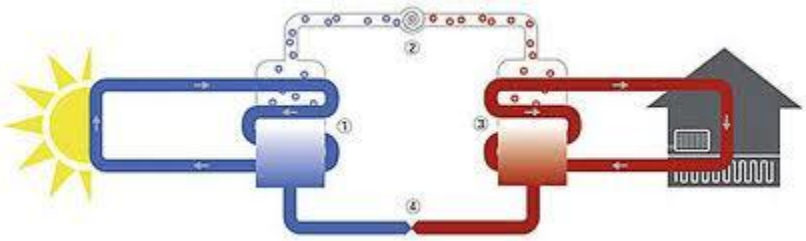
Energy Recovery Heat Pumps for the Ice Skating Industry

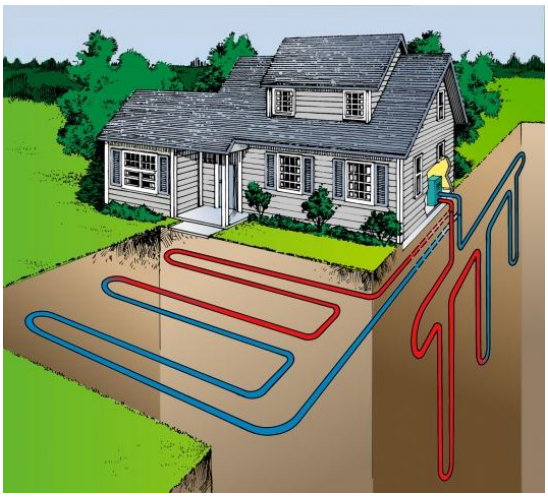
For many years, heat pumps have been commonly employed as a very efficient method of heating homes and commercial properties. Traditionally, a heat pump extracts energy from the outdoor ambient air or from a geothermal loop and through the use of the heat pump cycle it boosts the temperature high enough to provide comfort within the occupied space.



The level of efficiency obtainable from a heat pump is dependent on the temperature of the energy source and the temperature required in the occupied space. The higher the temperature of the energy source that the heat pump can extract energy from, the more efficient the system will operate. On the same token, the lower the temperature required to heat the occupied space will also improve system performance.

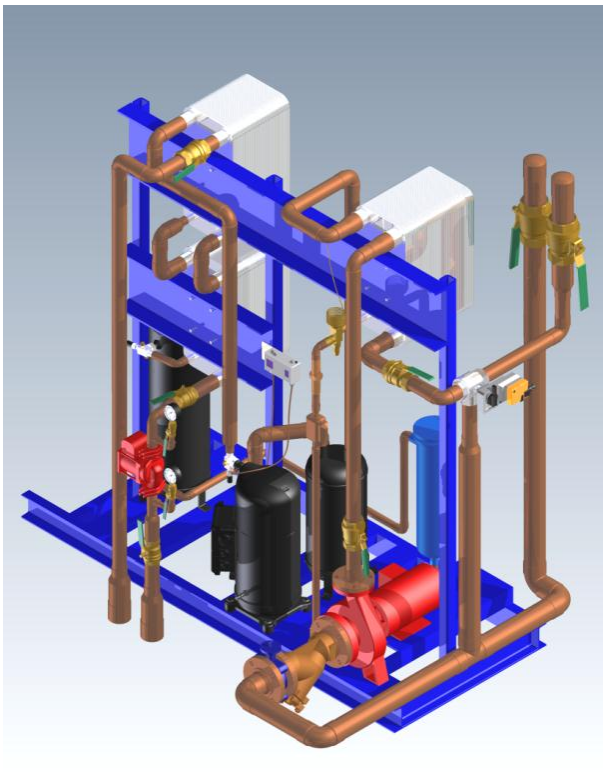
As a rule of thumb, for every degree we can increase the energy source temperature entering the heat pump, it will improve the heat pump performance by approximately 2% and for every degree that we can reduce the energy supply requirement in the occupied space we improve energy efficiency by approximately 1 ½%.

On an air source heat pump we are limited by the quantity of energy in the outdoor ambient air so it becomes quite apparent that as the colder days of winter approach, the efficiency drops by 2% for every degree the ambient temperature drops. Unfortunately it is on these cold days when you need your heat the most.

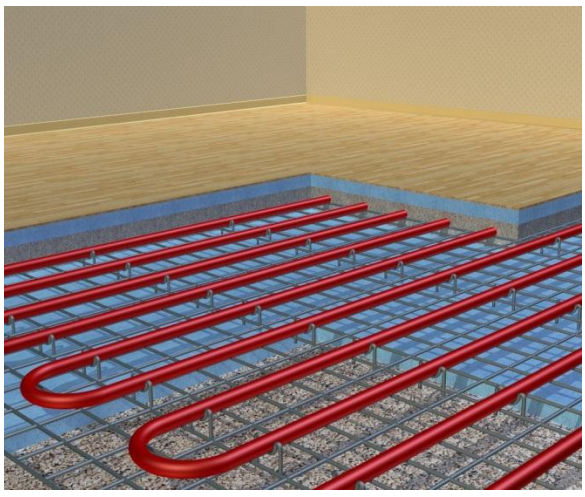


On a ground source heat pump we are limited by the temperature of the earth as an energy source. Typically the temperature of the earth in fall will be 55f and will degrade to 30f degrees or lower over the winter as energy is extracted. The first cost for a ground source heat pump can be much higher due to the excavation or drilling required but it does offer the opportunity to provide an efficient form of heating in climates that are too cold to support air source heat pumps. The average ground temperature is typically warmer than the average air temperature so there is a higher level of efficiency with a ground source heat pump.

An ice rink refrigeration system is all about moving heat, which creates a tremendous energy source opportunity ready to be tapped for use with modified heat pumps. Some recreation facilities have actually used commercial style heat pumps as their primary refrigeration system for chilling the ice.



A much better approach is a hybrid solution were a high efficient ammonia system is designed to provide the highest level of efficiency and reliability for the ice surface and then a properly designed energy recovery heat pump is employed to extract the waste heat from the ammonia system. This provides the best of both worlds and the highest level of efficiency obtainable. When the energy source is heat reclaim from an ice rink or an industrial refrigeration process it is possible to provide a consistent energy supply in the range of 70f. In comparison to an air source heat pump or a geothermal heat pump, an energy recovery heat pump has an efficiency advantage in excess of 60% with consistent temperatures available throughout the year. It truly becomes a heat pump on steroids.



To deliver the recovered energy into the occupied space, a radiant heating system with enhanced surface area not only provides the greatest level of comfort, it also provides the highest level of energy efficiency as well. Where a typical forced air heating system would require a minimum of 115f supply temperature for human comfort, a higher level of comfort can be obtained with temperatures as low as 95f with a properly designed radiant heating system. This translates into an additional 30% of energy savings over a conventional forced air heat pump system.

There are a number of very useful applications beyond comfort heating where these ultra-efficient heat pumps really shine. These hybrid systems provide useful energy at a fraction of the cost of natural gas, oil or traditional heat pumps.

Energy recovery heat pumps can provide the entire facility hot water building needs.

You can eliminate natural gas by providing the energy source for desiccant dehumidifiers.

Energy recovery heat pumps can provide heating for forced air heating units

An excellent application for energy recovery heat pumps is providing the pre-heat and post heat for entering fresh on heat recovery ventilators.

If you are in a multi-purpose facility including a pool these heat pumps are excellent for dehumidification, heating the air and for heating of hot water for the swimming pools.

Energy recovery heat pumps can even provide preheating for building boiler systems

An additional secondary realized energy savings is that when the energy is extracted from the ice rink condensing loop it lowers the ice rink refrigeration system discharge pressure which in turn improves its level of energy efficiency for a truly win-win situation.

The leading edge ultra-efficient Westhills community complex in Langford, British Columbia has three high performance energy recovery heat pumps manufactured by Accent Refrigeration Systems.

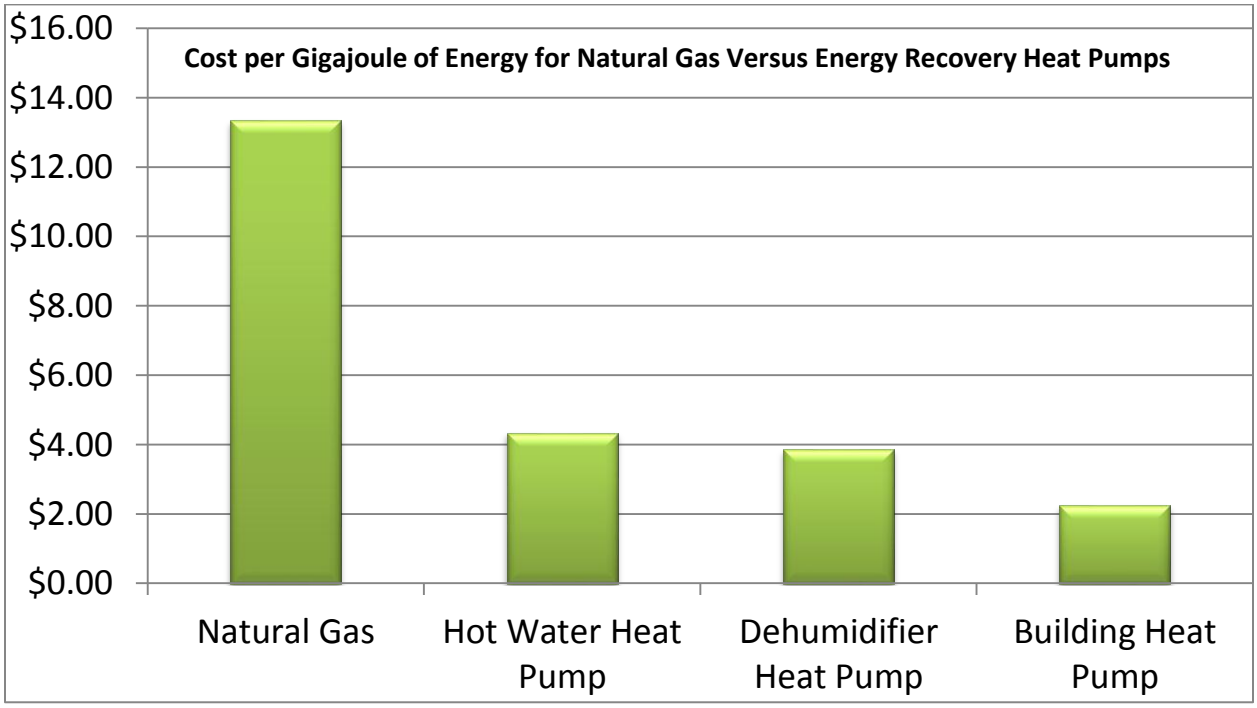
The first high performance heat pump provides radiant heating to 17,000 square feet of office space, hallways and bathrooms as well as serving 14 heat cool units throughout 35,000 square feet of public space and two bowling alleys and also provides heating to the entire fresh air requirement entering the building.

The heating costs for the first four months of operation from September through December were less than $1,200.00 for the entire complex.

The second heat pump provides the energy source to power the customized dehumidifier also designed and installed by accent refrigeration. The cost of running energy for the dehumidifier has been averaging less than $250.00 per month.

The third energy recovery heat pump services the entire hot water requirement for the facility including all the dressing room showers, public wash rooms, two bowling alleys, lounge and a restaurant and kitchen facilities.

The chart below shows the cost of a gigajoule of energy as supplied by natural gas versus the cost of the same unit of energy supplied by the three heat pumps manufactured by Accent Refrigeration Systems used at the Westhills Community Complex.



Accent Refrigeration Systems are world leaders in Ice Rink Construction, Energy Efficiency and Heat Recovery. We have over 50 valuable applications for your waste heat. If you are planning on building a new ice facility or would like to improve the operation of your existing facility, give us a call and we would be glad to work with you to make your facility efficient and profitable.

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