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**OIL MANAGEMENT FOR SCROLL COMPRESSORS
IN PARALLEL APPLICATIONS**

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Introduction

Copeland Refrigeration Scroll compressors have several inherent design differences from Copeland Discus semi-hermetic compressors. These differences require different considerations for oil management when using Copeland Refrigeration Scroll compressors in parallel rack applications. Copeland has worked closely with several supermarket rack manufacturers to develop acceptable system design parameters. This bulletin will describe the design differences, explain how they affect oil management and provide guidelines to ensure proper oil management.

Oil Volume

The typical horsepower range for Copeland Refrigeration Scrolls in these applications is 7.5 to 15 HP. Although Copeland Refrigeration Scroll compressors have more oil capacity (140 oz.) than comparably sized Copeland 3D Discus compressors (125 oz.), the amount of useful oil is much smaller. This is a result of the type of oil protection that is required for the different compressors.

Oil Protection

Copeland Discus compressors utilize the Sentronic oil protection system which monitors oil pressure from the oil pump to determine if there is satisfactory oil flow going to the bearings. The oil level can go down to the top of the oil pick up screen before there will be insufficient oil available to maintain oil pressure. This means that the compressor has approximately 100 oz. of useable oil.

Copeland Refrigeration Scroll compressors do not have an external oil pump that readily allows the measurement of oil pressure. Therefore, an external monitor of oil level is required. The Alco OMB, is required and combines the functions of oil level control and time compressor shutoff.

This device is mounted on the sight glass and monitors the level between ½ and the bottom of the sight glass. Therefore, the amount of useful oil prior to a potential control trip is only about 15 oz. This becomes very critical during start up commissioning.

Note: Due to issues that have been experienced with the Trax Oil level control, Copeland recommends that OEM's not use the Trax Oil on future new scroll compressor rack applications. We may consider denial of warranty for lubrication related failures when the Trax Oil control is used on new systems in the future.

Oil Return Pressure

Both low pressure and high pressure oil return systems have been successfully applied. However, they have different issues. The high pressure system requires an additional reservoir. The low pressure system already employs a separate reservoir. The main concern in the low pressure scheme is that the reservoir may drop below the required 20 PSIG differential to feed oil during low load conditions. The reservoir pressure depends on the oil separator feeding to keep adequate pressure above the crankcase pressure. The oil separator is sized for worst case conditions and in the event that only a couple of compressors are operating, the separator is ineffective. Therefore, the reservoir may be depleted if multiple compressors are calling for oil.

Start Up Commissioning

During initial start up, oil will be lost from the compressor as it coats the various system surfaces. During this time, the OMB will cause the oil reservoir level to fluctuate until equilibrium is reached. Since there is less useful oil available, it is necessary to monitor the oil levels closely to prevent unnecessary trips. Service technicians frequently relate trips to the need to add oil, when indeed this may not be the case and results in a system with too much oil.

Oil Reservoir

To prevent nuisance oil level trips, it is imperative that oil be available to the OMB when they are required to fill. This means that a larger reservoir is needed than might be used on comparable Discus parallel applications.

Compressor oil circulation rates vary by mass flow. Therefore, a larger increase in reservoir volume is needed for medium temperature racks than low temperature racks. Our studies indicate that per compressor, increase in reservoir capacity should be:

- ZS MEDIUM TEMPERATURE = 50 OZ. PER COMPRESSOR
- ZF LOW TEMPERATURE = 20 OZ. PER COMPRESSOR

On systems having a common discharge header for the medium and low temperature racks, the increase in reservoir capacity should be the sum of the number of low temperature and medium temperature compressors feeding the header. For example, a rack with 4 ZS medium temperature compressors and 3 ZF low temperature compressors would require,

For example: $(4 \times 50) + (3 \times 20) = 260$ additional oz. of oil.

Systems utilizing an integral oil separator/oil reservoir, supplying 8–10 compressors may not have sufficient oil capacity available to satisfy the OMB control. Consequently, the hot foaming oil being supplied causes the oil float to fluctuate resulting in erratic control performance. This condition also elevates the oil temperature, bottom shell temperature and generates numerous oil level trips. The additional reservoir eliminates this problem.

Oil Filters

The OMB, oil level controls, utilize a “Hall Effect” magnet to actuate the flow valve. Therefore, they are somewhat sensitive to any metallic particles and wear debris that may be in the oil. Therefore, we strongly recommend that a replaceable core oil filter be used.

Incorporating the above recommendations will provide valuable trouble free parallel rack applications with Copeland Refrigeration Scroll compressors. Should you have any questions or need any additional information, contact your Copeland Application Engineer.