Service Guide

RTAC

Motor Burn Clean-up Procedures

Order Number: **RTAC-SVG02A-EN** DATE: January 2005

Introduction

The purpose of this bulletin is to provide information on various clean-up procedures for RTAC compressors and units after a motor burn. Motor burns can either be classified as either mild, medium, or severe. The type of burn dictates the procedure needed for cleanup of the debris and acid.

NOTICE: Warnings and Cautions appear at appropriate sections throughout this literature. Read these carefully.

⚠ **WARNING:** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

CAUTION: Indicates a situation that may result in equipment or property-damage only accidents.

Discussion

Heat generated by a motor failure causes oil and refrigerant to break down. Acid and sludge is formed contaminating the system. If not properly cleaned, this may cause heat transfer problems and/or lead to future compressor failures. Cleaning of the system is extremely important to limit future problems within the compressor or refrigeration circuit.

Repair Procedure

⚠ WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged. Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

⚠ WARNING

Contains Refrigerant!

System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

Failure to follow proper procedures or the use of non-approved refrigerants, refrigerant substitutes, or refrigerant additives could result in death or serious injury or equipment damage.

⚠ CAUTION

Corrosive Acids!

Contaminated refrigerant from severe overheating or a motor burn may contain hydrochloric and/or hydrofluoric acid. To avoid burns from these acids, proper personal protective equipment including goggles or face shield, chemical resistant gloves, boots, and a chemical apron or suit are required. Failure to use proper care when handling these contaminated materials may result in minor to moderate injury.

Make certain that a motor burn has occurred by running the proper electrical tests. Be sure to remove all wiring from the compressor terminals prior to testing. A visual inspection of the motor may be necessary by removing the suction line and suction screen.

Note: Corroded or dirty terminals or terminal plate may give a false indication that the compressor is grounded. Ensure the motor terminals are not rusted or corroded when doing electrical tests.

1. Check the resistance of each lead pair using a DVM. Resistances are as follows:

   T1 to T4 approximately 0.1 - 0.5 OHMS
   T2 to T5 approximately 0.1 - 0.5 OHMS
   T3 to T6 approximately 0.1 - 0.5 OHMS
   T1 through T6 to ground should read infinity (OPEN)

2. Once a grounded/shorted motor is confirmed, determine the severity of the motor burn by analyzing the acid content of the oil at two locations, the bottom

of the compressor and the oil separator. This can be accomplished by utilizing an acid test kit. The acidity level should not exceed 0.50 mg KOH/gram. Note the color and smell of the oil and if any carbon deposits are present in the suction line and on top of the distributor of the evaporator.

3. If the oil is not acidic (<0.50 mg KOH/gram) and no other indication of a "severe burnout" is present, then the system can be classified as a mild burn. If the oil is acidic and the carbon is restricted to the suction line, the burn can be classified as a mild burn. If the oil is acidic and there are carbon deposits on top of the evaporator distributor then the burn must be classified as a severe burn. Follow the procedures below to clean the system for each type of burn.

Note: When recovering refrigerant after any burn classification the refrigerant should be recovered through a set of acid blocks to assist in cleanup. Also, when recharging the recovered refrigerant, it is good practice to recharge through a filter drier prior to installing it in the chiller.

Note: Once the system is clean it is always good practice to send an oil sample to a qualified laboratory for a complete oil analysis.

Procedure for a Mild Motor Burn Clean-up

The following items must be investigated prior to performing this procedure.

1. Oil acid level is below 0.50 mg KOH/gram in both the compressor and the oil separator.
2. There is no carbon deposits found in the suction line of the compressor or the suction screen.
3. Isolate and recover refrigerant from the compressor and/or circuit.
4. Remove the failed compressor and replace with the new compressor.
5. Remove the oil from the oil separator and unit.
6. Recharge the system with new oil (if warranted) and the reclaimed refrigerant.
7. ACID AWAY for POE oil can be added to the system based on manufacuters instructions. This will neutralize any small amounts of acid still in the system.

Note: ACID AWAY for POE oil is to be used only according to manufacturing directions and it is recommended to be used in conjunction with a filter core bypass to decrease the clean up time. See procedure below for clean up with a bypass core.

8. Return the compressor to normal operation.
9. Check the acid level of the oil after 10 hours of operation to determine if it has returned to normal levels, if not, take appropiate steps.

Procedure for a Medium Motor Burn Clean-up

The following items must be investigated prior to performing this procedure.

1. Oil acid level is above 0.50 KOH/gram in both the compressor and the oil separator.

2. There is carbon deposits in the suction line but not laying on top of the evaporator distributor. Note: the suction line MUST be removed to visually inspect the inside of the evaporator.
3. Isolate and recover the refrigerant from the compressor and evaporator.
4. Remove the suction line and the failed compressor.
5. Clean the suction line with a cleaning solution or solvent.
6. Remove the oil from the oil separator and properly discard.
7. Install a bypass filter core temporarily from the liquid line angle valve to the service valve on the bottom of the evaporator. An access port will need to be installed in the line for recovery and removal once the clean up is complete. See Figure 1.
8. Install the new compressor, clean suction line and recharge with new oil and recovered refrigerant. New refrigerant may need to be added instead of the recovered refrigerant.
9. This filter core will need to have a Normally Closed solenoid valve on the downstream side of the filter tied to a auxiliary contact on the compressor start contator to prevent migration of refrigerant during the off cycle.

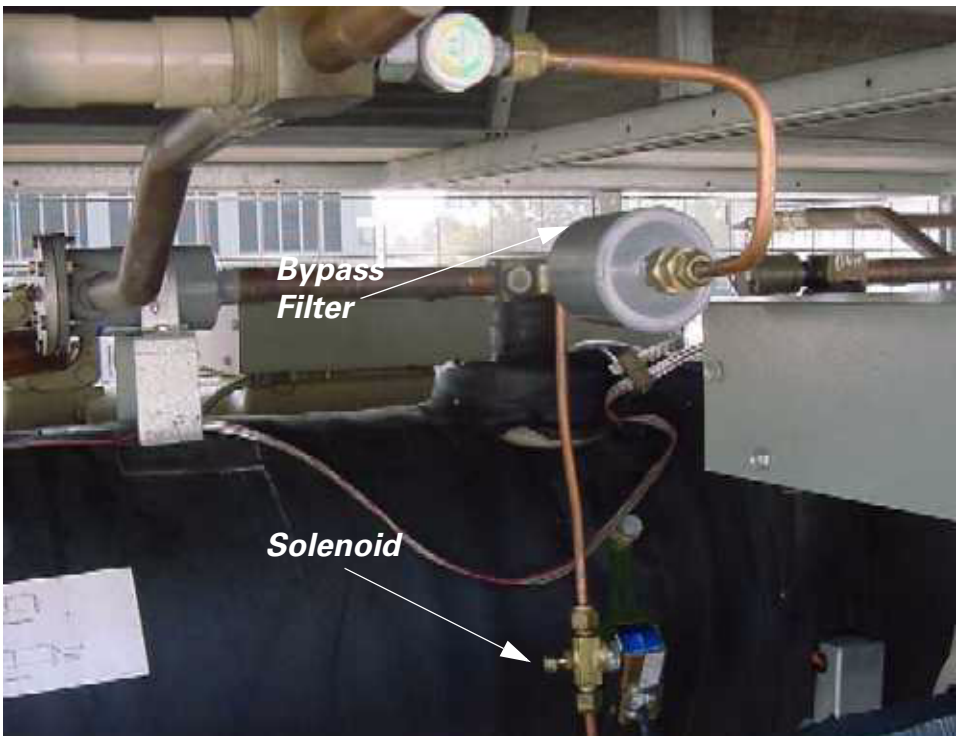
Note: A sightglass should be added to the temporary line to ensure proper refrigerant flow.

10. The intention of the filter core is to do a slow bleed of refrigerant through the core to remove any residual acid. Minimum flow should be obtained so as to not over-feed the evaporator with liquid refrigerant which could result in operational problems or nuisance diagnostics.
11. Return compressor to normal operation with a minimum flow of refrigerant through the bypass filter core.
12. Operate the compressor for approximately 10 hours and check acid level.
13. Change filter core and refrigerant liquid line filter as necessary until acid level is normal and the system is free of carbon debris.

Solvent "Virginia 10e" can be used: https://www.parker.com/literature/MSDS%20Virginia%2010e%20Degreasing%

14. Once the acid level has returned to normal remove the bypass filter and associated piping and return the system to normal operation.

Figure 1: Installation of temporary bypass filter core



Procedure for a Severe Motor Burn Clean-up

The following items must be investigated prior to performing this procedure.

1. Oil acid level is above 0.50 KOH/gram in both the compressor and the oil separator.
2. There is a large amount of carbon deposits in the suction line and laying on top of the evaporator distributor. Oil is black in color.

There are 2 options for cleaning the refrigerant system when it is determined that the compressor has suffered a severe motor burn. It is important that one of these options is followed to ensure the new compressor is not damaged once installed. The two options are discussed below:

Option 1: Install a temporary suction line filter core, evaporator oil return line filter and possibly a compressor oil line supply filter.
Option 2: Hire a qualified outside company to perform a liquid flush of the system.

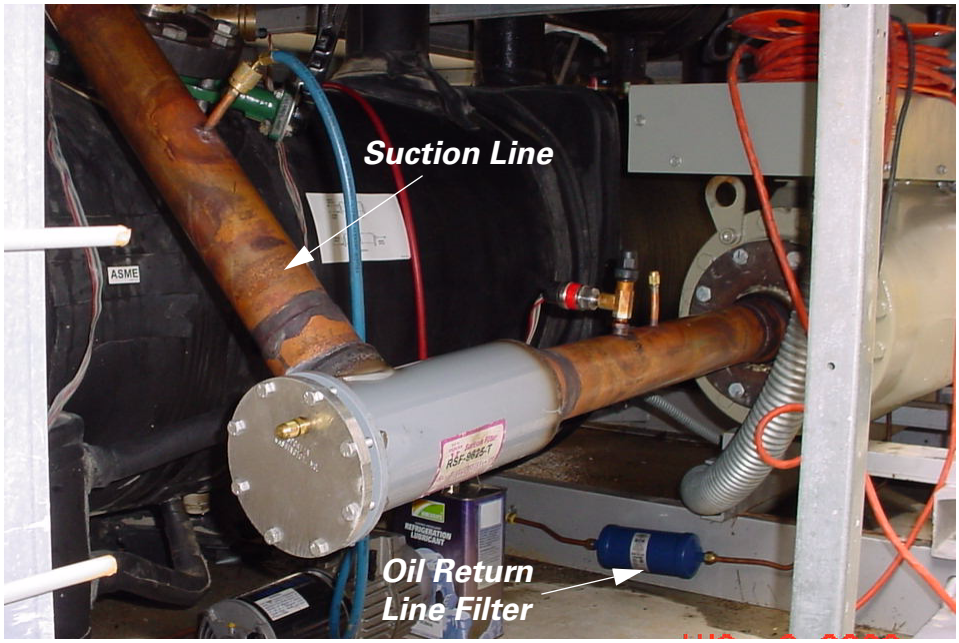
Note: It is the responsibility of the servicing agent to select a company that is qualified to do a proper flush and cleanup of the system and refrigerant.

Both options will adequately clean the system, although option 1 may be more cost effective.

Clean-up procedure for Option 1

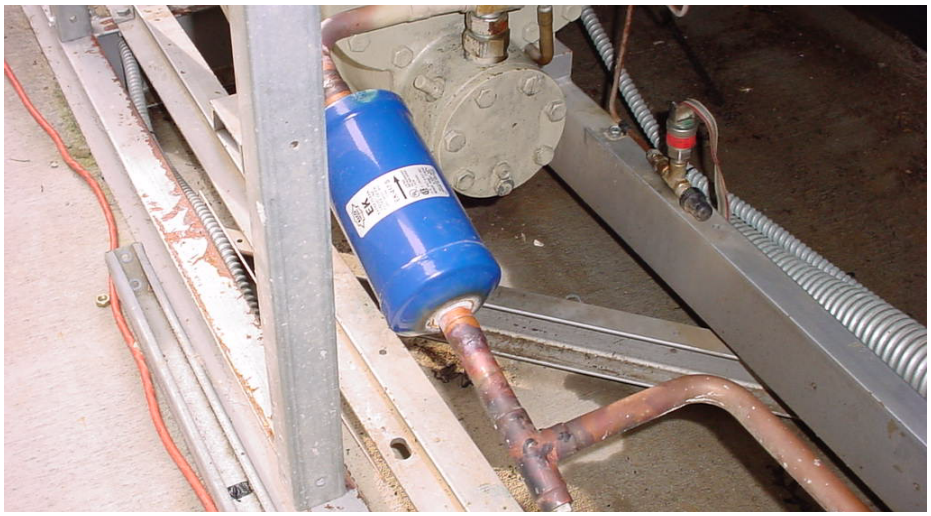
1. Remove and properly dispose of system oil and refrigerant (if warranted).
2. Remove failed compressor and the suction line.
3. Since the existing suction line is made of steel it is necessary to build a temporary suction line utilizing new flanges (sized for copper) and copper line. See Parts Ordering Information at the end of this bulletin for parts ordering information. Flanges are designed to be used with 3 1/8" copper line. All copper line and fittings will need to be field supplied.
4. Install field supplied suction line with High Capacity Acid blocks (burnout blocks) for initial system cleanup. After no less than 2 hours operating time on the compressor standard filter drier blocks may be installed for the remainder of the clean up. **Ensure the suction pressure transducer is installed on the temporary line on the downstream side of the suction clean up filter**. See Figure 2.
5. Install the new compressor.

Figure 2: Temporary suction line with High Capacity filter blocks



6. Install a small disposable filter core and sight glass on the oil return line from the bottom of the evaporator to the compressor. It is important that this filter is monitored to allow for oil return during the cleanup process. See Figure 2.
7. A disposable acid core filter may be added to the oil supply line to the compressor, although care must be taken to ensure this does not create an excessive pressure drop and resulting diagnostics. It is recommended to add access ports in this line and measure the initial pressure drop through the filter for a baseline measurement.

Figure 3: Installation of oil line filter core.



8. Recharge the system with new oil and refrigerant.
9. The compressor will need to operate at reduced capacity during the clean-up. Disable the Male Load solenoid to limit the loading of the compressor. It is recommended to remove the wires from the solenoid LLID (see the wiring diagram) rather than removing the solenoid to prevent damage to the solenoid.
10. Operate the compressor and periodically check the acid level and change cores and filters as necessary.
11. Once the acid levels have returned to normal recover the refrigerant.
12. Remove the filter cores from the oil line (if installed), the oil return line on the bottom of the evaporator and the temporary suction line and filter core.
13. Reinstall the original suction line.
14. Enable the Male Load solenoid valve.
15. Pressure test, evacuate and recharge the reclaimed refrigerant and place the system back into normal operation.

Clean-up procedure for Option 2

There are many companies that provide liquid refrigerant flushes for cleaning up after a motor burn. Two of these companies are Refimax (refimax.com) and Hudson Technologies (hudsontech.com). Choosing the correct company may depend on location of the chiller, and overall cost.

Note: It is the responsibility of the servicing agent to select a company that is qualified to do a proper flush and cleanup of the system and refrigerant.

1. Isolate and remove the failed compressor.
2. The company will need to adapt to the suction line and the discharge line with their equipment and therefore locally supplied adapting flanges will need to be obtained.
3. Once the flush is complete, install the new compressor.

4. Recharge the unit with new oil and reclaimed refrigerant from the flushing company.
5. Place the unit back in service.
6. After 10 hours of operation, check the acid level of the system, take appropiate action if the acidity level is outside the specifications.

Parts Ordering Information

Obtain the required parts from your local Trane Parts Center.

Part Number	Description
FLG01094	70 and 85 Ton compressors - Evaporator flange
FLG01095	100 and 120 Ton compressors - Evaporator flange
FLG1096	70 and 85 Ton compressors - Compressor flange
FLG01097	100 and 120 Ton compressors - Compressor flange
DHY00342	Suction line shell with 3 1/8" connections
COR00020	Burnout cleanup cores
COR00018	Operational replaceable cores
DHY00207	Evaporator oil return line filter drier
DHY00208	Compressor oil supply line filter drier
CHM00167	Acid Away for POE oils
KIT06815	Oil test kit
RNG01414	70 and 85 Ton Compressor flange oring
RNG01415	100 and 120 Ton Compressor flange oring
Copper	3 1/8" copper line and fittings - locally supplied

Questions

Contact the Product Technical Service department in Pueblo, Colorado with questions regarding this Bulletin. They can be reached at techservicepueblo@trane.com or 888-683-2665.

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