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NANYANG TECHNOLOGICAL UNIVERSITY

URECA *Undergraduate Research Experience on CAmpus*

Category: 5
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Vibrations of a rolling piston type ROTARY compressor

1 Introduction

Reasons for studying rolling piston rotary compressor are as follows:

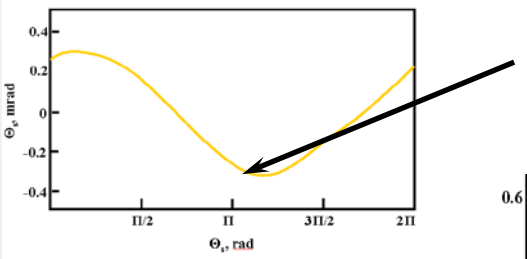
- Widely used in refrigerators & air-cons
- To reduce noise of vibrations
- To increase reliability/ reduce failure

2 Objective

- To analyse the torsional[1] vibrations at different state of operations.
- To be able to predict magnitude of torsional vibrations and affecting factors

3 Results

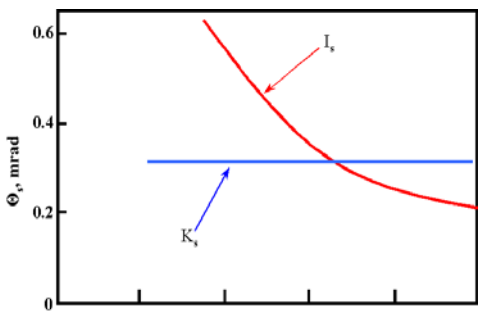
Steady state operations



20 μm (0.3mrad) displacement on hemetic shell

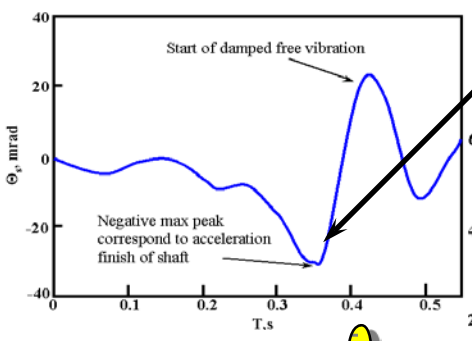
↑ inertia of stationary part

↓ torsional vibration

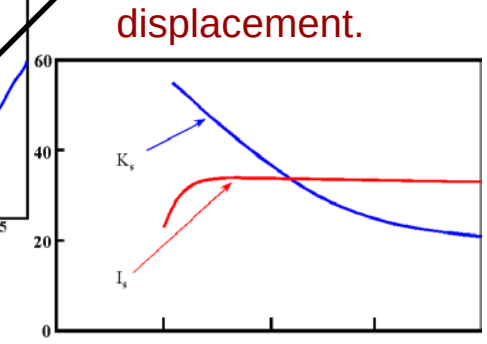


Why? Increased separation of natural frequency from exciting frequency reduce vibration.

Starting Operations



Negative magnitude of **2mm (30mrad)** displacement.

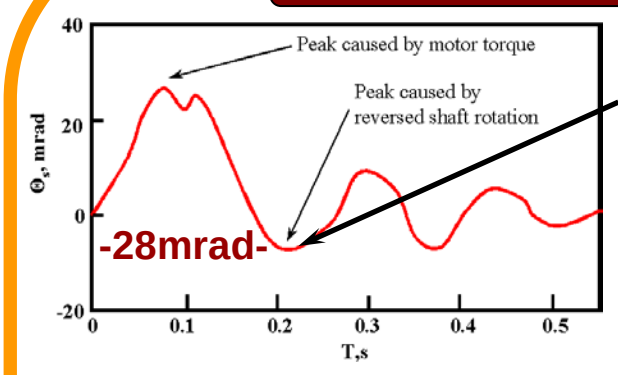


Increasing suspension constant is more effective in reducing vibrations during starting operations

Do you know?

Torsional vibration is 100 times that of steady state!

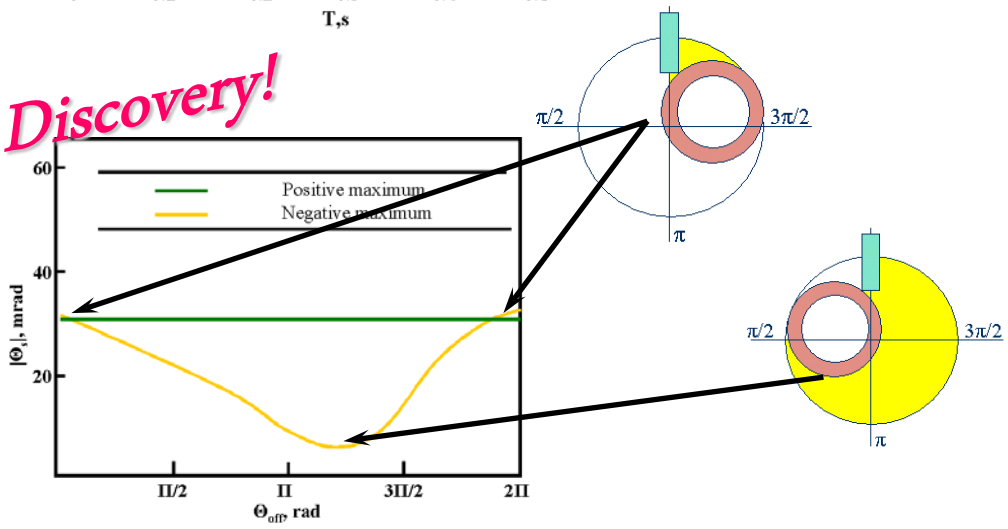
Stopping operations



Tweak compressor power- off angle, change vibration magnitude

Reason?

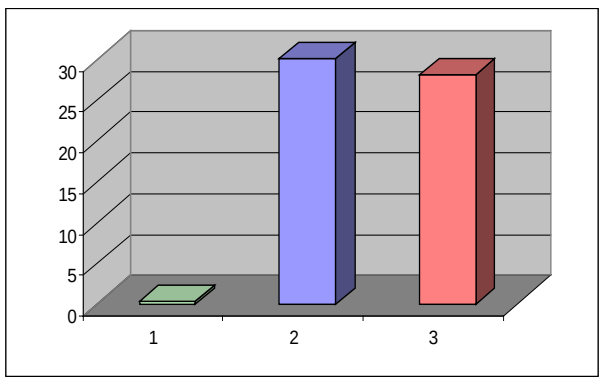
Discovery!



Small volume in compression chamber at 0 & 2π rad → Large compression moment → Large vibration magnitude

Swept volume of compression chamber

4 Magnitude of torsional vibration



- Steady state
- Starting operations
- Stopping operations

5 Conclusion

State	When vibration occur	How to estimate magnitude
Starting	End acceleration of shaft	Max motor torque and spring constant
Stopping	Just after power off	Corresponds to power off angle
Steady	-NA-	Max gas compression moment moment of inertia

1: Torsional vibration refers to vibration of stationary part

School of Mechanical and Aerospace Engineering
Project Title: The Study of Vibration of a Rolling Piston Compressor
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