

Cool solutions to thermal problems.

Rocky  
Research

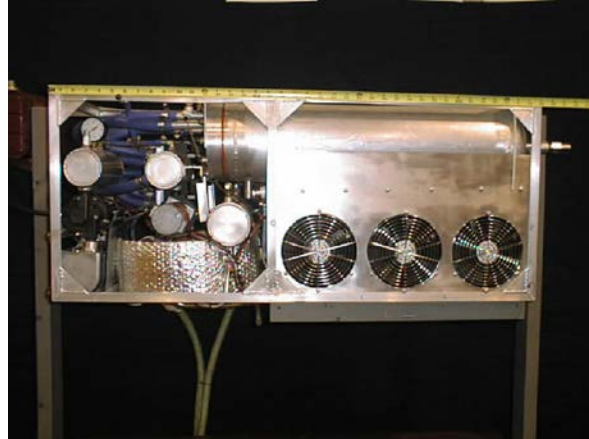
COMMERCIAL | INDUSTRIAL | DEFENSE

## Thermal Appliance Applications: Environmental Control Units/HVAC

The thermal expertise and solutions offered by Rocky Research have a startling range of applications, some of which are difficult to categorize. Over the past 20 years, we've developed a wide variety of specialized technologies for use in several special thermal appliances.

### Portable Climate Control for Commercial & Military Vehicles

Well over 1 million commercial trucks with sleeper cabins are on highways in the United States. These trucks are typically used for long distance hauling, and it is common for drivers to sleep in their trucks. Current practice is for the drivers to let their engines idle while sleeping, so that the sleeper cabin can be heated or cooled as needed by the vehicle heating or air conditioning system.



The practice of engine idling while sleeping is costly in terms of fuel consumption and engine maintenance. It also contributes significantly to CO, HC, and NOx emissions. For this reason, many European countries strictly forbid idling longer than a few minutes. Noise is also an issue with truck idling, and many communities have adopted noise ordinances prohibiting commercial truck engine idling while the drivers sleep.

Thus the need for comfort control of sleeper cabins without engine idling is great. Products have been introduced to meet this need, but have not achieved commercial success. Such products include heat and chill storage charged by the vehicle heating and AC systems, and small diesel engines driving air conditioning compressors. These products have failed in the market place due to poor performance, excessive maintenance requirements, and high first cost.

The no-idle climate control (NICC) system being developed and tested by Rocky Research under sponsorship of the U. S. Army TACOM has shown great results, is expected to overcome the problems encountered with other systems and achieve commercial success.

**Principle of Operation**

- **WINTER HEATING MODE:** Diesel-fired heater warms cabin via a water-glycol loop, with optional engine preheating.
- **SUMMER COOLING MODE:** Diesel-fired heater powers a solid-vapor absorption refrigeration cycle to cool the cabin.

Cooling cycle utilizes proprietary Rocky Research complex compound refrigeration technology.

**Performance**

- 4 kW heat output
- 0.75 kW cooling with dehumidification
- 8-10 amp current draw at 12 VDC
- 0.125 Gal/hour diesel consumption

**Size and Weight**

Most of the system is rail mounted outside the truck cabin, with one coil and fan inside the cabin.

Outside unit dimensions: 39" x 16" x 14"

Approximately 5 cubic feet and 160 pounds.

**Development Program**

Joint development effort funded by the U. S. Army TACOM and Bergstrom, Inc. Development work is being performed at Rocky Research. There is also synergistic program support by the U.S. DOE.

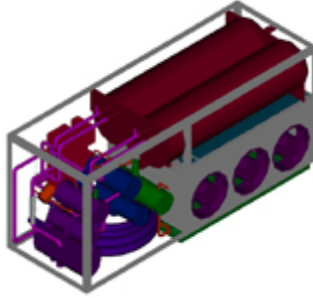
**Development Status**

Proof-of-concept prototypes have been built and operated including wind tunnel testing and 3000 mile road vibration simulation.

The First Packaged prototype is completed for stationary and truck road testing.

**N.I.C.C. Specifications**

	<u>Goal</u>	<i>Prototype, measured</i>
Size:	<u>5 ft3</u>	<i>5 ft3</i>
Mass:	<u>150 lbs.</u>	<i>~ 162 lbs. With instrumentation</i>
Capacity (@95EF ambient):	<u>2000 Btu/hr</u>	<i>~ 2300 Btu/hr measured</i>
Current @ 12V DC	<u>10 to 12A</u>	<i>~8 A W/O Cabin pump and fans. ~ 10 A With pump and fans</i>
Fuel Consumption	<u>0.1 Gal/hr</u>	<i>0.125 Gal/hr this will decrease on the 2nd prototype.</i>



### **Advantages over Competitive Products/Concepts**

#### **Compared to Engine Idle**

- 90% reduction in atmospheric pollutants
- Reduced noise
- 80% Reduced fuel consumption and operating costs
- Reduced engine wear
- Reduced engine maintenance

#### **Thermal Storage Systems**

- Reduced size and weight
- Longer operating periods possible
- Higher heating and cooling capacity
- Needs no connection to vehicle AC system

**Retrofit installations** - possible

#### **Auxiliary Diesel Engine Driving an AC Compressor**

- Reduced emissions
- Reduced noise
- Less fuel consumption
- Less maintenance
- Lower weight
- Lower first cost
- Lower operating cost

#### **Cost Savings**

- Maintenance from idling: \$150/month.
- Fuel savings from non-idling engine: \$320/month.

*Above figures are based on: 2000 hr idle/year, 167 hours/month with cost of fuel=\$1.40/gallon.  
 Engine consumption at idle=1.5 gallons/hour, N.I.C.C. fuel consumption=0.125 gallons/hr,  
 Average engine maintenance cost=\$1.05/hour.*