BOXED WINE TRENDS DRIVE BIB TECHNOLOGY ADVANCES

It is the dawn of a new age in bag-in-box® for wine.

Fifty years since the invention of the package, and more than 30 years since its first application for wine in Australia, bag-in-box is changing dramatically. New technologies in films, in taps, and in how bags are made and filled are available today or in development for tomorrow.

What is driving this technology focus? Clearly, there is an upward trend in the quality of wine offered in boxes. Early BIB products were often alternatives to five-litre glass jugs for low-end bulk wine. “Today the face of boxed wine is changing, and popular premium and fighting varietals are now available in 1½, two, or three-litre boxes,” says Richard Barrett, director of Global Wine Business Development for Scholle Packaging, the largest worldwide supplier of bags for wine. “In Australia, where bag-in-box was first used for wine, Yalumba Wineries launched premium two-litre boxed varietals in 1984, followed by B.R.L. Hardy’s 1996 release of Banrock Station–the first time in Australia that the same wine was available in both bottles and boxes. In both cases, the wineries have enjoyed enormous success, with boxed versions often outselling bottled versions.”

Europe and North America have followed the trend. In France, where boxed wine sales were up 32% in 2004, the average price of a litre of BIB wine is 2.01€, higher than almost any other category. According to Nicolas Garros, quality director for Friedrich, France’s largest boxed wine producer, “For the past few years, our plan in the Bag-in-Box market has been to develop and launch top-of-the-range products offering consumers well-known, high-quality wines. Consequently, the share of AOC [appellation d'origine contrôlée] wine available in BIB continues to increase, and we are now offering a broad range of prestigious names such as Côtes de Bourg, St Estèphe, Margaux, and St Emilion, all of which are having real commercial success.”

In the United States, the hot trend is the premium three-litre varietal, a category started by Black Box Wines back in 2003. In addition to three Australian import brands, there are now a dozen U.S. producers offering premium boxed wine. When added to the five-litre brands that have been a staple in the U.S. for several decades, the total U.S. consumption from the box is around 20% by volume.

Better wines in smaller packs challenges the BIB industry. Says Barrett, “In larger packages, the surface to volume ratio is decreased, offering better protection from oxidation. In the popular new smaller packages (two and three litre), that ratio is increased, which reduces shelf life.” Thus the combination of better wine and smaller packages has been a factor driving bag-in-box technology development.

Another factor is globalization of the wine business and the increased popularity of boxed wines for export. Today boxed wine is transported across the world: from Australia to the United States; from California to Japan; from South Africa and South America to Europe. Viña San Pedro, one of Chile’s most important wine exporters, ships its wine casks to Northern Europe palletized six layers high and packed in 20-foot (6.1m) and 40-foot (12.19m) ISO or intermodal containers. The wine must withstand the rigors and climate changes of a 12,000-kilometre sea journey that can take up to two months. Naturally VSP and other exporters are interested in technology developments that can protect its product throughout the distribution channel.

This growing concern for bag-in-box’s capability to protect wine led to the creation in 2003 of The Performance BIB Research Group, a consortium of 51 leading boxed wine industry companies from around the world. The Performance BIB’s expressed goal is “to improve the quality of wines in BIB

through better bag filling and storage procedures." Ongoing research is addressing the effects of temperature and oxygen on the shelf life of BIB wine; the development of a Code of Good Practice for BIB fillers; and an exchange of technical information among members.

In addition, individual bag-in-box manufacturers are stepping up their research and development. Ken Micnerski, Manager of Innovation and Growth for Scholle, acknowledges that concern about wine quality and industry globalization have challenged bag suppliers to increase their understanding of what happens to wine in bags. "We've learned an incredible amount about wine over the last few years," he admits. "We've had to because our customers are increasingly concerned about giving the consumer the best possible experience with their wines, whether from a bottle or from a box."

Micnerski makes a clear distinction between shelf life and flavor life of wine. "The degradation of a wine's flavor profile is a gradual process. It doesn't just reach a 'Best When Used By' date and suddenly go bad. It is a gradual process during which the wine may not be at its best long before it definitively turns. In the past, wineries and consumers were willing to tolerate this, but with today's premium wines in boxes, deteriorating quality is no longer acceptable."

The foremost enemy of wine, of course, is oxygen that is trapped in the bag during filling or that enters the bag afterwards through either the film or the fitment. "Wine producers need to minimize oxygen during filling as much as possible to keep the wine tasting its best." Micnerski points to some of the solutions to trapped oxygen: control of the bag manufacturing process, using an airless fill system, drawing a vacuum before filling, maintaining low dissolved oxygen levels in the wine pre-fill; filling with a slower, more gentle flow to minimize foaming; and eliminating head space in the box.

A new bagmaking and filling technology, Form-Seal-Fill (F-S-F), has been developed by French company Flextainer and introduced in France last year. It uses a rotary filler that minimizes oxygen by filling through four heads simultaneously. Flextainer Founder Rene Erb explains that, even though the overall fill volume over a given period is increased, each fill head actually fills more slowly. This gentle fill reduces the amount of new oxygen introduced and filtrated through the wine.

However, even the most careful filling cannot prevent some oxygen from being trapped in the package. The traditional method to counter this trapped oxygen is to treat the wine with free SO_2 that reacts with and therefore absorbs oxygen. Says Micnerski, "BIB may require a slightly higher addition of FSO2 than bottles. Some wineries may not realize how much SO_2 is required—upwards of 45 parts per million in some cases." By undertreating the wine, these producers steepen the oxidation curve and shorten their products' flavor life.

In addition to oxygen trapped during the filling process, there is a small amount of additional oxygen that permeates the bag over the life of the product. Metallized polyester (MPET) was the original and still quite popular barrier film for wine. However, Micnerski's testing shows that as a MPET bag is shipped and handled, both before and after filling, it can suffer from minute crazing of the metallized surface. These tiny cracks do not leak liquid but can allow oxygen to pass through the bag into the wine, deplete the FSO2, and cause premature degradation of the wine. The relationship between oxygen transmission rate (OTR) and number of flexes for a MPET laminate can be found in Figure 1.

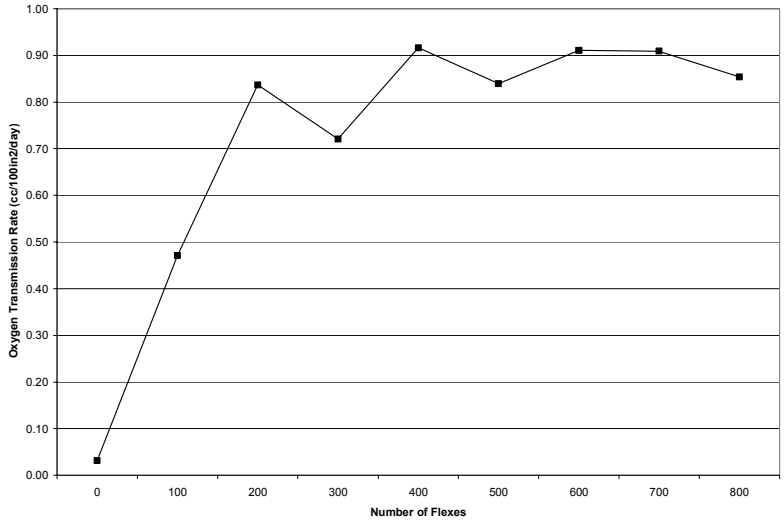


Figure 1. The Relationship between Oxygen Transmission Rate and Number of Flexes for MPET

Standard EVOH films at first seemed to be an attractive alternative to MPET, but they have proven to be less durable—that is, more vulnerable to flex-cracking. More specifically, after 2000 flexes it has been recorded that a standard EVOH film developed 36 holes, while a MPET laminate developed only 12 holes. Simply put, since standard EVOH film has a higher tendency to develop holes, it has a higher propensity to leak liquid.

In addition to its susceptibility to flex-cracking, standard EVOH also loses oxygen barrier performance when exposed to increased temperatures and relative humidity. This interaction is illustrated in Figure 2.

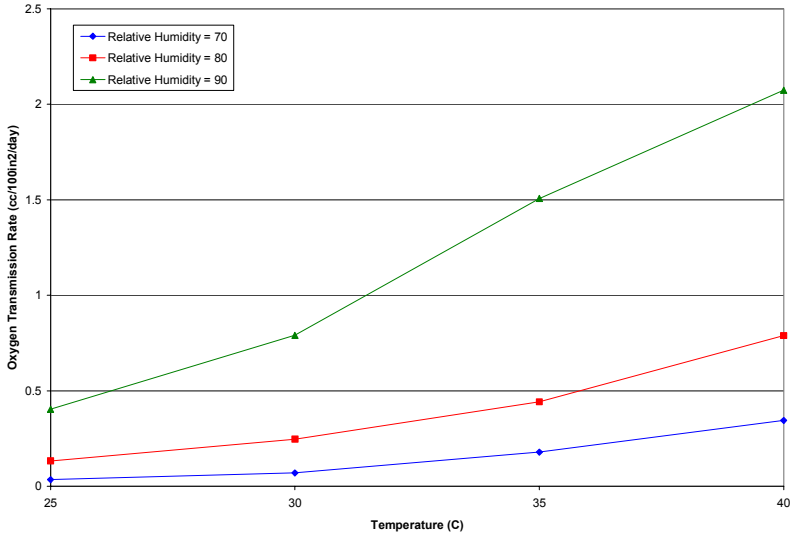


Figure 2. The Relationship between Oxygen Transmission Rate, Temperature, and Relative Humidity for Standard EVOH

The negative attributes of MPET and standard EVOH have led to the development of EVOH / nylon laminates, such as Scholle's DuraShield™ and its new extended shelf-life version DuraShield ES. Unlike an MPET laminate, both of these EVOH / nylon films offer a consistent barrier throughout the life cycle of the package. The relationship between oxygen transmission rate (OTR) and number of flexes for MPET and EVOH / nylon laminates can be found in Figure 3.

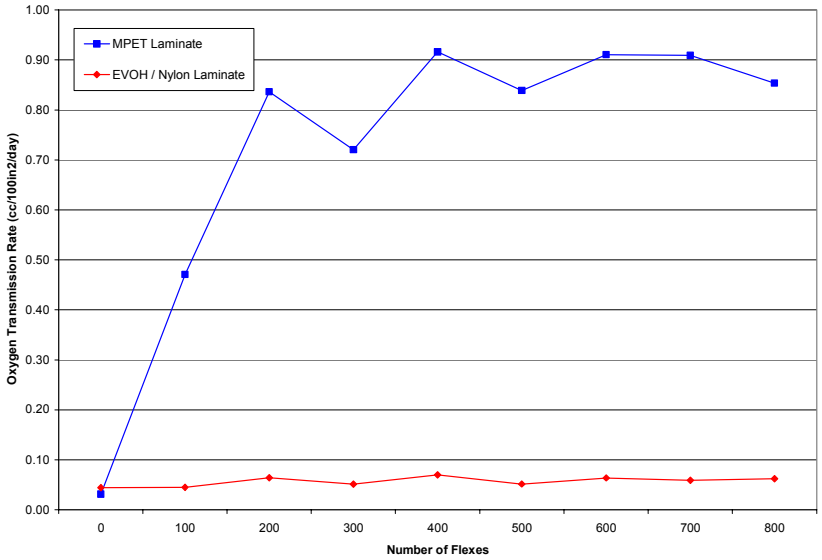


Figure 3. The Relationship between Oxygen Transmission Rate and Number of Flexes for MPET and EVOH / Nylon Laminates

Furthermore, Scholle's EVOH/nylon laminates are also extremely resistant to flex-cracking caused by transporting the wine over long distances. After 2000 flexes it has been recorded that a EVOH/nylon laminate develops no holes, which is significantly better than the 36 and 12 holes that the standard EVOH film and MPET laminate developed.

Form-Seal-Fill technology also reduces surface crazing because the bags are manufactured in-line just before filling and are therefore handled far less than pre-made bags. In addition, the filling pressure exerted on the film in F-S-F is much less than with conventional BIB fillers. As illustrated in Figure 4, using the same film an F-S-F bag can have a significantly lower OTR than a pre-made bag.

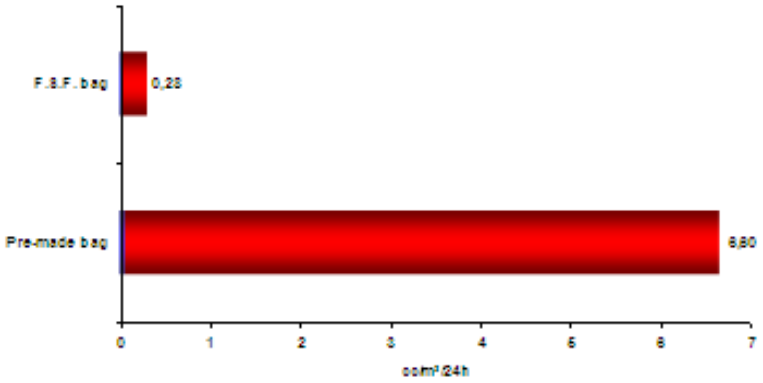


Figure 4. An Oxygen Transmission Rate Comparison between a Form-Seal-Fill and Pre-Made Bag made with the same Film

Another source of oxygen permeation is the tap. Development of new taps that provide a better oxygen barrier is ongoing. Flextainer developed some of today's most popular taps—Smurfit's Vitop® and Scholle's FlexTap®. Its efforts are now focused on its latest tap, the NR7, which contains state-of-the art barrier materials, and reduces the surface area in order to minimize oxygen permeation. As illustrated in Figure 5, the NR-7 has a significantly lower OTR than other popular wine taps.

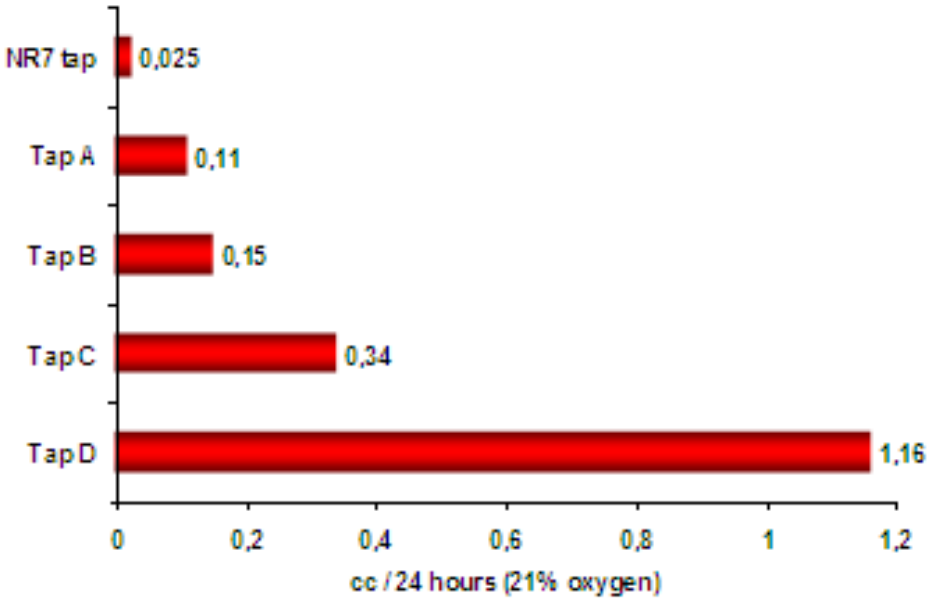
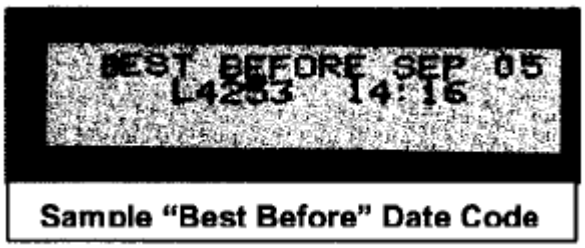


Figure 5. An Oxygen Transmission Rate Comparison between Flextainers' NR-7 and other Popular Wine Taps

In addition to oxygen, another factor in the degradation of taste in boxed wine is storage temperature. As more wine is shipped internationally between continents and across the equator, this has become a greater issue. This wine, whether bulk, bottled or in BIB, is often subjected to high temperatures that "cook" the wine and degrade its flavor. The effect is dependent on exactly what temperatures and for how long the wine is exposed. Higher temperatures create conditions for chemical changes that do not happen at low temperatures. It has been suggested that a 10°C temperature increase doubles certain chemical processes, including oxidation. These chemical changes may render the wine undrinkable.

"Bag-in-box already offers tremendous advantages over the bottle in protecting wine quality after opening. Now the goal of BIB suppliers is to give wine producers a package that protects the wine as well as the bottle *before* opening," says Scholle's Richard Barrett. "Until that time, wine producers must evaluate the entire life cycle of their product ranges to determine what current film and fitments are best suited for their brand(s). If a mid-range product is produced and consumed locally within a reasonable time frame, metallized polyester and standard taps are absolutely adequate. Once you start packaging finer wines, shipping them over long geographic distances, and/or distributing them through complex channels over many months, wine producers need to do a cost/benefit analysis of switching to clear high-barrier films, high-barrier fitments and new filling technology. In the least, producers need to date code the boxes with a 'Best When Consumed By' code to alert the retailer and the consumer when the wine is no longer at its best. Remember that nothing can weaken a brand image more than selling a consumer wine that has turned and not alerting him or her to the problem."



Sample "Best Before" Date Code

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