

Alibi Ale Works Brewery and Barrel House CO₂ Capture and Ozone Cleaning



Incline Village, NV

Hazardous Materials Reduced:
2,600 lbs/year less CO₂ released

Annual Savings:
2,600 lbs/year

Annual Opportunity Cost:
\$30/lb CO₂ x 2,600 lbs/year
= \$78,000

- Case Study focus is to share best practices that can assist the brewing industry in preventing pollution and accidental releases, minimizing waste, and protecting the environment.
- Best practices include: Carbon Dioxide (CO₂) capture, Ozone (O₃) cleaning, pollution prevention, and seismic safety at Alibi Ale Works Brewery and Barrel House in Incline Village, NV.

Key Findings:

- Climate Protection includes the use of bulk CO₂ tanks, and all tanks are bolted onto the concrete floors of the brewery to prevent accidental releases.
- 2,600 lbs/year less CO₂ is released into the atmosphere because of the transport and use of bulk CO₂ in the brewery. CO₂ monitors are installed in all coolers to detect CO₂ leaks. To date, there have been no accidental releases of CO₂ in the brewery.
- Methods for release prevention include securing the bulk CO₂ tanks and daily walk-through checks by Alibi team members.
- Environmental health and safety of workers, visitors and neighbors on and near the site are a high priority for Alibi management and all team members.

Introduction

- **Alibi Ale Works** operates a brewery and barrel house, restaurants, pubs, and beer garden in Incline Village, NV and Truckee, CA. (Website: alibialeworks.com)
- Description of the process at Alibi Ale Works that may be unique to the brewing industry, barrels per year, and sustainability practices are below.
- Alibi brewers use a dry hopping method, spunding valves, and CO2 capture in their brewing process to enhance the flavor, maximize the quality of their beer, and reduce their CO2 use and release for environmental protection and cost savings.
- Capturing CO2 on site at Alibi Ale Works saves 2,600 lbs/year, using a closed loop cycle on site for CO2 management.
- Environmental and cost benefits result from the saving of CO2 at Alibi Ale Works.

About Alibi Ale Works Brewery Barrel House

All Alibi Ale Works locations, including the restaurant, are in the Lake Tahoe area:

- *Brewery and Barrel House – 204 East Enterprise St., Incline Village, NV*
- *Incline Public House – 931 Tahoe Blvd., Incline Village, NV*
- *Truckee Public House – 10069 Bridge St., Truckee, CA*

Unique processes and methods for saving 2,600 lbs/year of CO2 are utilized. Special features include CO2 capture and bulk purchases and shipments to Alibi Ale Works. Finer CO2 bubbles in the beer, improved aroma quality and head retention, and added creaminess in the finished beer all result in a higher quality product. Staff also clean the tap lines every two weeks for quality control and safety.

Alibi has a positive working relationship with North Lake Tahoe Fire Protection District; the Fire Marshall and Inspector walk through the brewery on a regular basis.



They have maintained or increased their number of employees since beginning operation in 2014, and they currently employ 55 staff.

Each employee receives worker health and safety training, safety meetings, and personal protective equipment (PPE).

Seismic Safety Measures are carried out in the brewery and barrel house, as Nevada is one of the most seismically active states in the United States. Spill prevention and release prevention measures during and after an earthquake are incorporated in the Alibi Ale Works program for worker and visitor safety. For example, fermentation tanks are bolted securely to the floor of Alibi Brewery; dry hops are purchased in bulk packaging and stored on pallets; and a maximum of three pallets are stacked, one on top of the other, for worker protection and seismic safety.

CO2 Capture and Ozone Cleaning/Sanitizing



Spunding valve used in the CO2 capture process.

CO2 Capture

CO2 forms during the fermentation process and carbonation of the beer; capturing the CO2 saves on the total cost of production. Alibi Ale Works is saving 2,600 lbs/year of CO2 during the brewing process. Tap lines are cleaned with a chlorinated alkaline cleaner every two weeks, and they are cleaned with an acid cleaner and water to finish every three months. On a yearly basis, gaskets in the storage tanks are replaced to prevent the loss of CO2 into the brewery. The CO2 is measured in the beer, and Alibi has installed CO2 monitors inside the brewery to detect leaks within the enclosed indoor environment for safety. To date, there have been no accidental releases of CO2 in the brewery.

Spunding valves are used during fermentation to control tank head pressure, capture natural CO2, produce finer CO2 bubbles in the beer and foam, enhance aroma, and to add creaminess and softness to the foam, which helps retain the aroma.

Ozone Cleaning

Alibi maintains a clean and sanitary workplace in the brewery, using high pH (caustic) cleaning agents, and scrubbing the floors and drains with cleaning agents, hot water, agitation, ozonated water, periacetic acid, and isopropyl alcohol.

Cost Savings and Benefits

Purchasing materials in bulk reduces emissions and shipping costs for beer production. Bulk purchasing reduces the cost per pound of materials and inputs of production, including hops, bulk CO2, brewer's yeast, malt, and water. Fewer shipments are needed per year, thus reducing CO2 emissions from delivery vehicles, especially during the transport of bulk CO2 and hops.

Table 1. CO2 Capture Cost Savings

Annual CO2 Savings	2,600 lbs
Annual Opportunity Cost	\$78,000



Kevin Drake, Co-Owner and President of Alibi Ale Works, expresses his commitment to quality, "Sustainability is close to my heart. I have studied and worked as an environmental scientist and forest ecologist, and we have brought that knowledge and ethic into our brewing at Alibi Ale Works. We always strive to make environmentally responsible choices and work in the most sustainable way possible."

