

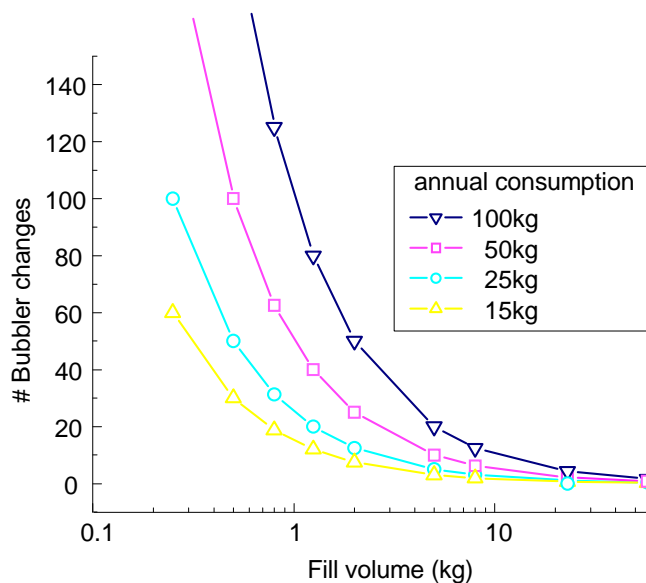


Large Cylinder with Heat Exchanger

Efficient production is a major goal for most companies; this usually involves minimizing production downtime. In the case of epitaxial growth, a large portion of machine downtime is associated with the need to change source cylinders, flush them, and qualify them.

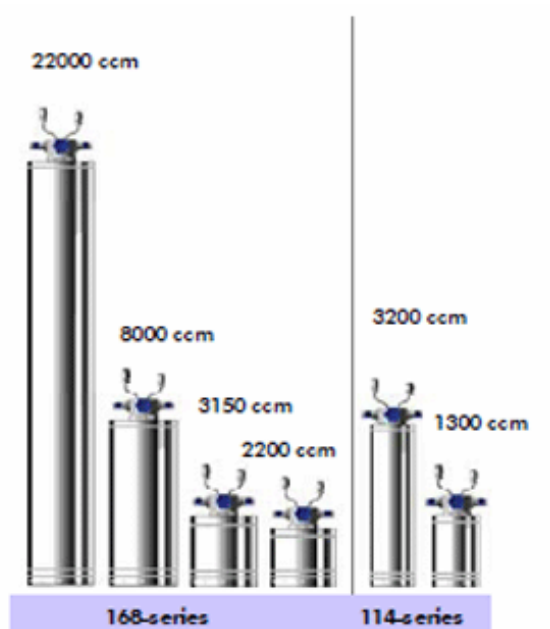
One way to minimize the downtime associated with cylinder changes is to use a larger cylinder. Figure 1 shows a comparison of number of cylinder changes as a function of cylinder fill weight for various yearly consumptions.

Figure 1. The number of cylinder changes required in one year versus the cylinder fill weights is shown for various annual consumptions



To accommodate the growing need for larger cylinder volumes, AkzoNobel High Purity Metalorganics (AkzoNobel HP MO) offers a number of 'large volume' cylinders available in varying sizes from 1300 ml to 22 l. Figure 2 shows some of the different cylinder sizes available. These large volume cylinders can accommodate fill weights of TMGa from 1000 g to 20 kg.

Figure 2: AkzoNobel HPMO 'large volume' cylinder series



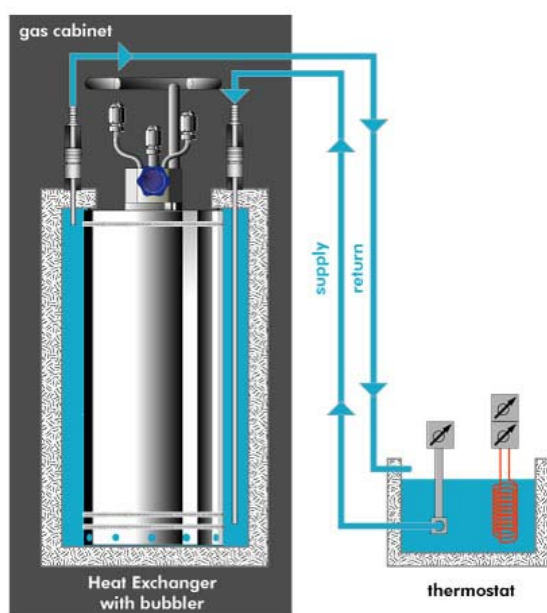
The use of large volume cylinders with conventional constant temperature baths has limited applicability due to the in-cabinet space required for such baths as well as the cost associated with the purchasing of an additional large capacity bath. To help reduce customer costs and to help optimize in-cabinet space, AkzoNobel HPMO has developed the Heat Exchanger.

Figure 3: Cylinder with Heat Exchanger



The Heat Exchanger is an in-cabinet cylinder heat exchanger that operates in conjunction with your conventional constant temperature bath and circulator pump, as illustrated in Figure 4. It not only allows an easy, cost effective conversion to large capacity cylinders which reduce production downtime, but also provides a more stable thermal condition for the cylinder which improves flow stability.

Figure 4. Schematic of a cylinder and Heat Exchanger in the gas cabinet and the thermostat water bath out of the gas cabinet



The Heat Exchanger is made of 316 l stainless steel with thermal insulation. The coolant liquid is pumped through the 'shield' using an external thermostat connected to a circulator pump. Figure 5 shows two 8 l cylinders both with Heat Exchangers installed and being used in an Aixtron[®] 200 machine. These 8 l cylinders have been reliably used for the past five years.

The use of the large cylinder/Heat Exchanger combination has several advantages. First, the large cylinder reduces production downtime by reducing the number of cylinder changes and thus reducing the time needed for re-qualification and flushing of the cylinder. When used with the heat exchanger, a low cost and easily implemented method of switching to large volume cylinders is achieved when compared to the high investment needed for large state-of-the-art thermostats. More importantly, this packaged solution achieves the goal of constant thermal conditions in the gas cabinet, since there is no wasted energy from all the excess thermostat heat. Best of all, the composition of the ternary and quaternary compounds can be maintained since the mass flow controllers and pressure controllers no longer experience changes in-cabinet temperature and therefore can be more accurately controlled.

Figure 5. Two 8 l cylinder plus Heat Exchangers in use with an Aixtron 200 machine.



AkzoNobel HPMO has Heat Exchangers that have been specifically designed for use the 'large volume' cylinder series. They are suitable for all liquid MO sources, especially those used in high volumes such as TMGa.

AkzoNobel HPMO manufactures and globally supplies a full range of metalorganics of the highest purity and consistency for III-V and II-VI epitaxy.

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