



## **Ammonia, the "Green" Refrigerant**

*By Eric Bradley (2005)*

The use of ammonia as a refrigerant is considered best choice when selecting a "green" refrigeration system. At a recent conference in Vancouver, sponsored by "CANMET", a department of the Federal Government, Natural Resources Canada, ammonia was rated as having no ozone depletion effect when compared to other refrigerants. In addition, many applications were described using "free" heat from the refrigeration plant, for use in other parts of the arena building. With the emphasis on reusing this "free" or "waste" heat to increase the overall efficiency of the building, the refrigeration plant design can be optimized during the planning stage.

This concept requires the refrigeration engineer to work closely with the mechanical engineer during the initial stages of design.

The first step is to identify the uses of waste heat. These uses would include the following:

- Underfloor heating
- Snow melting
- Hot water heating for ice resurfacers
- Hot water heating for showers
- Building heating systems (bleachers, dressing rooms, etc.)
- Swimming pools or other adjoining facilities

The second step is to determine if the waste heat from the refrigeration plant will function as the source of heat. This requires a review of the temperature level of the heat at the source (refrigeration plant), the temperature of the heat required for the use, and the availability of the heat when it is required.

The second step often eliminated the waste heat for some applications, as the refrigeration plant may not run in the coldest weather or in the summer months. A standby or backup source of heat is required for these periods, or heat storage using geothermal systems must be considered.

The third step is to conduct a feasibility study to establish if the concept is cost effective. This review will establish a cost for each application, estimate the savings, and measure the payback of the application. If the payback is realistic in terms of cost, the work can then proceed to a detailed design.

Some of these heat recovery systems are available from proprietary arena refrigeration equipment manufacturers.

This feasibility study should be conducted by an independent consultant to examine and verify the claims of the proprietary manufacturers of this system before the system equipment is selected. Once the "green" options have been demonstrated to be cost effective and offer a reasonable payback, these options can be added to the design of the refrigeration system and building systems.

Subsidies may be available from both the local utilities and federal government for this type of system. Your design consultant or the local utility representative can provide information on how to access the subsidies.