you look at it and it has a white nylon adjuster screw, then you have the old type....(not a problem if your not going to play with it, or haven't played around with it). if it has a Brass adjuster screw....then you got the new type. The new type can easily adjust down to 9 bar and doesn't leak if you adjust it. Replacement of the old type OPV with the new type: I did this job the other day....it's best achieved by removing the pump (3 bolts), **remove one high pressure line only**, withdraw the pump and remove OPV, plus adaptor nut on the end of the ULKA Pumps brass tube (cos the new OPV doesn't need one). Use plumbers PTFE Tape round the threads to get a good seal (don't use thread sealant, I think the tape is better). Replacement of this OPV valve takes around 30 minutes. *Tech Tip: unscrew the brass adjuster of the OPV until you can withdraw the barrel and lubricate the O'ring with a bit of lip salve can't hurt and will help keep it lubricated and leak free in service.*

After fitting there may be a bit of screeching due to a mix of water and air in the system, which vibrates and screeches as it exits the new valve, but this soon disappears and all is quiet in the house again 😊

cautionary note The Ulka pump has a plastic fitting in the end of its brass (or plastic tube), you can see it clearly. Initially put the OPV valve on as a test fit with no PTFE tape and turn it lightly until you feel it come up against this internal plastic fitting. Count the number of turns to do this. When you fit it properly with PTFE tape, be carefull not to go too far and damage the fitting. Remember it only needs to go on around 3 turns and have enough PTFE tape to be tightish to screw in, for it to have no chance of leaking.

2. The high pressure plastic tube in the machine. Again this stuff works very well indeed, no problem there....but if during assembly they (Expobar) over tighten the fittings, it can "tear" the self formed flange at the end of the tube and cause it to leak, or pop out of its holder. **However, one of the easiest fixes in the industry. If you come up against a leaky high pressure plastic tube joint, simply undo it, trim of 1mm of the tube (the self formed flange bit, you will probably see the tear), replace on the fitting and retighten. As you tighten the fitting will reshape (cold form) the end of the tube and it autoimatically forms it's own seal. Just don't overtighten it (no thread sealants of any kind are needed, or should be used).**

3. Descaling - the steam boiler is a piece of cake and very easy to descale....mainly because the hot water outlet is right at the bottom of the boiler and it's really easy to drain completely. The Brew water boiler is a bit harder...because as mentioned earlier the inlet and outlet are at the top of the boiler, it's much harder to get the descaler out (for obvious reasons). It can take around 12 litres of water to get it out completely, with a pump for 1 minute wait for 30 seconds routine to allow mixing in the brew boiler.

So really any fix is easy to do and the machine does give a nice shot, it's a good strong steamer and for the money offers a lot of features, especially the plumb, not plumbed feature. Component quality is good and it should give good service.


Keep your eyes out for a longer article with Photos covering this whole area on Coffeetime, pictures of disassembled OPVs and other stuff to excite the mechanical. I will of course link to the article again in this thread.

P.S. I did a couple of fixes on the machine for Paul (one High pressure line leak I spotted, plus re-routing the OPV runoff back to the tank instead of the drip tray). Bella Barista trust me to do this sort of thing in the field without invalidating peoples warranties. Mainly because of the relationship I enjoy with respect to coffee and coffee machine knowledge. **I don't get paid for fixing peoples machines on their behalf (Pauls machine was a favour for a friend), so please don't come to me to get your machine fixed and ALWAYS contact Bella Barista before making ANY adjustments that are not standard user operation. This way you will get the benefit of any recent knowledge and cautions, plus avoid any risk of invalidating your warranty.**

	Izzo Alex, Rotary Pump and onboard tank Mazzer Mini-E Toper Cafemino 1kg electric roaster http://myweb.tiscali.co.uk/coffeetime/index.htm Last edited by davec on 08 Dec 2006 06:36 pm; edited 6 times in total
 07 Dec 2006 05:47 pm	profile PM email www

akallio Joined: 08 Dec 2006 Posts: 2 : Items	Interesting read! edit quote X IP Very interesting read! This is what I've experienced also. Though my Brewtus was leaking already when it shipped (its not from BB). Loosening the screw has made it leak maybe a bit more. I see that BB is stocking the improved OPV and will definitely get a one. (And one of those no-burn wands.) I'm quite familiar with Brewtus internals, as I've already once had to replace the digital thermostat, so I think replacement should not be a problem. And proper brew pressure would be really good... Will the improved OPV be a bit longer so that it can reach the front panel hole behind the drip tray (for adjusting)?
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davec Site Admin  Joined: 14 Nov 2006 Posts: 45 : Location: South of London (J10 of M25) Items	Re: Interesting read! edit quote X IP quote: <hr/> <i>Originally posted by akallio</i> Very interesting read! This is what I've experienced also. Though my Brewtus was leaking already when it shipped (its not from BB). Loosening the screw has made it leak maybe a bit more. I see that BB is stocking the improved OPV and will definitely get a one. (And one of those no-burn wands.) I'm quite familiar with Brewtus internals, as I've already once had to replace the digital thermostat, so I think replacement should not be a problem. And proper brew pressure would be really good... Will the improved OPV be a bit longer so that it can reach the front panel hole behind the drip tray (for adjusting)? <hr/> Firstly....welcome aboard, nice to see you on here. There were a bad batch of thermostats, I think all those will have failed and been replaced by now. I don't think any have been failing after replacement. Just a advice....don't get a no burn steam wand. Izzo were going to fit no burn wands on the Vivi and Alex and I advised Bella Barista & Izzo not to do it. I also think that BB are specifically getting the Brewtus II without a no burn steam wand, even though it's available if they want it. You really don't want a no burn steam wand, you will not have the luxury of using different steam tips and I think the bottom doesn't come off so easy. Besides, when did you last burn yourself on the steam wand (and cleaning a normal one is quite easy)? I think the positioning/length of the OPV will not make it something you can adjust from the front panel, just make sure it's vertical and use a long screwdriver from the top of the machine....remember you shouldn't need to remove the whole case...just the top plate (3 screws) so not such a problem. Definitely use PTFE tape (much better than thread sealant) and be careful not to damage the one way valve by screwing into it.
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I adjusted Pauls machine to 10 bar as I really think that 9 bar is a bit low for the vibe pump machines and I like to see them a touch higher....you won't be able to tell the difference in the taste of the shot.

Conclusion

- OPV valves are to protect the machine from an over pressure situation
- Some are not very adjustable and shouldn't be touched

Expobar now ship the Brewtus II in the UK with the improved OPV valve, this can be adjusted to 9 bar and doesn't leak after adjustment. What can you do if you have a machine (not necessarily a Brewtus II), with an OPV valve that looks suspiciously like the one with the white nylon adjustment screw. Simple, it's a direct replacement with the middle OPV (the one with the brass adjustment screw). In the UK I know Bella Barista stock them and I am sure they would also be happy to ship to anywhere in the world. If your not intending to adjust your machines pressure....then don't worry about it.

If you decide you want the Vivi fitment on your machine (whatever it's make), you will also need a T piece adaptor as the Vivi needs to screw in to one, again the stockist in the UK is Bella Barista, but there may be others.

Finally I want to stress that if your machine (**whoever makes it**) has the OPV valve with the white nylon adjuster, it doesn't mean it's faulty (because if you don't touch it, it should be fine), or that you can go back to your in-country retailer demanding a replacement OPV. That's how the machine was made and it met its specification. The manufacturers don't really envision you adjusting the OPV and you shouldn't do it without permission from your retailer (who normally is responsible for the warranty). Also machines **and parts (e.g. the OPV)** specifications do change over time and a model that may have had a particular part, may no longer be fitted with it or the design of that part may have changed.

I would also like to thank Bella Barista <http://www.bellabarista.co.uk/> for kindly supplying the OPV valves for this article and also being open about their own improvement standards for the machines they sell.