

Energy Concepts Company

SUBFREEZING ABSORPTION REFRIGERATION 250 RT CHILLER FOR CHEESE PLANT

INDUSTRIAL WASTE HEAT POWERED CHILLING

Project Overview

Two hundred and fifty tons of subfreezing refrigeration has been commissioned at a dairy processing plant in Atwater, California. This ammonia absorption refrigeration plant's first claim to being green is that it is powered by engine waste heat. Further, the engine is powered by renewable methane, from manure in an anaerobic digester. In addition, waste heat from the refrigeration plant supplies useful heat to the dairy.

Additional green features:

- The refrigerant (ammonia) has zero ozone depletion and zero global warming potential.
- Low charge - designed for less than four pounds of ammonia per ton of refrigeration, and diluted with water.
- Both jacket heat and exhaust heat are converted to subfreezing refrigeration.

The refrigeration produces 33°F propylene glycol for the plant chilling loop. This 250 ton chiller operates automatically and unattended. It starts up when the engine starts, and stops when the engine stops. It is equipped with remote monitoring.



Chiller Innovations

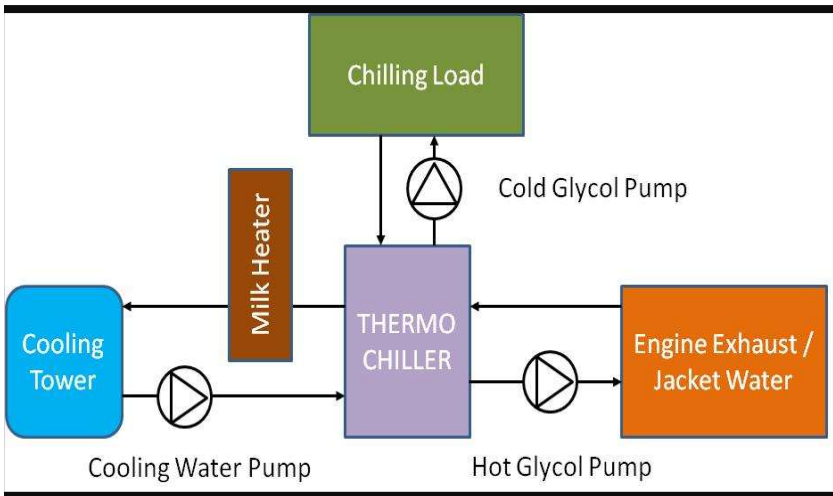
- Thermodynamic improvements (patented)
 - Unique heat and mass exchangers for optimal performance (patented)
 - Controls for reliable, automated, efficient operation (know-how)
 - Fabrication techniques of heat and mass exchangers for low cost components (know-how)
 - Air cooled available
 - Capacities from 3 RT to 3,000 RT
 - Chill temperatures from -40 to +45°F
 - Can use heat from 175 to 800°F
- These innovations provide **compact, reliable, low cost machines**

Opens New Markets

Chiller can be powered by-

- CHP Systems
- Biomass, biogas
- Solar
- Process waste heat
- Geothermal

Project Description



Heat is captured from the jacket and exhaust of two existing 800 kW bio gas engines. Thus 700 gpm hot glycol at 209°F is supplied to the chiller. The chiller produces 250 RT of chilling at 33°F. About 0.62 MMBtu/hr of the reject heat from the chiller is used to preheat milk and the rest is rejected to a cooling tower. As part of the project 1.22 MMBtu/hr of recovered engine waste heat is also used for cream drying and boiler feed water heating

Economics and Environmental Benefits

- Reduced total site annual natural gas consumption by 18,624 MMBtu (23.5% of total)
- Reduced total site annual electric consumption by 1,307,432 kWh (38% of total)
- Simple payback for total installation is about 4 years; 1 year with CEC grant
- Reduced total site greenhouse gas emissions by 2,398,861 CO₂ lbs per year
- Significantly reduced run time on existing compressor-chillers facilitates servicing and extends their life

Applications

Many applications requiring low temperature chilling can benefit from absorption chilling driven by waste heat from CHP or processes or from renewable energy resources.

- Food Processors: beef, chicken, vegetable, cheese, yogurt, dairy
- Cold storage warehouses
- Ice making
- Breweries
- Wineries
- Ice Rinks
- Industrial / Lodging / Microgrid / District chilling

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Host Site-Joseph Gallo Farms

Project Partner-Maas Energy Works

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