PENTAIR

CASE STUDY

HOW TENNENT'S BREWERY COLLECTS & RECOVERS ITS OWN CO_2

Tennent's Brewery Glasgow, Scotland.

THE NEED FOR A DEPENDABLE SUPPLY OF CO_2

Carbon dioxide (CO_2) is an essential component in beer production, required for carbonating beverages, regulating pressure in tanks during fermentation and dispensing, purging oxygen from bottles and kegs during filling, and cleaning and sanitizing equipment.

A shortage of CO_2 can create harmful disruptions for breweries, which could result in delaying many of these essential actions in the beer production process.

Like many breweries, Tennent's Brewery, a Scottish-based brewery, relied on purchasing CO_2, which can pose challenges, such as the environmental impact of transporting CO_2 to the brewery and, depending on the CO_2 merchant market, volatile market prices and supply risks.

Tennent's required a fully end-to-end CO_2 collection and recovery system, allowing them complete autonomy over recovering their CO_2 and the capability to utilize it back into the beer production process.

TENNENT'S BREWERY - A PART OF SCOTTISH HISTORY

Tennent's Brewery has a remarkable legacy that extends across numerous centuries. Since its inception in 1740[1] , it has contributed to Scotland's thriving brewing industry.

Their flagship product, Tennent's Lager, has become an iconic Scottish beverage beloved by many. As the market grew, so did Tennent's Brewery, expanding and modernizing to meet the demand. They remain a vital part of Glasgow's identity and a symbol of Scottish brewing heritage.

The brewery is committed to being environmentally responsible, having set up a wastewater treatment plant that produces biogas, which is used as a heat source for the brewery. They are also moving to fully recyclable cardboard packaging, removing 150 tonnes of plastic packaging annually[2], and, most recently, have installed a CO_2 collection and recovery system.

COLLECTING & RECOVERING THEIR OWN CO_2

Tennent's Brewery uses high-gravity brewing, which creates more CO_2 during fermentation than regular brewing because of the higher concentration of fermentable sugars in the wort. This results in more substrate for the yeast to metabolize.

A common practice in brewing is to vent this CO_2 into the atmosphere to release pressure within the fermentation vessels, which, in turn, increases the brewery's carbon footprint.

As a brewery committed to sustainability, Tennent's sought to collect (or harvest) and recover the CO_2 they previously vented. This was when they turned to Pentair for assistance.

Pentair, a process-oriented solution provider with a substantial worldwide footprint in carbon recovery solutions, supplied a complete package that included the collection, recovery, vaporization, and storage of CO_2.

"As an environmentally conscious brewery, it was a natural decision to utilize the CO_2 generated in our fermentation process and incorporate it back into our brewing. Thanks to Pentair's expertise, we could implement the technology. From start to finish, our experience with Pentair was exceptional. They recommended a comprehensive system that allows us to recover our CO_2 and reintroduce it back into our brewing process through a collection capability. With this system in place, we can avoid the fluctuations of the CO_2 market and focus on consistent and reliable operations."

Alasdair Hamilton
Engineering Manager, C&C Group
Tennent's Brewery

TO LEARN MORE VISIT FOODANDBEVERAGE.PENTAIR.COM

[1] *"A Legend is Born, A milestone in Scottish History", Date accessed 24/10/2023, https://tennents.co.uk/heritage/our-story*
[2] *"Sustainability, Out of Plastics", Date Accessed 24/10/2023, https://www.tennents.co.uk/sustainability*

Alistair Fyfe of Tennent's Brewery standing in front of the Pentair Südmo Double Seat Valve Gas Manifold.

HARVESTING CO_2 FROM FERMENTATION

The first step for Tennent's was to adapt its fermentation process from an open (atmospheric) fermentation to a closed fermentation vessel with controlled gas in and out. This change required a significant modification to the existing fermentation process.

Pentair used its Tank Top Valve technology to collect CO_2 gas from Tennent's cylindrical, conical fermentation tanks (CCT). This innovative design prepares the gas for harvesting and allows simultaneous cleaning of the fermentation tank from the same supply pipe, meaning no additional cleaning piping is needed.

Once the CO_2 is collected from the fermentation tanks via the Pentair Südmo Valve Tank Tops, the gas is directed to the Pentair Südmo Double Seat Valve Gas Manifold, a centralized gas and CIP (cleaning in place) media distribution system. From there, the gas can be sent to either a foam trap or a vent trap (if the purity of the CO_2 is insufficient for harvesting). The foam trap ensures that the raw fermentation gas is transferred to the Pentair Haffmans CO_2 Recovery system foam-free.

Due to their small footprint, these gas manifolds are easily installed in existing cellars. They are fully automated and integrated into Tennent's process control, with a view to providing brewers with fermentation (and CO_2 recovery) control.

Detailed engineering of the prefabricated gas manifolds and fermenter tank tops was vital to keep the downtime in the CCT area low, with the installation of the new tank tops, gas manifolds, and fermenter bunging valves performed in parallel to the running production.

CO_2 RECOVERY

After the initial fermentation process, the raw, foam-free gas is sent to the CO_2 recovery plant. Here, it is buffered and scrubbed of water-soluble contaminants (like ethanol). The gas pressure is then increased to 18barg (261psig) using a two-stage CO_2 compressor unit, removing condensate. The remaining impurities are removed using a dual-activated carbon filter and drier unit.

At the end of the recovery process, the CO_2 is liquified and stored in a liquid storage tank. From there, the CO_2 can either be exported or sent to the vaporizer, where the CO_2 will be processed into gas form and sent to the CCT and BBT (bright beer tank) area to be utilized back into the brewing process.

Ernst Aalbers, Product Manager of Pentair CO_2 Recovery, comments, "Our dedication to technology and sustainability has led us to create a system that empowers brewers by collecting and recovering CO_2 from their fermentation process. With our technology, breweries can reduce their carbon footprint and focus on what they do best: crafting outstanding beer."

KEY FACTS

LOCATION
GLASGOW, SCOTLAND

BEFORE
NEEDED TO BUY 4,000 T OF CO_2 ANNUALLY

APPLICATION
CO_2 RECOVERY FOR BREWERIES

NOW
RECOVERS 4,200 TONS OF CO_2 ANNUALLY, REPURPOSING 95% INTO THEIR BREWING PROCESS [3]

FOR MORE INFORMATION:
CONTACT US OR VISIT FOODANDBEVERAGE.PENTAIR.COM

[3] *Tennent's Brewery has not needed to buy CO_2 from external, third-party sources due to the Pentair CO_2 Collection & Recovery system.*

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