

Keeping Australian wines 'cool' for the world

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Introduction

Wine production is a significant industry in Australia. On a national scale, the Australian wine industry involves around 2000 wine companies, directly employs 28000 people in both winemaking and grape growing capacities (2006 Census) and generates related employment in the retail, wholesale and hospitality industries. There are 167,000 hectares under vine and the total grape crush in 2006 was 1.85 million tonnes (AWBC, 2009).

Australia is now the fourth largest wine exporting nation after France, Italy and Spain and Australian wines are drunk in more than 100 countries. Every day, about 2.5 million bottles of Australian wine head overseas. In a year, that's worth about \$2.8 billion to the national economy (AWBC, 2009). Australia's largest wine export market in 2006–07 was the United Kingdom (269 million litres, worth \$977 million), closely followed by the United States (215 million litres, worth \$856 million). Other leading destinations for Australian wines include Canada, Germany and New Zealand (DFAT, 2009). Australian wine is

also making inroads into Japan, Scandinavia and Europe, and beyond. Other markets in Asia, Africa, Central and South America, Eastern Europe and Russia offer potential export opportunities.

Wine quality is essential for maintaining Australia's high levels of export and temperature plays a significant part in ensuring that wines reach the customer table in optimum condition. Numerous studies (Ough, 1985; Rankine, 1998; Marais, 1986) have shown that extreme temperatures and excessive temperature fluctuations have a damaging effect on the quality and appearance of bottled wine. These alterations in the chemical and sensory properties of wine often lead to the rejection of the product affected, which causes not only financial loss but also loss of consumer confidence on the winemaker. This research provides one piece in the complex challenge of continually providing optimum shipping conditions for wine exports under changing economic and climate conditions.

Temperature conditions during shipment are highly important since wine shipments from Australia to its major markets travel long distances, endure long travel periods over land and sea, and can be subjected to rapidly changing seasons by crossing the equator. It is of the utmost importance that the wine, produced with so much care, is packaged in such a way that it is contained, protected and identifiable until it is consumed (Meyer, 2002). It is therefore vital for winemakers and exporters to at least know the temperature fluctuations that wine is exposed to during shipments.

Wine Supply Chain Council (WSCC) temperature study

As previous studies (Miclette and Martin, 2000; Smale and Eddy, 2006; Ospack, 2007) have shown, Australia's environment and distance from its major wine markets can have serious implications on the quality of Australian wine delivered to its customers. The Australian wine industry needs more comprehensive studies of temperature in wine shipments covering longer time periods and involving more wineries and distribution routes. One such study has been initiated by the Wine Supply Chain Council (WSCC, 2008), a new international initiative concerned with wine logistics and supply-chain issues. The founding participants of the WSCC are CSIR (South Africa), National University of Cuyo (Argentina), Catholic University Santiago (Chile), CSIRO (Australia) and Georgia Institute of Technology (The Logistics Institute, Atlanta, USA).

The WSCC wine temperature study, started in September 2007, is gathering data on variations in temperature and transit times for international wine shipments. This is achieved by inserting temperature-recording devices in cases or containers of wine at wineries in Australia, Chile, and South Africa. The containers are then shipped to the US, where the WSCC team at Georgia Tech retrieve the temperature-recording devices. The measurements include time and temperature, recorded at 1 or 2-hour intervals. The devices are not much larger than a watch battery, are self-powered and are placed securely in an envelope inside each case.

The Australian portion of the study involves 4 of the 5 biggest wine exporters in Australia. The data from the returned loggers are being analysed in order to

correlate time with location by interpolating scanning data collected along each supply chain. The shipping scans will be of value in themselves, independent of the temperature records, because these will be useful in understanding the distribution of transit and processing times.

Study Results

The WSCC wine temperature study continues to collect data on temperature and transit times of international wine shipments. Results from the Australian component of the study shows that there are areas where Australian wine exporters should put in more consideration and planning. The data collected will assist the Australian wine industry identify and understand the causes of temperature variations and implement policies and measures aimed at minimising exposure to heat and other damage of wine shipments by using appropriate packaging, insulated containers and appropriate storage facilities.

For example, the results showed that the great majority of the daily temperature fluctuations considered unacceptable occurred during the land transport stages, with temperatures from the Australian (OZ) land leg exceeding or at least equalling those the US land leg. As the distance between source winery and departure port, or between arrival port and final destination, increases, so does the risk that extreme daily summer or winter temperatures will impact the wine shipment. Many Australian wine shipments arrive at the port of Oakland in California destined for the East Coast, such as Baltimore or Philadelphia. Some of the points in this route are known to produce daily temperatures of 43°C in summer and minus 4°C during winter (Butzke, 2001).

Temperature levels and fluctuations during the sea stage were found to be mostly at acceptable levels, irrespective of whether the containers were insulated or not. The minimal or nonexistent temperature fluctuations and the low proportion of 25C+ or 40C+ hours during the sea legs is most likely the result of standard instructions that wine containers be stored below deck. However, irrespective of what directives the captain of the ship may have been given, there is always the possibility that the container could be placed above deck or placed next to a ship's boiler (Dean and Paffard, 2002).

In response, some Australian wine companies have already taken a number of actions to reduce the risk of spoilage as a result of exposure to high temperatures. These include (Dean and Paffard, 2002):

- Trials on the use of inverted cases.
- Use of synthetic corks to minimize exposure to cork taint and random oxidation.
- Use of container liners in every shipment.
- Use of at least one data logger in each container.
- Identification of status (temperature controlled or not) of destination warehouses, and
- Establishing guidelines for distributors regarding the use of quilted containers, the operation of data loggers and the thresholds of warehouse temperatures limitations.

Data collected by the WSCC wine temperature study indicate that the issues surrounding extreme temperatures in wine shipments continue to go

unresolved. There is sufficient evidence that the Australian wine industry should review policies and guidelines on current shipping conditions with the goal of raising awareness among wine producers, exporters, freight companies, distributors, wholesalers and retailers about the mutual goal of minimising exposure to heat and other damage by using appropriate packaging, insulated containers and appropriate storage facilities. Attention should also be given to truck routes and shipping schedules and to the whole shipping process (Meyer, 2002).

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