Turning to "Green Fluids" – Rivarose Case Study

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

Rivarose, a producer of sparkling wines, wanted to combine its two production plants on a single site in Salon-de-Provence, France. SMEF AZUR, a 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 their existing MTA refrigeration unit to support the increase in production.

In its specifications, Rivarose called out the use of propylene glycol as the coolant, one of the most commonly used in the food industry for its low toxicity. After discussions with SMEF AZUR the decision was made to instead use an energy efficient, low toxicity, bio-based heat transfer fluid to insure the continued operation of the aging MTA refrigeration unit: Climalife's Greenway® Neo heat transfer fluid based on bio-based Susterra® propanediol.

Established in 1909, Rivarose is situated in Salon de Provence and is now Provence's oldest and largest producer of sparkling wines. Rivarose has been part of the Veuve Ambal group since 1998 and is reconized as a leader in the Crémant de Bourgogne market.

Located in the south of France, it employs 35 people and produces 5 million bottles of sparkling wines each year. It sells its wines throughout the world, with 15% of the production being exported to the United States.

<u>Fermentation and cold stabilization require precise temperature control</u>

Today, there are several methods to create sparkling wine and creating the desired carbon dioxide bubbles. The traditional method can be time-consuming and labor-intensive, and over the years, winemakers have developed less costly variations on the process. The simplest is the tank method, in which 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 a faster method in tanks. 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."

Figure 1. Rivarose Fermentation Tanks – Up to 24K Liters of Sparkling Wine

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

The cooling loop for these jacketed fermentation tanks needs to be able to control the temperature to 20°C for fermentation and then drop the temperature of the tanks close to freezing for the cold stabilization. This means the existing MTA refrigeration unit typical cools the heat transfer fluid in the refrigeration loop to -5°C.

The optimal heat transfer fluid for Rivarose

Not replacing the MTA refrigeration unit was key for the SMEF AZUR project at Rivarose. To find the most efficient heat transfer fluid SMEF AZUR turned to Josiane Marin, key accounts manager south-east at Climalife, which offers a technological and environmental alternative, Greenway® Neo heat transfer fluid.

Figure 2. Rivarose 120 kW MTA Refrigeration Unit

Greenway® Neo heat transfer fluid has a unique composition based on bio-based Susterra® propanediol by DuPont Tate & Lyle Bio Products Company. This glycol is derived from renewable plant-based sourced feedstocks that are harvested, fermented, and refined to manufacture a 100% bio-based solution. Greenway® Neo Solar heat transfer fluid is also Borax free as it has been specially formulated leveraging a new generation of organic products.

After an in-depth study of all the technical characteristics of this newer bio-based 1,3-propanediol coolant, Jean-Pierre Leplatre, Technical Director of SMEF AZUR, turned to his client and advised him to opt for this Innovative and sustainable solution. "As an installer, we have a duty to advise. It is important for us to follow technical developments and advocate the best solution. At SMEF AZUR, innovation and the protection of the environment is in our genes," explains the installer.

Rivarose choses a high-performing "green fluid"

The Greenway® Neo heat transfer fluid made it possible both to preserve the environment and to reduce significantly the energy consumption of the production site.

Jean-Pierre Leplatre found that the viscosity of the Greenway® Neo 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. As the fluid is thinner at lower temperatures the fluid's performance also reduces the power consumption for re-circulation pumps and enables the system to achieve an overall lower minimum operating temperature. The viscosity of the coolant had an enormous impact on the energy consumption of the installation for Nicolas Quiles, "the advantage of the Greenway® Neo for Rivarose is clear."

Bio-based 1,3- propanediol is non-toxic, 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 and move away from petroleum-based materials such as traditional glycols. The viscosity profile is more faborable than propylene glycol. Figure 3. compares ethylene glycol, propylene glycol and propanediol low-temperature viscosities. Theoretically, based solely on viscosity, 1,3-propanediol heat transfer fluids would offer slightly less system efficiency as ethylene glycol and enhanced system efficiency compared to propylene glycol. Beverage systems typically do not use ethylene glycol due to toxicity.

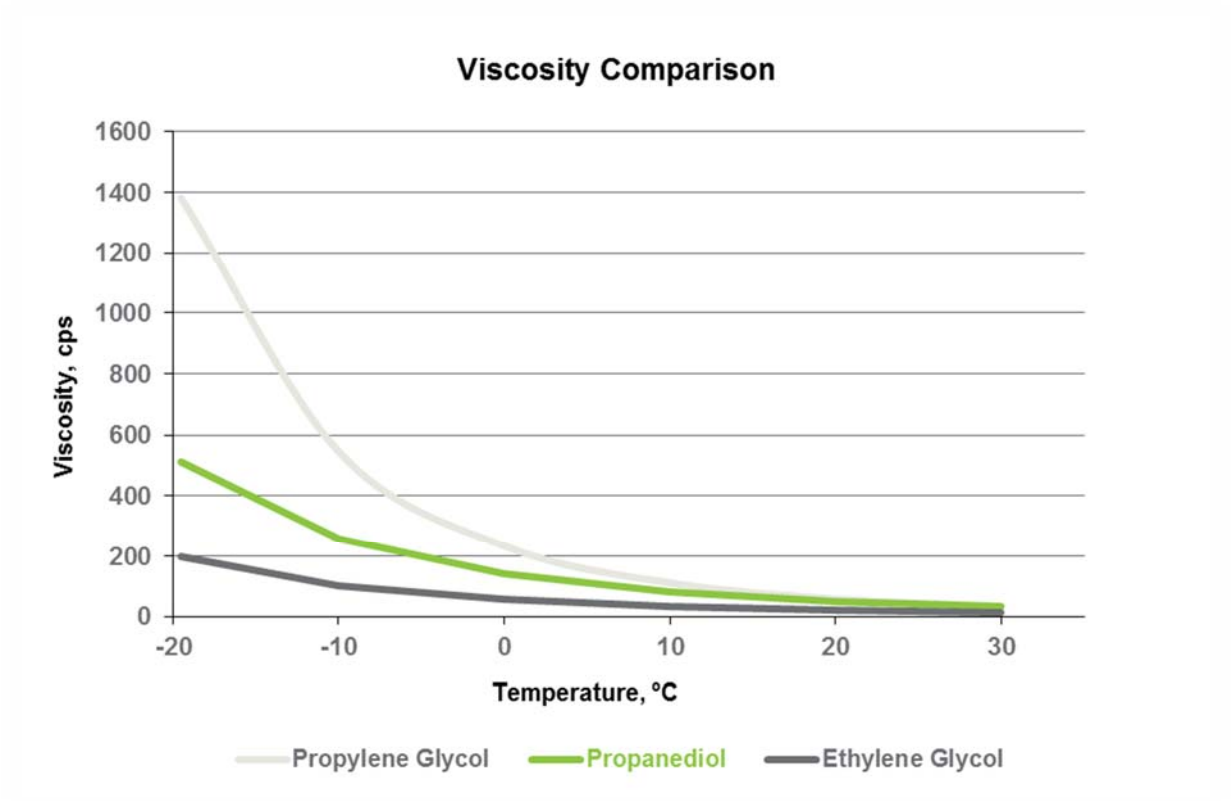

Figure 3. Low-temperature Viscosity Profiles

Beyond the choice of heat transfer fluid, a more energy efficient solution

Rivarose was able to keep its MTA refrigeration unit as it increased its production at the Salon-de-Provence site. The choice of the Greenway® Neo heat transfer fluid made it possible to retain the refrigeration unit by simply improving the insulation of the pipes. "The low viscosity of this coolant improves circulation through the heat exchanger," explains Jean-Pierre Leplatre. "It is therefore not necessary to replace the refrigeration unit. We lost a sale, but we won for the planet!"

The transition from propylene glycol to Greenway® Neo fluid based on Susterra® propanediol reduces the pressure drop by 20 to 30 percent and reduces the energy consumption of all equipment (pumps, etc.) by approximately 20 percent. The facility has been able to bring 5 more fermentation tanks online, a 20% production increase, with the same MTA cooling unit and an avoid a capital investment.