

## **PISTON RING LIFE IN BLACKMER COMPRESSORS**

### **PISTON RING LIFE**

Predicting piston ring life is no simple task since many factors are involved. These include discharge temperature, compressor speed, impurities in the gas, dew point of the gas, etc. For this reason, it is difficult to predict exactly what the ring life will be in a particular application. However, since piston rings are a critical component of any reciprocating compressor, factors that effect their life should be recognized and addressed.

### **HOW TO MAXIMIZE PISTON RING LIFE**

The key to maximizing piston ring life is to keep the operating temperature as low as possible. Piston ring wear rates start to increase at discharge temperatures around 300° F (149° C). At discharge temperatures above 350° F (177° C), piston ring wear accelerates drastically. The gas discharge temperature is mainly dependent on the compression ratio and the properties of the particular gas. With a given gas, a lower compression ratio will produce a lower discharge temperature and therefore longer piston ring life. Other factors that can result in high discharge temperature are restrictions such as clogged strainers or small pipe size, high suction or ambient temperature, and valve or piston ring problems.

Many Blackmer compressor models are available in water cooled versions. The water cooled versions will run significantly cooler and give longer service life.

Periodic abnormal conditions can also effect ring life. For example, if the discharge line were accidentally blocked, the discharge pressure would quickly reach the setting of the relief valve. Thus, the compression ratio and discharge temperature would be higher than normal - possibly much higher. In such a case it would be worthwhile to inspect the rings for damage.

Foreign material must be kept out of the compressor cylinder. Any abrasive material in the gas stream such as pipe scale, welding slag, or abrasive dust can quickly damage the piston rings as well as the cylinder, valves, and packing.

Compressor speed also affects ring life. Low compressor speeds will give longer ring life while higher compressor speeds will shorten ring life.

Blackmer "HD" compressors have extra thick piston rings to help maximize ring life.

### **PISTON RING MATERIAL**

Blackmer's standard piston ring material is glass and moly filled PTFE. This is suitable in virtually all applications. Optional poly filled PTFE piston rings offer longer ring life in dry gas service such as nitrogen, helium, etc. However, the poly filled piston ring is not suitable for ammonia service.

### **OPTIONAL TNT-12 TREATED CYLINDER**

Another way to maximize piston ring life in any service is to use a TNT-12 treated cylinder (see bulletin CB-001). TNT-12 is a surface treatment that can be specified on new compressors to provide a very hard, smooth, and slippery surface. The lower friction between the rings and a treated cylinder can double or even triple piston ring life. TNT-12 also inhibits rust that can act as an abrasive and shorten ring life in non-lube compressors.

### **WHEN TO INSPECT THE PISTON RINGS**

As a general rule, it is advisable to inspect the condition of the piston rings after the first 2,000 hours of operation. A spare set of rings should be kept on hand in case they are needed and for comparison to the used rings. At the time of inspection, the condition of the piston rings can be assessed. It is also important to inspect the piston rings anytime that it is suspected they were exposed to high temperature or abrasive material.

### **INSPECTION OF "HD" SERIES PISTON RINGS**

Blackmer "HD" series compressors have step cut piston rings. The used rings can be compared to a new ring. Set each ring squarely in the cylinder as it would normally fit but without the piston. If the remaining step cut overlap is 1/3 or less of the full overlap, the rings should be replaced. If the rings are run so long that there is no overlap, a ring expander can work its way out of the ring groove and seriously damage the cylinder, pistons, and other parts. Deep scratches or grooves in a piston ring can decrease the efficiency of the machine and create excess heat.

### **INSPECTION OF "LB" SERIES PISTON RINGS**

Blackmer "LB" series compressors have slant cut piston rings. The used rings can be compared to a new ring. Set each ring squarely in the cylinder as it would normally fit but without the piston. If the gap is wider than the thickness of the ring, the rings should be replaced. If the rings are run so long that the gap is too wide, a ring expander can work its way out of the ring groove and seriously damage the cylinder, pistons, and other parts. Deep scratches or grooves in a piston ring can decrease the efficiency of the machine and create excess heat.

### **WHEN TO REPLACE PISTON RINGS**

Upon close inspection of the rings as described above, a decision can be made to either replace them or put them back in service. After a couple such inspections, a wear rate or pattern for the particular application can be established. Wear rates are generally consistent after the first couple of sets of rings.