

PROCESS FOR PACKAGING WINE IN ALUMINIUM CANS

Technical Field

This invention relates to a process for packaging wine in aluminium cans. It also relates to aluminium cans filled with wine according to the process of the invention.

Background of the Invention

Wine has been produced since the times of the ancient Greeks. It has been stored in many types of containers. These have included timber, pottery and leather. The use of glass bottles has evolved as the preferred storage means for wine, particularly when stored in quantities less than one litre. While bottles are almost universally used they have the disadvantages of having relatively high weight and being relatively fragile.

For beverages other than wine, such as beer and soft drinks, alternative packages such as metal cans and polyethylenetetrathate (PET) bottles have been widely adopted. These offer advantages of lower weight and greater resistance to breakage. It has been proposed to store wine in such alternative containers. However, attempts to use such packaging types for wine have been generally unsuccessful. Some very low quality wines are stored in polyvinyl chloride containers. It is believed that the reasons for this lack of success has been the relatively aggressive nature of the materials in wine and the adverse effects of the reaction products of wine and the container on the wine quality, especially taste. Wine is a complex product that typically has a pH in the range 3 to 4. This compares to beer with a pH of 5 or more and many soft drinks with pH 3 or more. However, pH itself is not the sole determinant and it has been found that carbonated cola drinks with a pH as low as 3 may be adequately stored in PET containers. The low pH is the result of the phosphoric acid content in carbonated cola drinks. This may allow the satisfactory use of precoated aluminium cans and PET bottles for these beverages.

It would be desirable to package wine in aluminium cans whereby the quality of the wine does not deteriorate significantly on storage.

Summary of the Invention

This invention provides in one form a process for packaging wine in aluminium cans including the steps of:

- 5 preparing wine characterised in that it has less than 35 ppm of free SO₂,
less than 300 ppm of chloride and less than 800 ppm of sulfates;
filling a two piece aluminium can body with the wine and sealing the can
with an aluminium closure such that the pressure within the container is at
least 25 psi and wherein the inner surface of the aluminium is coated with a
corrosion resistant coating.

- 10 Preferably the wine is further characterised by having total sulfur dioxide
levels less than 250 ppm, and more preferably 100 ppm.

Preferably the wine is further characterised by having total nitrites less than 1
ppm, total nitrates less than 30 ppm, total phosphates less than 900 ppm and acidity
calculated as tartaric acid in the range 6g/litre to 9g/litre.

- 15 Preferably the wine is chilled before filling.

Preferably the corrosion resistant coating is a thermoset coating.

Preferably the headspace after sealing with the closure has the composition
nitrogen 80-97% v/v, and carbon dioxide 2-20% v/v.

- 20 Alternatively the wine is carbonated before the two piece can body is filled
with the wine whereby the headspace after sealing is predominantly carbon dioxide.

Preferably the maximum oxygen content of the headspace is 1% v/v.

Preferably liquid nitrogen is added just prior to the seaming of the closure to
the body of the can.

Preferably the headspace for a 330 millilitre can is in the range 2-5mm.

25 Detailed Description of the Invention

- The wine required for the process of the present invention may be prepared
by the use of particular viticulture and wine making techniques as are described
below. Alternatively the wine may be prepared by treating wine with higher than
specified levels of constituents and removing or lowering the content of these
30 constituents to those required for the present invention. In this invention the term
"wine" is used quite broadly and includes still and sparkling wine as well as

fortified wines and wines blended with mineral waters and fruit juices.

With regard to viticulture the absence of undesired materials may be obtained by ensuring adverse chemical sprays are not used. The use of chemical sprays needs to be monitored as this also affects the total build up of undesired
5 chemicals in the final wine product. Most vine diseases need heat or humidity to flourish, unpruned vines enhances this dilemma further creating the need for chemical spraying.

Shade has a major role in producing grape quality, a higher incidence of botrytis, powdery mildew and down mildew. Once again this requires chemical
10 intervention. Sulfur based fungicides can be used but they introduce unacceptable levels of sulfur. Unpruned vines have bunches which produce soggy wine with excessive herbaceous and abhorrent flavours. Light is one of the greatest natural assets, too often forgotten and taken for granted. The focus must be "a vine in harmonious balance" within itself. With the correct ratio of grapes, leaves, canes,
15 wood and roots within this balance occurring, minimal chemical intervention is required.

Excessive irrigation's legacy is an "out of balance" crop. A crop where there is a far too abundant canopy produces shaded fruit and in turn late ripening. Also excessive irrigation prior to harvest overloads the berry with water and chemical
20 uptake, which alters the berry's natural state. Again this often requires a chemical counter measure further down the processing line. Drip irrigation with a constant electronic soil moisture monitor is the preferred option.

Preferably grapes will be hand picked (with careful attention not to excessively damage the fruit) and should be harvested in a cool (8°C–16°C)
25 environment, preferably at night. Baume in the 13.0–14.0 range with pH 3.1–3.8 for "reds" and 10.0–13.0 Baume and pH 3.0–3.5 for "whites". Minimal sulfur dioxide dusting is required so as to minimise wild yeast degradation. It is preferred to rely upon the wild yeasts for fermentation.

For red wines crushing and de-stemming should occur as soon as possible
30 and preferably within 12 hours of harvesting. De-stemming before crushing is highly recommended so as to produce a higher quality wine. The advantages are an

improvement in taste by not containing astringent, leafy herbaceous stems. Possible alcoholic strength increases, by as much as 0.5%, because the stems which contain water and no sugar, absorb alcohol. An increase in colour occurs by avoiding the pigments in the stems. Fermentation with stems allows for more
5 oxygen intake at an accelerated process. We do not require speed when fermenting, only stability and quality. After de-stemming and crushing the must is pumped to a fermentation vessel, adjusted with tartaric acid, yeast levels adjusted to requirements and a minimum sulfur dioxide addition.

The vessel is fitted with a bubble system so as to allow excessive
10 fermentation gases out, and no oxygen in. Oxygen entry occurs only when punching occurs. This amount of aeration is important for yeast multiplication and complete sugar fermentation.

Punching down the skins (every 10–12 hours) at regular intervals and maintaining an ambient temperature of approximately 25°C is crucial in the
15 fermentation process. Dry-cap can allow oxidation and higher or lower temperatures create their own nemesis on the fermenting juice. Stability during maceration being the key element during the next 14–21 days. Baume is constantly monitored with a daily reduction of 0.7–1.0 Baume being the “benchmark”. When the Baume reaches 0°–1° the pomace or grape mass is “basket pressed”.

20 Pressing requires careful and astute monitoring. Over-pressing creates heavy astringents, phenolics and heavy coarse tannins. Balance pressing alleviates the need for eventual heavy chemical fining, unnecessary blending and chemical intervention.

At this stage the combination of free run juice and pressed juice is
25 transferred to pre-sulfited, sterilised used or new American Oak, French Oak stored in a naturally controlled temperature environment. The temperature range is 15°C – 25°C. After filling, the barrels are hit a few times with a rubber mallet to dislodge air bubbles and refilled to within 25mm of the barrel opening. The barrels are fitted with an air lock and the fermentation is allowed to proceed within the barrel. This
30 process takes 3–4 months to complete (the time factor dependent on the humidity

and temperature variations in the host environment). About this stage malo-lactic fermentation occurs, either by inoculation or naturally if it is endemic in the winery.

After fermentation is complete the barrel is racked, cleaned, sterilised, lightly sulfited, filled and air locks removed. After filling, the barrels are hit a few times
5 with a rubber mallet to dislodge air bubbles, refilled and bunged. The barrel then positioned with the bung at 30° to the vertical.

Sediment needs to be removed from young wine so that yeast cells, bacteria cells and foreign organic substances which create putrid, reduced and hydrogen sulfite can be avoided.

10 Aeration is another natural progression in our quest for excellence. This factor facilitates the completion of yeast transformation and the eventual stability of the wine. Within the fermentation medium, different areas of sedimentation occurs, dictating free sulfur dioxide levels to form. Racking synergises these layers into conformity. Sulfiting requirements at this stage are thus more precise.

15 Frequency of racking is a contentious issue, a time frame of every two to three months in the first year is quite acceptable although in reality factors such as the size of the tank or barrel, temperatures in the cellars and type of wine will dictate the cellar master's decision. His skill and experience will determine the final requirements. Egg white fining at the rate of 1–3 per 100 litres is required to
20 enhance the settling of the suspended material.

After ageing in casks for 12–18 months, racking at least 3–4 times, analysing, tasting, lightly sulfiting, (if 100% necessary) acknowledging the wine is sound, free from fermentable sugars and has completely undergone malo-lactic fermentation the wine is ready for blending. This is the final reward for the efforts
25 put forth in the preceding 12–18 months and the months leading up to harvest.

For white wine the grapes are de-stemmed before crushing. The pH of the juice adjusted to pH 3.0–3.4 with tartaric acid. Skin contact time dependent on grape variety, sourcing region, ambient temperature and the quantity of tannins or astringent phenolic requirements. The must drained under carbon dioxide addition.

Fermentation temperature is in the range 10–16°C. A sugar content reduction of between 0.4 and 0.8 Baume is the goal. After fermentation, the wine settling and racked under carbon dioxide, sulfur dioxide addition occurs.

In all procedures pertaining to white wine, exposure to air is to be avoided at
5 all costs, and a cool temperature environment is practised. Wine prepared as described above has a free sulfur dioxide level less than 35 ppm and a total sulfur dioxide level less than 250 ppm. The level of anions that may form acids, chlorides, nitrates and sulfates are less than the prescribed maxima.

The invention may also be applied to sparkling wine where nitrogen may not
10 be required in the headspace as the carbon dioxide may be sufficient to provide the required can strength.

The two piece cans suitable for the present invention are cans that are currently used for soft drink and beer beverages. The can linings are also similar and are typically an epoxy resin combined with a formaldehyde based crosslinking
15 agent. Typically the film thickness used is greater than that used for beer or soft drinks. Typically 175 mg/375 ml cans have been found to lead to a suitable film thickness. The internally coated can is baked at temperatures typically in the range 165–185°C for twenty minutes. It is important to ensure a well cross linked impermeable film to ensure excessive levels of aluminium are not dissolved into the
20 wine on storage.

The can filling process involves the addition of approximately 0.1ml of liquid nitrogen just prior to seaming the closure of the body. The internal pressure in the can is approximately 25–40 psi.

Alternatively the wine can be carbonated by mixing the wine with carbon
25 dioxide gas in equipment known as a carbonator. This type of equipment is well known and is extensively used in the soft drink industry.

As previously discussed, the storage stability of the wine in the aluminium can is vital. In contrast to bottled wine where the headspace includes oxygen, the headspace in the cans of the present invention have very low levels of oxygen. This
30 means the wine does not “age” on storage.

For test purposes, the packaged wine is stored under ambient conditions for a period of 6 months and at 30°C for 6 months. 50% of the cans are stored upright and 50% are inverted.

- The product is checked at 2 monthly intervals for Al, pH, °Brix, headspace oxygen and visual inspection of the cans, 6 cans inverted and 6 cans upright per variable. Visual inspection includes lacquer conditions, staining of the lacquer and seam condition. Samples are to be retained for 12 months. Sensory evaluation uses a recognised objective system by a tasting panel.

Results for storage evaluation of a white wine are set out in Table 1.

- A white wine has a lower pH on average than a red wine and is more severe test on storage stability.

Table 1

Storage	°Brix (20°C)	Orientation	Al mg/L	pH
Initial	6.7	-	0.5	3.40
3 months	6.9	Upright	0.65	3.47
3 months	6.5	Inverted	0.68	3.47
6 months	7.0	Upright	0.72	3.49
6 months	7.0	Inverted	0.68	3.50

- The increase in the aluminium content in the wine after storage in a can is calculated as:

$$\frac{(100 \times \text{aluminium content after storage} - \text{initial aluminium content})}{\text{initial aluminium content}} \%$$

- For the wine stored for three months in the upright position at 30°C this calculates, using the data in Table 1, as:

$$\frac{(100 \times 0.65 - 0.5)}{0.5} \%$$

$$= 30\%$$

- For the wine stored for three months in the inverted position at 30°C this calculates as:

$$\frac{(100 \times 0.68 - 0.5)}{0.5} \%$$

$$= 36\%$$

Similar calculations from the data in Table 1 give an aluminium increase of 44% and 36% for upright and inverted storage after six months.

This data shows satisfactory storage after six months at 30°C. The
5 acceptable quality of the wine was confirmed by the tasting panel.

In this specification, reference to values for analytes in wine, gas composition, dimensions, volumes and pressure refer to the values as determined under standard laboratory conditions of 20°C unless the context provides otherwise.

10 Since modifications within the spirit and scope of the invention may be readily effected by persons skilled in the art, it is to be understood that the invention is not limited to the particular embodiment described, by way of example, hereinabove.

The claims defining the invention are as follows:

1. A process for packaging wine in two-piece aluminium cans including the steps of:
 - preparing wine characterised in that it has less than 35 ppm of free
 - 5 SO₂, less than 300 ppm of chloride and less than 800 ppm of sulfates;
 - filling an aluminium can body with the wine and sealing the can with an aluminium closure such that the pressure within the can is at least 25 psi and wherein the inner surface of the aluminium is coated with a corrosion resistant coating.
- 10 2. A process as defined in claim 1, wherein the increase in aluminium content in wine that is stored in the can for three months in the upright position at 30°C is a maximum of 30%.
3. A process as defined in claim 1 or 2, wherein the wine is further characterised by having total sulfur dioxide levels less than 250 ppm.
- 15 4. A process as defined in claim 1 or 2, wherein the wine is further characterised by having total sulfur dioxide levels less than 100 ppm.
5. A process as defined in any one of claims 1 to 4, wherein the wine is further characterised by having total nitrites less than 1 ppm, total nitrates less than 30 ppm, total phosphates less than 900 ppm and acidity calculated as
- 20 tartaric acid in the range 6g/litre to 9g/litre.
6. A process as defined in any one of claims 1 to 5, wherein the wine is chilled before filling.
7. A process as defined in any one of claims 1 to 6, wherein the corrosion resistant coating is a thermoset coating.
- 25 8. A process as defined in any one of claims 1 to 5 and 7, wherein the headspace after sealing with the closure has the composition nitrogen 80-97% v/v, and carbon dioxide 2-20% v/v.
9. A process as defined in claim 8, wherein the wine is carbonated before the two piece can is filled with the wine whereby the headspace after sealing is
- 30 predominantly carbon dioxide.
10. A process as defined in any one of claims 1 to 9, wherein the headspace for a 330 millilitre can is in the range 2-5mm.

15 OCT 2004

12/11/03, at 13463, pcupccigps, 1

10

11. A filled wine can prepared by a process as defined in any one of claims 1 to 10.

12. A filled wine can as defined in claim 11, wherein the wine is a still red wine.

5 13. A filled wine can as defined in claim 11, wherein the wine is a still white wine.

14. A filled wine can as defined in claim 11, wherein the wine is carbonated red wine.

15 15. A filled wine can as defined in claim 11, wherein the wine is
10 carbonated white wine.

DATED this 12th day of November, 2003

15 BAROKES PTY LTD
By their Patent Attorneys:

