



COMPRESSOR SHORTBLOCK FAILURE REDUCTION

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ABSTRACT

Alliance Compressors manufactures compressors for residential and commercial air conditioning applications. The compressor's works can be divided into two components; a shortblock and a compression device (Fig. 1.). The shortblock consists of an AC electric motor, crankshaft, supporting bearings, frame, oil delivery mechanisms, and various performance and reliability devices. For Alliance compressors, the compression device consists of a scroll set, coupling components, and various performance enhancing devices. This project will concentrate solely on the shortblock assembly.

One of the plant's leading scrap causes is due to the rotor and crankshaft subassembly not rotating freely in the bearings. This defect will be referred to as "tight cranks." A six-sigma approach will be used to facilitate this project. The steps taken will include – Define – Measure – Analyze – Improve – Control.

Define

Tight cranks will be defined as the inability to rotate the rotor and crankshaft by hand. This check is performed on-line for 100% of the product. Process improvement will be determined through tracking line reject as well as line scrap rates.

Measure

On-line gages for bearing alignment will be verified for accuracy and precision. These are automatic LVDT gages that measure the lower bearing (LB) perpendicularity and true position in relation to the main bearing (MB). Additional gage studies will be conducted as required based on failure analysis.

Analyze

Failed compressors have been subjected to Pareto analysis to determine root causes. The top three failure modes include:

1. Galled lower bearings – occurring during testing due to lack of lubrication.
2. Damaged main bearings – occurring at lower end subassembly when the rotor and shaft are dropped into the main bearing.
3. Out of spec bearing alignments – occurring at lower bearing welder resulted in bearing edge loading.

Improve

1. An automatic oiler has been installed to address the issue of dry assembled lower bearing components
2. The end effect of the shaft is being changed from a chamfer to a radius to reduce the risk of damaging the aluminum lower bearing.
3. A work holding fixture has been designed and implemented to protect the main bearing during assembly operations
4. An experiment has been designed to understand the critical features affecting bearing alignment.

Control

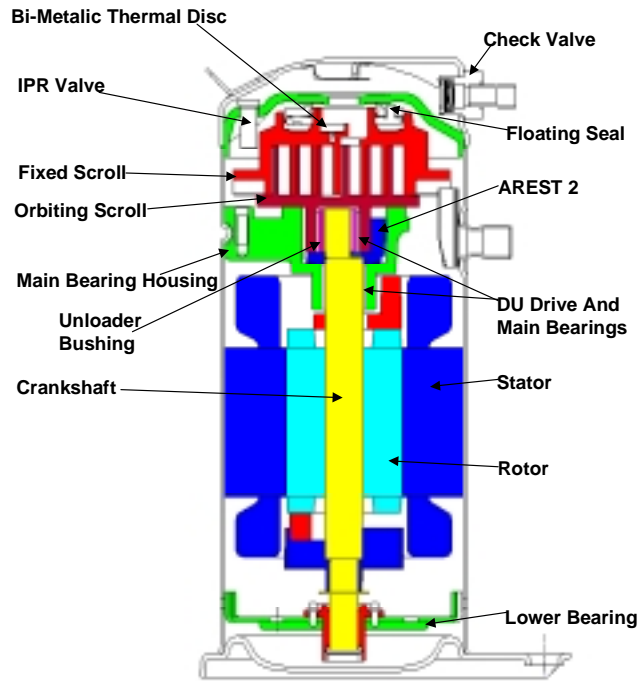
Daily tracking of tight crank assembly rejects and scrap has been implemented.

The automatic oiler has been tied to the assembly conveyor. This ensures the station has been completed prior to release for further processing.

A replacement schedule has been developed for the rotor assembly fixture.

FIGURES AND TABLES

Alliance Scroll



ZRKE3

Fig. 1.