Achieving success with canned wines

Canned wine is the fastest growing packaging segment in global wine consumption, due to perceived value for money, attractiveness of packaging, convenience, sustainability and millennial appeal. Unfortunately, many wines packaged in cans are susceptible to the formation of 'reductive' character after packaging, leading to increased risk of damaging consumer expectations and brand integrity. This presentation will provide detailed information on key wine attributes that can affect the shelf-life of canned wines and viable risk mitigation strategies that can be employed to combat this and maximise product quality on the shelf. At the 2022 PACKWINE Forum & Expo, **Neil Scrimgeour**, business development manager with Affinity Labs, discussed how to achieve success with canned wines. Here. *Grapegrower & Winemaker* presents an edited version of his presentation.

Cans have been a new and innovative entry into the market and I will explore some significant trial work we've done at Affinity Labs in the AWRI over the last three years.

Back in 2019, we did some benchmarking around canned wine products in the marketplace and we were seeing evidence of issues with poor quality and short shelf-life.

A lot of the work we did here was around understanding the problem in a bit more detail and understanding some of the chemistry behind the issues we were seeing.

Out of that body of work, our aim was really to try and come up with practical solutions for producers who want to move into this format; what could they do to maximise their chances of a long shelf life and maintain product quality?

As a background, there are many different alternatives to the glass bottle. Most of those still remain a small fraction of markets compared with glass, but there is a trend towards non-glass packaging which is gathering speed.

Some of that's been driven by sustainability initiatives and we're seeing that play out with things like cans and bag in box, where innovation in existing formats and new products coming to market are building momentum and have done for a few years.

The glass bottles are still seen by a lot of consumers as a fairly environmentally friendly choice, despite the data that's out there, compared with things like plastic and aluminium cans.

However, there is increasing pressure within the supply chain for traditional glass packaging to be made more lightweight to reduce its carbon footprint, and for producers to embrace other non-glass packaging technologies.

In terms of the can, and its success, it lies with the three P's: portability, portion control, preservation.

All these things appeal to consumers, especially millennial and Gen Z consumers.

The Australian domestic market for canned wine is approximately $12 million dollars and the annual sales growth is roughly 10 per cent - which is outperforming bottled wine, which is fairly flat in terms of growth.

However, the growth of canned wines has slowed to a degree in recent years. This is in part due to quality issues but also from increasing competition in the category. With products like hard seltzers and RTD products coming into that category, canned wines are still of interest to consumers but the growth has slowed.

There are also supply chain demands which can be significant in terms of impact on the market and there have been reports of major suppliers in the US having issues with global demand for aluminium cans and being able to meet that demand.

There are a number of clients we deal with who we know are having significant issues accessing the materials required to put product into can,

Consumer perceptions

A Tetrapak sponsored study commissioned in the UK explored the carbon and environmental footprint of various wine packages and showed aluminium cans looking fairly carbon intensive from a footprint perspective, even against things like glass bottles.

However, the recyclability element comes more into play with cans. So in theory, aluminium cans are a lot more recyclable than glass.

That plays out in a bit of a confusing message for consumers in the market around how sustainable cans are but there are big advantages over glass bottles if you can get the product quality challenge, right.

The same is true for other packaging types, especially for wine, which is a fairly aggressive matrix, and where the product interaction with the package can be significant.

We see this play out with things like different closures and glass bottles, but also things like PET, cartons, the Tetrapak, as well as some of the foil lined pouches that you see on the market, there can be quite a significant impact on the product quality from the packaging itself.

Oxygen permeation is also a big factor and for formats like bag in box and PET it is a constant challenge unless you're using things like oxygen scavengers.

From a sustainability perspective, balance is the key. Being as recyclable and as environmentally friendly as possible, but also maintaining our product integrity.

The issue we saw with canned wines was the product integrity challenge because there are a lot of products in the marketplace and there's a lot of anecdotal information around perceived reductive characters.

Some of those sulfur compounds that we often see in wines are naturally occurring and the big one for canned wines is hydrogen sulphide, which seemed to be a major issue with the products out there at the time.

We did some benchmarking using data from 2019, and there is data from 16 different products; commercial canned wines, straight off the shelf, recently packaged, and we monitor those over a five month period.

In most cases, the hydrogen sulfide (H_2S) levels are increasing over time. In some cases, the levels in the wines are close to that threshold and in a lot of cases, they're way above - you can't help but notice something that's got 40 micrograms of hydrogen sulfide per litre in the product, they will stink like rotten eggs and that's what the consumer was seeing.

That's why some of the major players ended up having to pull product from the shelf around that time.

In terms of hydrogen sulfide there is inherently two sources: In cans, one is the naturally occurring sulfides which can be either freely available H_2S, or that it might be present in a bound form to things like copper and other metals.

They can be released post packaging, depending on a number of different factors such as oxygen levels, and other metals present. That can happen in glass bottles, as well as in cans, so that's no different.

What we saw in cans is that there's a second pathway for hydrogen sulfide generation and that's from the aluminium that forms the in body and the lid of the can. We postulate at this point there was some sort of migration occurring from the inner surface of the product during storage.

To complete that benchmarking picture we looked at other factors like sulfur dioxide concentration.

Most of the information we had on cans at the time suggested that oxidation in cans wasn't a big issue, it was more reduction.

The data suggests that there is a decline in free sulfur dioxide over time while the products on the shelf, but it's not particularly significant. Drops occur due to the oxygen that's present at packaging, causing a depletion in free SO_2.

Once that's gone, the can is essentially an environment where no oxygen can enter. We ran oxygen transmission tests on some canned products and saw no detectable oxygen increase in package, which is what you would expect.

In most cases, oxidation was not the problem which means that in theory, producers going into can with products can probably target a lower free SO_2 level,

SPEAKER

Neil Scrimgeour

Neil Scrimgeour is business development manager with Affinity Labs. He has extensive experience in the design and management of technical performance trials for new product and packaging types and leads a team who specialise in tailored consulting and technical support services for a range of foods and beverages. Neil provides scientific insight, technical guidance and management of practical outcomes for new product development, both in the wine industry and in his previous roles in the pharmaceutical industry. Neil has spent the last 10 years working closely with packaging suppliers and wine producers on a broad range of process, product and packaging technology projects. This has included facilitating large-scale consortium trials to assess the performance of different wine closures, developing and testing innovative packaging solutions and management of shelf-life performance trials for new products.

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as long as the packaging conditions and oxygen management practices used are best practice.

If a producer has a lot of oxygen going into their can or packaging, then you will need a higher level of SO_2, but generally speaking, you can get away with a lower level.

Then we looked at the aluminium concentration, which was really interesting. We saw in almost every case [and] volume, aluminium increased.

There will be a naturally occurring background level of aluminium in wine, depending on whether it's white or red, which can sit between 300-500 micrograms per litre, but it shouldn't increase once the product is in the can. What we saw was that in most cases was the aluminium was increasing, sometimes quite significantly during that five month period.

This confirmed that there was a pathway for the aluminium to migrate into the wine and that doesn't exist when the wine is packaged in glass.

In terms of commercial cans, they are lined with a barrier film to protect the product, however some of our products are so aggressive that you actually need a thicker barrier film on the inner surface. Not generally a different film, just a thicker layer.

For things like wine, in most cases, you will need that thicker layer to protect from potential aluminium breakthrough. Despite this, our evidence did suggest that aluminium breakthrough was still occurring into a lot of commercial products.

The data I've seen suggests that there is no silver bullet yet in terms of that barrier film. It's fit for purpose in most cases, but not all.

Risk factors

Things like free SO_2, copper, chloride, and low pH are all risk factors for products going into a can whether it's wine or other products.

What we've seen a lot of cases is that wines generally have one or more of these factors which are over or under the threshold level.

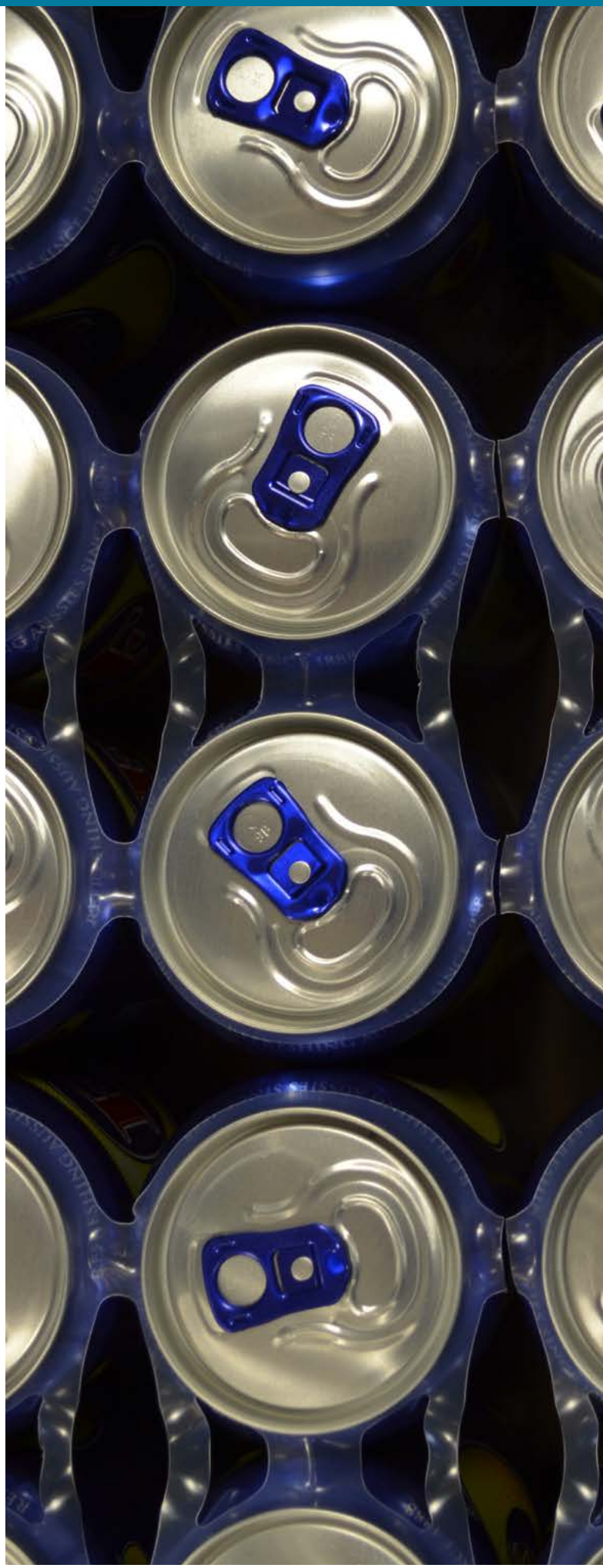
A lot of wines we've seen above that 0.2 milligramme per litre copper level, we've seen a lot that are over 100 milligrammes per litre of chloride. Straightaway, we know that's a risk factor for products that are going into can.

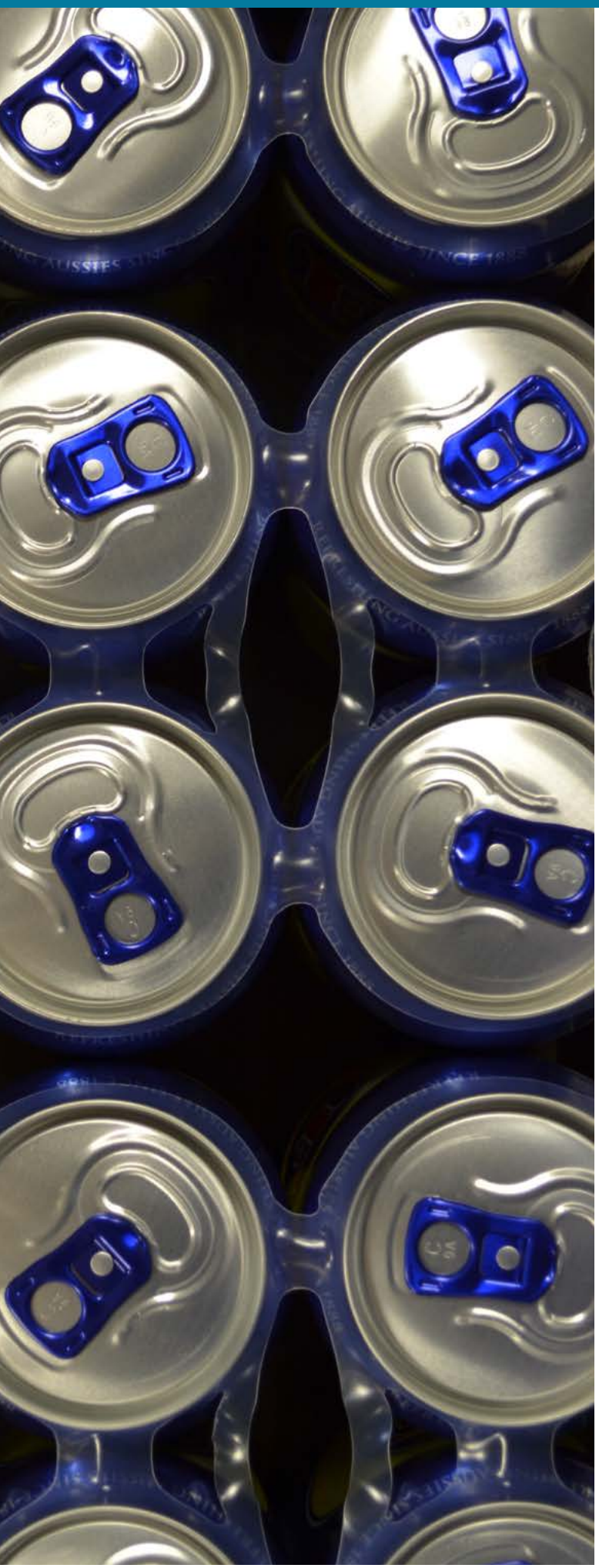
Chloride is a good example of something we looked at on a trial basis. We did a lot of benchtop trial work trying to understand the impact of some of these attributes on aluminium migration into the product. We looked at model wine and can and ampoule and adjusted SO_2 levels to be low and high.

We looked at no, moderate, or high chloride levels in those wines and, from the data, found that as you increase the level of chloride, you get an increase in aluminium concentration into the product. Higher SO_2 levels also accentuates the issue.

In an ampoule environment where you don't have aluminium present, there's no increase in aluminium concentration.

We see this play out with other factors: SO_2, copper, we see





similar trends and that's why they're risk factors identified by the can suppliers.

In order to better understand the role in these, we went through different benchtop scale experiments, most in glass ampoules using commercial wines, and we used elevated temperatures to accelerate some of those reactions.

We trialled various products but the one that seems to be the most effective was a polyvinyl imidazole polyvinylpyrrolidone crosslinked polymer, and there's commercial off the shelf products that you can buy.

It's very hard to get a consistent and common understanding of the chemistry because you've got all this noise from the can variation in the background but we did see from the trial work that high copper definitely was a big issue in that H_2S formation.

Following the trial

From the data collected during the six months of that trial, we observed the increases in aluminium from zero to three months, and then three to six. Generally, we saw a bigger aluminium increase in the control samples versus the treatment samples.

In most of the products, we only saw a modest increase in aluminium levels during the six months and no gross failures when compared to some of the data we saw when we did the benchmarking process back in 2019.

It suggested that screening and treatment process was reasonably effective at controlling the aluminium migration.

Looking at the hydrogen sulfide data. Most of is around or below the threshold level and there are a couple of products where we saw slightly elevated hydrogen sulfide levels.

Compared with the wine samples, where we're getting 40-50 micrograms per litre levels at the start, these were a lot lower, given H2OC is very volatile, and these are carbonated products, it provides a passive protection mechanism for being able to detect that aroma. There's still some there, but it'd be very hard to pick up.

On average, there really wasn't much difference between the control and the treated products. Again, can variability was a bit of a theme through the chemical data and the sensory data.

The big takeaway for us was a lot lower incidence of HDS beyond that threshold level, and no discernible tensile faults from the sensory panel. That suggests that the crosslink column is not importing anything negative into the wine. And we're not seeing H2S play a big role in the aroma attributes of the wine.

The takeaway from the cellared versus the accelerated data was a model that we can use to accelerate the reactions and give a rapid predictive test of how products will perform in a can environment and we're looking to extend this methodology into using a lined to aluminium coupon test so we can do that modelling without needing the whole can in the process. GW