TECHNICALLY SPEAKING

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Refrigerant Flood Back

There are many reasons why a compressor fails: Refrigerant Flood Back, Lack of Lubrication, Flooded Starts, Liquid Slugging and Overheating. All cause premature failure of compressors. Fortunately for us each has a specific cause and identifiable wear patterns or failure characteristics. This bulletin will focus on Refrigerant Flood back.

Flood back is described as liquid refrigerant entering the compressor during the run cycle. The amount of damage caused by a flood back condition varies with the amount of liquid returning to the compressor and the compressor type.

On refrigerant cooled compressors flood back causes more wear on the lower end of the compressor. Liquid refrigerant passes by the motor and enters the crankcase. When the liquid refrigerant enters the crankcase, it mixes with and dilutes the oil. The diluted oil is drawn into the pump and distributed to lubricate the crank, connecting rods and bearings. As the refrigerant rich oil makes contact with the hot parts of the compressor, the refrigerant flashes off leaving a reduced amount of oil available to lubricate the parts. The components further away from the pump receive the least amount of lubrication and the most damage. This is identified by progressive wear of the crank and/or failed motor bearings.

When the motor bearing wears, the rotor will have a tendency of dragging on the stator causing a motor winding failure. The majority of motor failures can be attributed to excessive flood back. The easiest way to determine this is to remove the oil pump and check the crank for up and down play. If there is play in the crank then the motor most likely failed due to a flood back condition.

The lack of lubrication at the connecting rod and end caps causes excessive heat between the surfaces. This will cause aluminum from the connecting rod and end cap to be deposited on the crank. If the condition gets bad enough, the rod may seize to the crank eventually causing the rod to twist and break.

On air cooled compressors flood back will generally cause more top end damage. As the liquid refrigerant enters the compressor it enters directly into the cylinders. When the refrigerant makes contact with the cylinder walls, the refrigerant flashes off and washes the oil from the cylinder causing scoring and wear of the cylinder and piston. The piston will show more signs of wear on the loaded side.

Once a flood back condition has been identified the cause has to be determined and the right corrective action needs to be applied. The majority of flood back conditions can be attributed to two main components: the Evaporator or the TEV.

Common TEV problems:
Oversized TEV
Misapplied TEV
Loose TEV Bulb or not properly mounted
Plugged or restricted equalizer line
Improper Super Heat setting

Common Evaporator problem:
Low evaporator load
Oversized equipment
Low Air Flow
Oil Logged Evaporator
Dirty filters
Inoperative fan
Dirty coils
Inadequate defrost cycles

On fixed orifice systems overcharging is also a common reason for flood back.

Corrective actions for a flood back condition will vary depending on the root cause. Accumulators are used to address load and equipment problems. Accumulators are used to ensure that any liquid refrigerant leaving the evaporator due to low loads does not make its way into the compressor. But if the flood back condition is severe enough, or the accumulator is not properly sized, this method will not provide adequate protection of the compressor. Maintaining a steady superheat reading under varying loads is the best way to eliminate flood back. Always verify superheat at low load, full load and design conditions. The amount of evaporator superheat will vary depending on application. Typical superheat settings are:

- ➔ Air conditioning 8°-12° F at outlet of evaporator
- ➔ Refrigeration 6°-10° F at outlet of evaporator
- ➔ Low temp. 4°-8° F at outlet of evaporator
- ➔ **Always check manufacturers recommendations for the proper heat setting at the evaporator and compressor**

I want to take this time to address a common misconception regarding superheat. There are two types of superheat on the low side of the system. One is evaporator superheat and the other is compressor superheat. Evaporator superheat is usually lower than compressor superheat. To get the most efficiency out of the evaporator, the evaporator superheat needs to be maintained to manufacturer's specs. In order to protect the compressor under **ALL CONDITIONS**, compressor manufacturers designate a minimum compressor superheat. Copeland recommends that **20 degrees of compressor superheat** be maintained **if a flood back condition is suspected**. That does not mean that the TEV be adjusted to maintain 20 degrees superheat at the outlet of the evaporator on a low temp application. Or that there must always be 20 degrees of superheat at the compressor. If you want to maintain a minimum of 20 degrees of compressor superheat while maintaining proper evaporator superheat, external means of raising the compressor superheat must be employed.

Next month's article will focus on causes and corrections for flooded starts.

**** For additional support contact Meier Supply at any of our locations ****

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