

WINE BUSINESS MONTHLY

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Glass on the Bottling Line

How to Ensure a Seamless Run

Cool Products

at the Unified Wine & Grape Symposium

PLUS:

Winemakers Discuss New Oak Alternative Options

New Technology for Recapturing Lost Aromas

Monterey County Winemakers on
Their Best & Worst Business Decisions

Innovation and Sustainability

AN ARTICLE ABOUT MOBILE phone adoption in this month’s issue cites a recent survey where more than half the respondents said it’s “absolutely critical or very important” for companies they purchase from to be innovative.

Our focus is on the ancient art of growing grapes and fermenting them but there is so much innovation happening in the wine business. We’re seeing innovation from dirt to the bottling line and beyond.

Sometimes innovation has unintended consequences or benefits. One of my favorite articles in this issue is about technology being deployed on fermentation tanks in California’s Central Valley to capture CO₂ and prevent it from escaping into the atmosphere. The technology is in use as a result of regulatory directives to cut emissions but there’s a cool twist: the aromatic volatiles and ethanol vapors produced from fermentation that would otherwise be lost along with that carbon dioxide can be reused in winemaking to significantly enhance wine quality.

This month’s issue also includes a focus on innovations we came across during the Unified Wine & Grape Symposium—a type of new receiving-hopper for the crush pad; a periscope for barrels allowing one to inspect inside barrel heads; an optical sorter design the cellar crew will appreciate because it’s easy to clean, to name just three.

Oak alternatives are an innovation we write about frequently. There’s a trend toward customization of toasting with precise time and temperature. This issue



includes a look at some of the latest options suppliers are offering and that winemakers are experimenting with through trials.

Trials are key to the pursuit of innovation and quality. This month’s featured trial involved three different yeast treatments with Grenache Blanc.

Innovation is often about doing things more efficiently or more sustainably and this issue includes a column about motivations for sustainability and why we should all be buying into the concept.

Cyril Penn - Editor

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EcoPAS Technology Captures Fermentation Volatile Aromas to Enhance Wine Quality

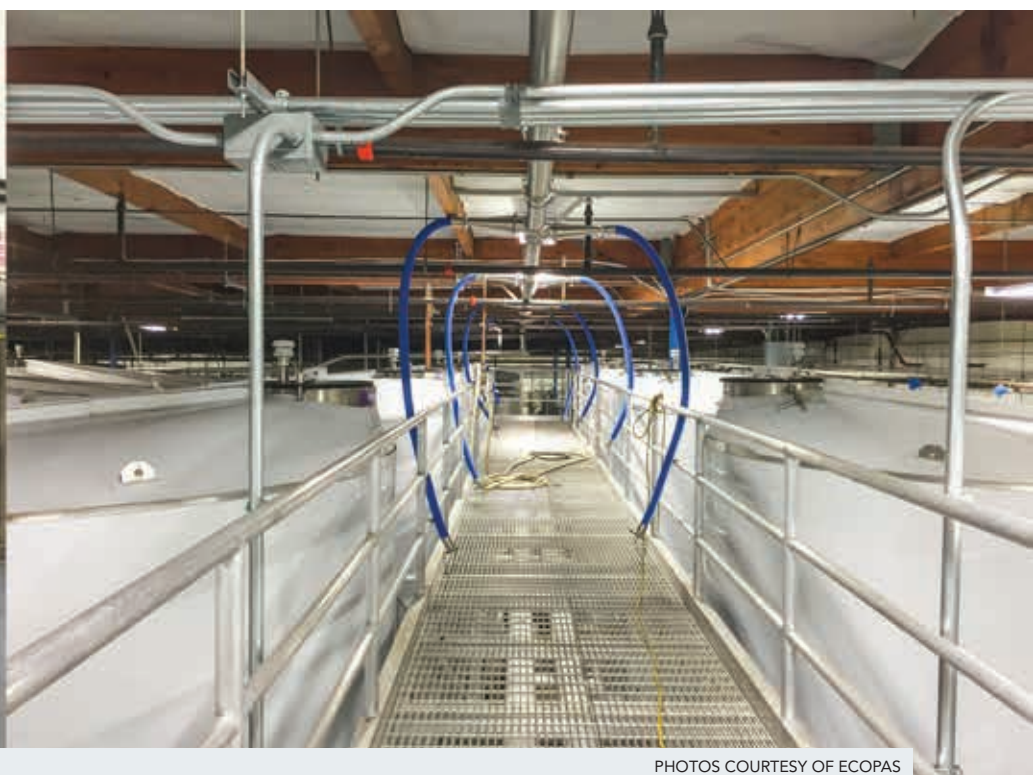
Technology can also capture ethanol, CO₂

Ted Rieger

Ted Rieger, CSW, is a wine journalist based in Sacramento, California and a writer for wine industry media since 1988.



A PAS-100 unit with condenser installed at a California winery can capture volatile aroma compounds and ethanol during fermentations from multiple tanks.



PHOTOS COURTESY OF ECOPAS

Blue manifold connections above a tank row catwalk can be attached to closed tank fermentors to capture volatile aromas and ethanol during fermentations using a PAS-100 unit located on the winery floor.

NEW TECHNOLOGY DEMONSTRATED DURING recent crush seasons in California is now available to winemakers. The EcoPAS (Passive Alcohol System) uses condenser technology connected to wine fermentation tanks to capture aromatic volatiles and ethanol vapors produced from fermentation that would otherwise be lost along with carbon dioxide (CO₂) that escapes from tanks during fermentation. These captured volatiles are then reused in winemaking to enhance wine quality.

CO₂ is produced in significant amounts during active fermentations and can serve to protect the must from oxidation while also removing heat produced during fermentation. Escaping CO₂ released through tank venting carries away 1 to 1.5 percent of the ethanol produced during fermentation, and removes volatile aroma compounds, such as esters, thiols, terpenes and other compounds that provide important sensory characteristics in wines. Aroma volatiles are highly concentrated, and it is estimated that up to one-third of the total volatile aroma compounds can be lost in vapor emissions from a wine lot during fermentation.

EcoPAS technology has been in development since 2007 by **Steven Colome**, an air pollution scientist and now the chief scientist at **EcoPAS, LLC**. It was originally intended as a technology to capture and mitigate

emissions of volatile organic compounds (VOCs) and CO₂ (a greenhouse gas), pollutants emitted during fermentation. At that time, the **San Joaquin Valley Air Pollution Control District** had proposed regulating fermentation emissions at large winery facilities in the San Joaquin Valley and was seeking information about possible technologies to capture and control emissions. Although emissions at these wineries are not yet subject to regulation as originally proposed, regulatory action is still possible in the future. In the meantime, as a result of interest by innovative winemakers, the EcoPAS technology has been re-evaluated and adapted to capture and reuse volatile aroma compounds for winemaking.

The EcoPAS is a smart condenser designed specifically for winery operations. EcoPAS CEO **Patrick Thompson** explained: “The concept of using condenser technology to capture fugitive aromas isn’t new. People have experimented with it off and on for 100 years, but there was a need to develop equipment that could operate with higher efficiency, was easier to use and could operate at different scales.” He observed, “Now the technology has improved to provide the ability to deal with a wide range of flow rates during fermentation and can provide a good capture rate at different flow rates.”

The resulting byproduct is a highly aromatic spirit of around 80 proof that can be added back to enhance the original wine, can be used to improve another wine that has lost aromatics, can be used for other blending purposes or can be sold separately as a wine spirit (vodka, brandy, grappa). The product can also be further distilled to use or sell as a “wine spirits addition” for fortification, such as in the production of Port-style wines. EcoPAS, which has its own distiller and spirits producer permit, is a supplier of these wine spirits products.

Equipment and Operation

The EcoPAS system can be used on any closed-top fermentation tank with a port at the top of the tank sized to the tank’s capacity. Tank headspace should be consistent with good winemaking practices, typically not filled more than 80 percent, especially with red wine fermentations.

The company currently has three models of systems available, generally based on the tank capacities for which they will be used. The PAS-1 is designed for 1,000-gallon tanks, the PAS-10 for 10,000-gallon tanks, and the PAS-100 for 100,000-gallon tanks. However, Thompson said the potential operational range for each model can be expanded based on other factors, such as the speed of the fermentation. “If you had a white variety with a cool, slow fermentation, the PAS-1 could be used with fermentations in 2,000-gallon or possibly 3,000-gallon tanks,” Thompson said.

A PAS unit can be mounted to a fermentation tank, a catwalk, a cart, a post, a wall or a support structure. The PAS condenser uses glycol refrigerant for operation. The glycol can be plumbed into and fed from the winery’s

refrigeration system. With the two smaller-sized PAS units, there are options to use a self-contained chiller on a cart for installations in wineries that want a separate chiller.

The PAS equipment can be used as either a fixed installation or as a mobile unit for multiple tanks. Thompson said the PAS-1 and the PAS-10 are being used as fixed units for individual tanks, and some wineries have placed them on carts to move them for use on different tanks. Fixed or mobile usage depends on each winery’s situation, winemaker preferences, proximity to glycol and utilities, and the general layout and operation of the facility and tank spacing. The PAS-100, being a larger unit weighing about 1,000 lbs., tends to be used as a fixed location unit. But depending on tank room layout, it could be connected to multiple tanks by a duct and manifold system.

Depending on variables, such as fermentation temperature, the system captures about 0.2 percent of the volume of the must fermented. Highest yields are from warmer red wine fermentations. White wine fermentations typically yield around 40 percent of the volumes captured in red wine fermentations. The system captures about 4 to 5 percent of the ethanol produced during a red wine fermentation. The product captured ranges from 60 to 100 proof.

Explaining how the product is handled once captured, Thompson said: “In the cases where winemakers are re-blending directly back into the original wine, no further processing is required. In the cases where we are selling the wine spirits, we distill to 140+ proof to meet regulations for wine spirits additions. In the cases where the winemakers seek to concentrate the esters, thiols, terpenes or other specific components, without concentrating alcohol, we are experimenting with a variety of fractionating techniques.”

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The recovered product is typically stored in stainless steel kegs or totes until it is blended back into a wine lot.

The first, full-scale commercial PAS unit was sold to and installed at a Central Coast winery where it has operated since the 2015 crush. Units are installed and used at multiple California winemaking facilities, including custom crush wineries. A PAS-100 installed at one winery is designed to connect to multiple tanks and can capture emissions through a manifold system from multiple tank fermentations simultaneously. In addition to sales of individual units, Thompson said the company offers options to lease units, and the company has a limited number of units in each size that it can take to wineries to perform trials. But there are a larger number of individual winemaker customers who have used the company's captured wine by-products to repair or enhance wine lots. PAS units have been used with fermentations for a wide range of grape varieties, and the process is believed to be practical and beneficial for any fermented variety. Varieties that have been more commonly processed to date include: Pinot Noir, Cabernet Sauvignon, Chardonnay, and aromatic white varieties such as Muscat, Viognier and Riesling.

Winemaking Applications

Industry consultant and winemaking technology expert **Clark Smith** is consulting for EcoPAS and has used the technology and its end-products to enhance his own wines and wines for client wineries. Smith has studied concepts and technologies for flavor and aroma capture since the early 1990s, as used by flavor companies for other food products, and their potential for winemaking applications. He noted that condenser technology is commonly used to capture flavors and aromas lost during processing and then added back, for many food and beverage products, citing orange juice as one example.

Smith co-founded **Vinovation**, a company specializing in the use of filtration systems and processes, such as reverse osmosis, to correct problems in wines, such as volatile acidity (VA), and to adjust/reduce wine alcohol content. He noted that using reverse osmosis to correct one problem can sometimes create other wine quality issues by removing desirable flavors and aromas. He believes the EcoPAS process, and its by-products, can be used to add back desired components to such wines. Smith has worked with EcoPAS to improve batches of Pinot Noir and Pinot Grigio.

Smith believes a key aspect to using a PAS system is determining at what point during the fermentation to turn on the condenser. He observed, "The time when the fermentation is most vigorous, commonly in the mid-fermentation time range, seems to be when you can get the highest amount of the rich and desired aromas."

Another consideration is integrating the technology with the winery's cap management practices. If the winery performs frequent pump-overs or punch-downs, it is difficult to maintain a closed system to capture volatile aromas. Smith said tanks that use a cap management system, such as **Pulsair**, can be good candidates for EcoPAS aroma capture.

Smith summarized: "I think this is a big deal. You can use this technology to turn an ordinary wine into a great wine, or you can use it to turn a bad wine into a drinkable wine." Smith cited an example of a Pinot Noir that had quality issues but was revived by adding back captured volatile aroma compounds and later won a silver medal in a major wine competition.

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EcoPAS Technology Captures Fermentation Volatile Aromas to Enhance Wine Quality

CO₂ Management and Capture Options

CO₂ emissions from fermentations are currently vented to the atmosphere at most wineries, and CO₂ is currently separated and vented from fermentations with PAS systems. Thompson said in an indoor fermentation cellar, a properly installed PAS system can be used to channel CO₂ emissions from multiple tanks to one venting location, thus improving worker safety and regulatory requirements, compared with uncontrolled CO₂ releases from every individual tank.

Given that CO₂ emissions in relation to a winery's carbon footprint can be a sustainability issue for some wineries, and if air quality regulations for wineries become more stringent, EcoPAS offers potential as a technology for CO₂ capture and emissions reductions. Thompson pointed out, "Our condensation process essentially purifies and cools the CO₂." The end product is suitable for food grade applications. A winery could install CO₂ compression equipment to store compressed CO₂ to either be sold or used and to reduce the facility's carbon footprint. But given current economics, Thompson noted, "The cost of CO₂ compression equipment, while falling, is still high, especially considering the fact that a winery will only use the equipment during the annual crush period." Improvements in technology and economics, and more regulatory requirements, could make CO₂ capture and reuse more viable in the future. EcoPAS technology could potentially also be utilized for emission credits and offsets in carbon market cap and trade programs.

EcoPAS Background

EcoPAS, LLC, a California-based company, was co-founded by Steven Colome and **Marci Norkin**. Colome holds a doctoral degree from Harvard University and has been a faculty member at **UCLA** and **UC Irvine**. His background is in air pollution science, and condensation and heat transfer technology. He is the chief scientist for EcoPAS and continues to work on improving and adapting the technology for wine industry applications and for client needs. Norkin, a mechanical engineer, obtained California contractor's licenses for the company to perform general contracting in addition to plumbing and HVAC contracting services. She designs and adapts the systems for installation at each winery based on needs and applications. Her work experience has focused on facilities for the wine, beer, coffee and bakery industries.

Colome and Norkin were researchers for a winery fermentation study and co-authors of a resulting paper, "Empirical Study of Carbon Dioxide Released to the Atmosphere During Commercial Red Grape Fermentation." Colome presented findings at a 2010 conference of the **American Society for Enology and Viticulture** (ASEV). The study monitored fermentation rates and measured CO₂ production during commercial winery fermentations for red grape varieties that included Zinfandel and Syrah.

Patrick Thompson's background is in developing and marketing technology companies and products. He has provided business consulting for EcoPAS since 2014. He joined the company full-time in January 2016 as CEO and general manager, and handles sales and marketing. More information is available at www.eco-pas.com. **WBM**

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