GOfermentor Jr. Arrives in Time for Harvest

It's the next step in small batch fermentation tools

Richard Carey

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FIGURE 1: GOfermentor as it arrives.

GOFERMENTOR HAS BEEN A unique tool for helping smaller wineries with experimental projects and small production runs for several years. Created by **Vijay Singh**, the original GOfermentor was designed to be used in 1,200 L bins that can hold up to 1000 Kg (2,200 lbs.) of grapes. I have been involved with Singh since the introduction of the first GOfermentor as a consultant, offering suggestions and tweaks to this novel approach to winemaking as he developed both a junior (smaller-sized) version and one for larger production.

Recently Singh released the **GOfermentor Jr.**, which is designed to be a new tool for wineries to help in product development, starting with fermentation characteristics and using small volumes that are scalable to full-scale production. This smaller version uses the same system as its larger brother: an inflatable bladder is inserted, in this case, into a specialized 35-gallon drum.

The primary target market for this device is the home winemaker, but commercial wineries will find this smaller version to be a valuable tool when they want to experiment with fermentation methods, yeast trials, nutrient trials or other aspects of wine production where small volumes of scalable product can be used to evaluate the feasibility of process changes.

For new product development or modifying a protocol for an existing wine type, one of the more important issues that need to be addressed is replication of the treatment of the product. Validation of that work requires multiple treatments so that statistical analysis can be used to be sure the protocol reliably produces the desired effect.

Small batch fermentation for the purpose of scaling up experimental levels is one of the more important and more expensive tasks to standardize. It is well-known that small changes in protocol on a batch can magnify their effect in the scale-up process. The larger the batch size, the more expensive the protocol. To minimize costs, wineries may reduce the number of replications, which then has the consequence of increasing the possibility of errors in the results.

In an article on the GOfermentor that I wrote in the August 2016 issue of *Wines & Vines*, I discussed the use of that system for conducting such wine trials. For large wineries, 1,000 L batches are not much of a problem. However, committing that quantity of grapes for experimental treatments can be a significant cost for a small- to medium-sized winery. As a consequence, the smaller winery either doesn't do experiments or doesn't provide the replicate steps. In addition, these types of experiments can be a sinkhole for time.

GOfermentor Jr. addresses many of these issues. It allows any winery to run accurate, scalable fermentation trials on 23 Kg (50 lbs.) to 50 Kg (110 lbs.) of fruit. It will also be very popular with hobby winemakers who don't want to use kit-type products and prefer to make wine out of real grapes.

FIGURES 2A AND 2B: 2A shows the bladder fitted into the barrel. 2B shows the air manifold attached to the bladder ports. The controller supplies the air for punching and pressing.

How the Junior Edition Works

Singh asked me to trial one of the early versions of the GOfermentor Jr., which gave me the opportunity both to use the equipment and offer suggestions for improving the final release model. During harvest in 2018, I ran a number of fermentations with a unit such as this **(SEE FIGURE 1)**. This unit is an updated version from what I used.

GOfermentor Jr. is delivered by **UPS** as a drum with all of its necessary parts inside. The fermentation vessel is a 130 L (35 gallon) specialized plastic barrel that has had modifications made to support the fermentation apparatus. For fermentation, the barrel is set up in one way; after fermentation is complete, the unit includes the necessary equipment for removing the wine and pressing the grapes.

The barrel is outfitted with a one-compartment bladder that goes into the barrel first **(FIGURE 2A)**. The top of the bladder is attached to the top of the barrel through holes in the barrel to the outside **(FIGURE 2B)**. An air manifold is connected to those ports on the bladder that delivers air from the controller to mediate the punching and pressing of the grapes.

A single-use fermentation bag is then placed into the barrel. The bag has an opening along the top that allows it to be filled with the grapes to be fermented **(FIGURE 3)**. Whole-cluster grapes can be placed in the bag through this large slit, or crushed and destemmed grape berries can be dumped into the bag. After the grapes are in the bag, it is sealed along that slit with tape and a clamp. The bag has a flap that is folded over, then twisted into a narrow round. A special clamp is put around the twisted bag and sealed in place with nuts on the clamp. Adhesive tape is used to cover the clamp so that it does not puncture the bag during fermentation **(FIGURE 4)**.

After the grapes are sealed in the bag, a 2-inch tri-clamp port that is attached to the fermentation bag must be located and brought to the top of the barrel. The port is placed through the barrel's clear lid, with a hole in its center. At this point, the lid rests in its groove on the top of the barrel, with the port protruding. A specialized U-bolt clamp secures the port so it does not fall back into the barrel, and another clamp secures the lid to the top of the barrel. During the fermentation process, the grapes will be emitting CO_2.

FIGURE 3: The slit in the fermentation bag allows for easy filling of grapes into the bag. It is best to destem the grapes before filling the bag to avoid damage to the fermentation bag. Whole-cluster fruit can be fermented in the bag.

FIGURE 4: Once fruit has been added, the slit is folded over and sealed with tape. The bag is then twisted into a tight roll and clamp-fitted around the roll. Heavy duty tape is then wrapped around the clamp to prevent damage to the bag while in the barrel.

FIGURE 5: Here the bag has been secured in the barrel with the barrel lid clamp. The pressure relief valve has been installed, and the sampling port on the top is available for monitoring the fermentation. Removal of the tri-clamp allows the return of sampled juice and the addition of nutrients/malolactic culture during fermentation.

In order to assure that the contents are contained in the barrel and do not push out, the barrel lid clamp must be securely fixed in place. At this point, yeast is added through the port, as well as any amendments such as enzymes and nutrients (**FIGURE 2B**). In **FIGURE 2B**, the bag is shown sealed in the drum with its clear top. The clear top allows visual monitoring of the contents of the fermentation bag.

The next step is to insert the sampling tube (**FIGURE 5**). This tube is a perforated stainless steel tube that reaches to nearly the bottom of the barrel. It rejects skins and seeds during the press cycle. At the time of sealing the bag into the barrel, the bag port is positioned to be inserted into the clear lid. The lid is set in place in the groove at the barrel top and secured by the large barrel clamp. A specialized U-bolt secures the port to the lid. A tri-clamp gasket is placed on the top of the port that has been attached to the clear lid. The pressure relief valve assembly is screwed into the side port on the sampling tube. This is a simple relief valve that prevents air from flowing back into the bag, thus preserving an inert atmosphere in the fermentation vessel.

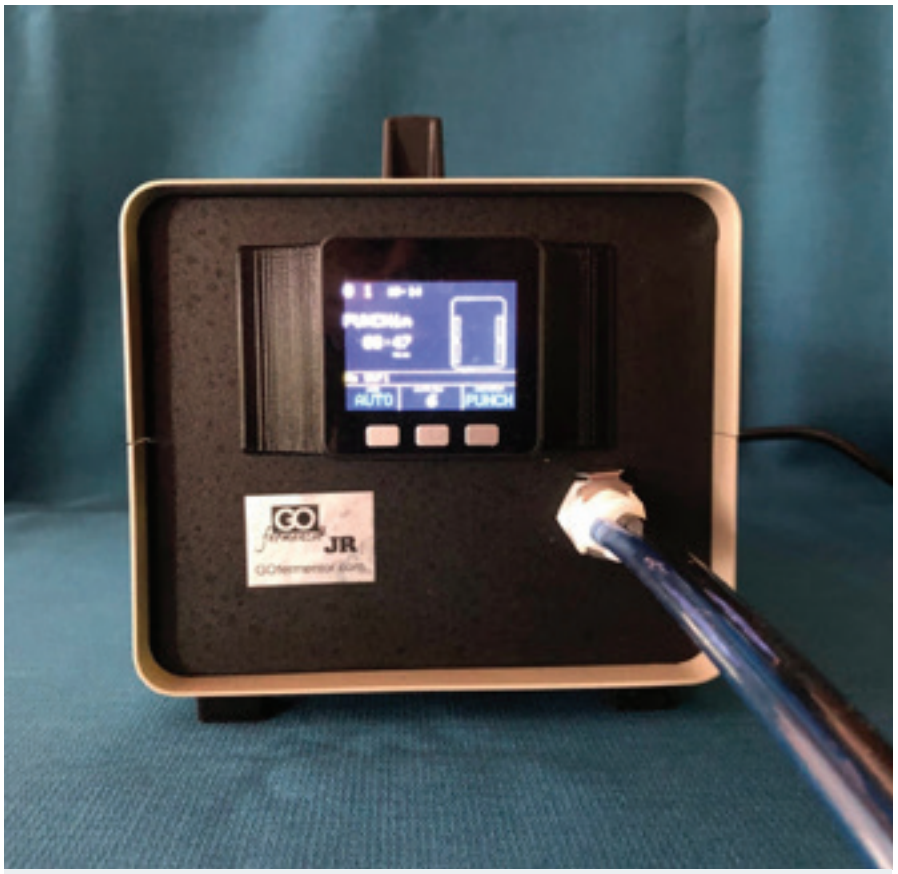

FIGURE 6: The controller is set up and monitored by the buttons on the front, where the cycles of punch and press are made. The controller can also be managed by smartphone apps.

The unique component of this fermentation system—and a good reason why it should be used on every experimental fermentation—is the GOfermentor controller (**FIGURE 6**). This device is the major innovation contributed by Singh in that it automates the manual processes of punch-down. It can be run entirely manually, or the winemaker can operate it automatically by setting the number of punch-downs per day from one to eight. All controllers come equipped to connect to WiFi. An Android app is available to monitor and supervise the controller from a smartphone. An Apple version will be available by Fall.

The app has several management tools to allow remote control of the fermentation and also the collective management of multiple fermentation units as a group. The winemaker has the option of changing the number of punch-downs per day at any time. A chart shows the time of day when the punch-downs will occur based on the number of punch-downs chosen.

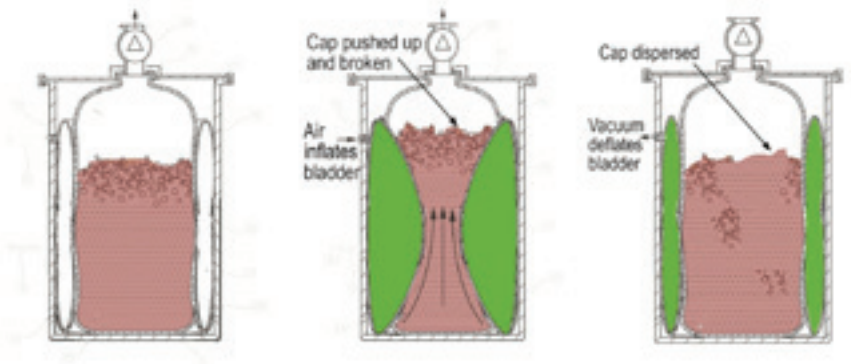

FIGURE 7: The punch cycle forces the wine up through the cap into the top of the barrel. Relaxing the bladder pressure lets the juice fall back into the barrel. This sequence is controlled by the remote controller.

Once fermentation begins, the bag contained in the barrel inflates like a balloon. The relief valve (FIGURE 5) regulates the pressure and lets excess gas escape, thus protecting the bag structure. At the assigned time for punching down, the controller pumps air into the bladder, which forces the wall of the bladder to the center of the barrel from all sides (FIGURE 7). The squeezing of the grapes into the center forces the juice to pass up through the skins. When fully inflated, the bladder pushes the juice on top of the skins into its upper space in the barrel; there is also liquid on the bottom. The bladder then releases the air in the bladder back to the original relaxed position against the wall of the barrel, allowing the skins to fall into the juice so that they can rise to the top again. This process takes about 10 minutes. The air compressor in the controller is relatively quiet (about 68 decibels).

Wine for analysis can be extracted from the bag by using the special sampling device, which has a quick connect fitting that fits into the top of the pressure relief head. This novel device sucks juice into a small bottle. It is possible that wineries may want to purchase this sampling device for use in other areas of the winery (FIGURE 8). By squeezing the trigger, a vacuum pulls juice through the sampling tube and up into the bottle. The bottle holds about 250 ml of juice when full. The device can be outfitted with a sample tube that can be immersed into the cap of a fermenting wine and draw in juice for examination. When additional nutrients or addition of ML bacteria are needed, the sampling head can be temporarily removed so that nutrients can be added into the grapes through the sample tube.

There are two more upgrades in the works. The first will be a temperature probe. When this upgrade is added, the controller will continuously log the temperature of the fermenting juice so that accurate fermentation curves can be recorded and then optimized on future iterations of those grapes. The second upgrade will be a chill plate to allow temperature control of wines that are getting too warm.

Once the wine has finished fermenting, the GOfermentor can be set up to press the grapes. To do that, the controller is switched to press mode. The pressure relief valve is removed from the sampling tube and the harvest connector is screwed into place (FIGURE 9). The air tube manifold is connected to the controller. When the button is pushed to begin pressing, the bladder inflates to start pushing the wine into the sample tube and out the harvest connector through a hose and into the container that is ready to receive the wine. The press cycle operates as it does in more conventional bladder-type presses. The pressure builds to its maximum level, waits until the pressure falls below the setpoint and then pumps up again. This process usually takes 15 minutes to complete. It can be repeated if desired.

FIGURE 9: At pressing, a hose is connected to the harvest port. When the controller is activated, it presses the bladder in as if it were punching, but in this case there is an outlet for the wine to rise up from the sample tube, bringing wine without skins from the barrel. Once all the wine is removed from the barrel, the top can be removed, and the last bit of juice can be removed with a pump, such as in FIGURE 10.

FIGURE 8: Sampling of wine is done through this vacuum pump that brings wine up through the sample tube into the 250 ml bottle. After sampling, the wine can be returned to the barrel by removing the tri-clamp and then reseating it onto the port.

If there is a small amount of recoverable wine left in the bottom of the fermentation bag that is impossible to push out, a small pump can be used to finish the job. If a winery doesn't have a small pump, **MoreWine** (*morewine.com*) has one available for less than $200. It is a positive displacement, variable speed diaphram pump, and it can tolerate temperatures up to 200° F. The only problem with this pump is that the variable speed part is not well-designed. Another solution, which may cost less, is first to look at the design of the pump on MoreWine, then go to **Ebay** and search for 110-Volt diaphragm pumps that do not have variable speed controls. These pumps are usually under $100. Then look for a variable voltage or VARIAC with a 500 VA capacity, which should cost about $50 (FIGURE 10). This will give a very smooth ramp up of speed and control. Any of these pumps will be able to pull out all but the last few drops of wine. These pumps are somewhat sensitive to solids, and so come equipped with a screen to minimize any fouling of the pumps diaphragm. This pump has been outfitted with a 3/4-inch tri-clamp fitting so it can be used elsewhere in the winery. The capacity of these pumps is about 17 lpm. or 4.5 gpm.

At the end of pressing, all that is required is to remove any attachments from the barrel or barrel top, take the bag out of the barrel, put it in the trash and wash down. Then the GOfermentor Jr. will be ready for its next experimental run. **WBM**