Customer Success Story

# John Crane journal bearings reduce vibration, protect equipment

**MARKET**
Oil and Gas, Midstream

**EQUIPMENT**
Pipeline Direct Inlet Compressor

## BACKGROUND

John Crane was contacted by a leading compressor manufacturer to supply two journal bearings for a pipeline direct inlet (PDI) compressor, used for pressurizing natural gas pipelines. For the Original Equipment Manufacturer (OEM) customer, having a tight bore tolerance of 0.0004 inches would allow for a more predictable, controlled operation enabling lower vibration levels. In cases like this where low vibration limits are key, not meeting the first pass could lead to missed delivery dates, increased costs and more time on the test stand, imposing extended and rescheduled visits on the customer. Partnering with a team who could get it right the first time was essential.

## CUSTOMER CHALLENGE

Enabling reduced levels of vibration delivers a number of benefits for the end user — such as meeting API 617 regulations which specify the peak to peak vibration must be sqr (12,000/mcos) or 0.001 inches, whichever is lower. Lower vibration also safeguards equipment, since high vibration levels can lead to unplanned shutdown by proximity probes that continually monitor vibration and will shut the machine down in order to prevent catastrophic failure. Additionally, low vibration reduces wear on the equipment's components, preventing unplanned maintenance and extending bearing life.

Although manufacturing this bearing design to the tight tolerances required is not complicated, it takes longer at the final assembly stage of the process to grind the shims to the exact thickness required. The challenge was that while this type of bearing typically does not have replacement parts, the OEM specified that the shoe subassemblies must be replaceable, lowering the cost of service to the end user. Replacing a new pad set can cost up to 60 percent less than the cost of a new bearing.

## JOHN CRANE SOLUTION

There are a number of advantages to the ball and socket design of the bearings John Crane supplied. Greater axial misalignment capabilities reduce the potential for edge loading which can lead to premature pivot wear and early, unplanned maintenance intervals. This also protects the dynamic properties and performance of the bearing.

Pivot wear can lead to increased bearing clearance which may lead to higher vibration, causing more wear on the pivot in a cycle that leads to performance deterioration. The John Crane ball and socket design utilizes a low stress pivot which can lessen the effects of pivot wear, often intensified by high stress pivots. High levels of vibration can also be caused by a lack of bearing damping, a problem typical where softer pivots are encountered. This design lends itself to higher pivot stiffness allowing the total bearing stiffness to be controlled more by the oil film which has both stiffness and damping properties, able to suppress vibration.

Once the equipment is operational, causes of unexpected high vibration might include missed rotor dynamic calculations, softer than expected field support stiffness, pivot wear, or an undersized shaft. If analytical modeling suggests a change in bearing clearance can lower vibration, the ball and socket design allows for easy clearance adjustment without a long lead time and eliminates the cost of complete bearing or component replacement. By simply re-shimming the pivots, it is possible to increase or decrease the bearing clearance to ensure optimum performance of the machine.

## RESULTS

With a little extra time and attention, John Crane was able to accommodate this request by using extremely precise measuring equipment to serialize, measure, and record the shoe sub-assemblies, in order to reproduce the part as needed in the future. Not only did John Crane's journal bearings meet the first pass, it was reported that the compressor was one of the smoothest running compressors they had tested.

**Journal Bearings**

**North America**
United States of America
Tel: 1-847-967-2400
Fax: 1-847-967-3915

**Europe**
United Kingdom
Tel: 44-1753-224000
Fax: 44-1753-224224

**Latin America**
Brazil
Tel: 55-11-3371-2500
Fax: 55-11-3371-2599

**Middle East & Africa**
United Arab Emirates
Tel: 971-481-27800
Fax: 971-488-62830

**Asia Pacific**
Singapore
Tel: 65-6518-1800
Fax: 65-6518-1803