

Tongue River Winery



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Company Background

Bob and Marilyn Thaden planted the first grapes at Tongue River Winery in 2004 and opened for business in 2010. They now have two additional full-time employees, one being an apprentice wine maker. Located in Miles City right along the Tongue River, the hot and dry climate demands hardy fruits that can also withstand frigid winters. They are committed to growing and making wine only from fruits that can be grown in Montana, hence their motto “Fruit exclusively from the Northern Plains”. The winery produces about 1200 gallons of wine yearly. Their vineyard is now approximately 3 acres, and the winery commercial space available is 3960 ft². Their grape varieties are mostly from University of Minnesota, created to tolerate temperatures from -25° F to -45° F. Over

38 wine varieties are produced at the winery. Common prairie fruits like apples, plums, cherries, raspberries, currants, rosehips, and honeysuckle are also grown for winemaking. Tongue River wine is sold in over 30 stores/restaurants throughout Montana and can be shipped to customers in 41 states.

Project Background

Tongue River Winery already has some pollution prevention practices in place such as solar tube lighting, drip irrigation, and 1-foot-thick insulation on their buildings to prevent heat loss. Despite being a small business, they are eager to see what P2 changes can be made. Their project goal was to save energy through implementing solar panels and find ways to make processes more efficient. A value stream map was used to identify wastes in their wine-making processes. CarbonScope, EPA estimations, and local energy supplier information was used to calculate CO₂e and energy reductions.

Incentives To Change

Shipping wine all over the country can have a hefty carbon footprint, but that part is out of Tongue River Winery’s control. Seeking to reduce their emissions at the cradle-to-gate phase can offset the environmental impact of their product later in its lifecycle. Supplying most of their own fruit from the vineyard has become a pillar of the Tongue River Winery’s brand image. Being able to supply most of their own energy from solar panels would coincide well with their motto. They would also be setting an example for other small businesses to invest in P2 practices.

Solutions

Follow a Formula for the Bottle Cleaning Solution

In the bottling process, bottles are cleaned with a citric acid and potassium metabisulfite solution before filling. The lower the pH in the solution, the less sulfite required for an effective cleaning concentration. The sink is filled with approximately 5 gallons of hot water, and with 3 tablespoons of citric acid the pH is 3.5. At that pH, only a quarter teaspoon of sulfite is needed. Compared to previous methods, about 36 times less sulfite is being used now. Over the course of a year, this cleaning formula will save 0.011 kg of potassium metabisulfite. This change benefits the safety of the employees as sulfites are irritants on the skin, eyes, and lungs. It is released into the air during cleaning as it is quite volatile in hot water.

Solar Energy

The winery's current monthly energy consumption is 1100 to 1400 kWh. The average cost per kWh is about \$0.09. Harvest Solar in Billings, MT is giving the winery a quote on what system they would recommend and its cost analysis. Since the winery roof is east-west facing, there will be a 20-30% drop in photovoltaic efficiency. With a 5-kW system, it would be expected to produce 16 kWh on a good day. Solar panels could provide over 4500 kWh per year, or about one third of the winery's yearly consumption. Production of energy and cost will vary greatly depending on system recommended.

Companion Planting in the Vineyard

Companion planting nitrogen-fixing legumes like clover has been shown to increase vine growth and out compete wild grass. Having a stable population of clover would prevent the need to mow weeds in the vineyard as often. Once the nitrogen fixing from the clover is no longer desired, it can be mowed down to provide a natural mulch for the soil. Mowing less frequently can spread less ice nucleation-active (INA) bacteria from decaying vegetation, increasing the potential frost damage resistance of the vines. INA bacteria catalyze the formation of ice on plant surfaces at temperatures of -10°C to -1°C . For every hour a gas mower is run, it releases the same pollution as eight new cars driving at 55 mph. Not mowing for the first couple months of the season would save 760 kg CO_2e .

Buy Back Bottle Offer

Currently, bottles are ordered by the pallet at about 80 cents a bottle from a manufacturer in Mexico. Since there are 7 locations in Miles City that sells Tongue River wine, locals and regulars could be encouraged to bring back their used bottles for a 25-cent per bottle buyback. Each case (12 bottles) prevented from being ordered would save 3.85 kg CO_2e and \$6.60.

Motion Sensor Lights

When walking in and out of the garage or cellar inventory, an employee's hands are typically full of wine bottles. On a busy day with customers or bottling, sometimes the room might not be returned to for an hour. There are 26 fluorescent rods between the cellar and garage. By having a motion sensor light that turns off automatically after 5 minutes, they could save 150 kWh a year (512,000 Btu). This would reduce yearly energy cost by about \$14. For two switches at a cost of \$20 each, this change would pay for itself in about 3 years.

New Sink Drain Plugs

Bottles often need to be cleaned at two different instances during the bottling process because there is not enough room for all bottles to dry at the same time. So, the cleaning solution is left in the sink with a drain plug. The current drain plugs do not seal very well and most times when the sink is returned to for more cleaning, the water level is too low. A new sink drain plug could save 2-5 gallons of water per bottling and about 300 gallons per year.

Recommendation	Waste Prevented	Status
Set formula for citric acid and potassium metabisulfite cleaning solution	0.011 kg potassium metabisulfite per year	Implemented
Install solar panels on the roof of the winery	4500+ kWh per year	Implementing
Companion planting clover in the vineyard	760 kg CO ₂ e per season	Recommended
Buy back bottles from community	3.85 kg CO ₂ e and \$6.60 per case of bottles	Recommended
Motion sensor lights	150 kWh or 512,000 Btu per year	Recommended
New sink drain plugs	300 gallons of water per year	Recommended

Future State Ideas

Installation of More Garage Space

In between the garage of the winery and the extended garage is an outdoor storage area being underutilized. If business continues to increase, production demands will require more space for storing large tanks of wine. A solution would be to construct an enclosed storage space that connects the garages. This addition could also make room for the bottling process and some inventory to be upstairs, instead of in the cellar. Distance between storage of materials to production to inventory would be greatly reduced. However, a better cooling system may need to be installed as the garage areas are not temperature controlled as reliably for stable storage of bottled wine.



Clean and Reorganize Detached Garage

Current layout is very messy and reaching desired boxes of wine is difficult. There is 720 sq ft of garage available. Area that pallets of bottles will take up can be calculated, and an optimal layout could be organized on a grid. Walking space in between pallets of bottles would be advantageous for accessing cases at a more comfortable angle.

