

TECHNICALLY SPEAKING

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Field Analysis of Failed Compressors

I recently completed a 3 week process to become an Emerson Technical Specialist. The process involved two weeks of training at the Copeland factory in Ohio and completing a three day COSS (Compressor Operation Service Seminar) seminar sponsored by our branch in Allentown, PA. During this time a lot of useful information was reviewed. I want to share some of that valuable information with you.

There has been some misunderstanding on whether or not doing a field teardown of a compressor will void the warranty. The answer is no. Actually, it is recommended that any time a compressor fails that a field teardown be performed to identify the root cause of the failure. Simply replacing a failed compressor with a new compressor without finding out why the first compressor failed will most likely result in another failed compressor. The answer as to **why** the compressor failed can only be found by examining the conditions of the internal parts the compressor.

Copeland has identified the 5 most common reasons for compressor failure. Each has a specific cause and identifiable wear patterns or failure characteristics. Each of these reasons will be discussed in depth in future technical bulletins.

The five main reasons for compressor failure:

1. Refrigerant Flood Back
2. Flooded Starts
3. Liquid Slugging
4. Overheating
5. Lack of Lubrication

As you can see motor failure is not on this list. The reason is that in a majority of the cases the root cause of the motor failure can be attributed to one of the reasons listed above. The compressor that my group tore down during class is a perfect example. The return tag stated the reason for the failure to be electrical in nature. The bill of material indicated that it was a service replacement compressor that was less than two years old. (Not the first compressor, and probably not the last compressor replaced in this application.) We verified that the motor windings were open and the head of the compressor was never removed. Once we removed the compressor head, we saw no specific signs of overheating. When we removed the oil pump and "shook hands" with the crank there was an excessive amount of up and down play in the crank. Next we moved the stator cover and found grooves worn in the rotor where it was dragging on the stator. The crank and bearings caps had shown perfect examples of progressive wear. This is a telltale sign of flood back. During

the compressor teardown, evidence of the cause was revealed! It was a flood back situation that ultimately created additional conditions that caused the motor to fail. This information would have been invaluable to the technician who replaced this compressor. What are the chances that this will be the last compressor installed in this piece of equipment?

If the technician had taken the time to do a field teardown of this compressor he would have found the root cause of the compressor and would have been able to address those issues to prevent another compressor failure on this piece of equipment.

I want to clear the air on the difference between a field teardown and complete teardown. A complete teardown involves removing every part from the compressor until only the casting and stator are left. Once all the parts are removed, each can be inspected individually to gain a more comprehensive analysis of what is going on inside the compressor.

A field teardown requires removing fewer components and reveals a broader picture of what has been happening inside the compressor. At minimum, all that needs to be removed is the head, oil pump, end cover, and sump plate. Removing these components, one can check for busted valves, cylinder wear pattern, crank play, oil contamination and examine for top end and bottom end damage.

This does not take a lot of time to do and the information is vital to a worry-free replacement. Look at it this way - if it saves a warranty claim, or a callback on one compressor you will be ahead on so many levels and possibly save hundreds of dollars. I have attached a [field tear-down report form](#) for you to use to make this process easier. The more information you can fill in the better. I also would recommend attending a compressor tear down class if it has been a while since you last attended. The information you learn will be invaluable in making the job of reading the components easier.

Next month's article will focus on causes and corrections for compressor overheating.

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



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