

# Clearwater

Bedford, NS

## *The technology*

Onboard refrigeration of shellfish by thermal compression.

Traditional refrigeration units use electric-powered mechanical compressors. Thermalfrost Inc., an Ottawa company, has developed a thermal compressor employing a technology known as DMSR (double mechanism sorptive refrigeration).

Thermal compressor technologies are known as adsorption or absorption refrigerators or chillers. DSMR is the world's first thermal compressor to combine the two processes (adsorption and absorption) in a single system. It harnesses low-grade heat to generate deep refrigeration, or freezing. The Clearwater adaptation harvests waste heat from diesel engine exhaust.

In developing DMSR refrigeration technology for offshore shellfish applications, Clearwater proposes to modify four offshore fishing vessels to divert exhaust gases from the engines to Thermalfrost thermal compressors. Onboard refrigeration currently requires diesel generation of electricity to power the refrigerating compressors.

The system is designed to resist harsh environments, including shaking, vibration, and rocking. It has few moving parts, resulting in quiet operation and limited maintenance requirements. It is efficient in all temperature ranges. It is smaller and lighter than traditional compressor technology. It does not require environmentally hazardous refrigerants.

## *Specifications*

- Expected reduction in fuel consumption: 30 percent (portion currently expended on onboard refrigeration)
- Useful heat source temperature: as low as 70 °C
- Attainable freezing temperature: as low as -30 °C
- Refrigerant: environmentally benign ammonia (NH<sub>3</sub>)

## *Environmental benefits*

- Estimated annual reduction of GHG emissions (four vessels): 250,000 t CO<sub>2</sub>; 5–6 million kg NO<sub>x</sub>; significant reduction in emission of particulate matter and VOCs
- No environmentally dangerous chemicals (such as CFCs, HFCs, or HCFCs) required for refrigerant

## **Applications:**

Refrigeration and air conditioning wherever a source of low-grade heat exists – including engine exhaust, solar, geothermal, biomass; offshore and onshore seafood processing; potential for other commercial applications

**Advantages:**

Elimination of fossil fuel used directly for refrigeration onboard shellfish harvesting vessels; direct cost savings; reduction of GHG emissions in direct proportion to fossil fuel reduction; low maintenance costs

As the technology is proven, it will become available to other Nova Scotian fishing organizations.

Nova Scotia will be seen as a leader in adoption of green technology and will become a source of expertise in heat-recovery refrigeration. This will lead to potentially increased employment in Nova Scotia as Thermalfrost licenses distributors and service providers.

**Partner:**

Thermalfrost Inc.