



 knowhow@norit.com

 Beverage

# Norit Haffmans helps Brand Brouwerij to be more sustainable! CO<sub>2</sub> as refrigerant, a cool piece of art!

The Dutch-based Brand Bierbrouwerij BV has a long history with centuries of experience. Since 1340, beer has been brewed in Wijlre. Brand Bierbrouwerij, which is part of Heineken, was one of the first breweries that chose a Norit Haffmans CO<sub>2</sub> recovery plant with a double cooling unit, using CO<sub>2</sub> as refrigerant.

The brewery was looking for a new CO<sub>2</sub> recovery plant that met the following requirements:

- Run continuously on 300 kg/h with a maximum capacity of 500 kg/h
- Be energy efficient
- Contribute to a more sustainable brewery

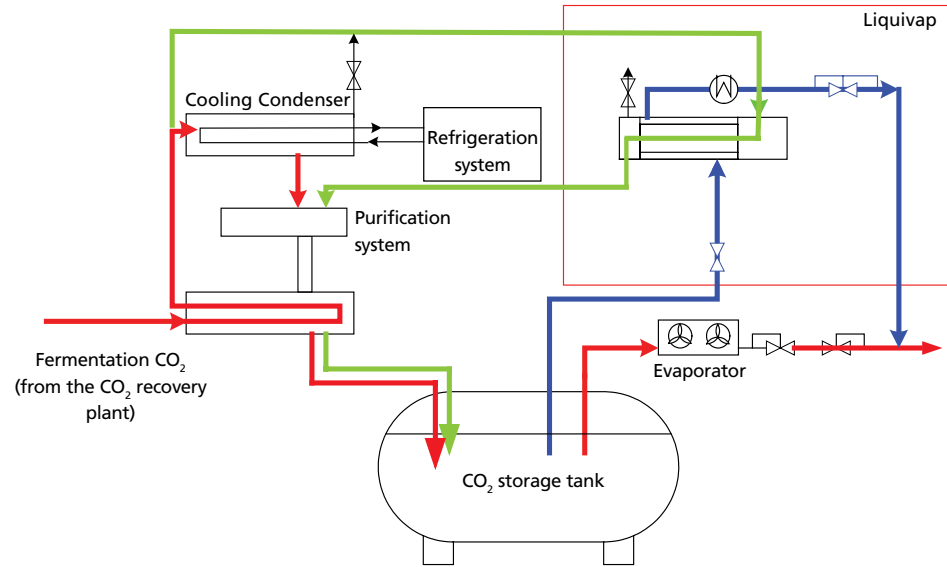
As a specialist in CO<sub>2</sub> management Norit Haffmans develops and supplies a range of solutions from cost-effective conventional CO<sub>2</sub> recovery plants to state-of-the-art plants incorporating the latest technologies, including using CO<sub>2</sub> as refrigerant.

In the past, CO<sub>2</sub> was used as a refrigerant but was replaced by chemical refrigerants such as chlorofluorocarbons. These haloalkanic gases are created by chemical processes and dissolve when they are released into the atmosphere. For a long period of time, these haloalkanes were believed to be safer, more energy efficient and cheaper than natural refrigerants. However, recent research has shown that they are one of the major causes for the reduction of the ozone layer and contribute to global warming. As a result of this, working with chemical refrigerants is put

under strict supervision of the government. This increased the demand for natural coolants.

CO<sub>2</sub> gas has a high density compared to other refrigerants and therefore the overall pressures in the cooling system are high. This used to be a disadvantage compared to other refrigerants, but with the renaissance of CO<sub>2</sub> big manufacturers of cooling equipment have developed new materials and components especially for CO<sub>2</sub>, making a CO<sub>2</sub> cooling unit safe and reliable. The positive side of the high density of CO<sub>2</sub> is that its very energy efficient at low temperatures. By installing a Norit Haffmans CO<sub>2</sub> recovery system, including CO<sub>2</sub> as refrigerant, the CO<sub>2</sub> is cooled down to -30 °C and sometimes even -40 °C, which saves energy and reduces the emission of detrimental gases.

Because it is a closed cooling system, no gases are emitted to the atmosphere. The only emission is caused by the electrical energy usage, produced from fossil fuels. The electrical energy efficiency of a cooling system therefore determines if the installation is environmentally friendly.



Using CO<sub>2</sub> as refrigerant has the advantage of being:

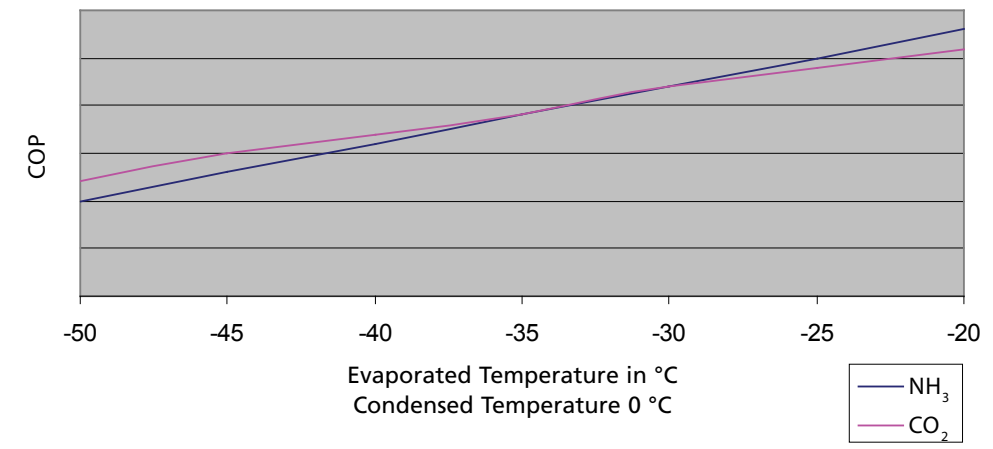
- Environmentally friendly as CO<sub>2</sub> is non-corrosive, non-flammable.
- The amount of CO<sub>2</sub> produced in the installation is not harmful to employees. With the use of detectors, leaks easily can be tracked down.
- A coolant with good cooling properties at a lower temperature providing energy savings.
- Cost-efficient, with lower operating costs.

Norit Haffmans offers a CO<sub>2</sub> recovery plant, operating at low temperatures (-40 °C and -30 °C) with a cooling unit working as a cascade system in combination with Brand Bierbrouwerij's NH<sub>3</sub> cooling system (CO<sub>2</sub> - NH<sub>3</sub>). Heat coming from the recovery system is cooled by Brand Bierbrouwerij's NH<sub>3</sub> cooling system. Especially in such a combination, the energy return is very positive.

Norit Haffmans already uses CO<sub>2</sub> as refrigerant in the LiquiVap heat recovery system. The LiquiVap system optimally applies the two "neglected" energy streams - heat released when liquefying CO<sub>2</sub> gas and cold released when evaporating liquid CO<sub>2</sub>. Effectively, LiquiVap simultaneously facilitates the liquefaction of incoming CO<sub>2</sub> gas (from the fermenters) and vaporization of incoming liquid CO<sub>2</sub> (from the storage tanks) as shown in the drawing on the opposite page. The LiquiVap system, however, is not a closed cooling system with high pressures and moving parts like a cooling compressor. Consequently, electrical energy and maintenance costs are minimal.

At Brand Bierbrouwerij bringing all advantages of CO<sub>2</sub> as a coolant together optimized the cooling system. The cooling system consists of a LiquiVap working closely together with the closed cooling system using CO<sub>2</sub> as refrigerant. LiquiVap is an acronym for liquefy and evaporate. As the words mention, the

Energy Comparison NH<sub>3</sub> / CO<sub>2</sub>



cooling energy stored in the liquid CO<sub>2</sub> is re-used for condensing the CO<sub>2</sub> gas that needs to be condensed. By "recycling" this cooling energy, 90 percent of the required cooling energy can be recovered and saves up to 60 percent of the electrical energy costs.

Brand Bierbrouwerij decided to install a LiquiVap due to the fact that the LiquiVap system produces cooling energy when it's most needed, during the high production time. When the brewery runs on full capacity the NH<sub>3</sub> cooling system delivers just enough cooling energy when the need of CO<sub>2</sub> gas from the brewery is at it's greatest. Therefore the LiquiVap can produce at full capacity, creating a lot of cooling energy and relieving the NH<sub>3</sub> system.

With regard to future expansion plans this could be a problem as the NH<sub>3</sub> cooling unit, by itself, would not be sufficient to meet cooling energy needs. By installing a Norit Haffmans LiquiVap, the brewery saves a lot of energy and costs and is also prepared for expansion in the future. Norit Haffmans offered the brewery a solution that not only meets requirements, but also proved

to be a real partner who thinks ahead to the future.

**Niels den Heijer**