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Ice Arena Crashes Due to Pilot Error

By **Bill Holmes, P.E.** March 25, 2013 11:11:00 am[Email](#)[Print](#)[Like](#)

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"I don't have any objections to Mr. Holmes but I can tell you he is wasting his time. We have already done absolutely everything possible to reduce the energy costs." That was how Jerry, head of maintenance for the Park Department, responded to Jim Lloyd, president of the Parks and Recreation Board, asking, "Any more comments before we sign this contract to hire Holmes as energy manager for the Lincoln Center Ice Arena?"

Jim turned to me and asked, "If we don't save anything, we don't owe you anything, right?"

"That's right," I said.

"I'd like to have a deal like that every day," he said. "All in favor?"

That was how the project started that resulted in a savings of 67%, recognition from the governor of Indiana and a DOE Award for Energy Innovation. Sorry Jerry. I guess you hadn't done absolutely everything.

Poor Operation Lost All the Savings

About 10 years after the original capital project that had reduced energy costs by about 50%, I had my own business and got a call from Chuck Wilt, director of the Department of Parks and Recreation: All of the savings are gone, the 50% energy savings from the new cooling tower and heat recovery system are gone. The rink is down to six-month operation, the annual utility costs have risen to \$140,000 and its continued existence is again in doubt.

The humidity is out of control. It is raining in there. The beautiful wood ceiling is wet, stained and turning green. Drips from the ceiling are making stalagmites on the ice, little mountains where they hit the surface; and bumpy ice is really not good for skating. They can't fix it and the contractors they have had in to look at it have, if anything, made it worse, and charged them a lot of money to make it worse. Can I help?

"What time do you want to meet me there? I'll come over and take a look," I said. We met at the arena and took a look around. I had no idea what was going on, the same as the contractors who had kept trying different fixes without success and sending Chuck their bills. I guess that was their way of saying they had no idea either. But by now, after five years of putting instrumentation in buildings, even though I didn't know the answers, I had confidence that following the process of installing instrumentation and gathering and analyzing the data would lead to the answers. Basic problem solving, freshman year stuff. I put together the proposal for the Park Board that was approved despite Jerry's objections.

I picked the points to monitor, ordered the proper sensors, and installed the entire system. I knew from just being in the building for several weeks that all four of the rooftop air conditioning units were running 24 hours a day trying to dehumidify the rink, to pull out all the moisture, but it was still a rain/ice forest in there. I didn't know why.

Sustainability Infographics



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Author Bio

**Bill Holmes, P.E.**

Bill Holmes, P.E. founded Holmes Energy LLC www.holmesenergy.com and developed the AutoPilot Monitoring-Based Commissioning (MBCx) System in 1979. He has a B.S. and M.S. in mechanical engineering and has done additional coursework and research for his PhD. He is a former Purdue professor and taught for several years in the Continuing Education in Energy Management Program at the University of Wisconsin.

Bill has produced savings from 20% to, in a few projects, more than 50% from low-cost, no-cost changes in management, operation, maintenance and control alone in all types of facilities including Industrial Plants owned by Fortune 500 Companies.

He is the recipient of a DOE Award for Energy Innovation and was the Indiana Energy

I soon found out. Each of these units had large compressors for air conditioning, just like the one buzzing in the outdoor condensing unit in your house. From the monitoring system, I could immediately see them running for 30 seconds or so and then shutting off. Then on, then off. Short cycling will destroy an electric motor. Some may have already been ruined. When I opened the access doors on the sides of the units (the ones that are often taken off, laid on the roof and left there by a serviceman or left open; rooftop units are often hard to get too, hard to carry tools to and nearly inaccessible in severe weather), the air conditioning coils on all four units were completely encased in ice. In one unit I could see – and from the monitored data, knew – that a huge, 100 kW electric resistance heater was running 24 hours a day.

This 100 kW heater, that had been shut down, disabled, never to be used again when the heat recovery system was added 10 years before, was back in service running 24 hours a day and using as much electricity as eight or 10 houses. I wonder how that could have happened?

Why were four huge units on the roof to air condition a building with a 21-degree Fahrenheit ice floor in the first place? Were they provided to remove heat or humidity? What I suspected, and a little research confirmed, was that only one of the rooftop units was actually designed to dehumidify. The others were air conditioners only, designed for a normal air conditioning application, where the space being air conditioned was in the mid-70s. They were designed for summers, in case the city ever wanted to shut the rink down and use the facility for other sports or events during the hot weather months.

But they were all running and all completely frozen. And with the big blowers in the units trying to blow air through a frozen coil, there was no dehumidification. No humidity was being removed. And not only was no moisture being removed, more was being added from the fresh air that the units were pulling in from the typical hot, humid Indiana summer bypassing the frozen coils. The more hours per day the unit was operated, the more humidity it was sucking into the rink. And in a futile attempt to stop the dripping, all four of the units had been turned on and were running 24 hours. The contractor figured that if he turned on the 100 kW electric heater, the one that was costing them a fortune, it would warm the rink, melt the ice from the cooling coils and everything would be hunky dory.

In other words, he really didn't understand the cause of the problem; he didn't have the engineering background. But he had tried to do something. Unfortunately he did exactly the opposite of what should of have been done, and made the problem worse. In addition to the huge utility bills, the Parks Department also had to pay the contractor's bills. But he was one of the leading contractors in the area. If he couldn't solve their problems, who could?

A Master's Degree in Humidity

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Manager of the Year in 1990. He has published numerous papers and been making presentations on his projects and methods for more than 25 years. Bill is a sculptor, a writer and a regular contributor to Sustainable Plant.

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