

# The Locomotive

## Help Your Air Conditioning System Beat the Heat This Summer

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### Starting the Season with a Clean Condenser and High Quality Lubrication Will Help

May, June and July are peak months for losses to air conditioning equipment. Although there are several contributing factors to these losses, starting the cooling season with a dirty condenser or poor quality lubrication is a sure way to decrease system performance and increase chances for equipment breakdowns during periods of high cooling load. In addition to the high cost associated with replacing a motor/ compressor unit, you may experience delays in repairs during the peak months, as local service contractors are likely to be busy.

This article discusses the importance of having a clean condenser and high quality lubrication before you start up your air conditioning equipment for the cooling season. This applies to all systems, large and small. For additional tips on avoiding losses to air conditioning equipment, check out these articles in *The Locomotive* library:

- “The Key to Avoiding Costly Refrigeration and Air Conditioning Failures is Proper Maintenance and Effective Protection”



- “Recommended Accident Prevention Procedures for Refrigeration and Air Conditioning Equipment”
- “How Will Your Air Conditioning Perform This Summer?”

### Condensers Perform Key Functions

Take a look at your condenser. Fans, coils — not much to look at compared to some of the other system components. Now take a closer look. Just what is going on in this rather simple looking device? First, regardless of what the nominal rated tonnage of your system is, the condenser, more than



Hartford Steam Boiler

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any other single component, will determine the true capacity of your air conditioning system. In other words, if you have a unit rated at 50 tons, and you only reject heat at a rate equivalent to forty 40 tons, your system capacity will be limited to 40 tons of cooling.

The primary function of a condenser is to reject the heat absorbed in the evaporator, but this is not the only function. The compressor will add a significant amount of heat as it shrinks gas volume and increases its pressure. In fact, when refrigerant gas enters the condenser, it is a “superheated” gas (at a temperature above that corresponding to its pressure). So, the first job of the condenser is to “de-superheat” the gas.

Once this is done, the condenser can get to the job of “condensing” or changing the refrigerant gas into a liquid. To avoid excessive flash gas as the refrigerant metering device controls flow to the evaporator, most condensers are also designed to provide some degree of liquid “sub-cooling” (at a temperature below that corresponding to its pressure). In order for any condenser to perform all of these functions properly, it must be clean and have the proper airflow across the coils.

### **Don't Neglect Condenser Maintenance**

Unfortunately, condensers don't always get the attention they deserve, possibly due to the typical location for condensers on rooftops. Over a period of years of operation, condenser coils will become fouled with dirt and organic matter. In certain areas, they can become rapidly fouled, as Mother Nature likes to spread its seeds in the springtime. Try maintaining a condenser anywhere near a cottonwood tree in the springtime. In other areas, hail damage to condensers can severely restrict airflow.

Condenser “combs” can be used to straighten coil fins if damage isn't too severe. Cleaning the exterior of a condenser can be a challenge. Air conditioning condensers tend to have closely spaced fins, and will often be three or more rows deep. It will require at least partial disassembly of the condenser to do an effective job of cleaning. While this is labor intensive adding to the cost of maintenance, it is often

the only way to assure your condenser will perform well during the warmest days of summer. The condenser coil can also become fouled inside if poor quality lubricant or improper levels of lubricant additives are in the system.



### **“Lubrication Breakdown”**

The primary function of lubrication is to prevent metal-to-metal contact. In order to perform this function, oil needs to be relatively free of contamination and within a specified viscosity range. Viscosity, of course, decreases with an increase in temperature. This simple fact can be easy to overlook when trying to figure out why your compressor has seized long before its time. Remember our simple condenser? If you don't reject heat in the condenser, it will stay in the system.

Condensers in poor condition will have two very detrimental effects on your air conditioning system. The higher temperature can lower oil viscosity to the point where metal-to-metal contact occurs in the compressor. This will result in rapid wear, or even compressor seizure in extreme cases. This condition is often referred to as “lack of lubrication” or “lubrication breakdown.”

### **Moisture is the No. 1 Problem**

In both hermetic and semi-hermetic systems, refrigerant is often used to cool the motor windings. Again, if you don't reject heat in the condenser, it stays in the system. The

higher operating temperatures will break down motor insulation more rapidly over time and eventually cause the motor insulation to fail (burnout). There are, of course, other factors contributing to early motor insulation failures more directly related to lubrication quality. Moisture contamination is the No. 1 problem associated with breakdown of oils. Refrigerant oils are particularly susceptible to this problem because they are “hygroscopic” (readily absorb moisture).

### Monitoring Conditions with Oil Analysis

Spectrochemical oil analysis is the best method available to assure your system’s oil is in good condition for continued service. While it is good maintenance practice to change oil on a routine basis, simply changing the oil does not provide any information on possible system problems. For larger units, original equipment manufacturers (OEMs) may recommend changing oil only when the oil analysis indicates the need to do so. The most important parameters to monitor for oil analysis include:

- Moisture (ppm) — helps identify possible system leaks (air, water or both).
- Acid Number — indicates level of corrosive acids in the oil (may be caused by moisture contamination or high operating temperatures).
- Gardner Color — a high number or dark color indicates higher than normal operating temperatures.

### Improving Efficiency, Extending Equipment Life

Although the spectrochemical oil analysis report will include metals content, it is not necessarily a good indication of “wear” metals. The indication may be an “oxide” due to moisture contamination. Medium and larger size systems may also include highly efficient oil filters trapping any actual wear metals above 5 microns in size. If your system has such filters, consider examining the oil filter for actual wear particles under a good light and with magnification.

OEMs or experienced labs will often specify limits for the critical parameters found in spectrochemical oil analysis reports. Routine oil analysis will allow you to compare your system’s lubricant to “new” oil conditions to determine if contamination or other operating problems are present. This

will not only help identify problems before a failure occurs, but will help maintain good operating efficiency and extend the life of system components, especially the motor/compressor unit.

### Lubricant Additives

Most of us are familiar with numerous lubricant additives available for our auto engines that promise to do everything from increasing gas mileage to making our engines run indefinitely. When it comes to refrigerant oil additives, there are additives that will help oil perform better in your system. These are the additives that have been approved by OEMs such as foam depressants, rust inhibitors, anti-oxidants and viscosity extenders. Many other additives are available that have not been approved by OEMs and claim to provide benefits which are, at best, questionable. Some may even damage your system. Clogged oil filters are often the first indication that an additive may be causing problems, or that an approved additive is not at proper treatment levels.

### Summary

Condensers are an important part of your air conditioning system. Often, we don’t give this critical equipment the attention it deserves. We may even try to hide condensers with foliage or architecture. If, however, you want to give your air conditioning system a head start in “beating the heat,” starting with a clean condenser and high quality lubrication are the keys to a long “cool” summer.

### About the Author

James Brogan, an industry consultant with HSB Inspection Services in Denver, received an Associate in Risk Management (ARM) designation from the Insurance Institute of America. He specializes in loss control and risk management issues associated with heating, air conditioning and refrigeration equipment and systems.