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Turning to Green Fluids

Bio-based, sustainable heat transfer fluids demonstrated advanced performance and energy savings.

By Laurie Kronenberg, DuPont Tate & Lyle Bio Products Co. LLC

Blédina, a Danone company, wanted to replace the production refrigeration plant at its Brive site, its largest factory for infant foods in Europe. Seeking to reduce energy consumption and environmental impact, Blédina selected Climalife to assist them in selecting an environmentally friendly and energy-efficient solution, which included a high performing bio-based heat transfer fluid.

Eliminating the Existing R22 System

Climate change is having a significant impact on the natural cycles that influence the food industry. As a major producer in the food industry, the Danone group takes a unique business approach integrating solutions for better health, better lives and a better world. It has a vested interest in contributing to the fight against global warming by helping to

establish a carbon-free economy. “To bring health through food to as many people as possible, we are committed to achieving long-term zero net carbon through solutions co-created with our partners,” says Frédéric Lebas, director of the Blédina site in Brive-la-Gaillarde, France.

Blédina is particularly committed to reducing its impact on the environment, both in its manufacturing processes and in its products. The carbon footprint is measured across its entire value chain: at its own operating level (logistics, operations, packaging, etc.) and that of its suppliers (agricultural holdings, etc.) as well as for consumers and local communities. After reducing its carbon footprint by 37 percent between 2007 and 2013, Blédina has reinforced its commitment with a 50 percent reduction target by 2020.

Many refrigerant gases such as R22 have high global warming

potential (GWP). The leakage of refrigerant gas is a small but significant source of greenhouse gas emissions. Also, refrigerant losses negatively affect the energy efficiency of a refrigeration or air-conditioning system and, therefore, increase energy consumption.

When replacing the refrigeration system on the Brive-la-Gaillarde site, Nicolas Tomas, the technical manager of refrigeration at Blédina, had to look for an energy-efficient solution that could contribute to reducing the site’s carbon footprint. It was also important to achieve compliance with the ISO 14001 (environmental management system) and 50001 (energy management system) standards.

Blédina Selects Carbon Dioxide Refrigeration System

The production refrigeration plant at the Brive site cooled two

above-zero cold rooms as well as a subzero cold storage room. With temperatures in this range, a CO₂ transcritical system can be an effective solution. A transcritical cycle is a thermodynamic cycle where the working fluid goes through both subcritical and supercritical states. This is often the case when carbon dioxide (CO₂) is the refrigerant. Due to the tight installation deadlines, this type of system was not an option for cooling all three locations.

Instead, what Blédina opted for was a multipart solution. For the subzero cold storage room, a cooling unit using CO₂ with a power capacity of 127 kW at -0.4°F (-18°C) was selected. CO₂ is called a natural refrigerant because it exists in the environment naturally. A release into the atmosphere from the refrigeration systems would have a negligible effect, particularly compared to other CO₂ sources that



The Blédina facility also incorporates a central CO₂ unit.

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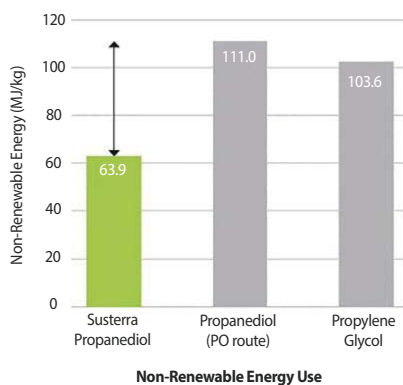
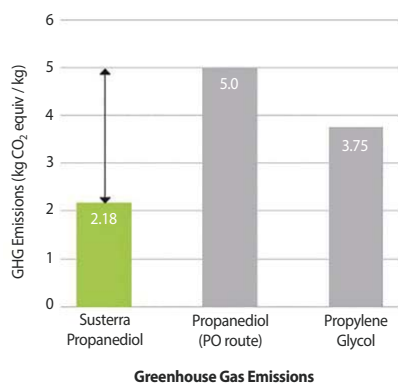
And outdoor chiller also was installed at the Blédina facility.

are driving the global warming debate. In industrial refrigeration installations, there is no need to account for the amount of CO₂ used, and it does not need to be reclaimed.

For the above-zero cold rooms, a Trane unit running on R134a with a power capacity of 268 kW at 21°F (-6°C), and a secondary refrigerant circuit was selected. The

low pressure of this unit makes R123 refrigerant far less likely to leak from the system. As long as the refrigerant stays in the system, it cannot harm the environment. In fact, Trane guarantees a leakage rate of less than 0.5 percent per year for this type of unit – a fraction of federal allowable limits in the United States.

From extraction and production prior to delivery to the consumer, Susterra propanediol produces 56 percent less greenhouse gas emissions and consumes 42 percent less nonrenewable energy than petroleum-based 1, 3-propanediol. Compared with propylene glycol, Susterra propanediol produces 42 percent less greenhouse gas emissions and uses 38 percent less nonrenewable energy from cradle to gate.



Bio-Based Heat Transfer Fluid Tapped

With this type of arrangement, a secondary heat transfer fluid was needed that could contribute to reducing the site's carbon footprint. Nicolas Tomaz, reached out to Climalife, a producer of heat transfer fluids, and quickly settled on Greenway Neo fluid for the secondary refrigerant circuit. "Our goal was to replace R22 with the



For Blédina's subzero cold storage room, a cooling unit using CO₂ with a power capacity of 127kW at -0.4°F (-18°C) was selected.

most environmentally friendly and energy efficient fluids," explains Tomaz. "The safety data sheet does not have any hazard warnings or symbols on the label."

Greenway Neo heat transfer fluid has a unique composition based on bio-based Susterra propanediol by DuPont Tate & Lyle Bio Products. The glycol is derived from renewable plant-based sourced feedstocks that are harvested, fermented and refined to manufacture a 100 percent bio-based solution. Greenway Neo Solar heat transfer fluid also is free of borax. It has been specially formulated utilizing organic products.

A key aspect of Climalife's heat transfer fluid that played a significant role in the selection was its performance. Greenway Neo fluid offers low viscosity, and this profile profile allowed the site to opt for smaller KSB pumps. This led the way to significant energy savings. "A reduction in pressure

loss of almost 30 percent, which was impressive," explains Tomaz. "This was an excellent surprise and as a customer, we are delighted."

Greenway Neo heat transfer fluid, based on bio-based propanediol, also contributes to the carbon free goal. Susterra propanediol is manufactured through a proprietary process that uses glucose from natural raw materials instead of petroleum-based feedstocks. The basic materials can be derived from renewable, farm-grown sources such as corn. Such a product makes the promise of carbon neutrality and independence from petroleum a possibility. As documented by Loudon process design data and peer reviewed by Five Winds International, the bio-based 1,3-propanediol consumes 40 percent less energy and reduces greenhouse gas emissions by more than 40 percent versus petroleum-based 1,3-propanediol and propylene glycol.

In conclusion, MCI delivered a technical solution to meet Blédina's performance, innovation and environmental requirements while respecting the tight deadline. The CO₂ cooling unit, the Trane unit with the secondary refrigerant circuit running the bio-based heat transfer fluid, a heat recovery unit for deicing, and implementation of hydraulic and electrical energy meters delivered the optimal solution. The investments that allowed Blédina to take advantage of the Energy Saving Certificates (EEC), granting them 10 percent back of the total investment. **PC**

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