Rivarose's fermentation tanks can process up to 6,340 gallons (24,000 liters) of sparkling wine

# Sustainable Heat Transfer Fluid Helps Winery Meet Production Goals

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

By Laurie Kronenberg, DuPont, Tate & Lyle Bio Products Company, LLC

Rivarose, a Salon-de-Provence, France-based producer of sparkling wines, wanted to combine its two production plants on a single site in Salon-de-Provence, France. SMEF Azur, a France-based specialist in thermal installations, was asked to review Rivarose's refrigeration system in order to ensure the continuity of its process. One of Rivarose's goals was to continue to use its existing refrigeration unit to support the increase in production.

In its specifications, Rivarose called out the use of propylene glycol — one of the most commonly used heat transfer fluids in the food industry due to its low toxicity — as the coolant. After discussions with SMEF Azur, the decision was made to instead use an energy-efficient, bio-based heat transfer fluid: Climalife's Greenway Neo heat transfer fluid, which is based on bio-based Susterra propanediol. The fluid would help ensure the continued operation of the aging refrigeration unit.

## Fermentation, Cold Stabilization for Precise Temperature Control

For modern winemakers, several methods can be used to create sparkling wine and the desired carbon dioxide ($CO_2$) bubbles. The traditional method can be time-consuming and labor-intensive. As a result, over the years, winemakers have developed less costly variations on the process.

The simplest alternative is the tank method. In this method, winemakers induce the secondary fermentation of still wine in a large pressurized tank instead of individual bottles.

The chief advantage of the tank method is its lower cost of production. The tanks are sometimes large enough to produce 100,000 bottles at a time. The wine's basic ingredients and care in production are vitally important — the better the base wine, the finer the product, regardless of fermentation method.

Depending on the desired result, Rivarose uses a traditional fermentation method (in bottles) or the faster tank fermentation method. Precise temperature control is imperative. Nicolas Quiles, technical director and oenologist at Rivarose explains, "We use the temperature to regulate the fermentation and to lower the pressure of the wine during bottling. Thus, when the wine arrives in the bottle, it does not foam. At room temperature, the slightest impurity would cause the wine to react and cause it to lather."

After fermentation, the sparkling wine is cold stabilized in the same jacketed tanks. Cold stabilization is a method of separating unstable natural ionic salts — for instance, potassium (K+), calcium (Ca2+) and bitartrate (HT-) — from wine. Cold stability is conducted to prevent the tartaric salt (bitartrate) from precipitating out of the wine when stored and chilled post-bottling.

The cooling loop for these jacketed fermentation tanks must be able to control the temperature to 68°F (20°C) for fermentation and then drop the temperature of the tanks close to freezing for the cold stabilization. This means the existing refrigeration unit typically cools the heat transfer fluid in the refrigeration loop to 23°F (-5°C).

## Rivarose Selects Heat Transfer Fluid

Not replacing the refrigeration unit was key for the SMEF Azur project at Rivarose. To find the most efficient heat transfer fluid, SMEF Azur worked with Josiane Marin, the key accounts manager in the southeast at Climalife. The company offers a Greenway Neo heat transfer fluid, a technological and environmental

alternative to propylene glycol.

Greenway Neo heat transfer fluid has a unique composition based on bio-based Susterra propanediol, which is manufactured 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 borax-free because it has been specially formulated using organic products.

After an in-depth study of the technical characteristics of the bio-based 1,3-propanediol coolant, Jean-Pierre Leplatre, technical director of SMEF Azur, recommended that Rivarose opt for the sustainable solution. "As an installer, we have a duty to advise [our clients]. It is important for us to follow technical developments and advocate the best

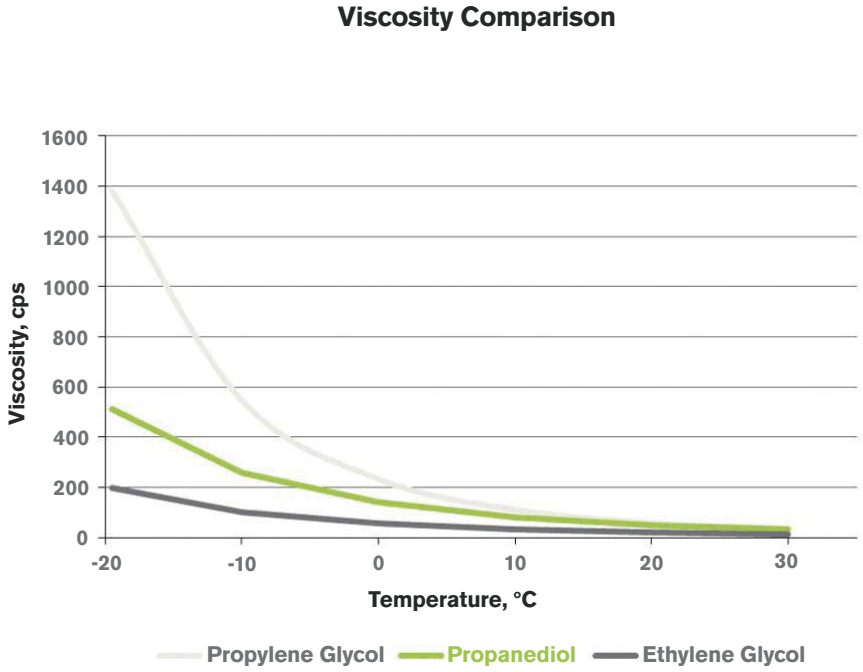


**FIGURE 1. The low temperature viscosity profile of ethylene glycol, propylene glycol and propanediol are compared.**

**Rivarose wanted to retain its existing 120 kW refrigeration unit during a production expansion.**

solution. At SMEF Azur, innovation and the protection of the environment [are] in our genes," he says.

During his study, Leplatre found that the viscosity of the heat transfer fluid based on bio-based 1,3-propanediol was approximately half the viscosity of the propylene glycol fluid previously used in the same fermentation cooling loop. Because the fluid is thinner at lower temperatures, the fluid's performance also reduces the power consumption for recirculation pumps. This enables the system to achieve an overall lower minimum operating temperature. Overall, the viscosity of the coolant had a significant impact on the energy consumption of the installation. For Rivarose, Climalife's bio-based heat transfer fluid made it possible to preserve the environment and reduce the energy consumption of the production site.

Bio-based 1,3-propanediol is nontoxic, approved for food contact and, in some countries, already approved as a food ingredient. It was developed through a joint venture between DuPont and Tate & Lyle in an effort to create more sustainable solutions. The viscosity profile is lower than propylene glycol but higher than ethylene glycol. Figure 1 compares ethylene glycol, propylene glycol and propanediol's low temperature viscosities. Theoretically, based solely on viscosity, 1,3-propanediol heat transfer fluids would offer slightly less system efficiency than ethylene glycol and enhanced system efficiency compared to propylene glycol. Beverage systems typically do not use ethylene glycol due to toxicity.

In the end, Rivarose was able to keep its existing refrigeration unit as it increased its production at the Salon-de-Provence site. The choice of the bio-based, sustainable heat transfer fluid ensure that with minor retrofitting — improving the insulation of the pipes — the existing refrigeration unit could meet the cooling demand.

"The low viscosity of this coolant improves circulation through the heat exchanger," says Leplatre. "It is therefore not necessary to replace the refrigeration unit."

The transition from propylene glycol to the bio-based, sustainable heat transfer fluid — based on Susterra propanediol — reduces the pressure drop by 20 to 30 percent. Also, the energy consumption of all equipment (pumps, etc.) was reduced by approximately 20 percent. In the end, Rivarose was able to bring five more fermentation tanks online — a 20 percent production increase — with the same cooling unit. **PC**

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