

# WINES & VINES

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## Finding Closure

As market grows, oxygen transmission rates are at heart of alternative closure options

by [Jamie Goode, Ph.D.](#)



So, you've made your wine, and it's time to start thinking about bottling it. Which closure are you going to use? It's an important decision, but it's also becoming an increasingly complicated one. Of course it used to be easy, because the only decision that needed making was what grade of natural cork you could afford for each product. Now, if anything, there's too much choice, with very little information save for the varying claims of closure manufacturers and salespeople.

While natural cork is still very important as a wine closure, and will likely always have a market

(see ["Natural Cork's Rebirth"](#)), its

### HIGHLIGHTS

- If anything, there's too much choice in closures, with very little information to inform this choice, save for the claims of manufacturers.
- One problem is our lack of understanding about how much closure oxygen transmission we want, and how much oxygen existing closures deliver.
- Synthetic (plastic) corks still have a far larger share of the U.S. closure market than screwcaps.

shortcomings are well documented. As well as a taint rate that, despite signs of decreasing over recent years, is still uncomfortably high for many winemakers, corks show some variation in their oxygen transmission rate (OTR), which translates to a degree of bottle variation.

- Winemakers soon may be choosing "designer closures."

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First, some theoretical considerations. In recent years, scientists have conducted a number of studies on closure performance, focusing attention on what happens to wine after bottling. Previously, the attitude among winemakers was that as soon as wine got to the bottling line, the winemaker's job was done. But the closures debate, and particularly the battle between advocates of screwcaps and natural corks, has raised awareness of post-bottling wine chemistry and led to the concept of winemaking continuing after bottling, because closures with different oxygen transmission rates will lead to wines that taste very different by the time they reach consumers. (See "[Viewpoint](#)") This has led to the concept of "designer closures," with winemakers choosing the appropriate closure to suit the wine under consideration.

There is, however, a problem with matching closures to wines, and that is our lack of understanding about, first, how much closure oxygen transmission we actually want for each style of wine, and second, how much oxygen existing closures actually deliver.

#### [Environmental Concerns](#)

It is because of these unanswered questions that leading synthetic cork manufacturer Nomacorc recently initiated an oxygen-in-wine research project with the University of California, Davis, INRA (France), Geisenheim (Germany), the Australian Wine Research Institute and, more recently, an as-yet unnamed Chilean research institute to look at the role of oxygen in post-bottling wine chemistry. (See "[Nomacorc and Davis Collaborate on Research](#)," January 2008.) "Tell us what OTR you want, and we can deliver it," says Nomacorc's Malcom Thompson. "But the problem is, we don't know what OTR is needed."

These studies will use a range of wines and winemaking processes: In California, Cabernets and Chardonnays with four different winemaking regimens will be studied, with the same process repeated using different varieties in the other countries. "We hope to be in a position to design closures that will have optimum oxygen transmission for the wine style," Thompson says.

Another closure company interested in tailoring closure oxygen transmission to wine style is Oeneo, which makes the DIAM closure, a "technical cork" combining tiny granules of cleaned natural cork with synthetic microspheres. "We have known for some time that there is a strong relationship between wine and gas exchange, and for over five years we have been investigating this subject," an Oeneo spokesperson reports.

"This has led to the development of three additional versions of DIAM to complement the range, based upon different levels of gas exchange and the potential shelf life and aging potential of various wines. We know that wine develops without oxygen, but we also know that wine develops differently with varying amounts of oxygen. It can be a positive or a negative, depending on the wine style."

## Screwcaps

Screwcaps have done incredibly well in some markets, but they have struggled in others. In New Zealand, estimates are that 90% of wines are sealed this way; Australia doesn't lag far behind, with screwcap usage at nearly 70%. But in many markets, screwcaps have encountered consumer resistance because they are associated with cheap wine, although in Europe these perceptions may be fading.

"Traditional European countries are much more open than before," says Anne Seznec, marketing manager for screwcap manufacturer Guala Closures Group, which owns GlobalCap and AusCap. "We think people will soon understand that screwcaps are not just for cheap products." Seznec estimates that the global screwcap market is growing by 15% per year.

Figures from Alcan Packaging, which owns the leading screwcap brand Stelvin, state that in 2007 the screwcap market in the United States grew 24%, 2.3 times faster growth than the wine market itself. Screwcaps currently seal around 2 billion bottles annually--out of a total of all bottled wine of roughly 18 billion units.

It is because of issues of consumer acceptance that screwcap manufacturers are bringing out new products that look less like screwcaps and more like capsules used for in-neck closures. In addition to Divinum, a standard screwcap, GlobalCap has added a new product, WAK, which looks more like a traditional capsule but still uses the same BVS finish bottle type used for other screwcaps. Similarly, Alcan has introduced Stelvin Lux, a screwcap with an internal thread that looks similar to a traditional capsule from the outside. (See "[Coming Soon](#)" in the January 2008 issue.)

One point that must be emphasized is that screwcaps aren't *the closure*. They are just a means of holding the sealing medium, the screwcap liner, in close apposition to the rim of the bottle. In discussing screwcaps, we need to be precise about the liner type, because these determine the closure's properties.

Currently, two liners are available for wine: Saran/tin and Saranex only. These are used by all screwcap manufacturers, of which there are now several. The former has a metal layer, which allows very little oxygen transmission; the latter allows a bit more. The tin/Saran liner is the one that is used almost exclusively by producers in Australia and New Zealand, while many European producers have opted for the Saranex-only liner.

Alcan currently is working on a new liner material that will offer an oxygen transmission level somewhere in between those of the two existing liners; the company wouldn't give any details about its composition but says that it will be on the market in about a year. GlobalCap also says it is working on a new liner material. (For in-depth discussion of winemaking issues related to screwcap use, see "[Reductive Reasoning](#)," in the August 2007 issue of *Wines & Vines*.)



## Synthetic corks

As the first real alternative to natural cork to gain much ground, synthetic (plastic) corks still have a far larger share of the closure market

*SupremeCorq synthetic closures are made with precision injection molds in a variety of colors.*

than screwcaps. The leading synthetic closure company, Nomacorc, alone has a global volume that is approaching 2 billion units annually--a figure similar to the total number of screwcaps used--and they claim a 15% share of all bottled wines globally. Malcolm Thompson states that the company grew a remarkable 25% in 2007, and now it has 45% of the synthetic market.

The problem faced by synthetic cork manufacturers has been controlling oxygen transmission. Plastic allows the diffusion of oxygen, and so synthetic corks that form an "air-tight" seal still may allow oxygen to enter via diffusion through the body of the closure. This has resulted in wines showing signs of oxidation after as little as a year in bottle.

However, the main synthetic companies such as Nomacorc, Neocork, Supremecorq and NuKorc all have worked hard developing new products with better properties. The Nomacorc Premium, for example, is designed for wines recommended for six years of aging. Supremecorq, whose injection-molded synthetics have more than 1,600 customers worldwide, also has a lower oxygen transmission product, the SupremeCorq X2, which is engineered to reduce oxygen permeability through a dramatic improvement of the internal structure of the closure. "The SupremeCorq X2 provides permeability rates of 0.006 cc/pkg/day, which is comparable to high-grade/high-cost natural cork and superior to any synthetic offerings," says Joyce Steers-Greget, global marketing manager at SupremeCorq. A relative newcomer is Vinova, which offers a novel synthetic cork that is part extruded, part injection molded, and combines the benefits of both processes (namely, even cell structure and smooth, seamless exterior). Another important synthetic producer is Italian company Beltappo, whose product range includes injection-molded synthetics plus T-tops and synthetic sparkling wine corks. Vision is an injection-molded synthetic cork manufactured by Gültig, Germany's largest cork manufacturer, and is distributed in the United States.

Two of the great advantages of synthetic corks are that they are inexpensive and, because they are an in-neck closure, they can be used without the need for new bottling equipment. There doesn't seem to be a problem with consumer acceptance, and for the vast majority of wines, worries concerning aging are not an issue.

As Neocork's Mark Coleman puts it, "Neocork is perfectly suited for the 85% of wines that reflect the increasing trend of shorter wine consumption and storage cycles, and where bottle-to-bottle consistency, bottling-line efficiency, broad consumer acceptance and price are increasingly important in such a competitive global market." Neocork currently is working on making a closure that performs as well as its existing product but carries a lower price tag, so it can compete with lower-quality agglomerated, technical and colmated closures.

"The hard part is combining this in no more than two products, as it's clear the market is also growing fatigued at the variety of closure choices from both individual manufacturers and the closure industry in general," Coleman says. "We believe the wineries' current trend of trying to minimize packaging SKUs and inventory requirements will continue to gain importance as global competition increases."

#### **DIAM**

As mentioned earlier, DIAM is a "technical cork" made by combining small granules of cork with

synthetic microspheres to form an in-neck closure that performs very similarly to a high-grade natural cork, but without the inconsistency and taint issues. DIAM avoids the problem of cork taint by incorporating a special washing process using carbon dioxide in its "supercritical" state, when it has properties of both a liquid and a gas.

This state is achieved by a combination of pressure and temperature, and it renders the cork granules, for all intents and purposes, completely free of any musty taint. This is no mean feat, and developing this process required some serious investment in both research and plant development, but the need for such a cleaning process was made clear by the failure of DIAM's predecessor, Altec. Altec was constructed in a similar fashion to DIAM, and it looked to be a very good closure; however, the process of breaking cork down into small granules merely distributed any trichloroanisole (TCA) taint evenly among all the granules, and at such a level that an alarmingly high proportion of wines sealed with Altecs were tainted.

DIAM, however, has proven to be taint-free, and after a relatively slow start, it is now enjoying success in the marketplace. Tesco supermarket, the U.K.'s largest wine retailer, recently approved DIAM as one of the three preferred closure solutions for its own label wines (along with screwcaps and high-grade natural cork.) Additionally, Gallo now is looking to use DIAM in its Sonoma range since G3, Gallo's Quality Control Agency, recently approved DIAM.

Since the beginning of 2008, the DIAM range has grown. The original DIAM now is known as DIAM 5 and is intended for wines with a shelf life of five years. DIAM 2 allows slightly more gas exchange and is suited to wines with an estimated shelf life of two years, while DIAM 3 lies somewhere between D2 and D5 and has a three-year aging potential. Soon to be released is DIAM 10, which allows very little gas transmission and is closer to screwcap (with a Saran/tin liner) in its gas exchange potential. Oeneo guarantees its closures for these periods but emphasizes, "The warranty is given in years for the minimum aging potential for each. It is not an upper limit but a minimum, and covers sensory as well as mechanical properties."

### **Alternative alternatives**

Finally, we come to what may be dubbed "alternative" alternatives--closure solutions that are strikingly different in their approach.

The first of these is Vino-Seal, the "glass closure." Made by Alcoa, the world's largest manufacturer of aluminum, this is known in Europe as Vino-Lok, and it consists of a glass stopper that seals a specially made bottle by means of a plastic "O" ring around the base of the plug of the stopper. The glass stopper itself is held in place by an aluminum cap, which must first be removed (by hand), before the glass stopper can be popped open. The glass used for the stopper is much harder than the glass used in bottles, and there is no glass-to-glass contact, so there are no problems with potential for shards of glass to end up in the wine. It's a complicated but attractive looking closure, and so far it has been very successful in Germany, Austria and more recently, Italy. Altogether, some 600 customers have signed up in three years. Cost is similar to a good cork, at around 47 to 63 cents (U.S.) per unit. The only potential issue is oxygen transmission level, because the seal is created by means of a plastic ring. However, an Alcoa representative said the Vino-Seal has very similar oxygen transmission properties to a tin-lined screwcap.

The second "alternative" alternative is the Zork (*pictured*), a distinctive-looking closure that acts like a screwcap in terms of holding a lining material against the rim of a bottle, although in this case there is also an in-neck component. It looks very modern and can be used as part of the brand design, because of its distinctive appearance.



"Since the appointment of our U.S. manufacturing and licensing partner, Portola Packaging, activity in this market has increased significantly, and we anticipate that there will be at least 50 brands using ZORK by the end of this year," says Zork's Joey Baker. "[Don Sebastiani and Sons](#) have created additional brands (Pennywise, Moobuzz and Leese-Fitch) using ZORK within their "The Other Guys" Division." Indeed, Sebastiani promotes the fact that it only uses alternative closures on its brands. Other U.S. brands using Zork include [Deerfield Ranch](#) and Muse Winery. Zork also is commercializing a new closure specifically designed for sparkling wines.

### **Conclusion**

A wide array of alternative closure solutions currently exists. With the knowledge of wine bottling chemistry that emerges from studies currently under way, winemakers may be more confident making informed decisions about closure choices that will mean that an even higher proportion of wines reaches the consumer in optimum condition. The age of designer closure use is not far off.

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## Environmental Concerns

Interest in environmental or "green" issues resurfaced in the last several years, and considerations such as sustainability and carbon footprints now are being taken seriously by the wine industry.

One of the areas of focus has been packaging. Glass bottles may be recyclable, but they are heavy, and wine frequently is shipped around the world. One response from the trade has been "lightweighting," or reducing the carbon footprint of wine shipping by using lighter bottles. Another solution has been an increased emphasis on bulk shipping in 25,000-liter flexitanks, and then bottling in the destination country. This is often coupled with the use of alternative pack aging, such as the well-established bag-in-box, as well as newer packaging formats such as TetraPrisma (foil-lined cardboard box), 750ml PET bottles, and the "pouch" (effectively a bag-in-box without the box).

Attention also has focused on the carbon footprint of wine bottle closures. Oeneo, the makers of DIAM, kicked things off by commissioning Bilan Carbone for a study looking at the carbon footprint of natural cork, screwcap and DIAM, showing that natural cork did best and screwcap worst. This led to a flurry of activity, and now many closure companies have commissioned studies that outline their green credentials. Most recently, Nomacorc released the results of an independent carbon footprint benchmark analysis, which showed that the firm's synthetic cork came second only to natural cork in terms of grams of carbon dioxide-equivalent per unit.

**J.G.**



*Lightweight packaging can reduce emissions during shipping.*

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