SEA FROST®

Compressor Capacity & Efficiency

Capacity

Simply put the compressor has to move refrigerant to move heat. The displacement of the compressor cylinder and the speed of the motor directly controls the amount of refrigerant vapor being pumped. Higher motor speed and larger displacements increases capacity. At the same time the larger the displacement and the higher the speed the more power it takes to turn the compressor. Increasing compressor capacity includes using stronger motors as the displacement increases.

In comparing Danfoss compressors:

- The BD 35 displacement is 2.0 cc. Speed is variable between 2,000 to 3500 RPMs.
- The BD 50 displacement is 2.5 cc. Speed is variable between 2,000 and 3500 RPMs.
- The BD 80 displacement is 3.0 cc. Speed is variable between 2500 and 4400 RPMs.

Efficiency

Efficiency is a measure of refrigerant (or heat) moved by a measured amount of energy such as: BTUs per WATT.

Proper design is essential for energy saving. Slow speeds produce slightly better BTU per WATT ratios.

BD 35 speed:

- 2000 RPM= 113 BTU/HR 4.5 BTU per WATT
- 3500 RPM= 167 BTU/HR 3.7 BTU per WATT

BD 50 speed:

- 2000 RPM= 146 BTU/HR 4.2 BTU per WATT
- 3500 RPM= 249 BTU/HR 3.9 BTU per WATT

BD 80 speed:

- 2500 RPM= 231 BTU/HR 4.2 BTU per WATT
- 4400 RPM= 365 BTU/HR4.0 BTU per WATT

Test Points

Refrigerant pressures have a great deal to do with efficiency figures. The data here is from the compressor manufacture's data sheets using ASHRE (American Society of Heating and Refrigeration Engineers) test points. These are: evaporating at –10 F. condensing at 131 F which is using air cooling at a temperature of 90 F. This puts all the compressors in the same conditions for comparison. Compressors work more efficiently with low cooling temps and higher evaporator temperatures but this my not be practical for tropical conditions and refrigerating and freezing on a yacht.

Other Issues with System Design

Compressor capacity must be balanced with the capillary tube or valve metering system. Metering the flow of refrigerant is essential in creating useful evaporating temperatures. Evaporators must be efficient enough to absorb the cooling effects of the refrigerant being circulated. In some systems a larger compressor or one operating at too high an RPM will loose efficiency. Imagine a fire pump sucking through a straw. Some low speed evaporator/capillary tube systems cannot speed up and increase capacity. Their efficiency falls because the capillary tube being a fixed size was set for the lower speed and lower capacity.

Sea Frost

148 Old Concord Turnpike
Barrington NH 03825
Tel: (603)868-5720 Fax: (603) 868-1040

Sales@seafrost.com