



BREAKING THE ICE

STMA Ice Arena Gains CO₂ Transcritical Advantage

Table of Contents

- CO₂ Transcritical Scores Goal in Minnesota..... 1
- Choosing CO₂ Transcritical..... 2
- Inside the Chiller..... 3
- Built to Last..... 4
- End Goal: Making Quality Ice..... 6
- Meeting & Exceeding Expectations..... 9



St. Michael & Albertville (STMA) Ice Arena

CO₂ Transcritical Scores Goal in Minnesota

In Minnesota, the towns of St. Michael and Albertville (STMA)—located just 30 miles from the heart of Minneapolis—share both a school district and also the STMA Ice Arena. Ice skating is so popular in St. Michael and Albertville that one sheet of ice was no longer sufficient to meet the communities' demands for skate time. They needed a second sheet of ice. Plus, their existing chiller system was not producing high-quality ice. They needed an upgrade. They partnered with Scott Ward, PE, of B32 Engineering Group, Mark Fitch of St. Cloud Refrigeration (SCR), and Zero Zone. The result: a new Zero Zone ColdLoop™ Ice Arena Chiller that uses CO₂ transcritical and a glycol secondary loop.

CO₂ has been used as a refrigerant for years, but CO₂ transcritical is a newer option that is now being applied to ice arenas. Mark Fitch says CO₂ transcritical is a perfect choice for STMA. "I wanted this arena to be a CO₂ [transcritical] ice arena because I knew of the technology, and I knew the technology worked, and I knew the application fits well."

So let's hit the ice and learn more about this CO₂ transcritical ice arena.

ColdLoopTM
ice arena chillers

Choosing CO₂ Transcritical

“Zero Zone is a great partner in making sure everything runs and goes smoothly, and their product is built to what they say it is.”

– Mark Fitch

The STMA Ice Arena was overdue for a new chiller to replace their old R-22 system. Scott Ward, Mark Fitch, and the school district started planning. With the rising cost of synthetic refrigerants, the team quickly narrowed their focus to either ammonia or CO₂. Both refrigerants have some complications, most notably the safety concern of potential ammonia leaks and high pressures of CO₂.

Terry Zerwas, the STMA Director of Buildings and Grounds, was one of the early advocates for CO₂ because he heard that Canada had successfully used CO₂ for ice arenas. He reasoned that Canada knows a thing or two about hockey and ice rinks, so he said, “Let’s be a trendsetter and let’s put it in.”

After establishing that CO₂ was feasible, there was still the lingering concern about the high pressures. SCR Owner Mark Fitch felt that



Mark Fitch, Owner of St. Cloud Refrigeration



ColdLoop™ CO₂ Transcritical Ice Arena Chiller



concern was not necessary. “People shouldn’t be afraid of CO₂. It can create high pressure, but the system is built for it. The copper is built for it, the piping is built for it, the compressors are built for it, the valves are built for it. Every component is built to deal with this pressure.” He explained that high pressure applications are not unusual either. Many homes, apartments, and businesses have high pressure steam running through the building. These systems are built specifically for high pressure.

The team chose Zero Zone as a partner because of our experience with ice arenas and our reputation for high-quality CO₂ systems. “We’ve partnered with Zero Zone on many projects dating back 20, 30, 40 years, so we’ve always been very familiar with Zero Zone’s equipment, how it operates, how it’s put together,” Mark Fitch said. One extra advantage was the proximity of the ice arena to the Zero Zone plant in Ramsey, MN. Mark Fitch praised the workers and workmanship at Zero Zone, and he thanked them for their support throughout installation.

Inside the Chiller

“I think CO₂ is a trend that a lot of rinks are going to be looking at with R-22 being phased out. CO₂ could be the future.”

– Grant Fitch

When asked about his new chiller, Arena Manager Grant Fitch admitted that using CO₂ transcritical “is a little scary and a little exciting at the same time.” Doing something new requires boldness and courage. But now that the new chiller is operating, he fully appreciates the ColdLoop Ice Arena Chiller. The STMA Ice Arena had an existing sheet of ice, but they also added a second sheet through this project, and both are being cooled by the new chiller. It was an opportunity to expand and improve.



Grant Fitch, Arena Manager
at STMA Ice Arena

One of the biggest improvements is the control system. The old system did not provide enough control over the actual ice temperature. “On the old system, there was a lot of guessing,” he explained. “We just had a supply/return temperature we could gauge, that was it. We didn’t have any slab temps to look at.” They could adjust set points based on what return temperature they were getting, but this still meant the actual ice temperature between the set point and return temperature was a mystery.

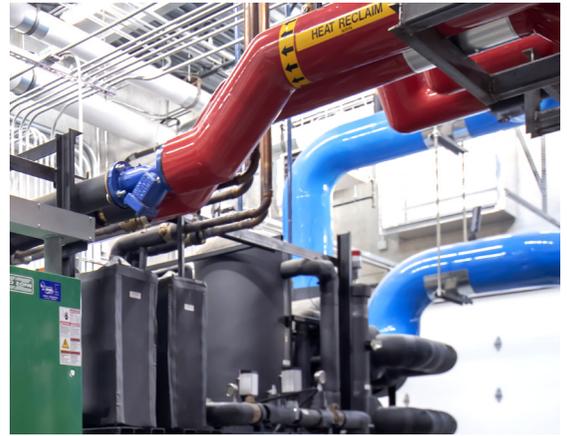
SCR Owner Mark Fitch explained that the Zero Zone system came with the “latest and greatest. They’re able to dial in every individual electronic valve, know every scenario.” Accurate measurements and control temperatures throughout the system improve energy efficiency.

Another energy saver is the heat reclaim system. In a refrigeration system, a condenser releases heat into either water or outside air. That heat exits and provides no benefit. Those in the industry call that “waste heat.” This new ColdLoop Chiller has heat reclaim systems that

reuse and repurpose that waste heat to heat the subfloors and the snowmelt system.

The subfloor under the ice needs to be heated so it does not freeze, expand, and crack. This would cause the sheet of ice to become uneven. Some of the waste heat is piped to the subfloor to heat it and protect it.

Mark Fitch explained the purpose of a snowmelt system. The ice resurfacer cuts small ice shavings to smooth the ice. These shavings, which have a texture similar to snow, are collected into a pit to be melted. In the old system, these shavings were melted by regular tap water, which could take



Heat Reclaim System



Heat Reclaim Pumps

all day. The new chiller has a big coil that pipes waste heat to the pit to melt the snow. This snowmelt system increases energy efficiency and reduces the water bill, too.

These upgrades will save money for the STMA ice arena. While it is still early, they are already seeing results. During the hottest months in previous years, they would see costs around \$8,000 for a single sheet of ice. With the new system, their costs were only \$11,500 for **both** sheets of ice during an unusually hot summer. This is a 28% reduction in per rink operating costs. Grant Fitch is pleased with these cost savings.

Activities Director Keith Cornell said their local energy cooperative provided an energy study of the ice arena. “They gave us an overwhelmingly positive response on how energy efficient the entire rink was, including the CO₂ system.” After years with an outdated system, these changes are welcome.

Built to Last

“I wanted the best product in here for the long run, not only economically but also environmentally, and that to me seemed like a no-brainer.”



Terry Zerwas, Director of Buildings & Grounds at STMA School District

– Terry Zerwas

Not only did the STMA school district gain an efficient system for today, they gained a reliable system for the future. Mark Fitch told us that CO₂ is a smart choice because it will not be subject to ever-changing refrigerant regulations. The United States Environmental Protection Agency (EPA) and individual states have been mandating phase-out dates for some refrigerants and charge limits on others based on ozone depletion potential (ODP) and global warming potential (GWP). But CO₂, a well-known natural refrigerant, has an ODP of 0 and a GWP of 1, so it will not be banned by the EPA. Although we don’t know what the next popular

refrigerant will be, Mark Fitch says “we do know that CO₂ will be around and will not be phased out and will actually get bigger and bigger as time goes on.”

Terry Zerwas described the transition to the new chiller as “flawless,” thanks to the support from SCR and Zero Zone. He says the new chiller performs well, citing Grant Fitch’s report that the rink operating cost improvements have exceeded expectations. The new chiller is equipped with variable frequency drives (VFDs) that control the compressors and pumps based on cooling demand for optimal chiller



ColdLoop™ CO₂ Transcritical Ice Arena Chiller

performance at any operating conditions.

Zerwas also added that repairs will be more affordable if a leak happens. “One leak in the old system would cost you \$10,000, \$15,000, \$20,000, where if there’s a leak in this, it’s very little.” Some differences are the cost of synthetic refrigerants versus CO₂, the cost of older replacement parts, and the ability to dial into the whole system and clearly identify problems with less guessing.

According to Mark Fitch, “CO₂ is a refrigerant that’s going to be around for a very, very long time.” The ColdLoop Ice Arena Chiller will be the right choice today, tomorrow, and for a long time.

End Goal: Making Quality Ice

“Since we put in the CO₂ system, we’ve had nothing but rave reports about the quality of our ice.”

The ColdLoop Ice Arena Chiller is an essential upgrade that will operate efficiently for years. But that’s just the tip of the iceberg. It serves an important role for the families of St. Michael and Albertville. Activities Director Keith Cornell described the second sheet of ice as a “huge resource” for their community. They had been overbooked and forced to send skaters to other ice arenas. This project began on the principal that “you either have headlights coming into your community or taillights leaving your community.” Adding a second sheet



Keith Cornell, Activities Director at STMA School District

was key to the success of the project.

The STMA School District actually solely owns the new sheet of ice and shares ownership of the old sheet with the cities, which Cornell said is “pretty unique.” This allows them to make decisions that benefit the students. “Part of what we wanted to do in building the second sheet of ice is to give a place for our community to really feel like hockey had a home. We had a smaller sheet of ice. This seats almost 1,000 people. With some of the rivalries we have in hockey, to come over here and see a full arena with everyone supporting our kids is really exciting.” The STMA boys’ hockey team is coming off their first state tournament, and the girls’ team has been to two state tournaments. Cornell said they are excited to “show off our facility” to the other schools and alumni.

Terry Zerwas described the school district’s mission “to make good adults, good people that can go out into the world to make a



difference” and how everyone in the school district has a role in accomplishing that. Now the ColdLoop Chiller also plays a role in that mission by providing smooth ice for students and other local skaters.

“In regard to the sheet quality,” Mark Fitch shared, “a big part of it is how we’re controlling the temperature that we’re sending out to the



First Sheet of Ice



Second Sheet of Ice

floor. We are taking the true temperature of the ice, so we can dial in to what ice temperature we want, which then is more beneficial to the skaters. In older methods, you would control your temperature of your ice based off of your returned glycol temperature. Here we're getting a more accurate sensing of the ice."

The ColdLoop Chiller easily creates good ice for either hockey or figure skating with this temperature control, and lots of people have noticed the improved sheet quality. "An Olympic skater had a program here," Zerwas said, "and that Olympic skater found that it was the best that they had skated on, and they were truly impressed with it." He credited that comment for skaters buying more ice time recently.



Meeting & Exceeding Expectations

Whenever we get something new, we expect it to make our lives better. We expect the new one to work better than the old one, to look better than the old one, and to be more fun than the old one. We expect it to be bigger, smarter, safer, and we expect it to last a while. People have the same expectations when they buy a new refrigeration system from Zero Zone.

Everyone involved with the STMA ice arena project said their needs were met by Zero Zone and this ColdLoop Ice Arena Chiller. The arena manager got an energy-efficient system that produces excellent ice, which increased revenue. The community gained access to more open skate time and other events. The parents know their school district chose a safe and sustainable option for the future. And most importantly, the students got a new home for hockey and figure skating.

Arena Manager Grant Fitch summarized the feeling. "We've been 20 years past due on the second rink, so to see this come to fruition in my lifetime is pretty amazing. And it's exciting to see these kids get involved in something and have a facility like this that we can take a lot of pride in."



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