

HAFFMANS COMPACT CO₂ RECOVERY SYSTEM MOSTEREI MÖHL AG

CASE STUDY

COMPACT CO₂ RECOVERY SYSTEM – DESIGNED FOR BEER, USED WITH CIDER



KEY FACTS

Location

Arbon, Thurgau region, Switzerland

Application

Cider production

Medium

CO₂ gas from cider fermentation process

Capacity

75 kg/h

Start-up

May 2010

As part of the expansion of its unique wooden barrel cellar, the Swiss cider-maker Möhl installed a Pentair Haffmans' compact CO₂ recovery system, a new type of plug-and-play design, which was originally created for use in small- and medium-sized breweries. This was the first compact CO₂ recovery system built worldwide and the Möhl cider manufacturing plant is the first in Switzerland to recover all its CO₂ with such a modern treatment process.

Since 1895, in the Thurgau region in Switzerland, Möhl has been making cider in the same tradition with the naturally cloudy "juice from the barrel" stored in large wooden barrels holding up to 20,000 liters for three months. It is then mixed with 30 percent sweet must, carbonated to approximately 3.5 g/l and bottled. Just to avoid misunderstandings: "juice" in Thurgau means cider with alcohol content!

Every year between 9,000 and 13,000 tonnes of fruit must are pressed at Möhl. The freshly pressed sweet must is either quickly pasteurized and bottled as fresh "juice from the press", fermented with pure yeast to make cider, stored in sterile conditions or carefully concentrated. The concentrate is stored in tanks and can later be diluted with water and fermented as required.

The Möhl business produced only cider up until 1947 when apple juice production started. Part of the reason was that this was when the Böhi process, a practical technique for preserving the sweet must by storing it at 7 °C and 7 bar CO₂ pressure, became established in the market place. This Böhi process was a typically Swiss phenomenon with an interesting side-effect. "For Swiss consumers, apple juice has, so far, always been carbonated," explained Markus Möhl, who is in charge of technology at the Möhl cider factory.

Previously, at the Möhl cider factory, when the "Böhi" CO₂ was recovered from the fermentation process, the CO₂ was first purified with water and an active carbon filter, and then stored at 7 bar and used in the plant. Greater consumption of CO₂ subsequently became synonymous with rapidly rising tank capacities and space requirements because the CO₂ was only gaseous in form and therefore very inefficient to store.

One liquid tank replaces the whole cellar

Production at Möhl became ever more CO₂-intensive over the years because of the ciders currently sold around two-thirds are alcohol-free and therefore have to be carbonated like the spritzers.

"We, in fact, kept our large Böhi cellar only because of the carbon dioxide," Möhl said. "We have now replaced all these tanks with a single liquid CO₂ tank. In the space that has been freed up, we are now making our new storage cellar with twelve 18,000 liter wooden barrels. With the compact CO₂ recovery system we have simply created space for our unique selling proposition – the wooden barrels. And the quality of the CO₂ is much better as well."

Delivered ready to work

The idea for the project first emerged in 2009 with delivery of the compact CO₂ recovery system in March 2010 and commissioning by May. At the Pentair Haffmans' factory in the Netherlands, all necessary components for the system are either pre-mounted on skids, as was the case at Möhl, or placed in 20 or 40 foot containers. After delivery the system is connected, cabled, completed with piping, and function-tested. For the customer this means fast commissioning. At the Möhl cider factory the individual frames were placed in production rooms.

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The framework module with compressor, activated carbon filter, gas scrubber, drier, gas holding tank, and an additional foam trap were placed in the cellar. The refrigeration unit was set up on another floor.

The whole system works outstandingly well

"We have everything cold in the cellar and everything hot is installed on the top floor," Möhl said. "In winter we use the waste heat for indoor heating, and in summer it is carried away over the roof. We take the cold air to cool the cellar. So the concept is also energy efficient."

The Pentair Haffmans plant draws in 75 kg/h. That is the largest possible option with an air-cooled compressor, and was chosen to optimize the price/performance ratio.

With its compact CO₂ recovery system the Möhl cider factory now fully recovers the CO₂ necessary for its operations. Fermenting mixed concentrate makes continuous production throughout the year possible.

This is where the cycle has similarities with the brewing industry. Comparable quantities are also involved: the "base wort" of the apple juice corresponds to that of a "full beer" (beer with 11-14 percent original wort) and its rapid fermentation is fully comparable with the production of wheat beer.

The proven Pentair Haffmans solutions are transferable across different beverages as Möhl expressly confirmed, "The whole system works outstandingly well."



MÖHL'S CO₂ RECOVERY SYSTEM AT A GLANCE

Medium	CO ₂ Gas from Cider Fermentation Process
Suction capacity	75 kg/h
Suction conditions	CO ₂ gas, 1,0 bar at 20 °C
CO ₂ gas inlet purity to plant	≥ 99,7 Vol. % CO ₂
CO ₂ outlet purity	> 99,97 Vol. % CO ₂ w
Storage conditions	17,5 bar(g) at -24 °C
Cooling plant	Environmentally friendly medium

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P.O. BOX 3150, 5902 RD VENLO, NETHERLANDS WWW.HAFFMANS.NL

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