



A Tale of Two Arenas

On the same block in Detroit, the heat transfer fluid systems in two well-known arenas experienced two very different results after 23 years of operation. At Cobo Arena, semi-professional hockey games and figure skating tournaments are part of the weekly schedules. Across the street at the Joe Louis Arena, the 85 x 200 foot ice rink has been home to the NHL's Detroit Red Wings since 1979.

Both arenas must maintain top-quality ice, while also meeting specific requirements for different types of events. For figure skating, the ice must be softer and thicker (about 1 1/2 inches) to allow for the variety of required toe and spin moves. In contrast, for hockey, the ice needs to be harder and more compressed (about 1 inch thick) to be able to stand up to the constant back-and-forth and sideways movements of players and referees.

With Detroit's frequent appearances in the NHL playoffs, the hockey season at Joe Louis Arena is often extended into May and sometimes June. It's no small task for Olympia Entertainment, the company that operates the arena, to continue to keep the ice cold in the early summer. Each arena used a different heat transfer fluid to meet the demands placed on it. And each arena has a different story to tell.

A Not-so-Successful Story: Corrosion at Cobo Arena

Built in 1959 by the city of Detroit as a downtown civic arena and convention center, Cobo Arena has played host to its fair share of semi-professional hockey teams, and also serves as a second venue, if needed, for figure skating competitions held at Joe Louis Arena.

When Olympia Entertainment took over operations management at Cobo Arena in 1983, it discovered that a calcium chloride, or brine solution (essentially a salt-water mix), had been used to maintain the arena's ice temperatures for 23 years. The first brines, which were originally based on sodium chloride (NaCl) or calcium chloride (CaCl₂), were extremely corrosive to most metals. In fact, most chloride-based brines are no longer used because of the lack of corrosion control. However, some brines were re-introduced with an acetate or formate base. Although this was an improvement over the original, brines still do not provide the same corrosion control as branded inhibited glycol fluids.

And while brines provide an efficiency advantage at temperatures below -29°C (-20°F), the enhanced corrosion protection offered by inhibited glycol fluids often outweighs the benefit even in such extreme temperatures. The brine solution at Cobo Arena was no different. It was highly corrosive, causing leaks in the Schedule 40 butt-welded steel piping used to circulate

the fluid. Sections of the pipe embedded in the concrete floor had to be replaced virtually every year, and fresh solution pumped in to replace the contaminated brine.

John Pettit, vice president of operations and general manager for Cobo Arena and Joe Louis Arena, recalls, "When we changed over at Cobo from calcium chloride to the DOWTHERM™ SR-1 Inhibited Ethylene Glycol-based Fluid, technical personnel at Dow's Larkin Laboratories were testing just about every other week to make sure the solution had enough inhibitors to keep the chloride levels down. Dow provided as much testing as we felt we needed." Testing is now conducted at regularly scheduled intervals "to make sure we're getting the efficiencies we need."

Adds Tom Schlang, chief engineer, "From a maintenance standpoint, we've reduced the deterioration of our piping system at Cobo Arena to virtually nothing because we're not using a corrosive fluid like calcium chloride. With a calcium chloride system, you may have to change the dilution of your mixture. The glycol-based solution gives us a greater range of operation, allowing us to do what we need to do without changing anything. Now we have greater flexibility and fewer maintenance headaches."

A Success Story: Maintaining the Ice at “The Joe”

For 23 years now, Tom Schlang, who is also chief engineer for the Joe Louis Arena (both arenas are operated by Olympia Entertainment), has worked with his staff of engineers to maintain the indirect cooling and refrigeration system that keeps sub-freezing temperatures in the concrete floor underneath the ice surface. For those same 23 years, DOWTHERM™ SR-1 Inhibited Ethylene Glycol-based Fluid has been the fluid of choice.

To cool the floor from an ambient temperature of about 24°C (75°F) to the required sub-freezing temperatures, a heat transfer solution is circulated continuously through, in about seven miles of piping.

Schedule 40 one-inch steel pipe is embedded in the floor an inch below the ice surface. Eight-inch Schedule 40 headers supply the glycol-based solution to the pipes.

The solution is a mixture of 40% DOWTHERM™ SR-1 Inhibited Ethylene Glycol-based Fluid and 60% water. Total system capacity is 2,000 gallons, conveyed through the piping at a rate of 1,150 gallons per minute by either of two Allis-Chalmers Model 2000 glycol pumps.

For hockey ice, the ethylene glycol-based fluid is maintained between -18 and -12°C (0 and 10°F), which keeps the actual ice temperature three to five degrees (Celsius) above

the fluid temperature. Any heat collecting in the floor is extracted by the fluid, which is then circulated back to a separate mechanical room containing the refrigeration system where the heat is separated from the fluid and ejected. The fluid is then re-refrigerated by as many as three Frick reciprocating compressors (using R502 ultra-low-temperature refrigerant). Because the arena is a public facility, the refrigeration system and refrigerant are kept separate from the general public, in compliance with BOCA and ASHRAE codes.

Each compressor has a cooling capacity of 60 tons. During a hockey game, all three compressors are usually required to keep enough refrigerated heat transfer fluid circulating. The fluid exiting the refrigeration room is roughly five degrees colder (Celsius) than the fluid coming in.

Inhibitors provided in the Dow fluid protect the pipes from corrosion and help to lubricate the pumps. For the past 23 years, the heat transfer fluid has been virtually maintenance-free. Even the piping is still in good shape, thanks to the corrosion protection provided by the Dow fluid.



Joe Louis Arena in Detroit uses DOWTHERM™ SR-1 Ethylene Glycol-based Heat Transfer Fluid to maintain top-quality ice for the NHL Detroit Red Wings (shown here) as well as a host of professional and world-class ice skating events.

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