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SEAL CONDITION MONITORING PRINCIPLES

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Bio:

Michael Forsthoffer has been involved with Rotating Equipment design and field work since 1998. He has worked in the field, monitoring Centrifugal Compressor Steam and Gas Turbine Condition, performing site specific rotating machinery audits, and Training. Michael has formerly worked for John Crane, Inc. from 2005-2008, in which he was the Site Mechanical Seal Specialist for three years at HOVENSA Refinery in St. Croix, USVI.

Abstract:

As many of you have experienced throughout your career, Mechanical Seals are the number 1 failed component within pumps. So, how do we fix that? In this tutorial, we will discuss why seals are the # 1 failed component, but most importantly, discuss how to effectively monitor the condition of mechanical seals. Effective Mechanical Seal Monitoring will revolve around the 3 steps:

- Is the Pump operating within its EROE?
- Seal Chamber Condition
- Seal Flush System Monitoring

You are probably asking what EROE is at this point. It is the one thing that is overlooked many times when monitoring mechanical seal condition and can greatly affect the life of a mechanical seal. We will define EROE and how it affects mechanical seal life, as well as discuss the other steps required to effectively monitor mechanical seals.

INTRODUCTION

The Seal Vendor designs the seal face geometry and supporting components in order to change the fluid to a vapor approximately at an optimum point across the seal faces (See figure 1).

MECHANICAL SEAL PRIMARY FACE VAPORIZATION POINT

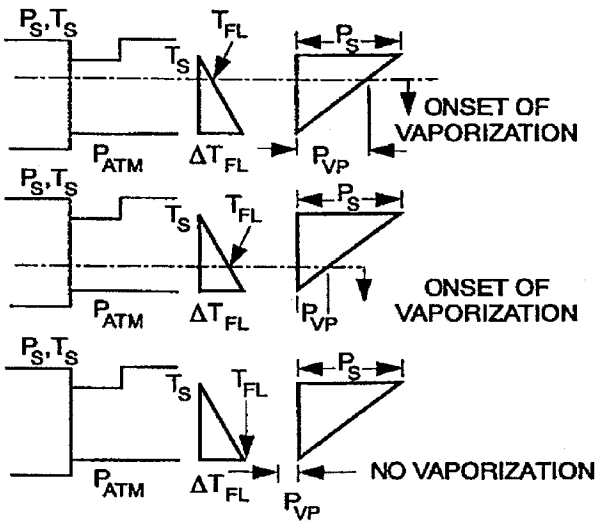

FIGURE 1 – RELATIONSHIP BETWEEN SEAL FLUID PRESSURE, TEMPERATURE AND FLUID CHARACTERISTICS

In figure 1 above, three distinct operating modes are shown for the primary ring (on the left) and the mating ring (on the right).

- The top mode shows a condition of early vaporization which can occur on light fluids, or hot fluids or where seal chamber pressure is lower than designed (Note: Seal chamber pressure is designed to be at least 50 psi or 345 kpa above the seal fluid vapor pressure).

- The middle figure shows the desired design condition of changing the fluid to a vapor approximately ¾ of the way down the faces. This is the design basis since it is known that fluid characteristics, temperature and/or pressure will change during operation a certain amount. Excessive changes in any or all of these parameters will lead to seal failure.