



Implications toward Energy Savings and the Green Movement

IOWA STATE
UNIVERSITY

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Introduction:

The Real Ice system was installed at the Ames Ice Arena in May 2009 on an experimental basis. Since then, research has been done to determine the amount of energy savings at the ice arena. This report will serve as an introduction to the Real Ice system and its benefits.

Problem:

Ice arenas around the nation have had to deal with the rising cost of fuel. And as prices go up it has become harder for ice arenas to cover their costs. So, using less energy would mean spending less money and saving energy which, in turn, will save the environment.

How it Works:

The Real Ice system creates a vortex of water as it passes through the vortex generator inside the Real Ice system. This changes the viscosity of the water and de-gasses the water, or eliminates the extra air bubbles. This means that the ice can be kept at higher temperatures, and it has a faster drying time which leads to lower energy consumption and energy savings.

Benefits of the system:

Ice can be kept at a temperature 1-2 degrees Celsius higher than normal ice, and a one degree increase in the temperature can equal about 5% in energy savings. Also, when resurfacing the water can be heated to a lower temperature, usually about 30 degrees Celsius lower than normal water. There is also a lower maintenance cost associated with the upkeep of the buildings due to a reduction in humidity due to less evaporation since the water is at lower temperatures when flooding the rink. In addition, machines do not need to produce as much power. It has been shown that compressors will last 10-15% longer with a Real Ice system installed. Estimates show that the system has save the Ames Ice Arena over 40% annually in thermal heating costs alone.

There are many other benefits to the Real Ice system that are noticed by the people who use the ice. The system helps create harder and more resilient ice. The ice is also faster, which means greater skating speed for both figure skating and hockey and faster shooting speed for hockey. For example, the ice has less friction so shooting the puck as better accuracy and speed. And, skates stay sharper longer.

Data Analysis:

As shown by the attached charts, the Real Ice system installed at the Ames Ice Arena has a significant impact on the amount of energy usage, specifically the thermal energy usage.

Conclusion:

After analyzing the collected data, it was determined that the Ames Ice Arena saved 41% of its Pre-Real Ice thermal energy costs in its second year at the location. This is comparable to its first year energy savings where it showed a 43% savings. If the system continues to save similar amounts of energy, it will eventually pay for itself in long term.

Also, the same technique used to change the viscosity of the water in the Real Ice system can be used to save water usage in areas like golf courses and irrigation systems. This is due to the fact that the water is more pure and more readily absorbed into the soil.

Data Collected:

Pre- Real Ice (2008)						
Period	# of Days	Units Billed	Therms/Day	Cost/Therms	Thermal Cost	Total Cost
02/07 - 03/12	34	3,865	113.68	\$ 0.93	\$ 3,580.50	\$ 4,279.16
03/12 - 04/07	27	1,820	67.41	\$ 0.95	\$ 1,720.94	\$ 2,056.48
04/07 - 05/06	30	1,692	56.40	\$ 1.00	\$ 1,698.99	\$ 2,014.10
05/06 - 06/06	32	1,670	52.19	\$ 1.14	\$ 1,904.03	\$ 2,216.60
06/06 - 07/07	32	1,792	56.00	\$ 1.17	\$ 2,098.59	\$ 2,432.51
07/07 - 08/08	33	1,914	58.00	\$ 1.11	\$ 2,122.19	\$ 2,478.12
08/08 - 09/05	29	1,300	44.83	\$ 0.80	\$ 1,044.64	\$ 1,290.49
09/05 - 10/10	36	2,245	62.36	\$ 0.77	\$ 1,733.70	\$ 2,149.52

Days/Period 253

Total Cost \$18,916.98
Avg Cost/Day \$ 74.77

Post- Real Ice: Year 1 (2009)						
Period	# of Days	Units Billed	Therms/Day	Cost/Therms	Thermal Cost	Total Cost
02/12 - 03/10	27	3,108	115.11	\$ 0.77	\$ 2,386.32	\$ 2,947.26
03/10 - 04/09	31	1,995	64.35	\$ 0.65	\$ 1,300.30	\$ 1,688.05
04/09 - 05/08	30	1,642	54.73	\$ 0.48	\$ 788.82	\$ 1,110.78
05/08 - 06/10	34	1,797	52.85	\$ 0.40	\$ 716.01	\$ 1,069.19
06/10 - 07/10	31	1,644	53.03	\$ 0.40	\$ 661.30	\$ 984.29
07/10 - 08/11	33	1,511	45.79	\$ 0.43	\$ 646.09	\$ 945.85
08/11 - 09/09	30	1,302	43.43	\$ 0.42	\$ 545.29	\$ 804.52
09/09 - 10/07	29	1,358	46.83	\$ 0.41	\$ 562.12	\$ 831.02

Days in Period 245

Total Cost \$10,380.96
Avg cost/day \$ 42.37

% Savings	43%
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Post- Real Ice: Year 2 (2010)						
Period	# of Days	Units Billed	Therms/Day	Cost/Therms	Thermal Cost	Total Cost
02/11 - 03/12	29	2,800	96.55	\$ 0.63	\$ 1,752.97	\$ 2,288.58
04/09 - 05/10	31	1,446	46.65	\$ 0.48	\$ 688.38	\$ 993.27
05/10 - 06/10	31	1,388	44.77	\$ 0.47	\$ 649.79	\$ 943.27
06/10 - 07/12	32	1,739	54.34	\$ 0.50	\$ 687.24	\$ 1,230.34
07/12 - 08/11	30	2,058	68.60	\$ 0.57	\$ 1,177.94	\$ 1,602.62
08/11 - 09/09	29	1,281	44.17	\$ 0.54	\$ 690.97	\$ 962.08

Days in Period 182

Total Cost \$ 8,020.16

Cost/Day \$ 44.07

% Savings 41%

Data courtesy Alliant Energy, Ames, IA

For more Information on Real Ice:

Links:

<http://www.h2ovortex.com/>

<http://www.watreco.com/engelska.php>

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