# High Efficiency HVAC

## At a Glance

### What is it?

High Efficiency HVAC will be achieved by development of the High Efficiency Large and Small Capacity Compressors (HEL-C & HES-C) to mate with existing Navy R-134a refrigerant chiller heat exchange shells to dramatically improve chiller capacity and performance.

### How does it work?

HEL-C/HES-C compressors are based on a variable speed, 2-stage compressor with oil-free magnetic bearings and high speed permanent magnet motor.

### What will it accomplish?

Reduce power usage by 25%/yr; reduce refrigerant (green house warming) leakage by 90%; eliminate oil hazardous waste; increase chiller cooling capacity by 20-50%; improved reliability by over 100%; and reduce maintenance by at least 50%.

### Metrics

- Potential fuel savings: 1200 bbls/yr/DDG
- Potential DDG cooling capacity increase of 50% with no change in weights & no major change in seawater or chilled water systems

### Applications

- Surface Combatants
- Submarines
- Carriers
- Amphibious
- Auxiliary

### Point of Contact:

Neil Antin
202.781.3609
neil.antin@navy.mil

### Description:

Navy chilled water plants (often called air conditioning plants or chillers) provide mission critical cooling to weapons and command & control systems, and cooling for crew comfort. As these systems advance to include high energy radars and directed energy weapons, the cooling demand along with acquisition, fuel, and life cycle cost will increase dramatically. In addition to the mission critical need, Navy chillers must be very robust having 35-50 year service lives (deep infrastructure); and designed for extreme environments such as weapons-effect shock, ship heavy-weather vibration, and Arctic and tropic conditions. The High Efficiency Large and Small Capacity (HEL-C & HES-C) compressors are being designed to meet all these challenges while providing space, weight, power, cost and environmental benefits for a win-win solution.

### Benefits:

- Magnetic bearings eliminate the oil lubrication system. This eliminates valves and fitting that are sources of refrigerant leakage (green house warming gas); eliminates oil changes (hazardous waste disposal); and eliminates on-board oil stowage (fire hazard).
- Variable speed drives eliminate complex mechanical vanes used to throttle compressor refrigerant flow and reduce the starting in-rush current by at least 75 percent. This improves reliability and reduces stress to the ship's electrical distribution system.
- Permanent magnet motors and variable speed drives eliminate the need for complex and costly speed increasing gears. This allows a compact, simple, two-stage compressor that provides improved cooling efficiency and allows the compressor-motor to be a single; easily tested and replaceable module.