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Ammonia-Free Ice Rink Refrigeration

There is an alternative to ammonia in ice rink plants. The advantages of a Trane synthetic refrigeration plant are significant.

Safety

Above all, Trane rink chiller refrigerants are much safer. ASHRAE Standard 34-2016, sets limits on refrigerant exposure in two categories – OEL (Occupational Exposure Limit) and RCL (Refrigerant Concentration Limit) as follows:

Refrigerant type	OEL	RCL	1,000 m3 Space*
R717 - Ammonia (table 4.1, pg. 7)	25 ppm	320 ppm	0.5 lbs.
R134a (table 4.1, pg. 6)	1,000 ppm	50,000 ppm	471.7 lbs.
R513A (table 4.2, pg. 12)	650 ppm	72,000 ppm	718.8 lbs.

*The amount of refrigerant release needed to reach the RCL value in a 10m x10m x 10m equipment room.

Additionally, Worksafe BC's "Ammonia in Refrigeration Systems" publication (pg. 5) calls ammonia concentrations above 300 ppm as, "Immediately Dangerous to Life and Health (IDLH)".

The synthetic refrigerants used in our rink chillers are classified in ASHRAE group A1 (low toxicity and non-flammable), whereas ammonia is in group B2L (higher toxicity and flammable). Finally, Trane rink chillers are factory built in our Pueblo, CO, ISO-2008 certified plant and ship as a package complete with refrigerant, all refrigeration piping, brine and/or glycol piping, electrical and controls. Each chiller is engineered to provide the most efficient refrigeration path with the fewest potential leak joints. Packaging also produces a low refrigerant charge of approximately 150 lbs. per circuit. Low leakage and small charge adds further to our safety advantages.

Environmental

Canada's new refrigerant regulations take effect on January 1, 2025. This new law will limit the GWP (Global Warming Potential) of refrigerants well below what is currently allowed. Trane rink chillers with next-generation R513A are well BELOW the threshold set in Schedule 1.1 (5), pg. 11, and we meet it TODAY. Also, the ODP (Ozone Depleting Substances) index is zero, meaning no impact on stratospheric ozone per the Montreal Protocol.

Code Compliance and Operating Engineers

All Trane rink refrigeration plants operate without the Technical Safety Authority BC (TSABC) requirement for certified personnel (RO's, IFO's and Safety Awareness).

Ammonia as mentioned, is in class B2L – hence the restrictions and safety requirements of TSABC.

Performance

We supply the same brine/glycol temperatures to the rink slab as do ammonia systems, so the rink ice will be the identical quality. Our chillers are independently tested and certified to meet strict ASHRAE 90.1 efficiency

guidelines unlike site-built ammonia systems. Trane guarantees the chiller will perform to our published efficiency ratings.

The efficiency differences between ammonia and synthetic refrigerant ice systems are small, if any, and depend largely on the system design and the degree to which heat recovery options are utilized. Reference NRC comparative document pg. 70, system A2 (site built ammonia) at 542,000 kWh vs pg. 90, system H5 (Trane packaged chiller) at 580,000 kWh yielding a slight \$3,420 yearly electrical cost advantage for the ammonia system.

You may be aware Dawson Creek opened new Trane ice plants for Kin and Memorial Arenas in 2015 (see attached). Feel free to contact the City of Dawson Creek, for their operational and efficiency experience.

Annual Owning and Operating Costs

Trane rink chiller systems require significantly less maintenance than an ammonia system which more than overcome the \$3,420 ammonia electrical energy savings. Reference NRC table 3, pg.4 under "Operating Costs" and see the advantage for Trane (system H5) over site-built ammonia (system A2) in Yearly Maintenance, Periodic Maintenance and Initial and Continuous Training and Repairs. Also reference NRC table 18, pg. 42. Therefore, overall owning and operating costs will be significantly less for Trane year after year for the life of the plant.

The time is now to consider alternatives to ammonia. My team is here to help.

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References:

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<https://www.ashrae.org/resources--publications/bookstore/standards-15--34>

NRC (National Resources Canada)" Comparative Study of Refrigeration Systems for Ice Rinks", July 2013
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Canadian Environmental Protection Act Regulations Amending the Ozone-depleting Substances and Halocarbon Alternatives Regulation, SOR/2017-216 October 5, 2017
<http://www.gazette.gc.ca/rp-pr/p2/2017/2017-10-18/html/sor-dors216-eng.php>

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<https://www.worksafebc.com/en/resources/health-safety/books-guides/ammonia-in-refrigeration-systems?lang=en&origin=s&returnurl=https%3A%2F%2Fwww.worksafebc.com%2Fen%2Fsearch%23q%3Dice%2520Orink%2520ammonia%26sort%3Drelevancy%26f%3Alanguage-facet%3D%5BEnglish%5D>

Trane Canada Dawson Creek Case Study
<http://www.trane.com/commercial/north-america/canada/en/about-us/newsroom/case-studies/lodging-and-entertainment/City-of-Dawson-Creek.html?resultNum=1>