

Refrigerant Conversions for Flooded Systems

Part 2. R-22 Ice Rink Refrigeration Plants

Conversion of an Ice Rink Chiller from R-22
to Opteon™ XP40 (R-449A)





Background

Freon™ R-22 was a prevalent refrigerant in many applications, including medium and low temperature chillers with flooded evaporators. Under the Montreal Protocol CFCs and HCFCs were phased out and as of January 1, 2020, the production and importation of R-22 was ceased in North America, leading to a significant concern over price and availability.

R-22 has a unique set of properties which delivered excellent performance in a wide array of applications. One such benefit of a single component refrigerant like R-22 is that it has no temperature glide, an important factor for flooded applications. Many of today's refrigerant solutions are multi-component blends with some degree of glide. In systems with flooded evaporators, these multi-component blends may exhibit behaviors that could possibly cause performance reductions when compared to R-22 with these designs.

Historically, blends have been avoided in flooded evaporator applications and until now, end users have been left with a tough choice; continue using R-22 with its associated supply risks or purchase new equipment.

The Solution

Working in conjunction with our partners in the ice rink community, Chemours has demonstrated success with using blends in flooded evaporator ice rink chillers, and we have developed a method for overcoming historical challenges that will allow end users to continue to use their existing R-22 equipment with minimal or no system changes.

Opteon™ XP40 (R-449A) is a low global warming potential (GWP) hydrofluorolefin (HFO) blend that has been used mainly as a replacement for R-404A, R-22, and R-507A in direct expansion systems. Opteon™ XP40 offers a close performance match to R-22 with a reduced GWP of 1397 and zero ozone depletion potential (ODP) and has been utilized extensively in the commercial refrigeration sector.

While Opteon™ XP40 offers an intriguing solution, there are certain considerations that must be taken when retrofitting. A comprehensive engineering evaluation of the system is recommended prior to retrofit. Once a system is deemed to be viable for a retrofit, the process of converting from R-22 to R-449A is quite simple and includes recovery of the R-22, an oil change to POE, the replacement of elastomeric seals, evacuation, leak testing, and charging with R-449A.

The Method

Chemours has extensive experience and published guidelines, which we encourage you to consult, for retrofit of DX R-22 systems to R-449A and include numerous best practices (oil, seals, etc.) that are also applicable to flooded systems.

Based on our experience, there are several other key considerations for flooded systems that must be taken when performing a retrofit with Opteon™ XP40 including the system control set points, pressure vs temperature control, safety device settings, component pressure ratings, motor amp draw, and liquid line sizing.

Special attention should be paid to the current control set points as the higher operating pressures and lower operating temperature of Opteon™ XP40 could lead to sub-optimum performance if not adjusted properly. Additionally, pressure relief devices must be inspected and reviewed to ensure they can manage the higher operating pressure without creating a discharge event. Due to the glide associated with R-449A, the discharge pressure will be higher than R-22. The mechanical components in the system should be inspected to verify the maximum operating pressure and ensure safe operation. Liquid line sizing should be verified to prevent liquid stacking in the condenser. If the condenser outlet piping is not properly sized the addition of an equalization line may be necessary to prevent liquid stacking in the condenser.

Although not all encompassing of the system changes that may need to occur with a retrofit of this type, the above points represent the critical considerations that should be evaluated based on our experience.

The Outcome

Converting an R-22 flooded ice rink system to Opteon™ XP40 can be an effective means of moving your operation away from R-22 while ensuring that the system still delivers on its intended purpose. Opteon™ XP40 can effectively extend the life of your existing system, removing the need for the significant expense associated with replacing the entire system while also allowing end users to have a greater degree of security when it comes to accessing future service gas. Specific performance results will vary on an application and location basis.

The team at Chemours is here to support, if you are considering a retrofit of your exiting R-22 flooded system and would like to discuss any questions you may have, contact us today through Opteon.com or through our tech-to-tech line; 866-433-8324 or via email at tech2tech@chemours.com

About Opteon™ Refrigerants

The Opteon™ refrigerants portfolio offers the optimal balance of environmental sustainability, performance, safety, and cost to help meet both regulations and business goals.

Businesses trust Opteon™ refrigerants because they offer:

Low GWP

Up to a 99% reduction compared to previous refrigerant generations.

Zero ODP

The HFO-based refrigerant family is non-ozone depleting.

Ease-of-Conversion

Minimizing conversion costs and downtime.

Excellent Capacity

A near match to many HCFC- and HFC-based technologies.

Energy Efficiency

Reduced energy use creates long-term savings over the system's life.

Long-Term Regulatory Compliance

HFO-based refrigerants can meet or exceed global and local regulatory standards.

Knowledgeable Experts

With more than 85 years of industry experience, Chemours refrigerant experts can help customers achieve both compliance and peak performance.

Visit [Opteon.com/regulations](https://www.opteon.com/regulations) for more information on HFC replacements or contact our experts.

For refrigerant related support, contact our Tech2Tech Support Team:

tech2tech@chemours.com 866-433-TECH
(8324)



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