

# Kaktus Brewing Co. Environmental Footprint Reduction

Bernalillo, NM

EPA Region 6 ; NAICS Code 312120

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**College of  
Engineering**

## **Kaktus Brewing Co.**

Kaktus Brewing Co. has been open since October 2013 in Bernalillo, NM. Kaktus Brewing Co. houses a 2-barrel brewing facility that brews 4 days a week. Alongside their selection of house-crafted beers, they also serve home-stilled ciders and wines from around New Mexico. On top of their selection of beverages, Kaktus Brewing offers appetizers, gourmet pizzas, and salads. The ingredients are sourced and purchased in-state and are certified organic. Kaktus Brewing does not use any artificial ingredients or fillers in either their brewing or food preparation. Kaktus Brewing Co. has a dog, game, and music-friendly patios so the entire family can have fun.

## **Case Study Point of Interest**

On March 22<sup>nd</sup>, 2022, a team from NMSU's Engineering New Mexico Resource Network (ENMRN) visited Kaktus Brewing Co. to conduct a Pollution Prevention (P2) assessment. The goals of this activity were to assess the brewery's efficiencies in production, materials handling and storage, environmental and energy performance, and to provide recommendations for improvement.

## **Challenge – Why P2?**

Kaktus Brewing Co. wanted to better understand and decrease the environmental impact of the brewery as part of its commitment to environmental stewardship. As an established brewery, Kaktus Brewing has exemplified a commitment to sustainability and has implemented several methodologies and techniques to continue the trend.

## **Contact Information**

Kaktus Brewing Co.  
471 South Hill  
Bernalillo, NM 87004  
Kaktus Brewing Co. - (505) 295-3186



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## Energy Efficient Recommendations

During the assessment, the team identified several opportunities for improvement in electricity, water, and solid waste reductions.

- **Plastic Cup Recycling**

The brewery generates approximately 1990 lbs. of waste in plastic cups alone, annually. The impact of recycling these materials will result in an overall reduction in carbon dioxide emissions of 3.12 tons per year.

- **Installing Aerators on Faucets**

Kaktus Brewing has 3 faucets which output 2.2 gallons of water per minute, each. With the installation of aerators to reduce the flow rate of water, the brewery can save around 340,000 gallons of water annually, which translates to \$750.00 in savings per year.

- **Installing LED Bulbs**

The brewery has a total of 100 incandescent lightbulbs throughout the building and patio. If all of these bulbs were replaced with their LED counterparts, a savings of 4.3 tons of CO<sub>2</sub> emissions is experienced per year.

## More Recommendations

- Treatment of hardwater
- Insulating the buildings and patios
- Mushroom farming
- Replacing patio heaters

## Hardwater Treatment

Kaktus Brewing Co. has implemented a water filtration system which helps reduce the high mineral content of the water they use for brewing and restaurant use. Unfortunately, the filters within this system have a short lifespan due to the high level of minerals they catch. This means extra costs for Kaktus Brewing to replace the filters very often.

## Water Softener System

A water softener is a water filtration system that removes high concentrations of minerals which produce hardwater. This system works similarly to a magnet. Calcium and magnesium are the two main elements that cause hardwater. Their molecules are positively charged. As the water is pumped through the system, it passes through a filter that contains negatively charged resin beads. Since opposites attract, the calcium and magnesium stick to the beads allowing only 'soft' water to flow (ion exchange). In the same way, when the system undergoes cleaning, a water and salt solution is flushed through the tank filled with the resin beads. The neutrally-charged salt ions attract any remnants of unwanted ions which have been left behind.

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## Purchasing Potable Water from a Private Company

As mentioned above, Kaktus Brewing is spending a significant amount of money on replacement filters for their current filtration system. If an entirely new filtration system (i.e. a water softener) is not desired, purchasing potable water directly from a private company could potentially reduce costs. Currently, the brewery is spending roughly \$1,300 per month on filter replacements, which is about \$15,600 annually. Potable water for purchase in the Santa Fe area can be sourced at \$0.25 per gallon\*\*. Kaktus Brewing's annual beer production is around 480 barrels, or 14,880 gallons. If Kaktus Brewing were to purchase all of its water for brewing at \$0.25/gal\*, the annual price for brewing water is estimated to be \$3,720.

\*This rate may differ, please contact water vendor for exact pricing.

\*\*To source water in the Santa Fe area for the mentioned price, please contact the owner of Rowley Farmhouse Ales, John Rowley at [jrowley@rowleyfarmhouse.com](mailto:jrowley@rowleyfarmhouse.com)

## Insulation of Buildings and Patios

Due to the building material and exposure to the outside, insulation is a great opportunity for Kaktus Brewing to save energy and reduce costs.

Even though the patio is not open technically an open space, the vinyl covers used as walls and the corrugated metal roof do not provide sufficient insulation to maintain the desired temperature without substantial energy input through the use of heaters and coolers. Because of this large expenditure of energy, Kaktus Brewing has been spending a lot of the profit generated during the winter to keep the front patio warm.

## Potential Savings from Purchasing Potable Water from a Private Company

Comparison of Filtration Replacements and Purchase of Potable Water	
Current Filtration System Costs	Cost/year, USD (\$)
Filters, \$1300/month	\$15,600
Purchasing Potable Water	Cost/year, USD (\$)
14,880 gal @ \$0.25/gal	\$3,720
<b>Total Savings, USD(\$):</b>	<b>\$11,880</b>

## Benefits of Proper Insulation

- Easier management of interior climate
- Reduced heat loss and heat gain
- Decreased condensation
- Improved air barrier
- Increased sound absorption

Savings from Adding Fiberglass Insulation	
Area (sq ft.)	1500
Initial R-value (plywood, and air film)	0.77
Final R-value	20.54
Heating Degree Days (HDDZ)	4281
Cost/Unit of heating fuel (\$/lb)	0.9
Btu/Unit	93000
Heating Efficiency	0.65
Annual Dollars Saved	\$2,868.20

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## Fiberglass Insulation

The price on this type of insulation varies on the R-value it associates with and the area covered. The R-Value increases by 3.1 – 3.4 per inch of batt insulation (type of fiberglass insulation, which comes in sections). Based on the visual parameters of the ceiling, it seems that there 2x6 beams running across, meaning there is around 5in – 6in to fill with insulation. In effect, the R-Value needed for the insulation used for the roof should anywhere between R19 – R21.

Assuming R19 insulation is used, the price per square foot is \$0.27 - \$0.34. In the same way, an estimate of the cost for insulation 1500ft<sup>2</sup> can be anywhere between \$405 - \$510 (not including labor and other installation expenses). On a national average the cost to install this type of insulation is \$1,035 - \$2,470. Using these assumptions, annual dollar savings were computed and shown in the respective table.

## Mushroom Farming

Kaktus Brewing Co. donates a portion of their spent grain to local farmers, they use a portion to feed on-site chickens, and utilize another portion for composting. Kaktus Brewing is planning on putting the spent grains to work as an organic base in which to grow mushrooms.

Kaktus Brewing is planning on using a shipping container to house the operation. The container will be temperature and climate controlled. Not all mushrooms harvested will be used in the Brewery's kitchen, as they are planning to sell all but 10 pounds of their harvest.

Spent grains are an ideal source of nutrients for mushrooms. The high cellulose content of the spent grains is also a key ingredient in producing strong and sumptuous mushrooms. Since the spent grains have already been boiled in the

brewing process, further sterilization is not necessary provided that the grains are either used immediately or stored in air-tight containers. If the spent grains are not properly stored, they can produce bacteria and other forms of fungi.

Based on previous assessments, this implementation is relatively novel, since the most common practice for spent hops is donation to local farmers. Mushroom farming, however, is becoming more popular across the U.S. as it can provide a decent source of supplemental income.

## Kaktus Mushroom Farming Specifics

- Kaktus Brewing is planning to grow 60 lbs. of fungi per month
- Currently, white mushrooms are selling for \$4 & \$7 per lb. for non-organic and organic, respectively
- With these values, an approximate supplemental income of \$420 per month is yielded
- Shiitake mushrooms and other mushroom species are sold for much higher prices. If Kaktus Brewing were to grow Shiitake mushrooms, a profit of up to \$20 per lb. could be generated.

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## Replacing Patio Heaters

Kaktus Brewing Co. utilizes propane heaters to distribute heat on their patios during the winter months. These heaters are known to be inefficient, and as such they absorb a majority of Kaktus Brewing's profits during the months of use. These heaters also pose safety hazards as the metal components become very hot. These hot parts have the potential to melt or damage surrounding materials, and even harm customers. According to the EPA, burning propane emits roughly 135 pounds of carbon dioxide per million BTU. If Kaktus Brewing Co. found an alternative heating source paired with new insulation, they could be reducing their CO<sub>2</sub> output by about 7 tons.

## Total Annual Savings Generated from Suggested Implementations

