

winemaking

Product Review: Micro-oxygenation Controllers

When shopping for micro-oxygenation equipment, focus on your goals before settling on a specific means.

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MICRO-OXYGENATION (MOX) has been something of a hot topic in winemaking during the past several years. To some, it is a useful addition to the winemaker's toolbox. To a number of vocal commentators, mainly from outside the industry, MOX is the fifth-horseman of the Apocalypse.

Micro-oxygenation is currently defined as the treatment of a wine with sub-saturation doses of oxygen over a short period of time. "Micro-oxygenation," per se, has really been around for as long as winemakers have been putting wine in barrels. Of course, the phrase is not used in this broadest sense but rather is restricted to the microbublage (literally: tiny bubbling) technique developed by **Patrick Ducournau** in 1991 as a way to tame the intense tannins found in Tannat wines from Madiran. Originally, the goal of this technique was to reproduce the oxidation that would normally occur during *élevage* without actually sending the wine to barrels. This allowed the winemaker to control the amount and rate of oxidation experienced by a given lot of wine.

We have been tracking MOX use for most of the last decade. Adoption of MOX seems to have leveled out after a modest increase in the number of wineries using MOX for several years. In our most recent Barrel and Oak Survey Report (*WBM*, Dec. 2008), we found that, currently, the overall usage of micro-oxygenation remains fairly low. Only 16 percent of the respondents indicated that they have used micro-oxidation, down from 22 percent in the 2007 survey.

Raw percentages don't really tell the whole story. Most wineries in the U.S. are pretty small, producing less than 1,500 cases per year. Our surveys tend to reflect the industry as a whole if we don't account for the volume of wine produced. Something in excess of 85 to 95 percent of all wine produced in the U.S. is made by the big wine companies like **Constellation**, **Diageo**, **Foster's**, **Gallo** and **The Wine Group**. Within the 15 to 20 percent of all wineries using MOX, we have found that essentially all large wineries are using MOX on at least some of their wine.



PHOTOS BY SCOTT SUMMERS

MOX WHAT?

MOX is really about control. The myth about micro-oxygenation in winemaking is that it's some newfangled, high-tech process. MOX is just controlling what would ordinarily happen anyway during traditional *élevage* and racking. To achieve this, all MOX systems consist of an oxygen source, at least one precision gas regulator capable of measuring out gas at very low flow rates on the order of a few milliliters of gas per month, at least one diffuser and enough tubing to connect them all together. The regulator may be controlled manually by a small special-purpose computer (PLC) that is built into the MOX unit or by a centralized controller that can control multiple MOX units at the same time.

BROAD USAGE SCENARIOS

Micro-oxygenation is usually considered a replacement for aging wine in barrels. This isn't always the case; for example, **Hogue Cellars** uses MOX extensively in conjunction with its existing barrel program. However, it looks like MOX will remain a tool of larger wineries. Most small wineries appear to be content with traditional barrel aging for the moment. **Zoller Wine Styling** winemaker **Signe Zoller** noted that smaller producers tend to be "sticking with barrels because it's part of their sales pitch, their identity, their competitive edge in that niche."



MOX FOR TANKS

As I noted above, Ducournau developed the modern controlled micro-oxygenation as a way to “tame” the tannins in Tannat. The process is pretty straightforward. After malolactic fermentation (MLF), an extremely small amount of oxygen is released into a tank of wine in the form of very small bubbles. The bubbles dissolve into the wine before they have a chance to float up to the surface. The dissolved oxygen reacts with ethanol to form ethanal (aka acetaldehyde), which then reacts with the tannins and anthocyanins in the wine via polymerization.

Pretty much any MOX unit on the market today could be used in this role; it’s what they are all designed for. However, to my mind, the portable units would be wasted in situations that don’t require their portability. The actual MOX setup should be sized appropriately for the total number of tanks in the winery. A single four or five regulator unit could be made to suit most small to mid-sized wineries. As a rule of thumb, I would recommend that any winery intending to use MOX should plan to do so extensively. To that end, once a winery has gotten past the experimentation phase and decided to make MOX a part of its standard wine-making repertoire, I would recommend that it invests in rigging most, if not all, of its tanks for MOX.

MOX FOR BARRELS

Operationally, micro-oxygenating in barrels has a few different requirements than doing so in tanks. In the main, however, these revolve around the details of the diffusers used rather than in the controller itself.

The porous stones and stainless-steel diffusers used in tanks won’t really work in a barrel due to the small volume and depth. The bubbles from a

tank diffuser do not have time to dissolve into the wine before they get to the top of the barrel. To this end, barrel-MOX systems use special tubing that allows the oxygen to diffuse into the wine directly through the plastic of the tubing itself. These barrel diffusers are usually daisy-chained together to make a “virtual-tank” of several barrels that is connected to a single regulator.

When using MOX in the barrel room, one should probably use portable MOX units. The internal geography of the average barrel room changes frequently enough to confound more permanent installations.

MOX FOR FERMENTATIONS

To my mind, so-called wine problems are really fermentation problems that weren’t corrected early enough. Oxygen is an often-forgotten “yeast-nutrient.” The yeast need oxygen for healthy cell walls, which are crucial to the successful fermentation of high-Brix grapes. Additionally, the growth phase during early primary fermentation is the time that the must/wine is the least vulnerable to over-oxidation.

Malolactic fermentation itself is not considered a good time for MOX, but the period immediately prior to MLF is considered the time when MOX is the most effective.

If it was just a matter of using MOX to speed-up the aging of a lot or two of wine, one could make due with a pretty minimal setup. When using MOX during fermentation, one has to be able to turn on the oxygen for any fermentor in the winery.

IMPORTANT ATTRIBUTES

At its core, MOX equipment is a really precise gas valve. Its only job is to deliver a prescribed amount of oxygen at a determined rate. Funny enough, one would think that the exact oxygen

source shouldn’t be considered an important attribute. Respirator-grade compressed air would work fine for MOX since the non-oxygen component of air is essentially inert to wine. All one should have to do is multiply the dosage by slightly less than a factor of five to account for the fact that the atmosphere is only 20.95 percent oxygen. The **O2mate MOX** systems from Australia are notable in that they use compressed air rather than oxygen.

PORTABILITY

Portable units can be used in any MOX role. Portable MOX units are most obviously useful for micro-oxygenating in barrels. They are also handy when the winery is just experimenting with MOX or using MOX to treat the occasional stinky fermentation.

HOW THE O₂ IS MEASURED

Most MOX equipment, indeed most precision gas regulators, measure the oxygen by volume in milliliters (ml). This means that the micro-oxygenation rate is calculated in terms of milliliters of oxygen per litre of wine per month (ml/l/mo). The actual amount of any gas in a ml depends upon the pressure. This means that, ideally, it would be more precise if the MOX unit measured the rate in terms of mass rather than volume. All the **Parsec MOX** units calculate micro-oxygenation rate by mass (mg/l/mo) while the **Oenodev Visio 6** can use either mass or volume.

NUMBER OF REGULATORS

The number of regulators per MOX unit is important in an operational sense. The more regulators a unit can control, the larger the number of individual tanks that can be micro-oxygenated at the same time.

EXPANDABILITY

Large MOX installations are often set up so that the computer in a single control unit can micro-oxygenate a large number of tanks by plugging in subsidiary units. The **Oenodev Visio 6** can control nine sub-units, and itself, for a total of 60 tanks per **Visio 6**. **Parsec’s SAEN 5000** series can be scaled up to 120 spargers.

HOW TO BUY/ WHAT TO CHOOSE

The cost of MOX can range considerably from a couple thousand dollars to a couple hundred thousand dollars, depending on how extensive an installation the winery is considering. Small MOX installations should cost less than \$1,000 per tank while large installations have a high initial cost due to their controllers but a fairly small marginal cost for adding MOX to additional tanks.

Minimalist MOX—Starting MOX for Tanks: Wineries looking to try out MOX with the least initial investment might want to start out with a portable MOX unit. Even if the winery later invests in a more extensive MOX installation, the portable unit gives the winery the ability to treat any tank or any set of barrels in the winery should the need arise.

A drawback of starting out with a portable unit is that there is only a single regulator and just one tank isn’t really enough to experiment with. A better option is go with one of the smaller mounted units and grow from there.

MOX on the Move—MOX for Barrels: Using MOX in the barrel room requires different diffusers than those generally used in tanks. Additionally, portable units seem to be much more commonly used in the barrel room.

Micro-Oxygenation

Manufacturer	Model	Dose Measured in:	No. of regulators*	Expansion	Portability	Note
Oenodev	Compact	ml/l/month	1**	none	Yes***	
	Eco2	ml/l/month	4	none	No	
	Visio 6	ml/l/month or mg/l/month	6	up to 60	No	Automatic N ₂ system used to keep system pressurized when O ₂ dosage is zero
Parsec	Oxygénus Plus	mg/l/month	1**	none	Yes***	Portable; runs on a battery
	SAEN 4000 P2	mg/l/month	2	none	No	
	SAEN 4000 x/5	mg/l/month	5	none	No	
	SAEN 4000 xx/15	mg/l/month	15	none	No	
	SAEN 5030	mg/l/month	30	none	No	
	SAEN 5060	mg/l/month	60	none	No	
	SAEN 5090	mg/l/month	90	none	No	
	SAEN 5120	mg/l/month	120	none	No	
	SAEN MON15TS or CNS15TS	mg/l/month	5	up to 120	No	
Westec	OxBox	ml/min (calc ml/l/mo)	4	none	No	Designed by StaVin, Built by Westec

* Also number of spargers. One sparger/diffuser per regulator

** Diffusers can be daisy-chained to multiple barrels

*** Expressly designed for portability

Ultimate MOX—MOX for All Occasions: The top of the line MOX systems are the most versatile. Once the winery has decided to micro-oxygenate more than just a small handful of tanks, it is really best to centralize the MOX controller. The top-end controllers are more expensive than the stand-alone units but the marginal cost of adding more tanks is much lower than buying a large number of stand alone units.

Micro-Oxygenation Vendors

Vendor	Location	Telephone	Web Address	Sells
American Tartaric Products	Windsor, CA	707-836-6840	site.ivenue.com/atpinc_2	Parsec
Oenodev USA	Santa Rosa, CA	707-529-8585	www.oenodev.com	Oenodev
StaVin	Sausalito, CA	415-331-7849	www.stavin.com	OxBox
Vinovation, Inc.	Sebastopol, CA	707-824-7900	www.vinovation.com	Oenodev
Vitis Research	Lancaster, PA	717-560-1650	www.vitisresearch.com	Parsec
Westec Tank & Equipment Co.	Healdsburg, CA	707-431-9342	www.westectank.com	OxBox

CONCLUSION

When shopping for MOX equipment:

- Realize MOX is really about control more than economy. You may have to pay more attention to your wine and do more “winemaking” in order to achieve good results.
- MOX is most effective immediately prior to and just after MLF. This narrow window means that you are better off kitting out a lot of tanks than trying to MOX in penny-packets.
- Oxygen is one of the best “yeast nutrients” there is. Consider rigging your fermentors for MOX, especially for “reductive” varietals like Syrah as well as varietals like Sauvignon Blanc and Muscat that can’t be treated with copper without destroying the varietal character. **wbm**

