

# Newest US soccer field opens this month

The newly built Toyota Park in Chicago, the fourth major soccer-specific field in the United States, features a turf-conditioning system underground. The system was installed in November 2005 by Althoff Industries, which built a similar system during the

2003-2004 renovation of Soldier Field.

Located on the Southwest side of the city, the \$70 million, 20,000-seat Toyota Park is home of the Chicago Fire, a Major League Soccer franchise whose season potentially stretches from early April to mid-November, depending upon playoff advancement. There are also plans for local high school football teams to use the field as well.

The turf-conditioning system at Toyota Park, manufactured by Uponor North America, circulates a warm, water-and-glycol mixture through underground tubing, made of crosslinked polyethylene (PEX). The intent is to warm the rootzone beneath the grass, so that the playing surface remains soft and forgiving, even at sub-freezing temperatures.

The radiant heating system consists of roughly 28 miles (over 150,000 linear feet) of 3/4-inch Uponor Wirsbo hePEX plus tubing, which serpentine from end zone to end zone, eight inches on center and 10 inches below the 200 by 425-foot playing surface. The only connections are at the copper manifolds, positioned at the south end of the field, where each PEX loop begins and ends, thus moving potential service issues to outside the playing area. The copper headers are fitted with stubouts at the factory for making the PEX connections, saving substantial time on the job site.

A pair of commercial-grade, 150-horsepower boilers, situated in a mechanical room under the concrete stands on the east side of the field, feed the 50%-glycol solution through two heat exchangers and 1,400 feet of four-inch copper supply and return piping, on their way to roughly 400 feet of manifold. Because so much of it is encased in concrete under the stands, the copper portion of the system had to be thoroughly tested at high pressures even before the PEX tubing was completely installed on the field. "We had to be sure there were absolutely no problems," says Althoff senior vice president Christopher Bennett, who supervised both this and the



Project supervisor Chris Bennett (left), senior vice president at Althoff Industries, with John Lavin, shown in early November 2005, with the partially installed turf-conditioning system at the new Toyota Park in the background.



Motorized sled, custom-made for the project by Althoff Industries, carried the loops of PEX tubing from one end of the playing field to the other.

Soldier Field projects. "Once the concrete is poured, it's pretty difficult to fix any leaks."

The glycol solution comes off the two boilers at 180 degrees F, while the use of mixing valves reduces the temperature of the solution to a maximum of 130 degrees F before pumping it into the 168 loops of underground PEX piping that transverse the field. As the outdoor temperature falls, the system automatically boosts the water temperature in the tubing to protect the turf root system.

"It is a closed, reverse-return system that is self-balancing," Bennett says. "The first half of each loop functions the supply line, moving the fluid from the copper manifold at the south end to the far north end of the field. The return line brings the solution back to that manifold, which then moves it to the boilers underneath the stands for reheating and recirculation."

#### Four heating zones

Like the interior of a home or a large office, the field is segmented into four heating zones, also running the length of the field from goal to goal. Each zone contains 42 PEX loops and two temperature sensors that sit within underground boxes connected to one another with plastic conduit. On sunny days, the demand for warmth varies from zone to zone, depending on the position of the sun. The sensors in each zone

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communicate an average demand back to a series of control valves, which modulate the flow of warm water in response.

The objective is to keep the root system at a consistently comfortable 65 degrees F, says Bennett. "The field is warm and moist enough that it can actually grow grass in December or even January," he says. "The freezing point for the glycol mixture is minus-25 degrees, so the system can be filled with fluid year-round, without the hassle and expense of draining and re-filling it prior to each season."

But what happens if any of the underground sensors ever need to be repaired? All eight are on a GPS (Global Positioning System), according to Bennett, enabling service personnel to pinpoint the positions of the underground boxes to within 18 inches. "We also provide a complete photo log of the boxes' installation, which should also help in locating them," he says.

Sports Construction Group, the Cleveland-based contractor responsible for building the playing surface at Toyota Park, began the installation process in early November 2005 by laying a four-inch foundation made of pea gravel. The earth-moving machinery used here was equipped with a laser to guide the grading process, so that the finished surface was flat. In the aftermath of this careful grading, Althoff's 10-man installation crew was not permitted to step onto the gravel while installing the PEX loops.

Bennett and company faced a similar dilemma at Soldier Field in 2003. Their solution then and, again, at Toyota Park was a motorized carrier built from a child's snow sled that could run unattended the length of the field. The Althoff crew fit the sled with a sheet-metal spool and tethered the sled to motorized pulleys behind each end zone. The Wirsbo hePEX plus tubing was looped around the spool: one end was held at the copper manifold, the other to a reel holding the rest of the 850-foot hePEX plus coil. The sled ran atop numerous 4 x 6-foot Masonite sheets that were laid end to end across the field. As it moved from end zone to end zone, the sled pulled the tubing over a series of plastic tracking rails positioned at intervals. Installers followed the sled down the field, walking on the same plywood planks to avoid dimpling the pea gravel, and snapping the hePEX plus into place on the rails with their shoes.

### New rail system

The rail system is a major upgrade over an older method of securing the tubing to the field. The latter involves hand-tying the PEX to a wire grid covering the pea-gravel surface. That process is not only more time-consuming, but also requires more bending and crouching by the installer.



To prevent dimpling of surface with shoe prints, Althoff mechanics stood on sheets of Masonite while working on the field surface.

"I don't care how good a shape the installers are in," says Bennett. "With the hand-tying approach, they could have back problems before too long. We have quality people on our team, and if we lose one of them to injury, it may take us awhile to find an equally qualified replacement. With the railing system, we move more quickly with no bending, so no one gets hurt."

Bennett reports that the Toyota Park installation ultimately went as smoothly as Althoff's previous work at Soldier Field, due in part to having the same field team led by John Lavin and Jay Althoff. The entire tubing system was firmly in place after only 5 days. "Speed, getting the tubing down quickly and properly, is a premium value on a job like this," says Bennett. "Because of rains in October, our startup was delayed by a week and a half. Once we finally had an opening in the weather, we had to get the job done before it turned bad again and we found ourselves working in a mud hole."

Only two days after the Althoff crew finished, the PEX tubing was buried in 10 inches of rootzone medium [a mixture of USGA sand and peat moss] and 1-5/8 inches of premium Kentucky bluegrass sod.

The spectacle of 10 grown men chasing a kid's sled up and down a soccer field, as it spins a web of plastic tubing from end to end, is bound to attract attention. "All the other trades have a tendency to stop and watch us," says Bennett, "and that's really kinda cool. At Althoff, we get involved in sorts of construction projects, but a job like this one or the one at Soldier Field gives our guys a little break from the norm, and they get excited about that."

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