2014 SPECIAL EDITION

PW PRACTICAL Winery & Vineyard

Good/bad thiols—fine-tuning the balance

Grain orientation effect on extraction of oak flavor compounds

Manipulating light in fruit zone improves grape quality

Functions/benefits of oak barrels

Nitrogen—Friend or foe of red wine quality

Impact of délestge with partial seed removal

Using SO_2 to influence wine style

SMART VITICULTURE
Grapevine trunk diseases—Larger problem than posed by phylloxera?

SUPPLEMENT TO
WINES & VINES

Ridge Monte Bello winery improvements

Ridge Monte Bello winery improvements

BY Don Neel, Editor

A custom-designed receiving hopper and a Vacher-Beguet Mistral sorting machine specifically for Bordeaux grape varieties were installed at Ridge Vineyards' Monte Bello winery in the Santa Cruz Mountains above Cupertino, Calif., in 2009. This began a five-year program of improvements, which includes additional tank capacity for the Bordeaux grapes, a new heating/cooling system with solar thermal collectors and a bio reactor for wastewater treatment completed in 2013.

The receiving hopper is 4 feet wide and 30 feet long with a slightly curved (to retain juice and grapes) poly conveyor belt with a variable-speed drive designed for easy cleaning and to achieve even, consistent delivery of grapes to the destemmer. Zinfandel is sorted for leaves and damaged fruit at the receiving conveyor.

Monte Bello Bordeaux grapes are destemmed but not crushed as whole berries go through the Mistral sorting machine at approximately 3 tons per hour. They are further sorted on a second conveyor by a crew of four to five. The Mistral sorting machine cannot be used for fully crushed Zinfandel grapes.

Tank room renovation included relocation of four 15-ton Zinfandel fermentors to be used for malolactic fermentations (MLF) and blending. Seven new 4.25-ton mobile primary fermentors were installed for the new replanting of additional 19th century blocks abandoned during Prohibition. A mezzanine was built above them to hold 12 580-gallon tanks to initiate natural MLF from the separate parcels of Bordeaux varieties.

Ridge fermentors are usually turned three times during harvest. Average Zinfandel fermentations typically run seven days before pressing. Zinfandel completes MLF in tank before transfer to barrels. Bordeaux varieties start MLF in tank and are transferred to barrel with malolactic lees to finish.

The tank sanitation procedure includes the use of a Lechler M20 tank cleaning head; first rinse with potassium hydroxide detergent and 150° F water 15 minutes for a 5-ton capacity tank. The second rinse is ambient water and citric acid for 15 minutes. The third rinse is 2–3 minutes ambient water.

There are nine acres of new Bordeaux variety plantings that have drip irrigation installed for use until the vines are sufficiently rooted.

Green retrofit of heating and cooling systems

BY Zachary Domich, Solarix Systems, San Francisco, Calif.

Ridge Vineyards Monte Bello winery installed high energy-efficiency mechanical equipment for the 2013 harvest. Chief winemaker Paul Draper asked the owners of Solarix Systems in San Francisco, Calif., Zachary Domich and Bob Bullach, to design and install a system worthy of the Ridge brand.

Through lengthy consultation with Ridge winemaker Eric Baugher, a system was implemented that most logically addresses the Ridge endeavor to make the best wine possible while utilizing the least amount of energy, without compromise.

With the history of Ridge Monte Bello dating back to the 1800s, its facilities have endured many revisions and upgrades. Ridge Monte Bello had outlived its most recent mechanical configuration, which was considered advanced when installed but after decades of service has become fatigued and outdated. The old system was decommissioned as the new system integration occurred.

As in many wineries, facility activity and dependence on the mechanical system continues year-round, leaving small windows of opportunity to execute time-consuming mechanical remodeling or upgrades without interrupting production. With the upgrade, the entire heating and cooling system was replaced, without interruption of harvest. Creativity was required in layout, configuration

A destemmer is positioned above the simple and effective Vacher-Beguet Mistral sorting machine that employs a slotted zone and an air knife to automatically remove unwanted stem pieces, shot berries, raisins, insects, and other MOG. A transfer conveyor feeds a KIESEL SP20FTF hopper-style progressive cavity must pump with a short, curvier, higher amplitude rotor that creates large pockets to move grapes gently through the pump with variable speed drive.

A south-facing roof of the winery adjacent to the grape-receiving pad (right) has 24 solar thermal collectors installed. When the sun is shining on the collectors, heat transfer fluid (water) circulates or is pumped through the collector field while absorbing heat. This thermal energy is stored and redistributed from an insulated 1,500-gallon storage tank inside the winery.

and execution.

To avoid downtime of any vital mechanical components during harvest season, Draper and Baugher allocated a portion of the facility previously used for about 50 wine barrels to house new mechanical equipment. This allowed them to design and build a complete new system while enjoying full functionality of the existing system.

The existing heating/cooling piping distribution network was deemed stable and reusable, therefore this extensive system remains in operation. New equipment was interfaced into the existing piping network while maintaining the ability to valve-in and -out new and old components as needed. This allowed for a seamless transition from the old to the new system, even during full harvest activity.

The hands-on approach to wine production at Ridge Monte Bello has relied on very little automation. Upgrading the outdated boilers, chillers and pumps, while incorporating solar thermal and chiller heat recovery required the integration of universally adaptable controls utilizing programmable logic (PLC).

In designing a system tailored to the needs of this facility, the energy-conservation strategy started with the integration of a new 30-ton chiller with heat-recovery capability. The chilled glycol from the evaporator side of the unit serves to feed fan coils for winery space-cooling, including the wine barrel rooms, offices, etc. This chilled glycol loop is also piped to allow for low-temperature wine tank cooling at most tank stations in the winery.

The by-product of the 30-ton chiller is hot water. The condenser side hot water is retained, stored and fed to five boilers in the form of pre-heated make-up water at temperatures as high as 140° F. A 1,500-gallon hot water storage tank serves as this heat-recovery storage. This tank is also heat-supplemented with 24 4-foot by 10-foot glazed flat plate solar thermal collectors that have the capacity to supply water temperatures as high as 180° F.

The configuration allows the 1,500-gallon "fossil fuel-free" thermal ballast to be distributed via heat exchangers to provide direct heating to all tank stations while remaining independent of gas-fired hot water. This energy-conserving functionality replaced the "gas-only" capabilities of the previous system and will reduce gas consumption consider-

ably. Features such as this required the universality of the PLC.

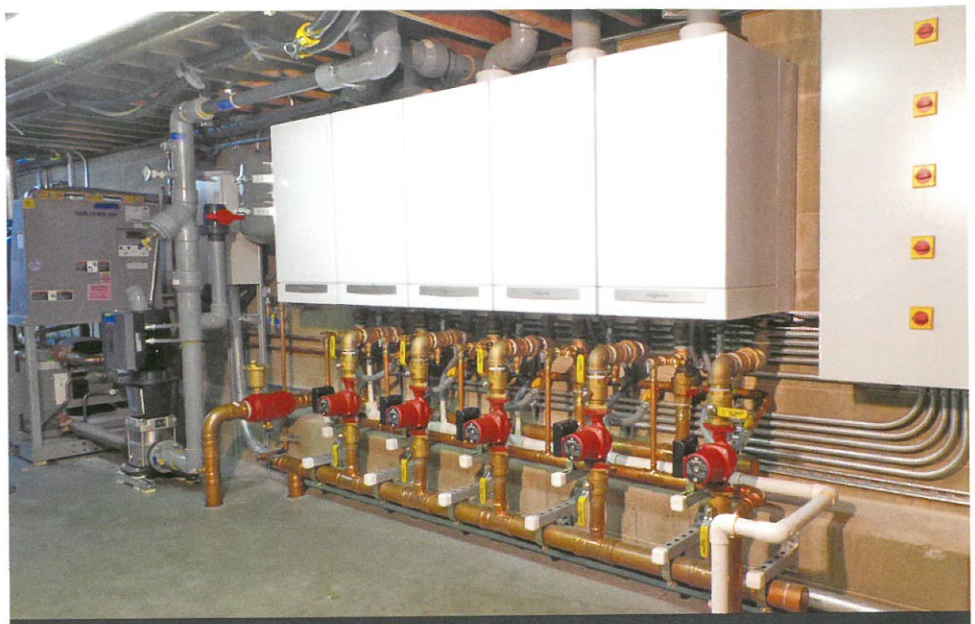
Five high-efficiency condensing boilers were installed. The five units have 96% efficiency along with modulating output and can allow for variation between 100,000 up to 1.776 million BTU per hour, only allowing 4% waste heat loss out of the flue.

Should the solar and chiller heat source become depleted, the five boilers (see photo at right) will sustain hot water supply in unison or separately, depending on demand, while the integrated controls rotate boiler duty-call, preventing uneven service hours between the units. Having five boilers also provides mechanical redundancy. Should any one of the boilers require service, the others will continue operation, preventing hot water downtime, which can be critical during harvest, especially in cold weather.

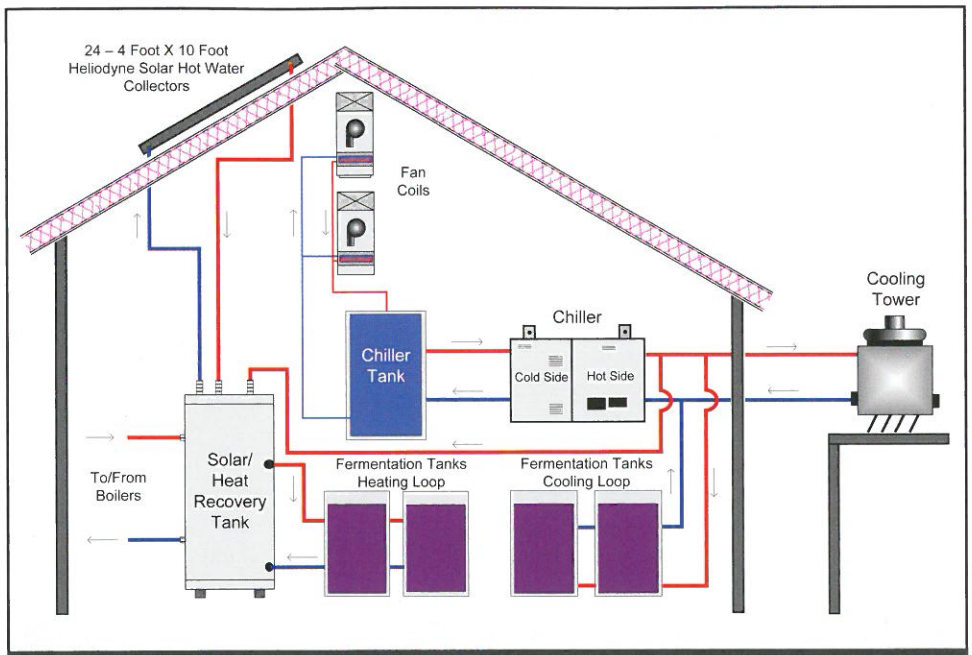
Electricty consumption is paramount when producing wine on a commercial level. Pumping hydronic solutions is a major electrical draw, therefore recent improvements in variable frequency drive (VFD) pump technology have proven key in this application.

In regards to older hydronic technology, the standard operating procedure was to size pumps for peak demand and not allow for a lower horsepower setting, should demand be less than maximum during off-peak periods. With variable-frequency-drive (VFD) pumps, the power consumption scales back as demand decreases, minimizing hydronic electrical consumption. With off-peak periods being a majority of the year, the annual electrical energy-savings will be substantial.

VFD pumps also allow for very accu-



Five 370k BTU per hour boilers providing 96% efficiency, redundancy and versatility are mounted on a wall to conserve floor space. Heat recovery chiller (left) produces much needed hot water as a by-product.



A representation of the new Ridge Monte Bello heating and cooling system.

rate temperature control. When fermentation tanks require heat, by varying the hydronic pump speed through the absorption side of the heat exchanger, we can dial the delivery temperature and GPM with precision and match the winemaker's thermal requests.

For example, Monte Bello winery receives most black grapes at an average of 62° to 64° F. After destemming and sorting of the grapes, and filling the fermentation tank, the tank jacket receives 78° F water that is circulated for 12 to 24 hours to raise the temperature of the grapes to 68° F and encourage natural fermentation to begin.

Having accurate and reliable hydronic control which mechanically conserves both natural gas and electricity while utilizing natural solar thermal and chiller heat recoverd energy was the goal.

Photovoltaics will be installed at the Monte Bello winery. As the electrical-metering reports are recorded and monitored, and the new Solarix System's reduction in electrical consumption is established over time, a full photovoltaic evaluation will be performed and the appropriate size system will be installed.

Wastewater purification for vineyard application

BY Peter Annunziato,
bioprocessH2O, Portsmouth, RI

Process wastewater generated by the Ridge Vineyards Monte Bello winery during crush and wine production is pumped to a Dontech Industries self-cleaning rotary drum fine screen (see page 18) that removes the solids, stems and particulate matter greater than 0.5

mm from the waste stream.

The screened wastewater flows by gravity into an integral sump where two multi-stage pumps transfer the screened wastewater to a 10,000-gallon equalization (EQ) tank prior to treatment in the membrane bioreactor (MBR) system supplied by bioprocessH2O.

The EQ tank provides surge and wastewater storage capacity to receive wastewater at a flow rate of 35 gallons per minute (70 GPM peak) from the fine screen transfer pumps. This allows a continuous wastewater feed of about 5 GPM into the 10,000-gallon aeration tank where the aerobic biological treatment occurs (oxidation of biochemical oxygen demand).

Wastewater in the aeration tank is biologically degraded by a population of heterotrophic bacteria and a diverse group of micro-organisms that consume the organic matter. The bacterial growth is regulated by the organic load entering the aeration tank and the amount of time the micro-organisms remain within the system.

Oxygen required for bacterial respiration is provided using positive displacement blowers, a fine bubble diffuser assembly and an automated dissolved oxygen (DO) control system. The control system measures the DO concentration within the aeration tank and responds by varying the amount of air supplied to the aeration tank using two variable speed drive (VSD) controlled blowers. The DO control system and VSD blowers are critical components to minimize power consumption.

The bioprocessH2O system to treat wastewater includes an equalization tank [1], aeration tank [2], blowers [3], membrane hood [4], membrane skid, controls, chemical feed inside the shipping container [5], and sludge holding tank [6].

A pH sensor and external controller provide for automatic dosing of potassium hydroxide to maintain the aeration tank pH between 6.5–8.0 while nutrients (ammonia and phosphorus) are also supplied to supplement the micro-organism's metabolic requirements.

Wastewater is pumped at a controlled rate from the aeration tank to a vertically configured bioPULSE™ Airlift tubular membrane. Diffused air is injected at the bottom of the membrane module to create an airlift pumping action and provide air scouring of the membrane surface to enhance and maintain system performance. This approach of utilizing air and liquid to provide membrane scouring results in an energy efficient MBR.

The semi-permeable polyvinylidene difluoride tubular ultrafiltration membranes have 5.2 mm diameter lumens with 0.03 micron pores passing clean water as ultrafiltration (UF) permeate. The bacteria and suspended solids commonly referred to as mixed-liquor suspended solids are rejected and returned to the aeration tank for multi-pass processing.

The UF permeate is pumped from the membrane module at a controlled rate using a VSD permeate transfer pump that is limited by a level sensor to maintain a constant liquid level within the aeration tank. The UF permeate is discharged to a distribution system for irrigation of grapevines and select trees in the vineyard.

The tubular membrane lumens are periodically back-pulsed by actuating a permeate backwash pump to reverse the UF permeate flow through the pores to dislodge solids, reduce membrane biofouling and sustain the permeate flow rate referred to as flux (gallons of permeate produced per square foot of membrane per day).

Additionally, the membrane lumens are typically cleaned once every four to eight weeks by a chemically enhanced backwash process. The entire process is automated using the PLC controller and monitored via a set of process viewing screens on an operator interface terminal.

The treatment process is automated using an Allen Bradley PLC and monitored via a set of process viewing screens on a color touch screen operator interface terminal. The treatment system can be controlled remotely through the PLC via an internet connection that allows bioprocessH2O to provide oversight and operational assistance to ensure successful system performance.

BioprocessH2O installed the UF membrane system, PLC control panel and chemical feed assemblies within a customized 20-foot long shipping container that facilitated system installation and ongoing operation and maintenance.

Biological sludge generated during the wastewater treatment process is digested on-site using an aerobic digestion tank that provides an environment in which the micro-organisms metabolize and consume a portion of the wasted biomass. PWV

Dontech Industries Inc. stainless steel externally fed rotary drum screen model RDS-WW-2512 WC is pictured with an oversized sump designed specifically for Ridge Winery to handle a peak flow of 75 gpm while removing solids 500 micron (0.02 inch) or greater from winery processing water. Overall dimensions are 44 inches x 44 inches x 88 inches tall with a 25-inch screen diameter. Collection drum inside yellow plastic housing receives solids that are transferred to winery composting operation.