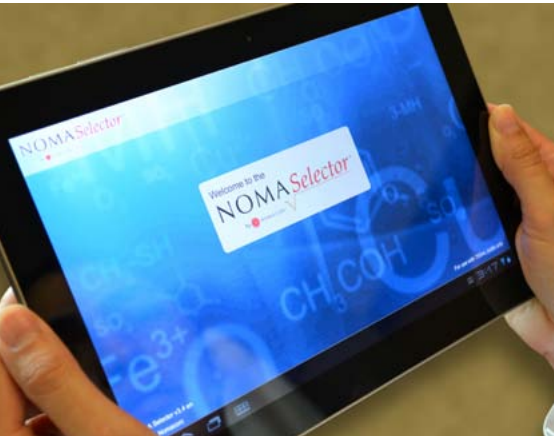


THE PROBLEM OF OXYGEN

Research into alternative closures has led to a new understanding of the way wine evolves and the particular role that oxygen plays in the process. Felicity Carter reports on a company that's uncovering the answers and looks at what they're doing with their findings.



The NomaSelector™

There's nothing romantic about the Nomacorc facility at Zebulon in North Carolina. Instead of chateaux and picturesque vineyards, the landscape is dotted with boxy offices. The ethos is unashamedly corporate, with wall charts outlining corporate goals, and notice boards encouraging employees to come up with new efficiencies.

Inside the factory, foam is being funnelled through machinery, before being cut and stamped with the logo of the end user. While the process looks simple enough, taking beads of foam through to the final product, the technology involved has resulted in more than 30 patents. These pieces of extruded foam, created to look like natural corks, are actually sophisticated gas exchange mechanisms.

While wine makers have always known that oxygen played an important role in wine development, it was Nomacorc's work that revealed just how important oxygen is throughout the winemaking process. Their research revealed so much, in fact, that it's become clear that something new would be required: a way to simplify the research and give winemakers a practical tool to use it.

The closures race

It was one too many dud bottles of wine that was the impetus for Nomacorc. A Belgian businessman, Gert Noël, decided to invent a

new wine closure after too many cork-tainted bottles appeared at a family party. He already understood plastic, as his company was a supplier of products like pipe insulation and pool noodles. But plastic stoppers, it turned out, made poor wine bottle closures, not least because they were hard to get out of the bottle. In 1993, Gert and his son Marc created 'Project Broomstick' to research the problem. Six years later, they had a solution: a strong inner core surrounded by a softer material. Not only was it easy to remove from the bottle, it could be made to look like natural cork – something that competitors hadn't understood was necessary, causing them to churn out multi-coloured stoppers that consumers didn't like.

Nomacorc's timing couldn't have been better. The 1990s saw growing dismay about cork taint, and new companies such as Supreme Corq and Neocork were already making headway in the alternative closures market. Around the turn of the century, Australia and New Zealand began to adopt the screw cap in earnest. The efforts of the alternative closure industry were also given an unintentional boost by the cork industry, which exasperated producers by refusing to deal with cork taint. By the time the cork industry woke up to the challenge it was facing, influential retailers in the key British market had begun to accept alternatives.

"In the late 1990s you had a number of closure studies taking place at the same time, the most famous being the AWRI (Australian Wine Research Institute) study," says Malcolm Thompson, vice president of marketing and innovation. "You had major customers like Gallo, Mondavi and Southcorp conducting their own studies. We were in the mix and fared extremely well." Thompson says the company grew so fast, that "it was chaos".

In 2001, Nomacorc added operations in Eupen, Belgium. In 2003, they began production in Thimister-Clermont, also in Belgium, and more recently they've opened a production facility in Yantai, Shandong, China. But despite the rapid growth, Nomacorc faced a number of challenges. First, there was the question of oxi-

dation. Synthetic corks had performed badly and producers of any wines with a shelf/cellar life of over two or three years were wary of using them. Second, there was the reputation for being hard to extract.

While Nomacorc's products are easy to insert and remove, they needed to address the performance issue. The answer lay in research into gas exchange and its role in wine making. Cork fans like the way wines are said to 'breathe' through the natural stoppers; screw-cap supporters like the 100% airtight qualities of those closures, despite the problems this can cause with reduction and delayed maturation.

The research

Nomacorc instituted a multi-million dollar research program, getting major research institutions, such as INRA in France, Geisenheim in Germany, and AWRI in Australia on board and using their expertise to study oxygen transfer rates (OTR). This had been studied in depth in industries as diverse as beer making and medical technology, but was virtually untouched by the wine trade. But preliminary studies revealed something unexpected: oxygen is important throughout the winemaking process. "What we learned quickly was there was a lot more to this issue than closure performance," says Thompson. "We realised we need to control oxygen at different stages of the wine making progress."

Dr Andrew Waterhouse from the University of California, Davis says the global collaboration has produced groundbreaking work. "In every case, the people involved were the best in the world in their particular area," he says. "I can't think of another instance where a company created a collaboration on such a large scale. It's never happened in the wine industry."

His team set out to understand post-bottling oxygen, working with Chardonnay and Cabernet Sauvignon. They "bottled hundreds and hundreds of wines – the inventory is now a bit of a headache," measuring oxygen at every stage. "It's really elevated the level of science. Now, no-one can publish a bottling trial if they

don't gather the data." The research didn't always go smoothly, however, as the researchers didn't initially understand all the variables involved. "Our first experiment was painful," says Dr Waterhouse. "We did one of the worst bottling jobs we could have done. There was so much oxygen in the wine that we had to re-name it the 'accelerated ageing experiment'."

But the discoveries came thick and fast. Waterhouse's team discovered, for example, that Chardonnay was much more sensitive to oxygen than Cabernet Sauvignon. "Winemakers want to spend all their money on the closures for Cabernet - according to our data, they should be doing the reverse."

Perhaps more importantly, the work led to breakthroughs in understanding how much oxygen gets into wine during the wine making process, how much through the closure, and how much oxygen is consumed by the wine itself. "That's critical to the wine's longevity - when the wine runs out of the capacity to absorb oxygen, it becomes oxidised," says Waterhouse. "We introduced this whole new concept that wines have this capacity."

Professor Eduardo Agosin, from the Catholic University of Chile, followed oxygen through the wine making process. "Do some parts of the tank receive more oxygen than others? Will the yeast cells be happier in that part of the tank?" His work turned up insights from how yeasts can spoil wine to learning that managing the bottling process properly is more crucial than thought. His team also discovered that the amount of oxygen that gets in through different closures varies wildly and that "Nomacorc's are much more reliable."

They made another serendipitous discovery, too - that housewives make fantastic sensory experts. "We had sensory panels with students and professors. They were enthusiastic at the beginning, but then they'd say, 'I have an exam' or 'I have to go with my girlfriend'," he says. Eventually, the university recruited and trained local housewives, who have become wine experts. They convene three times a week and, apparently, do a knock-out job of wine assessment.

Listening to the researchers, it seems there are endless implications to the role of oxygen in wine. There are so many, in fact, that wine making now appears much more complicated than originally thought. Although Nomacorc have developed a number of different closures that enable different OTR rates, and they offer a device to measure dissolved oxygen in wine,

there's no getting around the fact that their research has introduced complex new parameters into winemaking, as if wine making wasn't difficult enough.

Does Nomacorc have a solution to the challenge they've set the industry?

Is the Pope a Catholic?

Software solution

"We can identify four factors that are the key components of how winemakers should approach the wine closure process," says Maurizio Ugliano, oenological research manager. He says they are: grape varieties, winemaking, shelf life and what he calls 'winemaker intention'. "In our vision, none of these exists by themselves."

All the different parameters have been put together in the NomaSelector™ a software tool that takes winemakers through a questionnaire that covers grape variety, winemaking techniques used, intended shelf life and storage and distribution, before it spits out an answer. The answer will be one of the Nomacorc Select Series closures: the 700, 500 and 300, with the lowest oxygen permeability. Eventually there will be a 100 closure. All the products cost the same, to ensure that winemakers are choosing a closure based on what's best for their wine, not on price. This is in contrast to the cork industry where the cost of the best quality stoppers has risen steeply in recent years. Having chosen a closure, the producer can then choose how it will be branded, even printing a vintage on the end to make it harder to distinguish from a natural cork.

The last two years has seen consolidation in the synthetic alternatives market, leaving Nomacorc the clear market leader. They still face challenges, however. The Portuguese cork industry has taken steps to rehabilitate its product and TCA incidence is lower than it was. There are now even corks with special barrier coatings that claim to improve anti-oxidation consistency. And then there are the screwcap makers, who are also innovating. Finally, there's the question of how important OTR really is for the vast majority of wines, which are not made to be aged.

But whether Nomacorc takes its estimated 60% share of the alternatives market to the heights it clearly wants, what the company has done for the industry overall is undeniable, taking the understanding of wine making to a new level. Oxygen will never be seen the same way again. ■

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