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MTP2 INTERNSHIP

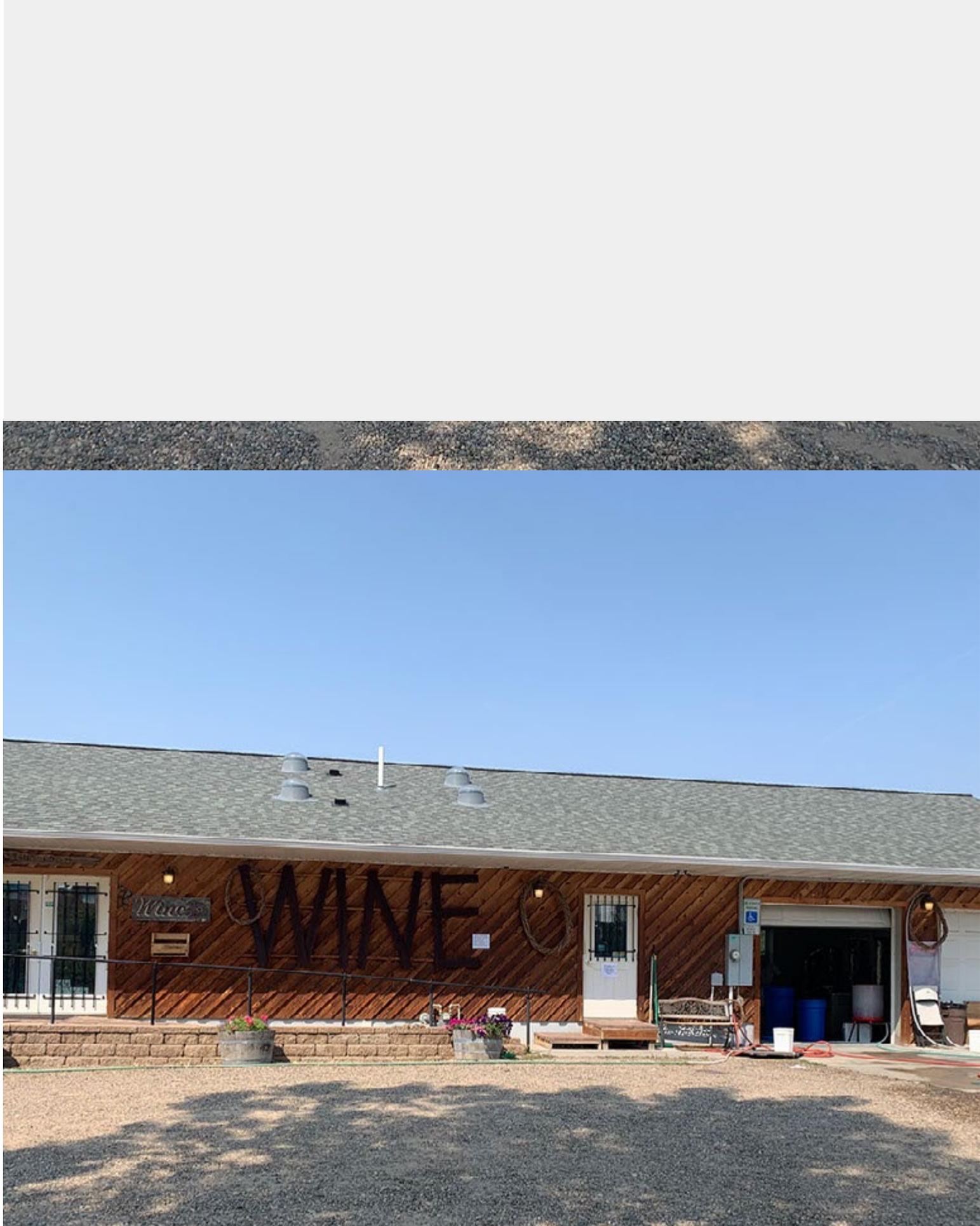
Marc Hansmeier | Tongue River Winery | Summer 2021





About Me

- Junior in Biological Engineering with a minor in Biomedical Engineering at Montana State University
- Born and raised in Anchorage, AK. Grew up with a love and appreciation for the natural environment





Tongue River Winery Background

- Planted the first grapes in 2004, opened for business in 2010
- Now have 2 full time employees in addition to the owners Bob and Marilyn
- 3960 sq ft of commercial space and 3 acres of vineyard
- Produce about 1200 gallons of wine yearly
- Over 38 varieties of wine
- Grape strains from University of Minnesota can withstand temperatures down to -45° F

[Tongue River Winery Website](#)



Motto

"Fruit exclusively from the Northern Plains"

Tongue River Winery takes pride in only making wine from fruits and grapes that can grow in Montana or adjacent states.

Project Background

Find ways to prevent energy, water, or chemical waste in their processes. Use tools like Value Stream Mapping to identify these wastes and non-value added activities.

Tongue River Winery already has some P2 practices in place, such as:

- Solar tube lighting (pictured)
- 1-foot insulation on their buildings
- Drip irrigation

Project Goal

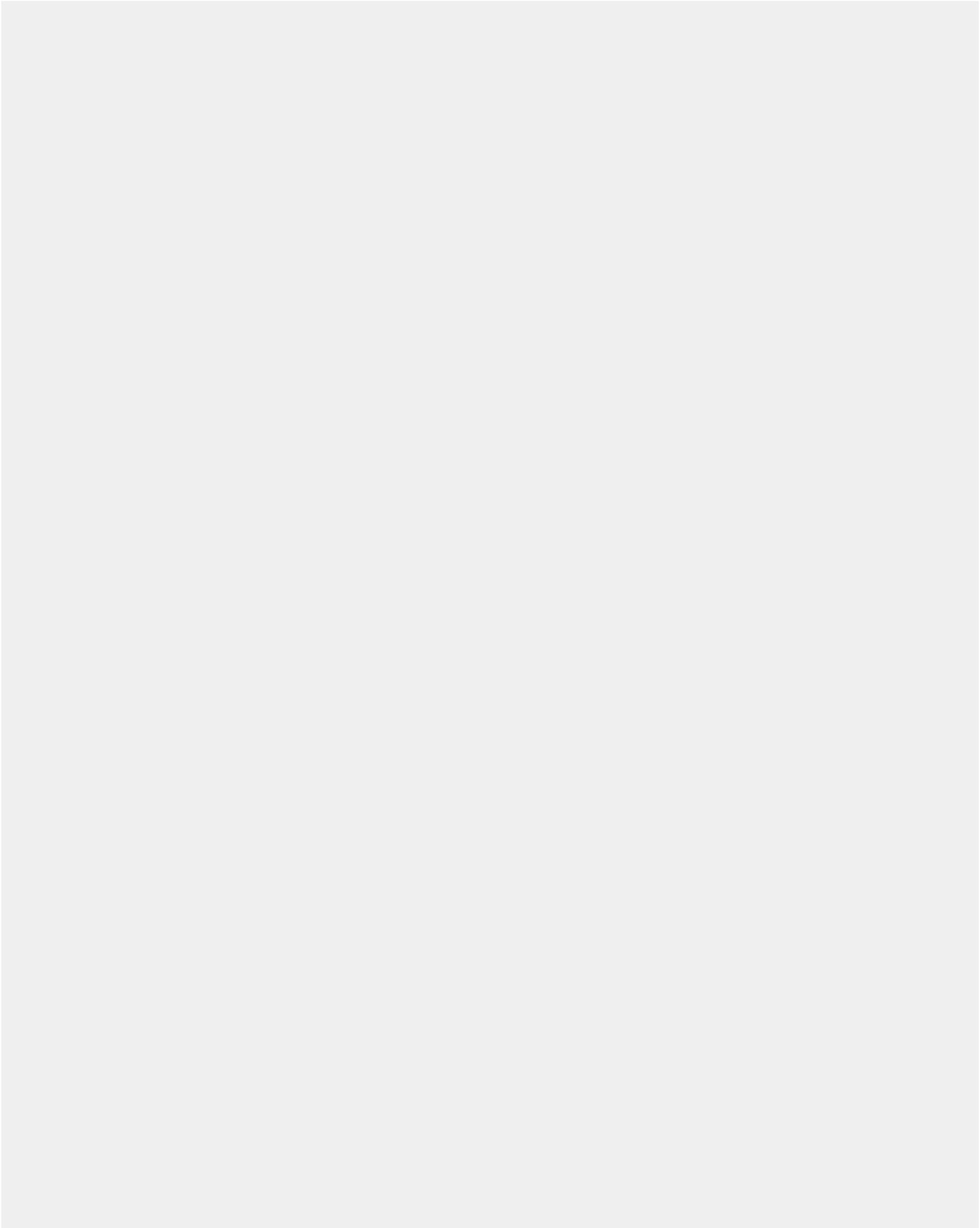
- Learn more about possible solar panel implementation at the winery
- Identify wastes in the wine making process and find solutions to be recommended

Incentive to Change

Their goal of supplying their own fruits from the Northern Plains coincides perfectly with supplying some of their own energy from Montana sun

Sets an example for more small businesses to incorporate P2 practices

Value Stream Map



Insights

- Wine making is a dynamic process
- A lot of the actual work done happens in the vineyard, pre-manufacturing
- Motion waste in Bottling process and moving inventory
- Unavoidable extra inventory during time dependent steps

Bottling Process

- Work cell flow: Fill -> Cork -> Label -> Box
- Squeezing work cell tighter sped up process by 15% and addition of a second operator was about a 75% increase
- Extremely low defect rate
- Label maker is in main house (285 steps), requiring an employee to make labels at least 20 minutes before bottling process

Bottlenecks

Filling bottles is the slowest part in the bottling process

- Varies with: sugar content of wine, number of operators, and level of wine in tank being pumped

If labels are not printed in the main house before bottling, unlabeled bottles build up quickly. Process is then bottlenecked at the labeler

Solutions

- Second pump - back up pump available in storage, requires a second operator
- Bottom filling nozzle - incompatible with current setup, would reduce foaming in sweet wines
- Move label maker from the main house to the winery cellar

Bottling Wastes

Bottle Cleaning Formula

- Citric acid and potassium metabisulfite used in 5 gallon hot water solution
- Set formula of 3 tablespoons citric acid (pH 3.5) and 1/4 teaspoon sulfite
- Previously used 36x required sulfite
- Sulfites are irritants on the eyes, skin, and lungs
- Use 0.011 kg less sulfites a year

Cellar Sink Drain Plugs

- Current plugs slowly drain out cleaning solution over time
- Need to wash bottles at two different times during bottling process
- Lose 2-5 gallons each bottling shift and around 300 gallons a year

Bottle Buyback Offer

- Currently purchase bottles from Mexico at 80 cents per bottle

- Offer to buy used empty wine bottles back from local customers at 25 cents per bottle
- Would prevent 3.85 kg CO₂e and save \$6.60 per case



Vineyard Wastes

Companion Planting Clover

- Nitrogen fixing in soil to increase vine growth and competition with native grass
- No need to mow in early months with controlled population
- When nitrogen supply is no longer desired, mow down for natural mulch
- Prevent over 760 kg CO₂e from not mowing

Ice Nucleation Active Bacteria

- Catalyze formation of ice around temperatures of -10° to -1° C
- Mainly *Pseudomonas syringae*
- Increases frost damage on plants
- Decaying vegetation is a large source of INA bacteria.
Mowing increases their spread
- Bactericides to target them are being researched

[More on INA Bacteria](#)

Solar Panels

- Current energy consumption: 1100-1400 kWh per month (avg. \$0.09/kWh)
- Consulting with Harvest Solar from Billings, MT
- Downside: winery roof faces east-west; 20-30% drop in efficiency
- A 5-kW system could produce 4500+ kWh a year (about 1/3 of the winery's consumption)

Motion Sensor Lights

- There are 26 fluorescent lights between the garage and cellar of the winery
- Lights are often left on during a rush of customers (15 min to 2 hours)
- 5 minute motion sensor could save 150 kWh a year (512,000 Btu)
- \$40 for two switches, 3 year payback by saving \$14 a year

Future State Renovations

Install Enclosed Space Between Garages

- Currently underutilized storage space in between garages
- Creates room for bottling process or bottled wine inventory to be moved upstairs (reduce movement waste)
- More room to meet future production expansion needs
- Downside: Garages are not temperature controlled as reliably as the cellar for storing bottled wine

Clean and Reorganize Detached Garage

- Current layout is messy; difficult to reach desired bottles
- Better utilize 720 sq ft available to optimize layout of bottles on pallets
- Move unused equipment to a designated area

Personal Experience

- Gained expertise on wine production and running a small business
- Connected with customers who came from all over the country
- Practice in designing a value stream map

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