

# ENGINEERING POLICY

Tecumseh Compressor Company  
Compressor Group



*Tecumseh*

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## ENGINEERING POLICY ON: Off Cycle Heat

EP-1

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Liquid refrigerant migration to the compressor will occur during shipping or prolonged off cycles. It is important to determine if crankcase heat is required to prevent slugging or oil pump out on startup conditions.

### 1.0 Crankcase Heat Requirement Test

- 1.1 Split systems should be tested with the longest authorized line set which represents the maximum charge.
- 1.2 Soak out the entire system fully charged for 24 hours in a 70 °F (21°C) ambient.
- 1.3 Raise the ambient surrounding the entire system 20 °F (11°C) over the next hour.
- 1.4 Start the compressor and listen for audible slugging.
- 1.5 Slugging on start establishes the need for crankcase heat.

Systems requiring crankcase heat must be energized a minimum of 12 hours before an initial startup.

The method of crankcase heat selected must maintain the oil pan temperature measured by a thermocouple attached to the shell bottom center location), a minimum of 10°F (5.6 °C) above the temperature of any other system component.

The effects of crankcase heat will change with different system designs. The following tests are suggested to establish the correct application of crankcase heat.

### 2.0 Liquid Refrigerant Drive Out Test

- 2.1 Soak out the entire system fully charged for 72 hours in a 60 °F (15.6 °C) ambient. This allows the maximum amount of refrigerant to migrate to the compressor.
- 2.2 Apply the crankcase heat for 12 hours using 90% rated voltage.
- 2.3 The bottom oil pan temperature must be a minimum of 10°F (5.6°C) above the lowest temperature of any other system component.

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- 3.0 High Ambient, Non-Operational Test - Run Capacitance Type Only In a 115°F ambient, the crankcase heat should be applied for a minimum of 24 hours to check for possible overload trips. This should be done with 110% rated voltage and wired CSR if planned. The motor temperature must not exceed 250°F (121.1°C).
- 4.0 Test for Effect on Minimum Load and Restart Time - The ARI maximum load test should be run to evaluate the effect of the crankcase heat on the operational characteristics. The overload reset time should be checked after a trip occurs at maximum load and in the event of a trip during the ARI restart test.
- 5.0 Wattage Consumption Evaluation Test - Proper instrumentation should be employed to correctly measure the actual amount of wattage dissipated by the method of crankcase heat used. This is particularly important on the capacitance method when system pressure, ambient, and wiring method (PSC or CSR) affect the wattage consumption.
- 6.0 One of the following approved methods of crankcase heat may be selected by the system design engineer to comply with the above requirements.
  - 6.1 Run Capacitance Off Cycle Heat: This method of heating uses the compressor motor windings to furnish heat during the off cycle. To accomplish this, a properly sized run capacitor is placed in series with the motor winding circuit and the resultant reduced current flow provides the heat required.
  - 6.2 External Resistance Heat: The wrap around resistance heater should be mounted on the lower housing at or below the compressor oil level. Mounting method and contact area are most important when using this method.
  - 6.3 Heated Compressor Compartment: This is a compressor enclosure, usually insulated, provided with resistance heat. It may or may not be thermostatically controlled. This approach has some effect on operation at maximum load conditions and overload reset time, and therefore, particular attention must be given to the tests described above. This method has the added advantage of providing a means for the reduction of sound level.
  - 6.4 PTC (Positive Temperature Coefficient) Heater: The PTC heater seeks to remain at a constant temperature. As the fluid temperature surrounding the heater goes down, this heater delivers greater heat input than at higher temperatures. This self-regulating feature is very beneficial to hermetic compressor applications. Solid State construction of the heater results in high field reliability.