

TEMPERATURE OPTIMIZATION IN THE STANDS

BACKGROUND

Reference conditions

For spectator comfort, many arenas keep the temperature in the stands between 10°C and 15°C, some as high as 18°C while the building is occupied. In the case of the reference arena, space heating accounts for more than 30% of the refrigeration system's energy consumption.

Proposed improvements

To reduce energy consumption for heating and cooling:

- Lower the temperature in the stands, during both unoccupied and occupied periods.
- Heat the stands with a low-temperature (< 32°C) Radiant Flooring Heating (RFH) system. Heat recovered from the refrigeration system condenser is utilized to heat a fluid circulating in a tubing network embedded in the floor of the stands.

BENEFITS

Direct impacts

By reducing the set point temperature in the stands:

- The refrigeration system's energy consumption is reduced.
- The energy consumption for heating the stands is reduced.

Indirect impact

- The temperature in the stands affects spectators' comfort.

REFRIGERATION SPECIALIST'S REMARKS

As shown in Figure 2, increasing the temperature set point of the stands heating system has a double effect on the total facility energy consumption. According to the reference arena, a 1°C increase of the stands temperature set point results in a 13,000 kWh/yr increase in refrigeration system energy consumption and a 12,000 kWh/yr heating system increase. This 25,000 kWh/yr/°C energy consumption increase represents 2%/°C of the total facility consumption, still considering heat recovered from the refrigeration system.

ARENA'S ANNUAL GREENHOUSE GAS (GHG) EMISSIONS

	Total emissions* Tonnes CO ₂ -eq./yr
Temperature in stands = 10°C	254 (-9%)
Temperature in stands = 13°C	262 (-6%)
Temperature in stands = 15°C	268 (-4%)
Temperature in stands = 18°C	278 (Ref.)
Temperature in stands = 20°C	286 (+3%)

NOTE* Calculations of GHG emissions include electricity, fossil-fuel energy and refrigerant leaks.

NOTE: Energy consumption and energy savings were estimated on the basis of Montréal's 1996 climatic profile. Readers may refer to the technical fact sheet "Reference Arena".

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<http://cetc-varennes.nrcan.gc.ca/fr/publication/2003-066-5f.html>.

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Arena's Energy Consumption

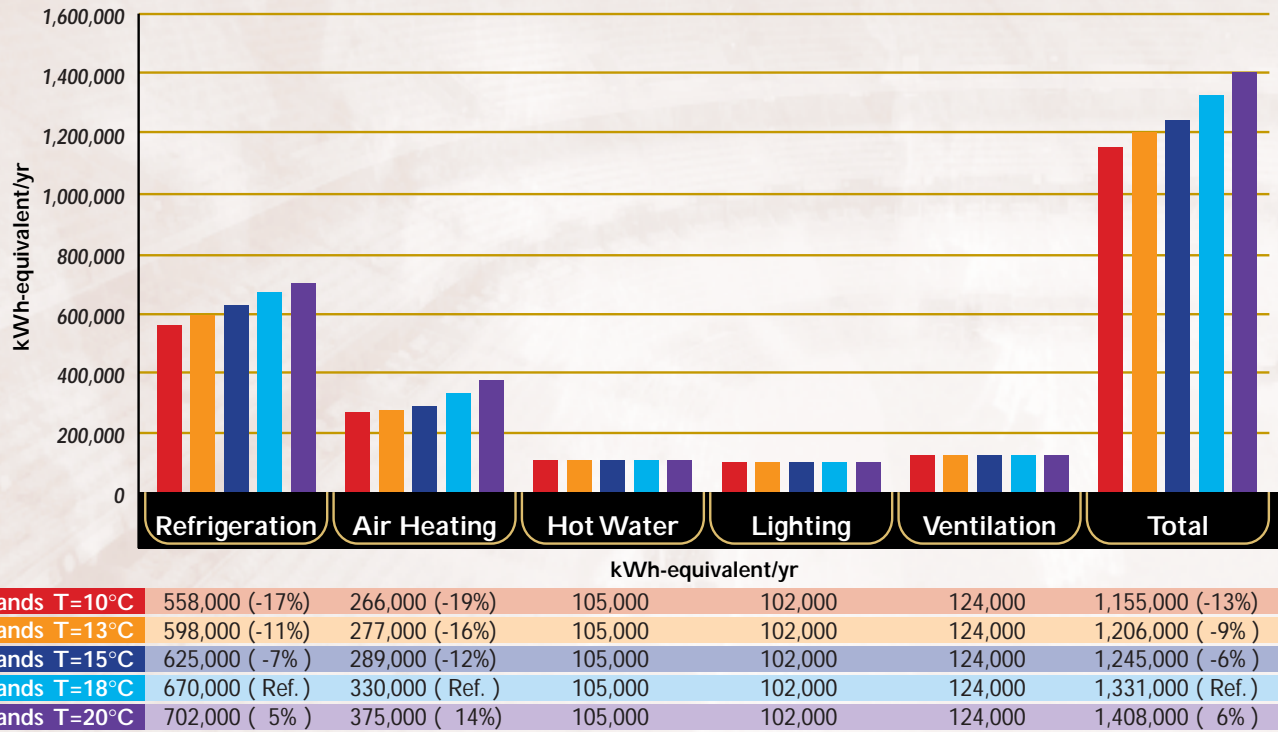


Figure 1

Impact of the air temperature setpoint on the energy consumption for heating the stands and on the compressors

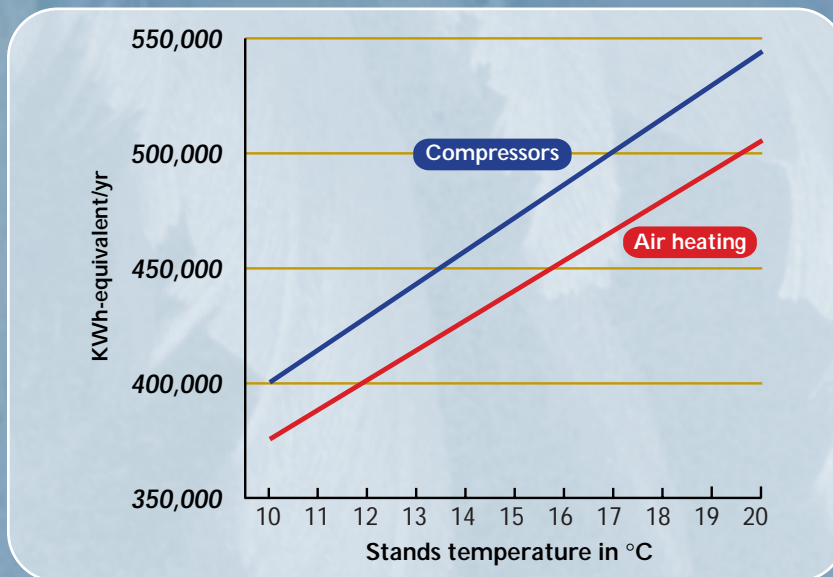


Figure 2

