Case Study in Wine Production

How did Sonoma Wine Company save money, water and energy while doubling production?

John Garn

SONOMA WINE COMPANY is a custom crush services provider in Sonoma County. Their primary facility for wine processing, wine storage and bottling is located in the town of Graton, situated in a former apple processing plant originally built in 1947. Last year, as Sonoma Wine Company considered their next round of upgrades and fully doubled their custom bottling capacity (from 1.5 to 3 million cases) per year, their facility's total energy use was far from their primary concern. Instead, President **Dennis Carroll**, general manager **Ed Silva** and director of business development **Natasha Granoff** worried about the regulatory and community risks as well as costs related to the inevitable increase in water use, wastewater output and changes in their permitted discharge levels, not to mention the potential impact and liabilities of that increase on the viable coho salmon stream adjacent to their property. But in the end, an integrated approach to energy efficiency for their planned facility expansion, which incorporated water conservation into the energy equation, not only solved their water problems but resulted in a plan that astonished the facility managers. The plan would reduce water use by 32 percent and wastewater discharge 31 percent below their existing baseline usage, and also reduce electricity use by 7 percent and natural gas by 35 percent all while producing twice as much wine Here's how they did it.

ESTABLISHING FACILITY BASELINES

When Sonoma Wine Company (SWC) bought the facility from **Pacific Wine Partners** in 2003, it suffered from antiquated equipment, un-insulated buildings and a generally inefficient layout. As business grew, providing quality services to their 20-plus client base began to place increasing stress on the existing production system and pushed capacity to the limits. In order to meet increased demand for custom wine processing services and gain market share, SWC knew they would have to invest in new equipment and expand their Graton facility. They couldn't implement their plans for growth and attract new business without equipment upgrades, new tanks and, most importantly, expanding the capacity of the wastewater pond.

The management of SWC wanted to incorporate sustainability into their plans, knew they had big improvements to make and needed to understand just how dire the current situation was. In February of 2003 they started by benchmarking their facility using the Sustainable Winegrowing Practices assessment put out by the **California Sustainable Winegrowers Alliance** (CSWA). The senior management team completed the assessment, answering questions about the 100-plus winery criteria to assess the overall sustainability of their current operations, including water use, energy use, ecosystem management, materials handling, solid waste generation, environmentally preferred purchasing and neighbors and community relations. "We realized we couldn't define where we needed to go to accomplish our goal of 100 percent production increase until we understood where we currently were," Granoff said. And according to her, completing the assessment together helped to put everyone on the same page.

> "An integrated approach to energy efficiency for their planned facility expansion, which incorporated water conservation into the energy equation, not only solved their water problems but resulted in a plan that astonished the facility managers."

The customized report they received back from CSWA compared their sustainability practices with over 100 other wineries in the state, and like many of the wineries that had completed the assessment, SWC had low scores in energy efficiency. The report prompted SWC to begin to question the intensity of all of their resource use by asking, "Just exactly how much water, energy and wastewater discharge is related to every case of wine we produce?"

Granoff, charged with researching their resource use baselines, immediately thought to enlist the services of their neighbors in Graton, the **Climate Protection Campaign** (CPC), a nonprofit organization that is a national leader in helping companies and municipalities reduce their emission of greenhouse gases (GHG). **Dave Erickson**, an analyst for the CPC, used SWC's meter data and billing history from **Pacific Gas and Electric** (PG&E) company to determine a baseline energy intensity of .74 kWh per case of wine. Their energy intensity, combined with total fuel use information, allowed Erickson to calculate SWC's total baseline greenhouse gas (GHG) intensity of .44 pounds of CO_2 per case of wine.

Calculating water use was outside the scope of CPC's expertise, so Dr. **John Rosenblum** of **Rosenblum Environmental Engineering** was brought into the picture. It turned out that Rosenblum, a local water and wastewater engineer, was already intimately familiar with the site. He had analyzed it back when it was owned by **Associated Vintage Group** in 1999.

DRILLING DOWN: POTENTIAL RETROFIT SAVINGS

Meanwhile, as Granoff researched high-level resource intensity questions, SWC facilities manager **Jim Neely** drilled down into the facility specifics. He contacted his representative at PG&E to request a free comprehensive energy survey.

Three weeks later, the owners had the PG&E Energy Survey Report in hand and sat down to review the list of facility upgrade recommendations, which were organized by measure, including potential energy savings, utility cost savings and returns on investment for each measure. It also included potential rebates and incentives PG&E would offer to help pay for the improvements. The list of recommendations was long, so SWC decided to develop a phased implementation plan and worked with PG&E to reserve the incentive funds for the projects:

2004—insulate 16 tanks, high efficiency water heaters, hot water and glycol storage tanks and lighting upgrades.

2005—additional tanks and insulation, new air compressor, variable speed drives, insulate roofing, solar tubes and additional lighting upgrades.

2006—additional tanks and insulation, new air compressor and additional lighting upgrades.

By the end of 2005, SWC had completed a capital investment of half a million dollars, with PG&E incentives covering about one-third of the investment. SWC realized a 7 percent reduction in electricity and 36 percent in natural gas, despite the fact that production had actually increased 28 percent during the same period.

With business growth projections looking strong, SWC made their final decision to expand the facility to reach the 100 percent growth goal.

AN INTEGRATED APPROACH TO DESIGN

About the time SWC was deciding to double their expansion, Rosenblum shared his water use and water benchmarking findings with the winery, along with some troubling news. By Rosenblum's calculations, doubling production would require SWC to increase their permit for pond capacity from 20,000 gallons per day to 50,000 gallons per day. The enormous expense coupled with the regulatory process and potential for community resistance became a major concern.

But Rosenblum had also seen SWC's huge waste of process water throughout the facility and was convinced that an integrated approach could not only help reduce process water requirements, but could also have significant energy efficiency benefits as well. "Each gallon of water has an energy coefficient, and one of the best ways to reduce total energy use is by conserving water." Rosenblum suggested SWC enroll in PG&E's Savings By Design new construction program, which provides no-cost new construction design assistance and incentives for design elements that exceed what is the industry "Standard Practice." PG&E thereby funded Rosenblum, who was already subcontracting services to Savings By Design, to do detailed design analysis for SWC's expansion.

Rosenblum's goal was threefold: to determine where the most water and energy was used in the winery process; to make design recommendations to reduce energy and water use; and to calculate the energy difference between a "Standard Design" expansion and an efficient, integrated "Savings By Design" expansion to accomplish SWC's planned 100 percent growth in production.

Integrated design, as a practice, looks beyond individual system component opportunities and seeks efficiency solutions that can have interactive effects throughout a facility. **Patsy Dugger**, who manages programs for PG&E's Agriculture and Food Processing segment, noted, "Savings By Design will pay for all kinds of energy savings, but good, integrated design tends to reap the greatest benefits—the energy savings can really snowball."

MONEY DOWN THE DRAIN

Rosenblum knew that the linear flow of hot water through the winery, down the drain and out to the wastewater ponds was a good bet for system inefficiencies. He quickly identified opportunities in tank cleaning, barrel washing and in the process to raise the wine to ambient temperature for label adhesion during bottling. Rosenblum's baseline calculations demonstrated that these three processes accounted for over 70 percent of the total water use and 95 percent of the total hot water use. He made the following recommendations:

> "The linear flow of hot water through the winery, down the drain and out to the wastewater ponds is a good bet for system inefficiencies."

- Install new hot water return line and insulate entire loop to barrel washer, wine preheating and bottling line sterilization.
- Use the final ozone rinse to make up wash water for the barrels.
- Develop equipment and establish cascaded rinse procedures for tank cleaning.
- Modify the heat exchanger for wine preheating.
- Install new barrel washer.

The energy efficiency recommendations are projected to achieve a 23 percent reduction in cold water and a 62 percent reduction in hot water below the facility's existing current production baseline. With these main efficiency measures, as well as several other implementations, it was projected that SWC would reduce their overall water use by 30 percent. By recapturing the hot water from the barrel washing, bottle pre-heating and tank washing, the planned production expansion could be achieved with the existing two water heaters while reducing natural gas use below baseline levels. This would also eliminate the capital expenditure for two additional water heaters and save an estimated 15,300 Therms/year.

COLD HARD REFRIGERATION SAVINGS

And there were other opportunities. The largest user of energy in any winery is refrigeration. With the planned Standard Design expansion, SWC had expected to add 200 tons of refrigeration capacity to accommodate 70 additional storage tanks, 800 additional fermentation barrels and tighter climate control for 35,000 barrels in storage.

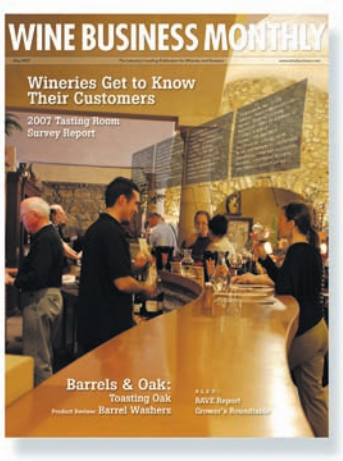
Rosenblum's Savings By Design analysis report found that improving building shells and insulating wine tanks would make a significant difference in refrigeration costs. He made the following recommendations:

- Insulate all tanks at the winery, both inside and outside.
- Insulate the main cellar building and improve ventilation to maintain inside air temperature at 70°F.
- Improve insulation and ventilation of barrel fermentation and storage buildings to maintain stable wine temperature.
- Integrate night-cooling and CO_2 controls for fermentation to avoid introducing hot afternoon air.

Insulating inside tanks appeared to be a particularly good measure given that SWC's wine cellar was an old, un-insulated sheet metal structure where the upper-level inside air temperatures often surpassed 100°F in summer months, and ice layers commonly formed on the wine tanks from the condensation. By insulating all refrigerated tanks and improving the ventilation and insulation of these buildings, Rosenblum and Petaluma architect **George Beeler** were able to determine that no more than 10 tons of additional refrigeration capacity would be needed to handle a doubling of production capacity. This was a 79 percent reduction in projected energy requirements for refrigeration from Standard Design.

WASTEWATER AS A MISNOMER

The SWC wastewater ponds are the third largest energy consumer at the winery. During the energy upgrades of 2005, SWC installed new efficient aerators along with dissolved oxygen controls. These measures were effective on the treatment side, but it was in reducing the process water through design



improvements that brought SWC the greatest energy saving benefits of all.

Rosenblum's recommendations included re-using water in a tiered system throughout the winery and building a 24,000 foot canopy over a tank farm that would divert uncontaminated rainwater from the wastewater stream to storm water drains (and also provide shade for the wine tanks). These Savings By Design water efficiency recommendations had threefold benefits: first, they reduced process water use and the associated water utility costs. Secondly, they saved pumping energy, water heating energy and water treatment energy at the wastewater pond 18 percent below SWC's baseline use. Finally, and most significantly, they reduced water output so much so that SWC does not have to build a new and larger pond to handle the increases in anticipated water use. According to Dr. Rosenblum and Granoff, avoiding much of the regulatory and permitting process is "the most significant win of all."

PROJECT SAVINGS

The cost savings and benefits from smart integrated design can include hard dollar savings (such as dollars saved on water and energy utility bills) to labor savings (such as from an avoided regulatory or permitting process) to environmental and PR savings (from avoiding potential impacts on the coho salmon stream or other community conflict). Other benefits, such as lowered temperatures in SWC's cellar, will make for improved working comfort for employees.

The hard dollar savings are impressive. While at current operating conditions, SWC is spending about $230,000 per year on gas and electricity alone, the Savings By Design proposal projects to bring them to approximately $200,000 per year with a doubling of capacity, which is approximately 43 percent of what would have been used under a Standard Design (that is, an estimated $470,000 per year).

Any CFO can tell you that good design and energy efficiency can cost more up front, which is the very barrier that PG&E and other California utilities aim to knock down by offering design assistance and incentives. For SWC, the Savings By Design approach would add $800,000 to initial costs, but with PG&E incentives of $260,000, the payback will be approximately 2.1 years.

IN SUMMARY: SMARTER BUSINESS EQUALS BETTER BUSINESS

By employing an integrated system approach with PG&E's Savings By Design program, Sonoma Wine Company will be able to double their production capacity from 1.5 million cases to 3 million cases per year while reducing electricity use by 7 percent, process water use by 32 percent, wastewater generation by 31 percent and natural gas use by 35 percent, all below their current usage baseline. What this means is that SWC will be making twice as much wine and generating twice as much business while reducing energy use by 1.5 million kWh per year and avoiding 584 tons of CO_2 emitted into the atmosphere, all while increasing the environmental protection of a coho salmon stream and addressing the environmental concerns of their neighbors. As Dennis Carroll, president of Sonoma Wine Company stated, "You can't deny this is smart business. It just makes sense!"

For their customers SWC can provide increasingly valuable information on the environmental performance of their products and become their preferred vendor as well. By being able to provide a "story of sustainable practices", SWC offers their clients a way to differentiate themselves in a competitive market while expanding the definition of "quality."

With the help of energy efficiency incentive programs like PG&E's Savings By Design program, combined with a smart integrated system approach, the California wine industry can stay globally competitive while improving the environmental quality of the state.

By the way, how intense is your wine? **wbm**

John Garn is an info-cartographer and a co-founder of ViewCraft, a management consulting firm. His experience includes private, non-profit and governmental entities such as the U.S. EPA, Wine Institute and the California Association of Winegrape Growers. In 1999 John's work on the collaboration-based Sonoma Green Business Program was recognized with a national sustainability award from the D.C.-based Joint Center for Sustainable Development.
