



# Pumps

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## **Aim**

To understand and be able to explain the principle of operation for the following pumps types.

## **Objectives**

The delegate will be able to:

- Explain the principles of operation, common faults and associated symptoms, operational parameters to be monitored to assure performance, seals and seals systems involved for the following types of pumps:
  - Single Stage and multi-stage centrifugal pumps
  - Reciprocating pumps
  - Positive Displacement pumps – gear, rotary, screw, Diaphragm, vane
- Explain with the aid of an example a typical application for each of the above types of pump
- Explain the concept of static head in simple terms

## **TOPICS COVERED INCLUDE**

- Static Head Pressure
- Seals and seal systems

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- Centrifugal pumps
- Dangers of reciprocating pumps
- Applications of pumps
- Manufacturers data sheets (interpretation of)

## **COURSE CONTENT**

### **1. INTRODUCTION**

### **2. CENTRIFUGAL PUMPS**

#### **2.1 MAJOR PARTS**

2.1.1. SUCTION INLET

2.1.2. IMPELLER & SHAFT

2.1.3. HOUSING

2.1.4. WEARING RINGS

2.1.5. DISCHARGE OUTLET

### **3. BEARINGS**

### **4. SEALS**

4.1. STUFFING BOX / PACKING SEAL

4.2. MECHANICAL SEAL

### **5. OPERATION OF CENTRIFUGAL PUMPS**

5.1. SINGLE-STAGE CENTRIFUGAL PUMP

5.2. MULTI-STAGE CENTRIFUGAL PUMP

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5.3. ADVANTAGES & DISADVANTAGES OF CENTRIFUGAL PUMPS

**6. ROTARY PUMPS**

6.1. POSITIVE DISPLACEMENT

6.2. MAJOR PARTS OF ROTARY PUMPS

6.2.1. BASIC ROTARY PUMP CONSTRUCTION

6.3. OPERATION OF ROTARY PUMPS

6.4. SCREW PUMP

6.5. SLIDING VANE PUMP

6.6. LOBE PUMP

6.7. PRESSURE RELIEF

6.8. ADVANTAGES & DISADVANTAGES OF ROTARY PUMPS

6.9. ENGINEERING DRAWING SYMBOL

**7. RECIPROCATING PUMPS**

7.1 MAJOR PARTS OF A RECIPROCATING PUMP

7.1.1. SUCTION INLET

7.1.2. CYLINDER

7.1.3. PISTON

7.1.4. DISCHARGE OUTLET VALVE

7.1.5. HOUSING

7.2 OPERATION OF RECIPROCATING PUMPS

7.2.1 SINGLE ACTION PUMP

7.2.2. SUCTION STROKE

- 7.2.3. DISCHARGE STROKE
- 7.2.4. PULSATION
- 7.2.5. DOUBLE ACTION PUMP
- 7.2.6. FORWARD STROKE
- 7.2.7. RETURN STROKE
- 7.2.8. PRESSURE RELIEF
- 7.2.9. CAM OPERATED
- 7.2.10. AIR OPERATED DIAPHRAGM PUMP
- 7.3. ENGINEERING DRAWING SYMBOL
- 7.4. DISADVANTAGES OF RECIPROCATING PUMPS
  
- 8. GLOSSARY
- 9. TROUBLESHOOTING
- 10. BASIC MECHANICAL SEAL OPERATION
- 11. SEALING BASICS
- 12. STUFFING BOX PACKING
- 13. MECHANICAL SEALS
  - 13.1. THE BASIC MECHANICAL SEAL
  - 13.2. HOW A MECHANICAL SEAL WORKS
  - 13.3. SEAL TYPES
    - 13.3.1. PUSHER
    - 13.3.2. UNBALANCED

13.3.2. CONVENTIONAL

13.3.3. NON-PUSHER

13.3.4. BALANCED

13.3.5. CARTRIDGE

#### **13.4. MECHANICAL SEAL ARRANGEMENTS**

13.4.1. SINGLE INSIDE

13.4.2. SINGLE OUTSIDE

13.4.3. DOUBLE (DUAL PRESSURISED)

13.4.4. DOUBLE GAS BARRIER (PRESSURISED DUAL GAS)

13.4.4. TANDEM (DUAL UNPRESSURISED)

#### **13.5 MECHANICAL SEAL SELECTION**

13.5.1. LIQUID

13.5.2. PRESSURE

13.5.3. TEMPERATURE

13.5.4. CHARACTERISTICS OF LIQUID

13.5.5. RELIABILITY & EMISSION CONCERNS

#### **13.6. SEAL ENVIRONMENT**

13.6.1 STANDARD BORE STUFFING BOX COVER

13.6.2 CONVENTIONAL LARGE BORE SEAL CHAMBER

13.6.3 LAREGE BORE SEAL CHAMBERS

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### **13.7. ENVIRONMENTAL CONTROLS**

- 13.7.1. CORROSION
- 13.7.2. TEMPERATURE CONTROL
- 13.7.3. DIRTY OR INCOMPATIBLE ENVIRONMENTS

### **13.8. FIELD TESTING METHODS**

- 13.8.1. DETERMINATION OF TOTAL HEAD
- 13.8.2. MEASUREMENT OF CAPACITY

## **14. THE MOST ASKED QUESTIONS ABOUT MECHANICAL SEALS**

**Dates available on request**

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