Load Parameters at the Winery Weighbridge

LIZ RILEY
Southcorp Wines

The basis of quality assurance in any production system is specifications. A quality is performance to specification, it is neither here nor there to say a product is of high quality unless the specifications are known. For example, a cask of rosé and a bottle of Grange are both quality products if the wine in the bag or bottle has meet the specifications described by the customer. This leads on to the setting of specifications. Who sets specifications?

Ultimately grape specifications are set by the demands of the market. Marketing determines what the consumer requires i.e. the customers’ specifications, these are then relayed to wine-makers as the consumer is seeking a medium bodied dry red i.e. the customers’ specifications, these are then relayed to wine-makers. In addition to the specifications set by the market there are some specifications which are set by statutory bodies e.g. Food Safety Codes such as P4. Load assessment is then the next step in the process, measuring performance to specification.

Specifications for ‘Grape Quality’

Cool, Clean, Fresh, Ripe, Colourful, Flavoursome fruit is a short summary of grape quality specifications, likely to be required in our current market situation.

Cool is the delivery of grapes within a specified temperature range, not too hot, not too cold. Grapes which are too hot have a double impact on quality or on the level of spoilage and subsequent loss. That is they are more prone to spoilage through oxidation or wild fermentation, as well as requiring a large amount of refrigeration resources to cool the fruit to an acceptable controlled fermentation temperature. An indirect impact of the increased cooling requirement is that winery tank space becomes tied up and results in reduced processing capacity. This can have varying significance, for example if there is a major rain event the need for tank space in the short term will increase.

Grapes which are too cold can also be a problem with slow to start fermentations again tying up tank space.

Cleanliness encompasses many factors such as matter other than grapes (MOG) e.g. vine debris, rocks, trellis and harvester parts, and contaminants e.g. fuels, oils, agrochemicals and salt. The specification is basically for none of the above. These factors impact on quality in a number of ways.

MOG, particularly leaf, stalks and petioles, can have an impact on flavour and colour of juice, with the phenolics being extracted from the macerated vine material. Excessive leaf also has the potential to increase the levels of agrochemical residues in a delivery, as the majority of spray deposition is on leaves rather than on bunches late in the season.

Other debris such as rocks, harvester and trellis parts can cause significant damage to processing equipment such as crushers and presses. This in turn results in down time which can impinge on quality in many ways. For example fruit which has already been harvested and is awaiting processing can deteriorate while repairs are carried out; this may take a considerable time. The damage may also result in other fruit being compromised due to the inability of the winery to accept further fruit for processing.

Contaminants such as agrochemicals and salinity are significant issues, with maximum residue limits (MRLs) being specified in food safety documents both domestically and internationally. It is essential that any residues present be below Australian MRLs for domestic consumption, and below those specified by any export destinations if wine is for export. Where no maximum residue limit is specified in an export destination it is prudent to assume that any residue must be below the level of reporting. Extended withholding periods as specified by major wine companies or The Australian Wine Research Institute’s ‘Agrochemical grid’ assist in ensuring that residues are below required levels for major export destinations.

Salinity is also a particular concern with increases in chloride and sodium levels being observed in some regions where salinity is a problem. A detrimental water management, e.g. use of drip irrigation rather than overhead irrigation will assist in achieving this specification.

All grapes (other than those for botrytised style wines) should be Fresh, i.e. free of rots, berry breakdown, undesirable oxidation and wild fermentation. All these characteristics have implications for loss of quality in the winery. Rots such as botrytis generally lead to laccase positive wines. These wines require heat treatment to ensure stability, which is a costly and unnecessary process if it can be avoided.

Undesirable oxidation can cause browning and the loss of some flavours.

Wild fermentation may not appear to be a concern, however undesirable characteristics can result from some yeast strains. There is always the potential scenario that one delivery of unsound fermenting fruit could result in the downgrading of other fruit if allowed to go undetected; e.g. a 100 t fermenter is filled with 80 t of sound fruit, plus 20 t of unsound fruit. The entire 100 t may then need to be downgraded if undesirable flavours or taints occur. The detection of fermenting fruit is therefore critical to ensure that other fruit is not downgraded and the growers are not unduly penalised.

Carrying out assessment which detects such fruit also enables the winery to maintain hygiene levels. If a delivery of unsound fruit is detected prior to crushing it can be quarantined until the end of the shift or variety, enabling the load to be processed just prior to scheduled cleaning down of equipment. This avoids delays from unscheduled cleaning as well as maintaining hygiene.

Ripeness, described as Baume or Brix, has traditionally been the only specification that has been supplied to grape suppliers from wineries. Sugar levels are generally specified according to variety and intended wine style. Wineries may specify a minimum sugar level in addition to a target sugar level, the minimum being the lowest acceptable sugar level to achieve the target end product, and the target sugar level being a higher end use for which the fruit has potential.

The achievement of colour may only be applicable for certain styles, particularly reds. However lack of colour may also be desirable for grapes targeted for sparkling wine. Specification of colour is not yet standard practice in the wine industry.

Grape flavour is again a load parameter which is unspecified at the winery weighbridge. The achievement of flavour is required for a desired style or end use. The non-achievement of flavours may not be required for desired styles e.g. neutrals or particular sparkling.
Why do wineries do load assessment?
W ineries carry out load assessment to reduce loss. This means from a quality system perspective, for example, the streaming of different value fruit such as sweet and sour grapes or premium and commercial grapes can be carried out to ensure that grapes are used in the highest potential end use.

The minimisation of equipment breakdowns and damage through load assessment reduces loss. Delays at the winery which result from breakdowns due to MOG and foreign matter can result in quality losses of already harvested fruit.

Maintenance of hygiene can be carried out by ensuring load assessors observe and react to problems such as rots, moulds, berry breakdown, fermentation, oil, etc.

However, the most important outcome of load assessment is achieved by providing rapid feedback to grape suppliers. This ensures that information regarding deliveries is fed back directly to growers to enable them to maintain their MOG or Baume levels or react to improve the levels.

Measurement and assessment of load parameters at the winery weighbridge must be relevant, repeatable and rapid. If the measurement is not relevant there is no point in carrying out assessment given that many deliveries and measurements are carried out on a daily basis. Any assessment must be repeatable, for example, specifications such as Baume and MOG have an impact on the bonuses or penalties which growers receive. They also have an impact on where the fruit is directed within the winery. Given the processing timetable at most major processing sites, measurement and assessment at the weighbridge must be rapid. A maximum 10–15 minutes is the practical limit for the weighbridge staff and grape deliverer.

There are many different categories of load parameters as previously mentioned. Some of these can be measured by rapid, repeatable and relevant methods, while others can only be assessed at a qualitative level.

For example, we are able to measure agrochemical residues 2–3 weeks prior to the delivery of the grapes. There are set methods for sampling grape samples and determining any residue present. The carrying out of analysis 2–3 weeks prior to harvest enables the grapes to be given the ‘all clear’ for delivery if no residues are detected. If residues are detected the grapes may be given an extended withholding period or in some situations may be rejected.

At the weighbridge, the temperature, sugar levels and MOG can be measured. The temperature can be measured using a temperature probe which has been calibrated on a regular basis. The sugar level can be measured using a calibrated refractometer or hydrometer, and MOG can be determined by taking a sample, e.g. 3 × 5 kg samples per delivery, and determining the MOG level on a fresh weight basis.

The determination of MOG by such a method is not rapid, and this leads to the use of assessment methods which are not quantitative, as was the case with the scientific methods mentioned above. MOG levels can be assessed by visual comparison of deliveries against photographic charts of known MOG levels, e.g. as percentage per tonne.

Fuels and oils and foreign objects can also be assessed at the winery weighbridge. Fuels and oils may be detected by observing the smell or slick on the surface of a delivery, e.g. as a result of machine harvesting. Foreign objects such as nails or other small sharp objects which have the potential for dealing with these inevitable situations.

As with any system there are problems. Load measurement and assessment techniques have a long way to go to ensure that they are relevant, repeatable and rapid before they become available to industry.

For example, there are many problems with machine and hand harvested deliveries. When carrying an assessment such as the level of rot in a machine harvested load it is very difficult to detect if any infection is present and if it is active. On the other hand, the same criteria could be observed very easily with a hand harvested delivery. Therefore, the development and improvement of tests which enable disease detection in machine harvested fruit are future objectives for the industry.

Sampling and repeatability are also major problems, with many of the methods of measurement and assessment currently being used; the problem is achieving consistency of results.

A gain, machine harvesting presents some challenges in the detection of foreign objects. It is very difficult to detect small nails and other small sharp objects which have the potential to damage winery equipment. In many cases nails slip through the system and end up in presses.

Winery management and the delivery of grapes prior to the ‘specified’ time presents management issues of when should the delivery of grapes be assessed. Should they be assessed when they arrive, which may be 3 hours, early or when they are booked, three hours later? The delivery may not be an issue when the temperature is 20°C and the fruit is sound, but if the temperature is 40°C and the fruit has active berry breakdown, the fruit condition could change significantly in that time. Also where the winery has a breakdown and fruit cannot be processed for 12 or 15 hours, the fruit should be assessed when it is scheduled for processing, not when the winery is able to process it. These management issues arise somewhere each vintage. Wineries should have protocols for dealing with these inevitable situations.

In the future, we are looking to the development of various testing methods to enable us to set specifications which are relevant. ELISA testing for agrochemicals and possible disease detection will enable rapid and quantitative analysis of residue levels and disease levels. Measurement methods such as the G-G Assay continue to be researched and developed as another measure of grape quality. This may lead to a whole new range of specifications. Flavour and colour analysis are also areas which are continuing to undergo development and may be used in the future.

In summary, there are many advantages in carrying out load assessment of grapes at the winery weighbridge. It is advantageous to both the grape supplier and processor i.e. the winery. Results of assessments should not be seen as vindictive or harsh by grape suppliers, but as a tool to assist in targeting areas of their production for improvement.

As technology moves from the realms of the scientists to industry standard practice many more of these assessments and measurements will become routine rather than experimental.