The Institution of Engineers, Malaysia

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Technical Talk On Leakage And Dynamic Forces In Pump Annular Seals Operating With Air/Oil Mixtures

Organised by the Mechanical Engineering Technical Division, IEM

BEM Approved CPD/PDP Hours: 2 Ref No: IEM19/HQ/086/T

Date : 12th March 2019 (Tuesday)
Time : 1.45pm – 3.45pm
Venue : Auditorium 1, Level 7, APU University, Jalan Teknologi 5, Taman Teknologi Malaysia, 57000 Kuala Lumpur

STRICTLY ONLINE REGISTRATION ONLY

Please take note that visitors would need to pay parking fee of RM7.00 (+SST) to Technology Park Malaysia (TPM) to avoid clamping.

SYNOPSIS

In the subsea oil and gas industry, multiphase pumps enable a long distance tie back system and eliminate topside oil and gas separation station. A persistent challenge to operate (vertical) centrifugal pumps handling (gas in liquid) mixtures is their poor reliability due to persistent sub synchronous vibrations. The mixture gas volume fraction (GVF), surely changing over time, affects the dynamic forced performance of leakage flow components, namely seals, and which may lead to an increase in lateral and axial rotor vibrations.

The seminar will present measurements of leakage and dynamic force coefficients for various annular seals (L/D = 0.36 mm) operating at a shaft speed of 3.5 krpm (58 Hz) and a pressure ratio out/in=2.0 while supplied with an air in oil mixture ranging from pure liquid to just air. The recorded mixture mass flow rate decreases continuously with an increase in inlet gas volume fraction (GVF). The seals operating with a pure liquid (GVF=0) show frequency independent force coefficients. On the other hand, operation with a mixture produces direct stiffness (K) and cross-coupled stiffness (k) that vary greatly with frequency, in particular K hardens with excitation frequency. The direct damping (C) coefficients, on the other hand, are not functions of excitation frequency, albeit dropping rapidly in magnitude as the GVF increases. A three-wave seal produces the greatest K and C, as well as the largest effective damping coefficient (C-k/ω) as is recommended for field use. The multiple tests with a plain band seal supplied with gas injection (GVF~0→0.6) demonstrate the seal recovers its dynamic stiffness, hence its usage to promote rotor stability in hydraulic pump/turbine systems. The comprehensive test campaign raids to better design multiple-phase flow centrifugal pumps.

BIODATA OF SPEAKER

Prof Luis San Andres
Mast-Childs Chair Professor
Texas A&M University

Luis San Andrés is the Mast-Childs Chair Professor at the Mechanical Engineering Department, Texas A&M University. He performs research in lubrication and rotor dynamics, having produced advanced technologies of hydrostatic bearings for primary power cryogenic turbo pumps, squeeze film dampers for aircraft jet engines, and gas foil bearings for oil-free micro Turbomachinery. Luis is a Fellow of ASME and STLE, and a member of the Industrial Advisory Committees for the Texas A&M Turbomachinery & Pump Symposia. Dr. San Andrés has educated dozens of graduate students serving the profession with distinction. Dr. San Andrés earned a BS in Mechanical Engineering(1981), MS in ME from the University of Pittsburgh(1982) and a PhD in ME from Texas A&M University(1981). Luis has published over 175 peer reviewed papers in various ASME journals. Several papers are recognized as best in various international conferences.

Ir. Syed Neguib bin Syed Mohamad
Chairman
Mechanical Engineering Technical Division, IEM

ANNOUNCEMENT TO NOTE

FEES

(Effective 1st October 2017)

Members

Registration Fee : FOC
Administrative Fee :

Online RM15

Non-Members

Registration Fee : RM50
Administrative Fee : RM20

- Limited seats are available on a "first come first served" basis (maximum 100 participants).
- **To secure your seat, kindly register online at www.myiem.org.my**

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