Product Review:
An Update on GOfermentor Products

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GOFERMENTOR EQUIPMENT OFFERS unique ways for winemakers to manage their wine production. The original GOfermentor design featured a one-ton size plastic bin containing a heavy-duty bag with two compartments inside, one for the grapes and one that could be inflated to press against the grape bag as the juice was fermenting. Vijay Singh, the creator of GOfermentor four years ago, came to the wine industry with a pharmaceutical engineering background, so it is not surprising that his production concept was based on cleanliness and ease of waste disposal.

GOfermentors are now available throughout the winemaking world with users in the U.S., Canada, Europe and South America. At one-ton of fruit per cycle, most users have been smaller size producers or home winemakers, but larger winery research projects can make very efficient use of these one-ton bins for scale-up trials. Singh told *Wine Business Monthly* that some winemakers are now producing grape wine from over 50 tons per year using the one-ton bin units.

Since the initial introduction of the one-ton size unit, there have been several developmental changes to the features of that unit and the GOfermentor product line has expanded. About three years ago, the GOfermentor JR unit was introduced with a 130 L (35 gal) blue plastic barrel that can ferment 45 to 50 Kg (100 to 110 lbs.) of fruit with all of the same techniques and controls of the larger unit. This smaller size unit is perfect for all commercial winery experiments and for avid home winemakers. A specialized "kart" is available that can hold four JRs, each of which has its own individually controlled mini-cooling system.

Another new development is the Smart Barrel, which now has several different adaptations. The original concept involved taking a used wine barrel and cutting a 10 to 12 cm opening at the bung hole. A plastic bag then can be inserted into the barrel for cleaner, safer barrel storage of wine. That same concept was adjusted to fit the 1135 L (300 gal) macrobin and then the 208 to 227 L (55 to 60 gal) vertical plastic barrel. All these devices can use plastic bags with different porosity levels to sequester the wine for an appropriate length of time.

GOfermentor Mechanics for Red Wine Production

For red grapes, it is best if the winery has a crush pad that can crush those grapes into a must pump/hopper unit. In this case, the grapes are crushed and directly pumped into a one-ton macrobin. Any one ton bin can be used for GOfermentor operations as special attachments for supporting the two-compartment liner. One compartment is for the punching/pressing functions and the main compartment is for the grapes or other fruit being processed. If there is more than one-ton of a grape variety, then multiple bins are needed.

Fermentation bags for both the one-ton GOfermentor and the GOfermentor JR are outfitted with various ports. One of those ports attaches the must pump hose directly into the main compartment. The bag has two additional ports, one for inflation/pressing and one for venting fermentation gasses. The bag for the one-ton unit also has a bottom valve. (**FIGURE 1**)

For wineries that do not have a must pump, a modification is available that allows red grapes to be crushed directly into a GOfermentor bin set under the crusher and lined with a bag setup. The bag is slit in one particular location and then positioned so the grapes drop directly into the bin. When the bin

FIGURE 1 (RIGHT) The grapes go from the crusher to a macrobin containing GOfermentor bags. (LEFT) The GOliner inflates in the macrobin.

FIGURE 2 If a winery doesn't have a must pump, the GOliner can be cut (RIGHT) and resealed with food-grade tape (LEFT).

has been filled, a special food grade tape is used to seal that cut and the grapes are fermented in the normal course of production. If the crusher cannot be so positioned, the crushed grapes can be bucketed into the GOfermentor bin bag, which is then sealed (**FIGURE 2**).

After grapes are in the GOLiner bag, the winemaker can add various nutrients, yeasts, and other amendments to the fermentation by removing the sampling/temperature port connected to the GOLiner. The company has adopted a hand-operated pump that has a negative displacement suction to collect material into a container as an accessory for retrieving samples. The device has strainers on the end of the sample hose that separate liquid samples from the fermenting wine that contains skins and seeds. It is a tool that many winemakers could use widely in their winery.

FIGURE 3 The GOfermentor controller attaches to the side of the bin and the controller screen is on top of the macrobin.

The fermentation process is controlled by the GOfermentor controller (**FIGURE 3**) attached to the outer side of the bin. Hoses are connected to the punch bag part the fermentation bag. If temperature control is needed, a fermentation cooling plate is prepositioned inside the bin underneath the bag and lines are connected either to chilled water or glycol.

One of the more important recent GOfermentor upgrades was the development of an App that connects to the GOfermentor controller from both iPhone and Android, providing communication with GOfermentor items (**FIGURE 4**). The user can check on the status of the GOfermentor unit and control its operation. Each controller is connected via WiFi connected to a cloud server and then to the App on the user's phone paired with the appropriate controller. If something happens to the phone or WiFi, the fermentation will continue as programmed, so there is little potential for problems from a network or system catastrophe.

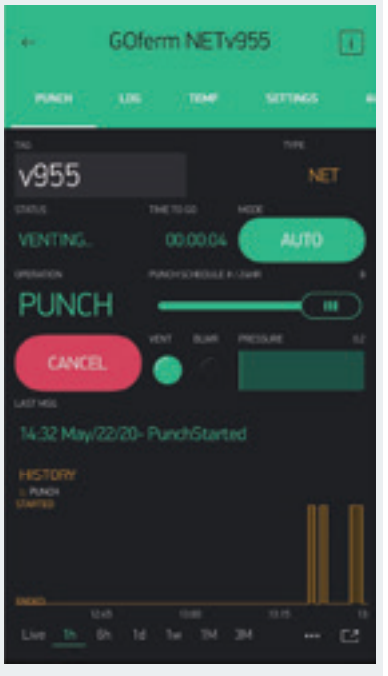

FIGURE 4 Managing GOfermentor functions is easier with the GOfermentor App that allows the user to enter information directly to the controller.

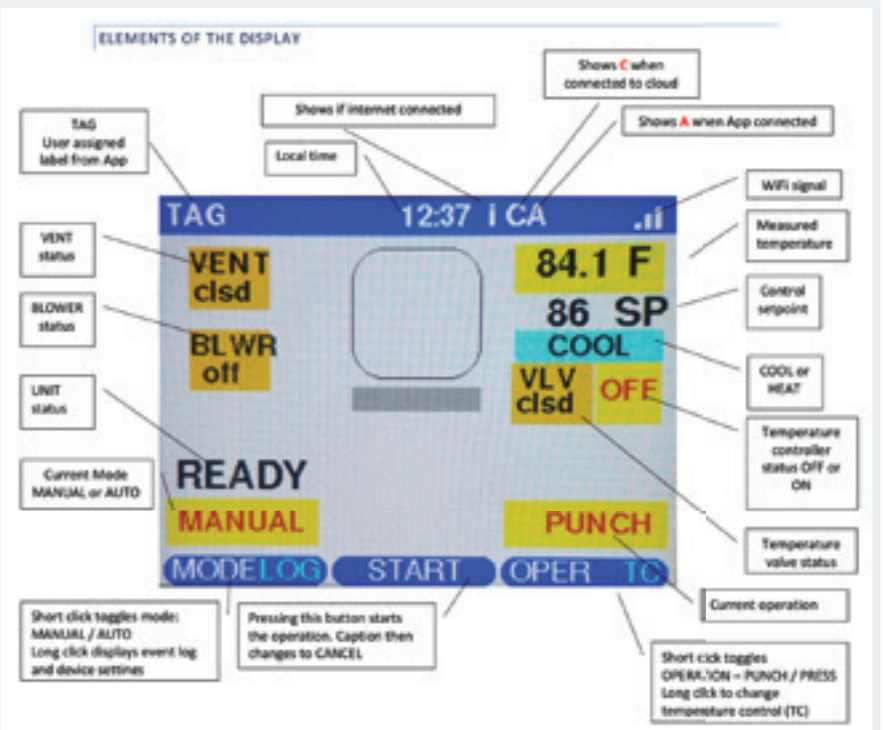

FIGURE 5 The GObase controller screen shows the powerful nature of its data management and control, but because the screen is only two inches square, one can understand why the app is so useful.

While the GOfermentor controller can perform all the necessary func-tions, the screen of the controller is only 2" square. One or two of three buttons below the screen are pushed with either a quick click or a longer press by the user to start input. Then the user chooses which input item is inserted into the controller memory and can select and set functions for the direct entry of parameters. The controller screen is valuable for obser-vation of current parameters, as many of the current conditions are shown in rudimentary code on the main status screen (**FIGURE 5**).

The App simplifies the entering of all the instructions that a winemaker might want their team to carry out on any wine batch, such as the tempera-ture at which the fermentation should max out or the temperature level that should be maintained for the fermenting wine. The number of times per day the skins and the juice should be mixed and how long that mixing should take place can be set on the App. All actions the controller is set to monitor are recorded in the controller's log and in the App, so accurate histories can be maintained on each fermentation.

When a punch cycle is triggered by the controller or the App, the gas in the head space of the main GOLiner compartment where the grapes are located is removed through the pressure relief valve as the secondary bag pushes its volume against the main fermentation compartment. As the secondary compartment expands, the fermenting juice in the bottom of the main compartment is infused into the skins floating on the top of the fermenting juice. Pressure builds until the juice/skin solids form one intermixed unit. This can be held for different lengths of time. When the hold time trigger is satisfied, the pressure is relieved from the secondary compartment and every-thing relaxes back to a no-pressure condition. The juice naturally flows to the bottom and the skins to the top, and fermenting gases will expand the bag until the pressure relief valve allows excess CO2 to escape.

Once fermentation is completed, the vacuum relief valve is removed from the vent port, which is then sealed for the pressing cycle. At the same time, the temperature/sample port is replaced with the perforated dip tube assembly.

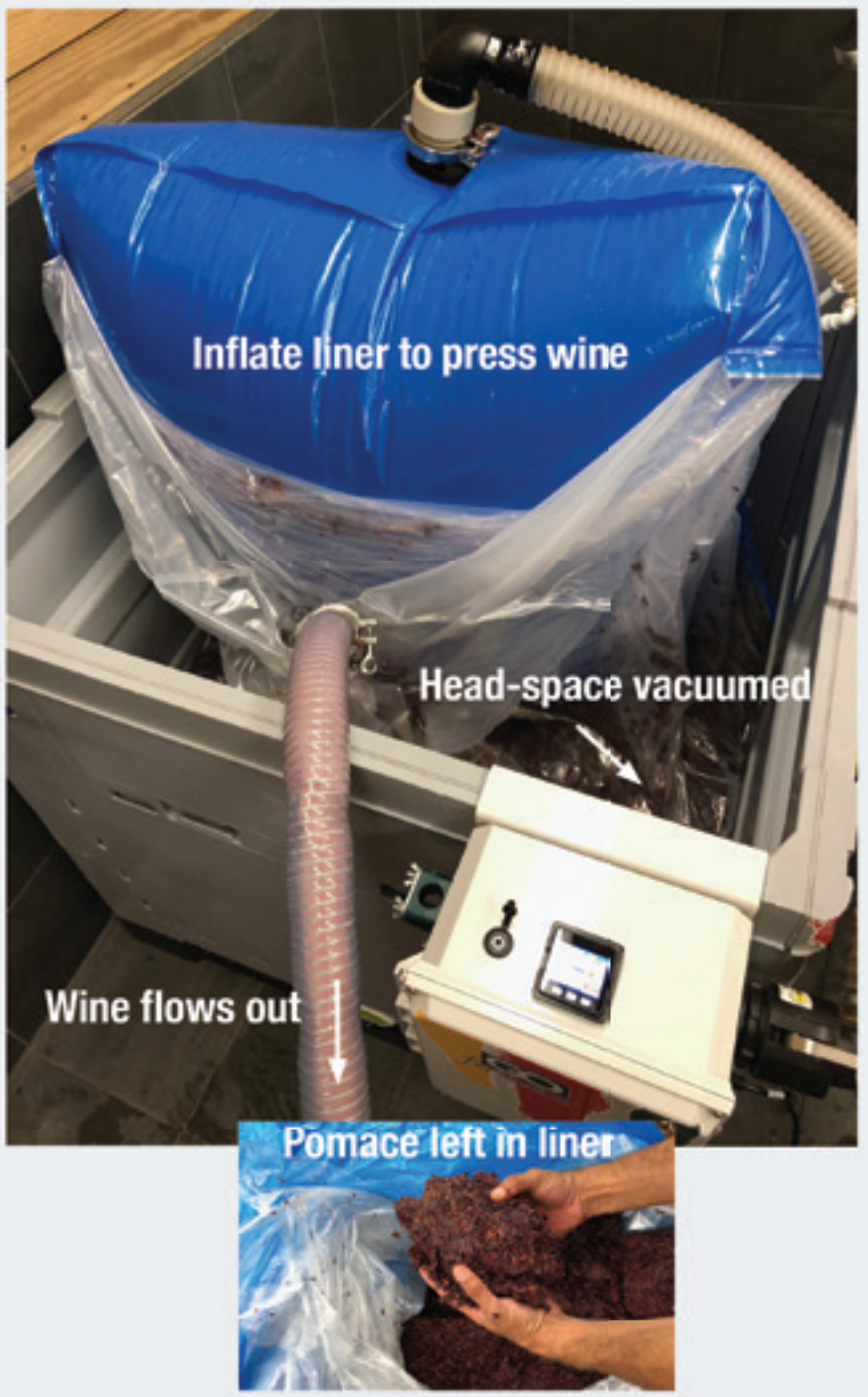

FIGURE 6 At the end of the pressing cycle, the GOliner is fully inflated and has pressed all the juice out. The inset image shows the friability of the pressed grapes.

A positive displacement pump is connected to the dip tube assembly and begins to remove first the head space gas, followed by the free-run wine. The dip tube keeps the skins and seeds in the fermentation bag. In the setup of the GOfermentor, there is a strap attached to the pressing bag to keep it at the correct angle to remove the maximum amount of wine from the fermentation compartment. Depending on the variety of grape, users of the system claim to have recovered 150 to 170 gallons per ton of fruit.

There are a variety of positive displacement pumps that can be used to evacuate the free-run juice. The most expensive are the conventional rotary lobe type pumps as well as flexible vane and air diaphragm pumps.

Upon completion of the pressing, the GOLiner can be lifted out of the bin and disposed of as compost or spread in the vineyard, leaving very little cleanup behind. The skins and seeds remaining in the GOLiner weigh a couple hundred pounds. It is therefore necessary to have either a forklift or a chain hoist to lift out the bag for disposal (**FIGURE 6**).

GOfermentor Mechanics for White Wine Production

The GOfermentor offers aspects for white wine production as well as for red wine. First, white wines are crushed into a GOLiner as any red wine would be. Dejuicing enzymes can be added after crushing, as can SO_2 to delay wild yeast fermentation. The grapes are in a protective environment, which reduces the possibility of oxidation and lets the enzymes safely do their work. The next step is to press the wine into another GOLiner for fermentation.

If a winemaker wants to make barrel-fermented white wines, this second GOLiner performs like a large barrel. With the automation offered by GOfermentor, the punch-down can now act as the batonnage for the wine by stirring the lees every few hours. This action provides a more constant means of manno-protein extraction from the expired yeast in the fermentation GOLiner. After fermentation is complete, the winemaker can determine with a little experimentation how much of the lees to retain by racking into successive liners, while still maintaining the reduced oxygen environment.

It is important to note that GOLiners do not have EVOH in their construction and, consequently, careful observation is needed to determine when to move the wine into tanks or Smart Barrel liners for longer-term aging.

GOfermentor JR

Many tweaks in the design of the GOfermentor one-ton unit have been incorporated into the GOfermentor JR. The current model of the JR is a compact unit that will appeal to winemakers interested in small lot fermentations of high-quality wine and can be used for both red and white wine fermentations (**FIGURE 7**).

FIGURE 7 This GOfermentor JR is in the middle of pressing the wine that has finished fermentation into one of the Smart Barrel liners.

The setup of the JR is simple. Instead of having two large compartment bags, the bladder is reusable, and the grapes go into a single use bag that is open on one side and sealed with a clamp after grapes are dumped in. The bladder for punch and press cycles consists of three bladders on the inside of a 130 L (35 gal) barrel-shaped container. An exterior plastic tube manifold connects each the three bladders to the GOBase JR controller.

The primary difference between the setup of the JR and the larger one-ton bin version is that the JR has a lid that fits into a barrel clamp ring on the top of the barrel and keeps the juice contained when punching and pressing occurs. An extra plastic ring has been added that extends further into the barrel clamp ring. The purpose of this extra ring is to help hold the main polycarbonate lid in the barrel clamp ring. The punch cycle squeezes the juice into the skins. For the press function, the dip tube that is attached to a pump is placed into the barrel and the bladder activated to begin pressing the juice.

The Smart Barrel

For years, the plastics industry has been looking for oxygen barriers for food protection and preservation. Today, ethylene-vinyl alcohol (EVOH) copolymer is the main oxygen barrier film. The interesting fact about this polymer is that the lower the percentage of ethylene, the greater the barrier to oxygen transport. Consequently, it is possible to control the amount of oxygen that can pass through the film from ambient conditions to the internal space of a container made with EVOH film. Unfortunately, EVOH is sensitive to moisture. This fact requires a coextrusion of film on either side of EVOH so that the EVOH does not break down in the presence of water.

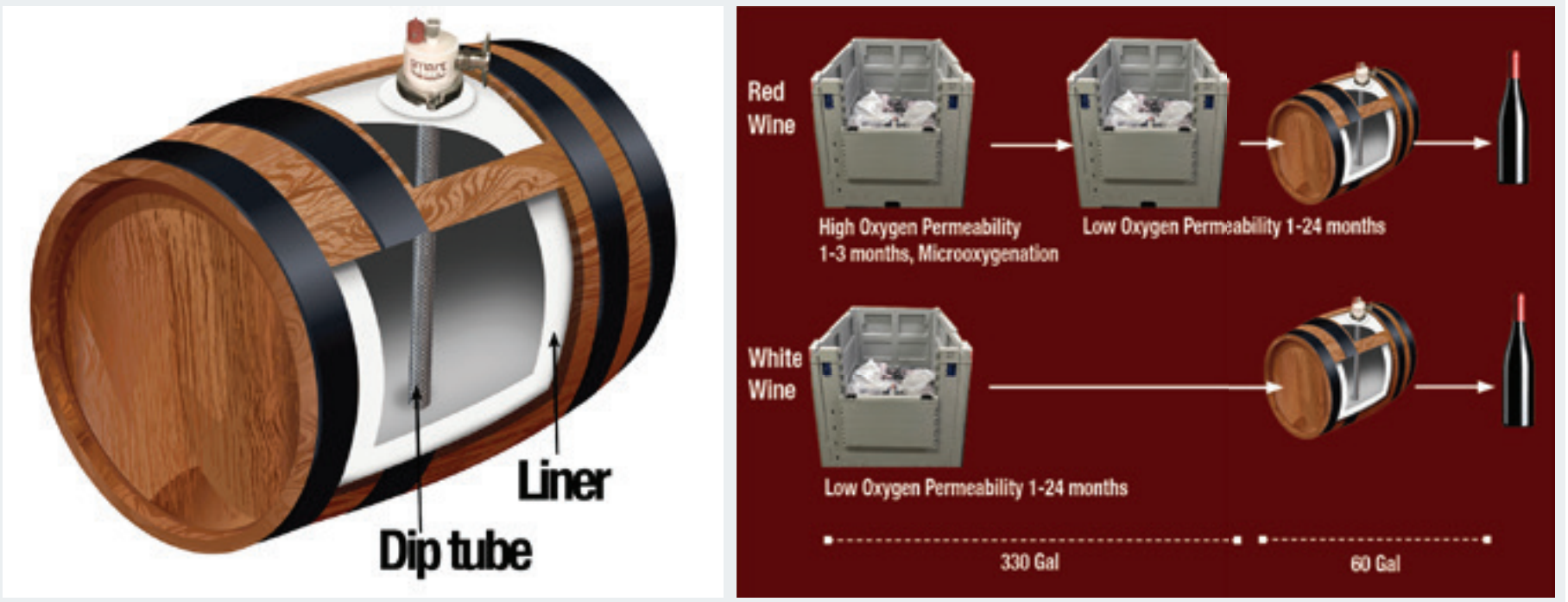

FIGURE 8 shows that the Smart Barrel liners can be used in any barrel by making a few changes to the barrel. Thus, if the ambiance of a barrel room is important for marketing, that function does not have to be lost. The Smart Barrel liners can be used in multiple other ways and have different levels of oxygen transport depending on the style of wine that is desired.

This is important for the Smart Barrel concept. Technically, a "Smart Barrel" can be a container of any size up to about 1135 L or 300 gal. As in any barrel, there also is the additional requirement that the container must not have any significant head space. As mentioned above, Smart Barrel has three iterations, and two different sets of film materials in which to store wine: one with high oxygen transport at a rate of about 10 times that of a barrel and one with low oxygen transport that is estimated to be about 0.1 that of a wooden barrel (**FIGURE 8**). The larger format macrobin type of container and the vertical plastic barrel both have functional elements that protect the wine. The third Smart Barrel – any old wooden barrel – may add ambiance to the winery and still be a vessel to hold the bag filled with wine.

The high oxygen transport utilizes a plastic film that "macro" oxygenates a wine or acts as a temporary storage unit to protect the wine from rapid oxygenation by open air. The rate of oxygenation is several times faster than a regular barrel and attention must be paid to the length of time the wine is in storage. The second option is a much slower oxygen barrier material that can offer some of the benefits of micro-oxygenation.

The Smart Barrel system has a sampler that can remove any head space from the bag and can also take samples of wine from the bag. In this manner, only wine is removed. No longer does one risk microbial contamination by sticking a wine thief into a bag that has just been in a previous bag that has microbial contaminants (**FIGURE 9**).

FIGURE 9 One interesting addition to GOfermentor's equipment is their Aspirator. The flexible tube with the blue end attaches to the top of the diptube. When the aspirator is turned on, it removes any air from the GOliner and then sucks a wine sample into the bottle attached to the aspirator. This process reduces the possibility of introducing microbial contamination to the wine.

Winemaking with GOfermentor

A 5,000 case winery processes 75 tons of grapes each year. With GOfermentor one-ton units, that would entail 75 separate fermentations in about a 6 to 8 week period. The question becomes, is this technology worth the extra time it takes to process that many separate fermentations? It is possible to produce wine in this way, and there are reasons to consider doing some wines using this technology. A major reason for using this technology is wine quality.

We all know that visiting wineries at harvest time is wonderful, in part because the aromas of fermentation add to the ambiance of wine country. However, the best way to make wine is not in open top fermenters, because every molecule that one smells during fermentation is one that is not contributing to the wine that gets into a bottle. GOfermentor, with its closed bag fermentation process, helps significantly with this issue, as the bags contain more of the aromas that could be lost to the environment. Only those aromas squeezed out of the bag during punch down are lost. [Anecdotally, my experience is that GOfermentor fermented wines are "fruitier," but I have not tested whether those wines analytically retain more aromatic compounds than other wines.]

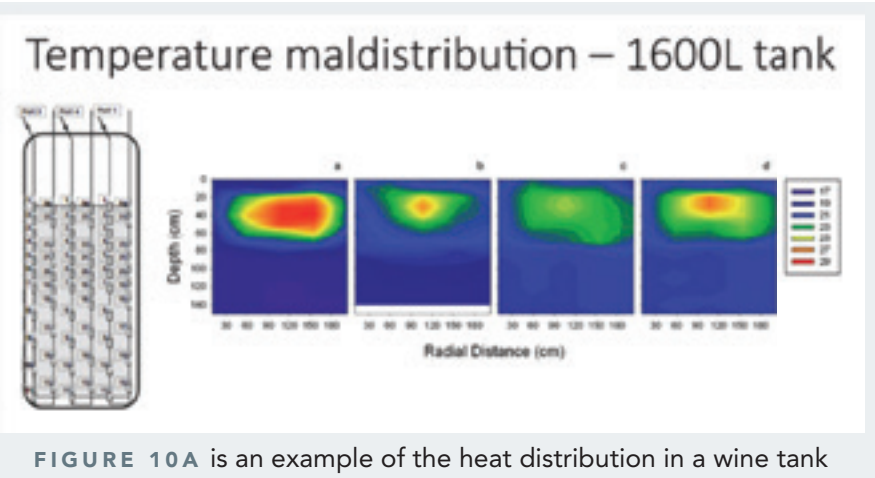

FIGURE 10A is an example of the heat distribution in a wine tank during fermentation. The cap is significantly warmer than the rest of the tank and does not change over the course of fermentation.

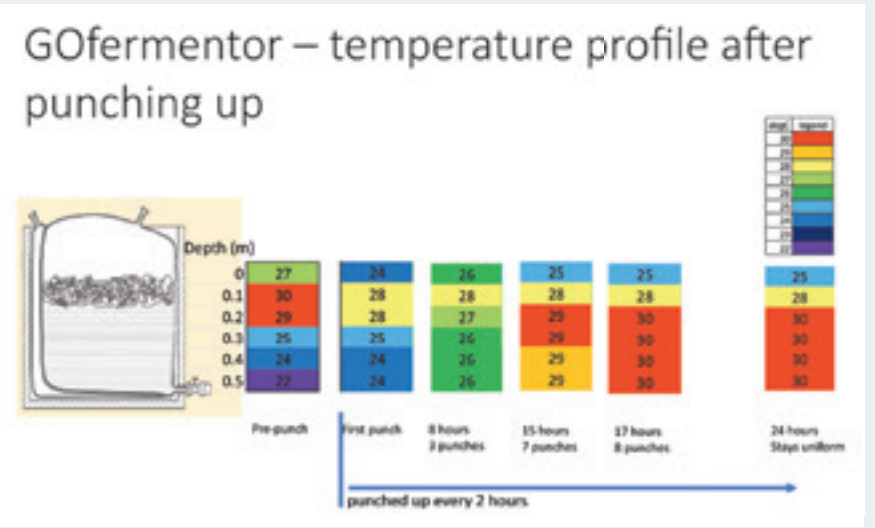

FIGURE 10B GOfermentor's ability to mix the juice and the skins more times a day and over many more days than is usually possible for most wineries to do, results in a warmer average temperature for red wines. This seems to be a primary reason for the better extraction of fruit flavors in wine that has been fermented in this way.

I do know from working with GOfermentors that their claim that better cap management temperatures result in lower levels of reductive aromas is accurate (**FIGURE 10**). A very careful study was conducted by Singh that compared cap temperatures in typical red wine fermentations. It showed a significant disparity between cap and tank wine temperatures in a conventional tank. Immediately after pump over, that temperature was briefly reduced, but was reestablished very quickly. That same temperature profile started to demonstrate itself at the beginning of a fermentation in a GOfermentor. However, since this system allows for automatic unattended mixing of the juice with the skins, the normal heat generated during red wine fermentation was more uniform throughout the entire volume of the fermenting wine.

Summary

In summary, GOfermentor technology can help very small wineries grow larger by allowing them to make better, more sound wines. However, additional advances will be necessary to adapt this technology for larger-sized fermentations.

The new control app allows for significantly better control of the production capabilities of the fermentation process as compared to the use of only the built-in panel of the GOfermentor controller. The Smart Barrel functionality adds containment and protection of wine when in containers that are not totally topped off and provides greater flexibility to wineries that need to keep wines safe from oxidation and microbial degradation. The GOfermentor bag system for aging and holding wines can significantly reduce the need for variable capacity tanks. **WBM**