Green Point

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Don't be a compressor killer: know causes to prevent failures!

When a field technician replaces a compressor, he must determine the root cause of the compressor failure, or the replacement compressor will be doomed to breakdown.

Typically, compressors die because something in the air conditioning or refrigeration system changes, which affects the compressor performance. For example, liquid slugging is a common cause of compressor failure, but the compressor doesn't cause this phenomenon. Motor burnout, another cause of premature death in a compressor, is also often caused by external factors. Therefore, when a technician replaces a compressor in the field, he must determine the root cause of the compressor failure, or the service replacement compressor will be doomed to death as well.

Conducting periodic preventive maintenance (PM) on any air conditioning or refrigeration system is highly recommended. More and more building owners, store owners, and facility managers are willing to pay for PM. Nevertheless, system components fail over time, resulting in compressor failures.

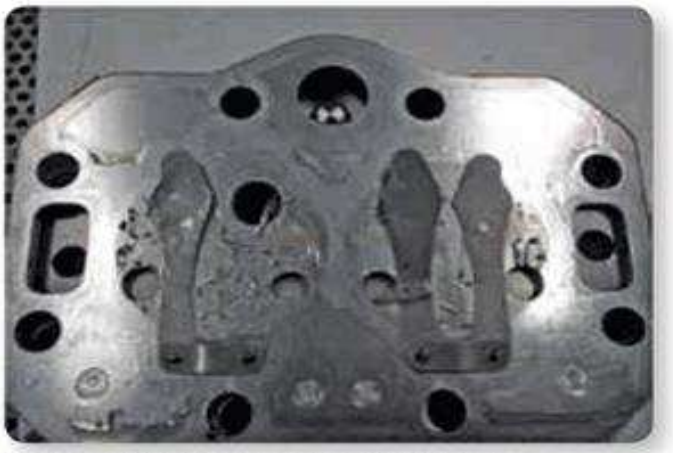
Evaporator Motor Failure:

Refrigerant Return For instance, if an evaporator fan motor goes out, causing a partial or complete loss of heat transfer, liquid refrigerant may return to the compressor, causing its own chain of harmful events. Liquid refrigerant tends to ping and degrade the compressor motor insulation over time, resulting in a motor failure. Liquid refrigerant also tends to push compressor oil out of the compressor and into the system resulting in a lubrication breakdown. In fact, the mere presence of high concentrations of liquid refrigerant in the oil compromises lubricity. At the RPMs that compressors run, it's only a matter of time before the compressor seizes. Liquid refrigerant, at its worst, causes the connecting rods and crankshaft to break into pieces.

On-the-Spot Autopsies Not Always Possible:

When a failed compressor is "autopsied," there's always evidence of the cause of failure such as those referenced above; but, since a technician must replace the failed compressor prior to receiving an autopsy or inspection report, he must try to determine the cause of failure prior to installing the service replacement. On a semi-hermetic reciprocating compressor, for instance, inspecting a valve plate or terminal plate may confirm whether the

problem is mechanical or electrical. Obviously, it's easier, quicker, and less expensive to replace a valve plate in the field than it is to replace an entire compressor. In any event, it's important to educate the building owner or facility manager as to the causes of the compressor failure. This information will help them understand why the technician has to install additional system components.


Broken suction reed (liquid slugging).

Once a compressor is removed from the system, it's required that liquid line dryers be replaced and, in the case of severe burnouts, a suction filter is installed into the system. A suction accumulator offers additional protection from flooding, should light evaporator loading occur.

Case of the Burned-Out Motor:

Assuming a semi-hermetic reciprocating compressor failed due to external causes, there are certain things a technician can do prior to installing the service replacement compressor. First, let's address motor burnouts.

Unfortunately, a motor burnout will contaminate the entire system, and will require a lengthy clean-up procedure. There are various remedies sold through wholesalers for cleaning out contaminated systems. Liquid and suction line filter dryers should be installed to eliminate any acid or moisture that might remain in the system after it's been evacuated and pulled-down to 500 microns. Whether the compressor failed due to a motor burnout or liquid slugging, these recommendations apply.

TXVs do not require seasonal adjustments, provided the system pressures and liquid temperature stay within the original design envelope. TXVs may need to be adjusted if the design boundaries of the valves are exceeded, requiring readjustment to once again establish the desired superheat.

Electronic TXVs are highly recommended as well. While the superheat at the evaporator is typically 6F to 8F in refrigeration systems and 10F to 12F in air conditioning systems, the superheat measured at the compressor should be no lower than 20F, allowing for part load operation. Install new contactors when changing / retrofitting a compressor.

Once the service replacement compressor is installed and prepared for start-up, a standard commissioning process should take place to ensure that everything is functioning properly and recorded for future reference.

Whether retrofitting a reciprocating, screw or scroll compressor, the process is essentially the same. It's vital to understand why the original compressor failed before retrofitting a service replacement compressor. Only then can you rest assured that you won't murder another compressor.

Retrofit Compressor Conversions

Occasionally, a failed compressor is no longer available, or the technician decides to upgrade to a different model, brand, or compressor type. This is referred to as a retrofit conversion, and could include the following possibilities:

- Brand X to Brand Y (of the same compressor type)
- Large reciprocating(s) to a screw compressor
- Scroll to a reciprocating
- Reciprocating to a scroll.

In some cases, an R22 system is being converted to an R407C or even an R-134a system. While it's easy to determine the matching BTU requirement in a retrofit conversion application, there are other considerations. For instance, if changing from R-22 and a mineral or AB oil based compressor to R-407C or R-134a, then POE oil will be required in the new compressor.

The technician will also need to confirm if the geometry of the replacement compressor is "equivalent," to ensure that the retrofit compressor will fit into the system. Changes to the mounting base and piping layouts must be considered in a retrofit conversion.

Another consideration is the controller that operates the compressor unloading. Unloading on a reciprocating compressor is different from unloading on a screw compressor, though

serve the same purpose. It's not unusual to change the controller in a retrofit conversion.

The retrofitting process as it relates to system components is unchanged. Regarding screw compressors, however, it's highly recommended that the technician do a complete oil change after several days of operation to ensure that the oil quality is perfect.

In today's economy, building owners and facility managers may not have a budget that allows for upgrading an entire system. In these situations, many are opting for new compressors that are much more efficient than those on their 10-15 year old systems.

In many cases, there are utility rebates available to those who upgrade their air conditioning and refrigeration systems.

The retrofit tips outlined here are valuable for virtually any retrofit application.

Source : Contracting Business

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April 1st, 2012