



## Tech Tip # 106

### Special Procedures Related to Compressor Replacement

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Keywords: Compressor Replacement, Acid, Particulate, Filters, Contamination

Desert Aire dehumidifiers are designed with scroll compressors. Scroll compressors are known for operating more reliably than other compressors in air conditioning and dehumidification applications due to their ability to cope with occasional periods of liquid refrigerant return. There are fewer moving parts in a scroll compressor subject to wear compared to alternative compressor designs. Nonetheless, there are still many mechanical and electrical parts with close tolerances. Replacement of the compressor may be required during the normal service life of the dehumidifier.

The procedures contained here are in addition to standard component procedures detailed in Tech Note #105.

This document is intended to provide guidance on specific procedures for installation and service of the compressors on Desert Aire dehumidifiers. This is not an all encompassing document. It is assumed that the service technician is qualified to service refrigeration systems with the applicable refrigerant and holds the appropriate EPA certifications for stationary equipment. Refrigerants under high pressure are dangerous and improper handling and use can cause property damage, injury, or death.

### **Inspection and Initial Diagnosis**

Generally, the compressor will have two basic failure modes, mechanical or electrical. The compressors are a hermetic design, meaning all components, including the motor, are in a sealed shell. It can be very difficult to determine which issue was the root cause of the failure in the field by inspection of the damaged compressor. For example, an initial bearing failure inside the compressor may create debris that contaminates motor windings. High current draw may be related to a bearing issue or a motor winding issue. The initial inspection must be combined with a final analysis of the machine when returned to working order to confirm diagnosis.

Specific items should be noted before the replacement to give the best indications of the failure and complete the diagnosis as the new compressor is installed.

The following data should be taken to assist in diagnosis:

- Current draw for each leg of power (if the compressor will run and pump)

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- High side and low side pressure (if the compressor will run and pump)
- Resistance of each leg to leg on three phase compressor or each leg to neutral on single phase compressors.
- Check of continuity from each leg to ground
- Review of all system alarms including the relative timing of the alarms and mode of operation.

It is important to note that other components or lines may have been damaged if the compressor has failed. At times the internal damage to a compressor creates extreme levels of vibration before complete failure. Refrigerant lines and connections may be damaged before the compressor stops. Inspect tubing and components of the system before completing the compressor replacement.

### **Compressor Replacement**

- Refrigeration oil must be tested for acid and particulate during any compressor replacement. For the initial testing, the compressor sump should be used to sample the oil. Oil can be recovered through the Schrader port on the low point compressor shell or through the suction line connection after the compressor has been removed.
- Use Virginia KMP, New-Calgon Phase III, Sporlan Test-All, or equivalent oil test where oil is sampled into a container. Vapor sampling methods may not show particulate and should not be used.
- Read the oil test kit manufacturer's instructions to determine if there is acid present in the oil. Determine if there are other contaminants by viewing the samples for darkness, cloudiness, or particulate.

The following procedures must be used depending on the results of the test above:

#### **Any Compressor Service**

- A new filter dryer must be installed when the system has been opened. Follow guidelines in Tech Note #105 for component replacements. If there is no acid or particulates indicated, the new compressor can be installed and run. Proceed to Testing and Final Diagnosis.

#### **Acid Indicated**

- Install a suction line filter shell and charcoal activated core such as a Sporlan or Emerson HH core type or equivalent. The acid levels will be monitored and several core changes may be required. Install ball valves

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on either side of the suction filter to facilitate these changes. Note that larger Desert Aire systems will have a suction filter shells installed from the factory. The shell can be used with charcoal activated cores. Note that a “safety screen” may be required with some manufacturer’s cores to prevent small pieces of the core from dislodging and finding their way to the compressor. Follow filter shell and core manufacturer’s instructions.

- Review compressor and suction line for area where future oil samples can be taken from the system. If an access fitting exists on the compressor shell below the oil level, no further action is needed. If this is not available, an access fitting can be located at the bottom of a trap in the suction line. Braze in a fitting as required to be able to remove an oil sample. Note: It is acceptable to use acid test kits that sample the refrigerant and connect to Schrader fittings.
- Ensure there are access fittings directly upstream and downstream of the suction filter. There is typically one fitting installed on the suction filter. There may be a bulkhead fitting attached to the compressor suction side.
- Do not use acid neutralizing additives or other chemicals for acid removal. The refrigeration system must contain only oil and refrigerant. Precipitates of additives and acids may be considered contamination in the refrigeration system. Other compounds may be present in additives as carriers. Long-term effects of specific additives or compounds with a particular system or design are unknown without significant controlled testing.

### Particulate Indicated

- Install a replaceable core liquid line filter shell. Note that larger Desert Aire systems will have replaceable core liquid line filter shells installed from the factory. The pressure drop levels will be monitored and several core changes may be required. Install ball valves on either side of the filter shell to facilitate these changes.
- Install a secondary filter such as Sporlan FS- series or equivalent 20 micron filter in the replaceable core.
- Ensure there are access fittings directly upstream and downstream of the liquid filter. There is typically one fitting installed on the filter shell. There is typically a fitting installed on the outlet side of the receiver.

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### **Returning to Service**

- Follow procedures in Tech Note #105 for evacuation and charging.
- Restart unit and set unit to run compressors.
- Record the pressure drop across the suction filter and liquid line filter dryer.
- Check sight-glass indicator for moisture level.
- Monitor pressure drop across the liquid and suction filters during the first hour of operation. Compare the reading taken earlier. If the pressure differential across the filters is 5 PSI or greater, isolate the filters using the valves installed and recover the refrigerant from the filters. Replace cores. If activated carbon filters were installed in the suction side to remove acid, replace with similar cores. If a secondary filter was installed in the liquid line core to remove particulate, install cores and secondary filter in this location.
- Run unit for 24 hours and review acid levels (if found previously) and pressure differentials.
  - If acid is found, replace with activated charcoal cores and test at 24 hour intervals until acids are at acceptable levels. Once acid is no longer detected, replace cores with standard filter elements. Remove outlet screens if they were required by filter manufacturer.
  - If the pressure differential across the liquid line filter is 5 PSI or greater, replace cores and secondary filter with new components and test at 24 hour intervals until pressure drop is at acceptable levels. Once pressure differential is less than 5 PSI, remove secondary filter and replace cores.

### **Testing and Final Diagnosis**

It is of critical importance to ensure that the system is operating as expected before unit is returned to normal service. Complete a ND-SA Series Compressor Replacement Form located in the Installation and Operation Manual. Validation of this report allows for the continued coverage of the compressor under the original warranty.

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It is possible that there was an internal defect in the compressor or normal mechanical wear occurred over time. Compressor longevity generally is a function of load, lubrication, electrical input conditions, and temperatures.

The cause for the compressor failure must be identified before unit is placed back into full service. Both the identification of the cause of compressor failure and the proper cleanup of the system must be addressed to avoid repeat compressor damage.