

Opt

for better

Opteon™ Refrigerant
Provides Ice for NHL® Elite

Denver's Pepsi Center, Home of
the NHL®'s Colorado Avalanche®,
Achieves Successful Upgrade
to Sustainable Opteon™ XP10
Refrigerant in Ice Plant



Opteon™



A Partnership for Sustainable Hockey Operations

After every NHL® hockey game, the ice surfaces are graded by the referees as well as representatives from both teams. For the NHL®, it's their responsibility to ensure all aspects of League facilities that impact player performance and safety meet the highest standards. For every period of every game, starting with the preseason through Game 7 of the Stanley Cup Finals, before approximately 20,000 screaming fans, nothing is more important than the ice for an NHL® game.

According to Brian Jennings, EVP Marketing and Chief Branding Officer, "The speed, energy, and forces that today's top players impart into the ice sheet when skating, turning, and stopping during a game can impact the rink's surface, and it needs to be ensured that the ice is in great shape for the entire game, beginning with pregame warm-ups when 40 world-class athletes take the ice, until potential overtime play, and even between game periods when the ice sheet needs to be quickly resurfaced, frozen, and ready for play within minutes."



Recently, the NHL® partnered with the Chemours Opteon™ refrigerants team as part of the League's effort to promote sustainable rink solutions across hockey at all levels. The partnership aims to educate and share best practices in the places and spaces where hockey is played to ultimately ensure continued growth of the sport in both an economically and environmentally sustainable manner.

Omar Mitchell, VP of Sustainable Growth and Infrastructure at the NHL®, who heads the partnership commented, "We found that many of the rinks in North America have aging and inefficient ice refrigeration systems. Partnering with Chemours, with their Opteon™ line of low global warming potential (GWP), non-ozone depleting refrigerants, as well as their network of OEM partners, rink application specialists, and engineering and design experts has been instrumental in addressing these industry needs."

Pepsi Center, Denver, CO

Pepsi Center, owned by Kroenke Sports & Entertainment (KSE) in Denver, CO, home of the NHL® Colorado Avalanche®, has consistently received some of the best grades for ice quality over the last decade. "At Pepsi Center, we have been fortunate to have a great ice plant, consisting of Trane® chiller systems that have provided outstanding

performance and reliability for more than 10 years," stated Craig Smith, Pepsi Center's Sr. Director of Engineering. When the opportunity was presented to upgrade to Opteon™ XP10 refrigerant (R-513A) at Pepsi Center, Smith was excited to participate.

"Pepsi Center has set a leading example for the sports community with their forward-thinking approach to sustainability. We share our customers' commitment by providing environmentally responsible products without compromising safety, performance, or efficiency."

**—David Gauvin, Strategic Manager
Ice Rinks, Trane®, North America**

“Opteon™ has performed flawlessly and exactly as expected...”

—Craig Smith, Senior Director of Engineering, KSE Pepsi Center

“After observing their track record of reliable performance, I had great confidence in the Trane® machines,” said Smith. “Since upgrading to the new low GWP Opteon™ refrigerant would reduce our arena’s environmental footprint, while maintaining our dependable performance, it was a pretty easy decision to make the switch; and, because Pepsi Center has redundant backup chillers, it also made a great opportunity to directly compare the performance of a newly charged Opteon™ system with an identical system still running the legacy R-134a refrigerant under the same operating conditions.”



Ice Plant Conversion to Opteon™

Prior to the start of the 2019-20 season, chiller 1 at Pepsi Center was converted from R-134a to Opteon™ XP10 refrigerant. The conversion was straightforward, and, other than the gas change out, consisted of only upgrading the controls for the new refrigerant and a compressor lubricant change. The Opteon™ chiller was started and closely monitored by facility operators while being used exclusively for the very important process of initial ice sheet build, as well as for several preseason tournaments and throughout the NHL® preseason and opening months of the NHL® season.

As part of the evaluation, Nexant, Inc. was brought in as a third party energy validation resource and installed data loggers to measure the energy performance of the refrigerant systems.

Successful Operations with Opteon™

“Operationally, based on the data collected and our direct observations, Opteon™ has performed flawlessly and exactly as expected based on the engineering analysis performed by Trane® and Chemours,” reports Smith after several months of operation.

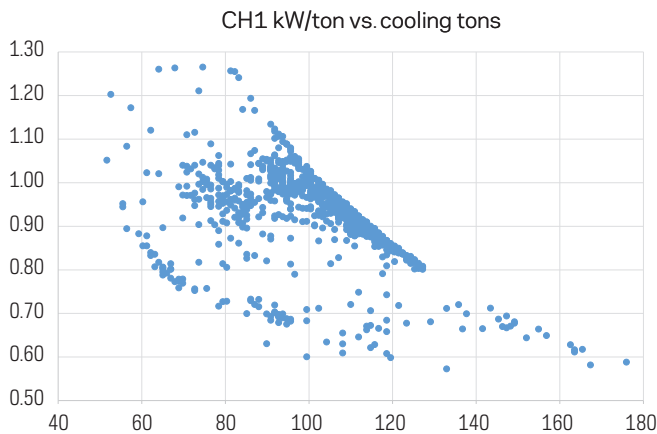
“We are excited to have Opteon™ installed at a premier facility like Pepsi Center, where the Avalanche® and some of the world’s best players perform daily on high quality ice. Working together with leading equipment suppliers like Trane®, great facilities like KSE’s Pepsi Center, and alongside the NHL®’s operations staff has been a tremendous success.”

—Chuck Allgood, PhD, Refrigerant Technology Leader, Chemours



With respect to energy efficiency, the bottom line is really the kW/ton value; where kW is the energy or power consumption and ton is the amount of heat removal or cooling load (Btu). Modern refrigeration systems are designed to provide the highest efficiency (lowest kW/ton) at maximum loads as evidenced in Pepsi Center data plotted in Figure 1 (kW/ton vs. cooling load). For the best direct performance comparison of Opteon™ XP10 refrigerant to R-134a, data was analyzed for the initial month of operation under typical steady-state conditions (fixed ice set-point and covered slab), and, as Table 1 shows, both systems were operating equivalently with respect to energy efficiency.

Figure 1. Energy Performance for Pepsi Center Chiller 1 with Opteon™ XP10 (R-513A)



Data Source: Power Metering Results from Pepsi Center Chiller Plant, Nexant, Inc., Oct 2019 Report to KSE

Table 1. Comparison of Pepsi Center Chiller 1 (Opteon™ XP10) and Chiller 2 (R-134a) Performance

	Chiller 1 (XP10)	Chiller 2 (R-134a)
kWh	22,751	6749
Run-hours	244	71
Avg. kW	93.1	94.7
Ton-hours	24,598	7427
Avg. tons	102	104
kW/ton	0.91	0.91

Data Source: Power Metering Results from Pepsi Center Chiller Plant, Nexant, Inc., Oct 2019 Report to KSE

While energy usage is important from a financial point of view, it also contributes to the environmental footprint of operations, as carbon emissions are generated during energy production. Another important factor impacting sustainability is the GWP of the refrigerant itself. As shown in Table 2, the GWP of Opteon™ XP10 is 631, a reduction of ~56% compared to the legacy R-134a refrigerant.

Table 2. Refrigerant Physical, Chemical, and Environmental Properties

	Opteon™ XP10 (R-513A)	R-134a
Composition	HFO-1234yf/HFC-134a (56/44%)	HFC-134a
Boiling Point at 1 atm	-20.6 °F	-14.9 °F
ASHRAE Safety Class	A1	A1
Liquid Density at 70 °F	74 lb/ft ³	76.2 lb/ft ³
Ozone Depletion Potential	0	0
GWP (AR5 Value)	631	1430

Refrigerant Properties provided by Chemours (www.opteon.com)



Opteon™



OFFICIAL REFRIGERANT SOLUTION OF THE NHL®

For more information on the Opteon™ family of low GWP products, visit optforbetter.com/NHL

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