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INSPECTION AND MAINTENANCE OF MECHANICAL PUMP SEALS

(PROJECT STANDARDS AND SPECIFICATIONS)

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SCOPE

This Project Standards and Specification covers the inspection and maintenance requirements for safe working of mechanical seals installed in various types of pumps in oil industry.

INTRODUCTION

Mechanical seals have been a source of failure of pumps in the oil industry. Breakdown of seals has even led to major fires. These comprehensive guidelines for inspection and maintenance of mechanical seals have been drawn up in the context of this knowledge.

TYPES OF MECHANICAL SEALS

These are the recommended type of mechanical seals for use in oil industries.

1. SINGLE BALANCED TYPE

This type of seal essentially consists of a satisfactory face with its insert packing and the rotary unit. This type of seal is normally internally mounted. Flushing arrangements used vary from seal to seal and can be selected from Appendix I depending upon the requirement.

2. DOUBLE MECHANICAL SEAL

Double mechanical seal arrangement should be used where a buffer zone is required between pump and atmosphere. Liquids in this category are mainly toxic, volatile, hazardous and abrasive fluids. Double mechanical seals can be arranged in tandem or back to back.

a) Tandem Arrangement

When two seals are arranged facing in the same direction then the mechanical seal arrangement is called tandem seal arrangement. In tandem mechanical seal the outer seal is flushed with a compatible fluid at lower pressure than the stuffing box pressure. Inner mechanical seal always takes high pressure, but the outer mechanical seal must also be able to withstand full pressure in the event of inner mechanical seal failure.

b) Back to Back Arrangement

Double mechanical seals are arranged back to back and a barrier of buffer fluid is used at a pressure of 1kg/sq. cm. above stuffing pressure. Seal flushing plans for single seals, double seals and tandem seals should be as per plans shown in Table 1.

INSTALLATION OF MECHANICAL SEALS

The following checks should be carried out on the equipment prior to seal installation.

1. LATERAL OR AXIAL MOVEMENT OF SHAFT

The total indicated axial movement of shaft should be held between .001" & .004". A mechanical seal cannot function satisfactorily with a great amount of endplay and can cause sealing problems due to the following reasons:

a) Excessive end play resulting in the shaft floating can cause pitting, fretting or wear at the point of contact between the shaft packing in the mechanical seal and the shaft or sleeve O.D.

b) As the mechanical seal driving element is locked to the shaft or sleeve, any excessive end play or lateral movement will result in overloading or underloading the springs, causing excessive wear and seal leakage.

c) A floating shaft can cause chattering, which results in chipping of the seal faces, especially the carbon element.

d) Ideal mechanical seal performance requires a minimum of wear pattern and the maintenance of a liquid film between the mating contact faces. Excessive end play reduces seal life and performance by disturbing both the established wear pattern and lubricating film between the contact faces.

2. RADIAL MOVEMENT OF SHAFT (Whip or Deflection)

The radial movement of the shaft (Whip or deflection) should be measured keeping the dial indicator as close to the radial bearing as possible. The reading should be less than .003".

Excessive radial movement can cause wear, fretting or pitting of the shaft packing or secondary sealing element at the point of contact between the shaft packing and sleeve OD.

Excessive wear at the mating contact faces will occur when excessive shaft whip or deflection is present, due to defective radial bearings or bearing fits. The contact area of the mating faces will be increased resulting in increased wear and the elimination or reduction of the lubricating film between the faces further reducing seal life.

This should be measured in the following manner:

Install the dial indicator so that the stem touches against the shaft as close to the radial bearing (back pull out type) as possible. Lift the shaft or exert light pressure at the impeller end. Reading on dial indicator gives the radial shaft movement. It should be less than 0.003".

3. SHAFT RUN OUT (BENT SHAFT)

Check the run out of the shaft at the impeller mounting area, sleeve bearing area, bearing mounting area and coupling end. The run out should not exceed 0.003".

A bent shaft can lead to many seal failures and poor sealing performance due to vibration and reduced life or bearings.