



# Saving energy in pumpless cooling systems

## Brazed heat exchangers integral part of sustainable refrigeration system Case story

The phase-out of ozone-depleting synthetic refrigerants in refrigeration systems becomes increasingly commonplace. Carbon dioxide, CO<sub>2</sub>, is one of the natural alternatives.

As early as the beginning of the 1990s, the Danish company Birton A/S saw the potential of carbon dioxide as a vital part of natural-refrigerant cooling systems. These systems are not only more lenient on the environment; they also significantly increase the efficiency of processes where they are used.

### Developed “pump-less” system

Today, Birton’s sustainable refrigeration systems with natural refrigerants are produced and sold under the brand CO<sub>2</sub>OL Solutions. “Our first CO<sub>2</sub> installation was a low temperature cascade system back in 2001,” says Bent Johansen, CEO at Birton.

In 2004, Birton developed medium and high-temperature systems with up to 50 bar CO<sub>2</sub> design pressure. Says Johansen: “Since there were no suitable CO<sub>2</sub> pumps available, we had to find other solutions to generate a pumping pressure. This led to the development of our thermal pump system, which circulates CO<sub>2</sub> using ‘free energy’ only.”

Interestingly, this “pump-less” system uses no pump, compressor or other mechanical device. Instead, it consists of two vessels, heat exchangers and pipes – with no moving parts. The system can be used as an alternative to (or replacement for) central refrigeration and air-condition systems using direct expansion of synthetic refrigerants, or in chillers with water or brine systems. Typical applica-



Bent Johansen, CEO at Birton, saves energy for his refrigeration customers.

tions are found both in commercial and industrial refrigeration.

### Significant savings

In Birton’s CO<sub>2</sub> system, a condenser is cooled by the primary refrigeration system [see flowcharts on second page]. Gravity leads liquid CO<sub>2</sub> to one of the two pumping vessels, where the pressure is equalized with the condenser pressure. The pumping pressure is generated by liquid from the primary system, which heats CO<sub>2</sub> trapped in the other vessel. This pressure sends the liquid CO<sub>2</sub> to the evaporator. When the pumping vessel is empty, the system alternates.

### Fast Facts:

#### The customer

- Birton A/S: headquartered in Viby, Denmark, with branch offices and service centres in Copenhagen, Denmark, and Flensburg, Germany.
- 35 employees
- One of Denmark’s leading suppliers of commercial and industrial HVAC and refrigeration systems, with a focus on energy efficiency and natural refrigerants.

#### The challenge

- Finding the right line of heat exchangers for the company’s advanced, patent-pending thermal pump system.

#### The benefits

By switching to Alfa Laval’s brazed heat exchangers, Birton gained several benefits, including:

- High-quality, reliable products
- Technical expertise
- Short delivery time



One of Birton's "pump-less" thermal pump systems where a plate heat exchanger replaces the pump.

"Without pumps and compressors," Johansen says, "energy consumption is reduced and the risk of pump cavitations is eliminated. Furthermore, fewer components means minimal maintenance needs."

Any primary refrigerant can be used with the system (including HFCs), but it can be confined to the compressor room or to an air-cooled outdoor unit, which greatly reduces the risk of leakage. Also, the amount of primary refrigerant is lower, which benefits the environment. For Birton's customers, it all adds up to major savings. By installing a Birton CO<sub>2</sub> system, one of the company's customers has saved roughly 40 per cent on energy, which translates into big money.

### The natural choice

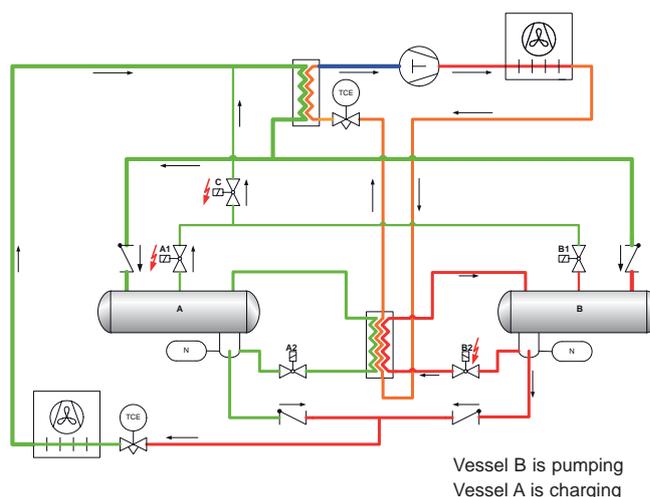
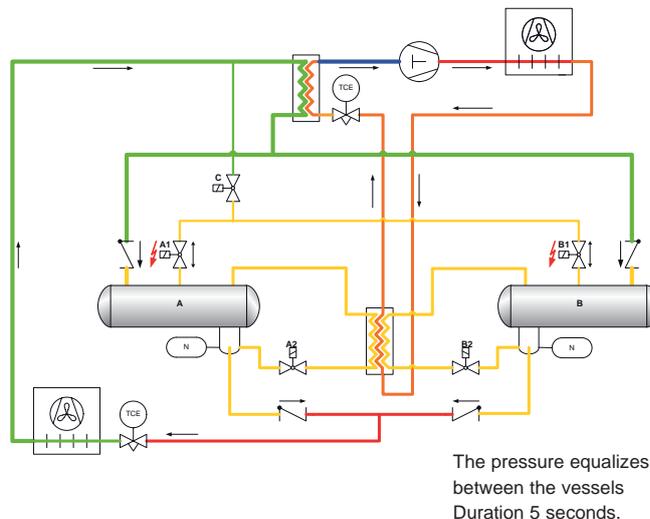
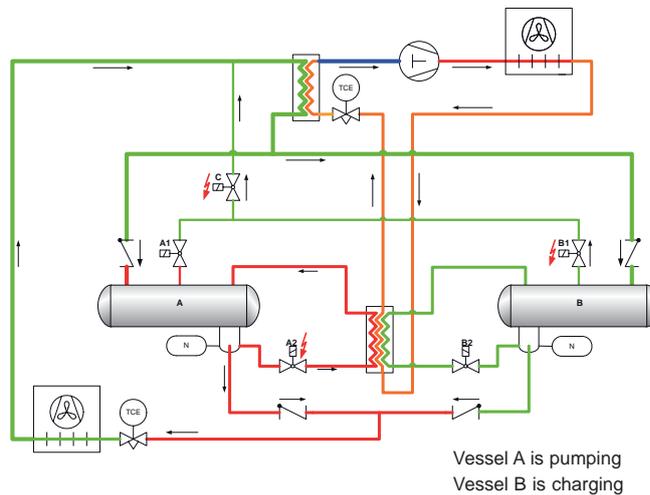
Birton relies heavily on the components they use. "We're a system builder," says Johansen, "and therefore the quality of all components is critical. Because the plate heat exchangers are so essential to the performance of our thermal systems, we chose to go with Alfa Laval. As a world leader in their field, they give us top-quality products, good delivery times, and the technical expertise that we need to feel comfortable."

#### About the product:

Birton has ordered around 50 Alfa Laval brazed heat exchangers.

These products offer:

- Superior heat transfer
- Extremely small footprint
- Cost efficient, reliable operation
- Simple installation



#### How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com).