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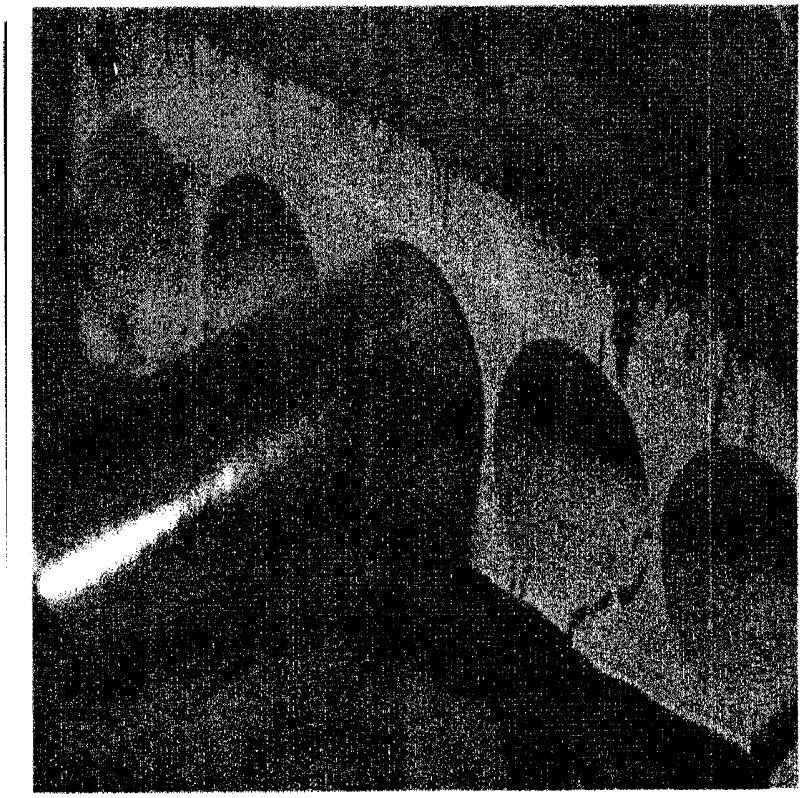
Memorandum

CORK fights for its life



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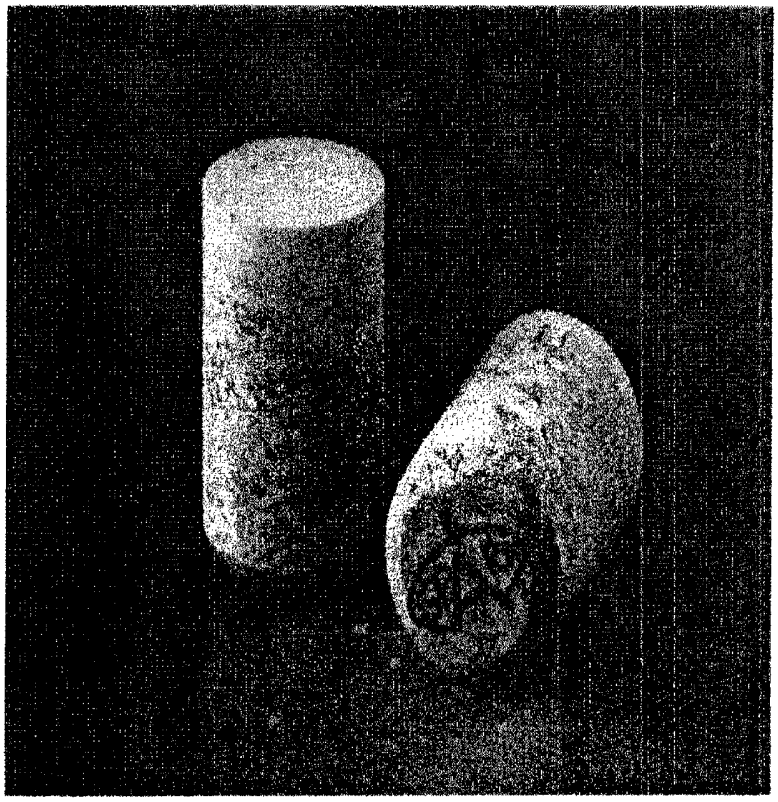

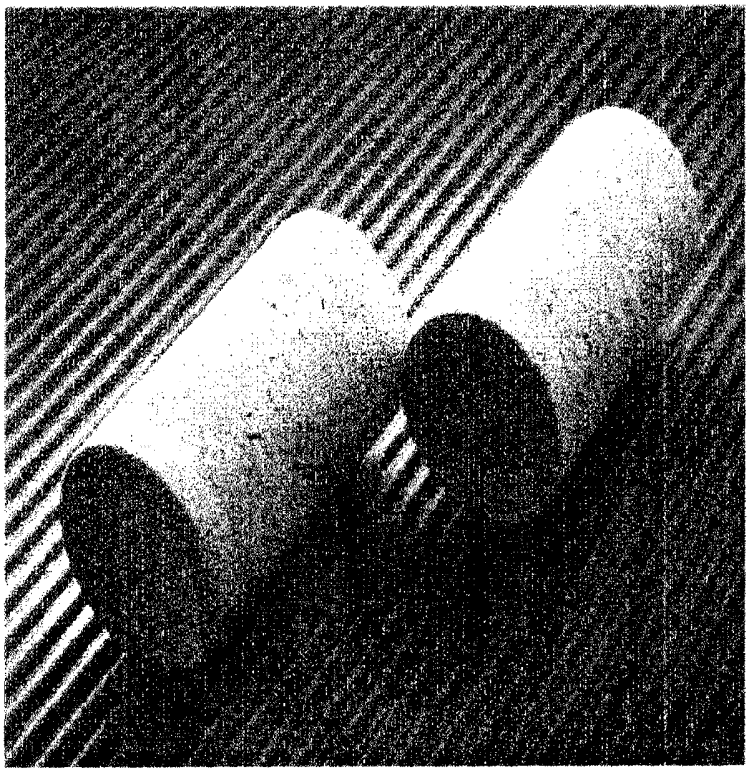

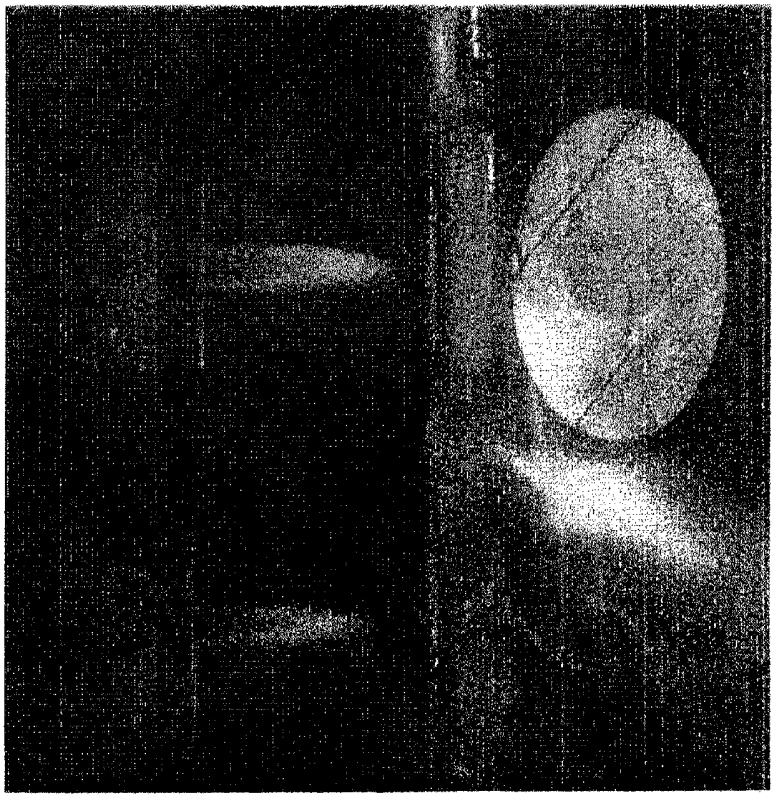

The cork industry currently looks a bit like a dinosaur watching the meteor impact that occurred at the Cretaceous–Tertiary boundary 65 million years ago. One imagines a slightly bewildered expression as it sees its once seemingly unassailable position as *the* closure dissipate in the face of an army of alternatives, led by the screwcaps.

And so anachronistic until now has been the response of the cork industry to this onslaught, that it has become almost unfashionable to point out that it is a remarkable natural substance ideally suited for sealing bottles with. The key to its mechanical properties is that it is formed of a honeycomb network of densely packed cells, whose walls have been transformed by the process called suberinisation that renders them flexible, inert and impermeable. A wine cork consists of hundreds of millions these cells and, because they're filled with g the whole cork structure is compressible a elastic. Cork can be compressed to about half width without losing flexibility and has t remarkable property of being able to compressed in one dimension without incre ing in another. It can resist moisture for decac and will stay compressed, thus maintaining seal, for equally long periods.

A decent cork will provide a good seal for years, possibly longer, allowing the wine develop and mature. And, despite the tightn of this seal, it is relatively easy to take a cork o Added to this, removing the cork is a valued p of the tradition and ceremony of wine. Peo like the process, and the fact that cork is a pr uct of nature is seen as a positive attribute many in today's environmentally conscious a

Cork's Achilles heel

But before I enthuse further, let me put thi in perspective. Cork has an Achilles heel. a natural substance it is variable and pro to failure. Most significantly, it harbours contaminant that is able to spoil wine at fant tically low doses. Meet TCA, curse of t wine industry.

TCA is the commonly used abbreviation fo chemical called 2,4,6-trichloroanisole. The di secret of the wine trade is that about one in bottles of wine is ruined by cork taint as soon it is bottled, which is when a wine takes o musty odour. The main culprit is TCA present some corks, although recently other relat molecules have also been implicated. TCA incredibly potent: most people can detect it concentrations as low as 5 parts per trillion (t same unit as nanograms per litre), and some even more sensitive. This makes it hard to era cate. To give you a better idea of this figure, i equivalent to one second in 64 centuries.

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Harvest time: natural cork is still a favourite with wine drinkers despite the growing number of alternative closures. With further research into tainting issues, cork could be set to make a comeback

Alternatives to cork

Because of the problems of cork taint, there has been a push within the wine industry towards different ways of sealing bottles. Synthetic corks have been popular for wines intended for near-term consumption, but it has proved incredibly difficult to simulate the performance of natural cork. It's theoretically possible to make synthetic closures that provide as good a seal, but these would be almost impossible to extract from the bottle. The early synthetic corks allowed the wine to oxidise after a couple of years, but signs are that some of the products now on the market do a better job.

The leading competition for cork is now the screwcap. Screwcaps have been around for a while, though for many decades associated with cheap wines only. Yet in recent years, they have been associated with quality wines, and their popularity has soared – such that many industry commentators are predicting that they'll replace cork almost entirely within a decade or two. The rise of screwcaps has been especially striking in Australia and New Zealand where, spurred on by a grass-roots pro-screwcap activist movement, sales have gone from virtually zero to many millions in just four years.

Pole position

But there are signs that cork is fighting back, and there are a number of reasons why natural corks might be with us for some time to come.

First of all, consumers still quite like cork. A large UK survey of consumer attitudes to different closures was recently published by market research company Wine Intelligence. This was an independent survey of some 25,000 wine drinkers. Of these, just 1,018 said they were aware of different kinds of closures and thus were eligible for this study. 55% said they liked buying wine with a natural cork closure, 29% said the same for synthetic corks, whereas only 18% said they actually liked buying wines sealed with a screwcap. When it came to negative responses, only 3% said they didn't like buying natural cork-sealed bottles, while more than a third were opposed to screwcaps. However, the survey showed that this proportion of anti-screwcap consumers had reduced to 36% from 59% the previous year, which is a significant turnaround.

Stay of execution

One of the reasons that cork has had a stay of execution is because of a lack of proper scientific data on how fine wines mature under screwcaps over long periods. In the 1970s, the Australians started experimenting with screwcaps for both white and red wines. Although the reds have all disappeared, some bottles of these screwcapped whites survive to this day, and people who have tried them say they're pretty good. But we can't assume the same will be true for reds, which age very differently in chemical terms.

From first principles, we can argue that wine ageing is a process that occurs to best effect in the absence of any external oxygen. But we can't yet be totally sure that the very tiny amount of oxygen transfer that corks permit isn't necessary for proper maturation of ageworthy reds. As a result, for a winemaker to bottle structured red wines under screwcap currently involves a degree of risk. For now, while most people think screwcaps are the closure of choice for many whites, most are waiting to see how they perform in red wine trials currently underway before committing themselves.

It seems, therefore, that cork producers have a window of opportunity to convince everyone they can clean up their act. If the taint rates associated with natural cork can be reduced significantly, it may be that the push towards screwcaps will be lessened.

Cleaning up cork

Initially, cork companies fought back against complaints of high levels of cork taint with a PR campaign, rather than addressing the problem itself. In recent years this has changed, and serious efforts have been made to reduce taint.

Two potential strategies for dealing with TCA exist: the first is to stop TCA getting into the cork in the first place; the second is to remove it once it is there. As yet, no one has succeeded with the first strategy – because cork is natural and has lenticels that are open to the environment, allowing microbes in, this may never be possible. TCA has been found in bark in cork forests. So cork producers have, instead, concentrated on ways of getting TCA out of the cork. This presents severe technical challenges. Any method invasive enough to get all the TCA out runs the risk of damaging the structure of the cork, impairing its physical properties.

Nevertheless, two leading cork manufacturers have both developed new techniques for dealing with TCA that they hope will dramatically reduce its incidence in their products.

Sabaté's Diamond process

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Sabaté, the globe's second largest cork producer, has developed the 'Diamond' process, which uses supercritical CO_2 for selective extraction of volatile compounds from cork. Supercritical CO_2 is a difficult concept to explain in simple terms, but I'll have a go. If you pressurise a gas,

Barking up the right tree: cork forests in Portugal where the cork oak tree, *Quercus suber*, has such thick bark that if stripped carefully does not damage th The oak must be at least 25 years old before its bark can be harvested, and its bark can then be stripped every eight to 14 years after that

at a certain point it becomes a liquid. If you then juggle the parameters of pressure and temperature, at a specific combination of these – known as the critical point – the interface between the two disappears, and you then have the penetration power of a gas and the extraction power of a liquid. The technique is already used to remove caffeine from coffee and by the perfume industry to extract fragrances.

The Diamond process shows an efficiency rate around 97% for TCA extraction. Initially, this process was used to treat the cork flour that is the basis for Sabaté's Altec closure. Wines sealed with prototype Diamond-treated Altecs, now marketed as 'Diam', showed no detectable TCA, both by sensory and chemical analysis, in a rigorous independently conducted panel study carried out in the UK in 2003, and subsequent data indicate that it does work.

While taint-free 'technological' corks, like Diam, are ideally suited for sealing more commercial wines, they are not suitable for fine wines destined for long ageing. Sabaté hopes to be able to extend this process for natural corks, but, at the time of writing, it is still working towards optimising this process. Tests show that the cleaning process does alter the mechanical properties of the cork, although not greatly. However, some uncertainty surrounds the capacity of these treated corks to retain a good seal for as long as their non-treated counterparts. This could be a major hindrance to their uptake by fine wine producers.

Amorim's ROSA process

Amorim is the globe's largest cork producer, and Miguel Cabral, in charge of research and development, told me about two of the approaches Amorim is taking to address the taint problem. First, Amorim has introduced chemical analysis for TCA in to its quality control. This involves a sensitive measurement technology called gas chromatography–mass spectrometry/ solid phase microextraction (CG–MS/SPME). Amorim has five different machines. 'We can do 400 analyses of cork soaks in 24 hours,' reveals Cabral, 'and the current threshold is 5 ng/l (1 ng/l = 1 ppt) TCA for a soak of 50 corks.' According to Cabral, half the volatiles from the soak would be expected to get into wine after 14 months, so this threshold would correspond to a wine with a TCA level of 2.5 ng/l. How many batches of corks fail to meet this threshold? 'An

enormous amount of batches are clean,' says Cabral, 'then some have 20% to 30% of bales with above threshold levels.'

Secondly, Amorim has also developed a curative strategy. ROSA (Rate of Optimal Steam Application) is a special method of steam cleaning. Cabral claims that it significantly reduces the TCA in the cork granules used to manufacture technical corks such as the hugely successful twin top, with a reduction of about 80%. The ROSA technique is used to treat granules and discs that form the successful twin-top closure, as well as natural corks.

Aside from novel technology, there's also hope that the cork companies will be able to reduce taint levels by improving their manufacturing practices. During cork processing, there are several stages where TCA-producing mould growth, or cross-contamination, could occur. The cork planks are left outside to season and dry for several months. Poor conditions here can encourage fungal growth. The planks are then boiled to improve their physical properties, remove tannins and kill off any bugs. If the water isn't changed frequently, or too many planks are boiled at once, then this may contribute to contamination. After this, the planks are allowed to stabilise, which takes a week or two: putting these planks in a warm warehouse encourages fungal growth. You would expect that care and attention during these stages, coupled with a quality control step that involves chemical analysis, would lessen the prevalence of TCA taint.

In a twist on the theme, one closure that looks set to gain a decent market share is Pro Cork. It's a hybrid closure: a natural cork sealed at the business end with a five layer taint-proof membrane so that the cork doesn't come into contact with the wine. The membrane also reduces the oxygen transmission characteristics of the cork, and initial independent data on its performance are impressive. Expect to hear more about this in the future.

So it seems that a different complexion is emerging to the closure debate. While previously it has been classed as a fight to the death between cork and its alternatives – particularly screwcaps – now people are talking in terms of the 'right closure for the right wine'. One reflection of this philosophical shift is that cork company Sabaté are now marketing a line of screwcaps, called S-CAP. With the prospects of cleaner corks with lower taint rates, perhaps there is a niche for natural cork after all. How big this niche is will largely depend on how far cork companies can get the taint rate down from its present high level of 5%.

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