Travel Information

Holiday Inn Express Pearland (1.1 miles from TurboCare)
13931 South Freeway, Hwy 288
Pearland, TX 77047
877-859-5095

SpringHill Suites (1.8 miles from TurboCare)
1820 Country Place Parkway
Pearland, Texas 77584
Telephone: 713-436-7377
Fax: 713-436-7376

Courtyard by Marriott (3.8 miles from TurboCare) (Siemens rate $148)
11200 Broadway
Pearland, Texas 77584
Telephone: 713-413-0500
Fax: 713-413-0501
This hotel is located in the Pearland Town Square, an open air walking mall. The mall has many retail establishments including Coach, Fossil, James Avery, Macy's, Dillard's. Eating establishments include BJ's Brewery, Red Robin, Mimi's Café, Red Lobster and numerous others.

Holiday Inn Express Pearland (8 miles from TurboCare) (Siemens rate $103)
1702 North Main Street
Pearland, Texas 77581
Telephone: 281-997-2600
Fax: 281-997-8332

Hampton Inn (7 miles from TurboCare) (Siemens rate $84)
6515 Broadway Street
Pearland, Texas 77581
Telephone: 832-736-9977
Fax: 832-736-9911

Hilton Garden Inn ***(3 miles from TurboCare) (Siemens rate $76)***
12101 Shadow Creek Pkwy.
Pearland, Texas 77584
Telephone: 713-340-0110
Fax: 713-340-0140

Airports:
IAH – George W. Bush *(32 miles from TurboCare)*
HOU – Houston Hobby (closest to TurboCare Houston – *12 miles from TurboCare*)

Driver Service (will pickup at either Houston airport):
Limousines Unlimited – Contact: Carlos (713) 782-7800

TurboCare

ROTOR BEARING SOLUTIONS INTERNATIONAL, LLC

Present

Advanced Rotordynamic Technology and Case Histories
In the Rotating Machinery Industry
Industrial Seminar
October 21-25, 2013

3.2 CEUs Are Available for Successful Completion of the Course

Hosted by:
TurboCare
3100 S. Sam Houston Pkwy East
Houston, TX 77047
(713) 336-1300

Registration Information

Contact:
Dr. Timothy Dimond
3277 Arbor Trace
Charlottesville, VA 22911
(434) 632-8469
Or register directly at www.rotorsolution.com

Cost and Payment
$2,850 pre-registration
$3,000 on-site registration
2.5% Discount for Payment by Check

SEATING IS LIMITED – REGISTER SOON

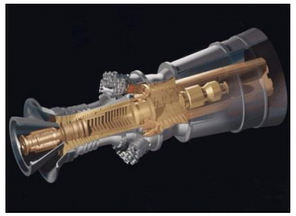
Make Checks Payable To:
Rotor Bearing Solutions International

Lectures Start Monday, October 21, 2013, at 9:00 am
and end on Friday, October 25, 2013, at 12 noon

Seminar Topics

Rotordynamics

Introduction - Jeffcott Rotor
Example Rotors
- Compressors
- Steam Turbines
- Motors and Generators
- Pumps
- Gas Turbines
- Blowers



Critical Speed Maps
- Campbell Diagrams

Mode Shapes
- Undamped
- Damped

Rotor Stability
- Instability
- Mechanisms
- Machine Fixes

Rotor Unbalance
- Unbalance Response
- Rotor Balancing

Fluid Film Bearings

Introduction to Bearings and Lubrication
Fixed Pad Bearings
- Plain Journal
- Multilobe, Offset Half,
- Pressure Dam
- Advances in Load Capacity, Power Loss and Cooling

Tilting Pad Bearings
- Basic Design,
- Advances in Load Capacity, Power Loss and Cooling

Squeeze Film Dampers
- Stiffness and Damping Properties

Damping Effects in Rotor Systems

Turbocare Tours

Tours of the TurboCare facility in Houston will be conducted by TurboCare personnel*

(*Some employees of competitors may not be able to take the tour)

Case Histories

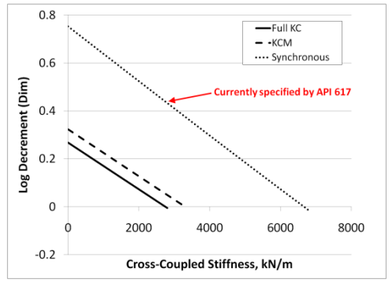
Industrial Compressors
Bearing Improvements/Bearing Redesign
Industrial Motors and Generators
Change Critical Speeds
Industrial Pumps
Modify Seals
Steam Turbines
Rotor Modifications
Substructure Improvements
Gas Turbines
Shaft Repairs/Stub Shaft Repair

Gas and Liquid Seals

Flow in Gas Seals
- Labyrinth
- Hole Pattern
- Honeycom

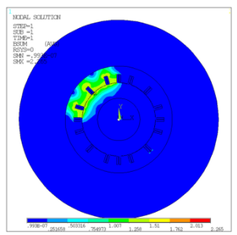
b Seals
Stiffness and Damping Properties
Destabilizing Effects on Seals
Stabilizing Rotors
- Swirl Brakes
- By Pass Flows

Liquid Seals
- Lomakin Effect



Active Magnetic Bearings

An Introduction – How Do They Work?
Working Principles
Principles of Design
Simple Control Concepts

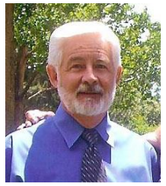


Lecturers:

Dr. Paul Allaire
Retired Chaired Professor at University of Virginia, Long Time Director of Rotating Machinery and Controls Laboratory (ROMAC)
Founder and Director of Center for Magnetic Bearings
Chief Technical Director, RBSI

Dr. Tim Dimond, P.E.
President – Rotor Bearing Solutions International
Formerly Principal Scientist in ROMAC
Extensive work in rotordynamics, bearing design, and rotordynamic system identification.

Sandye Simmons
BSME University of Virginia
TurboCare, Inc. Manager Steam Turbine Applications
33 years Industry Experience



Tom Smith
TurboCare, Inc.
Manager, Steam Turbine Technology Integration,
Service and Repair
41 years Industry Experience

Lectures and Notes

Most of the lectures have been prepared by Paul Allaire and Tim Dimond in the form of a future textbook. These notes are very detailed and the same ones used for lectures in the rotordynamics and bearings courses taught at the University of Virginia by Prof. Allaire and Dr. Dimond in recent years, to ROMAC graduate students, as well as some new material in the same form.

Unlike many industrial seminars (short courses) taught by other lecturers who use Power Point slide that leave views wondering what steps were followed in going from one slide to the next, these notes read just like a textbook when readers go back to them 6 months or years later.

Full copies of all of these notes will be provides to the attendees in electronic form. Some other lecturers will be delivered in Power Point or equivalent form but all of those talks will also be provided to the attendees in electronic form. The lectures in electronic form can be viewed on attendees' personal computers during the seminar lectures.

In the lectures, the mathematics behind the rotordynamics calculations will not be emphasized in the lectures and will only be summarized. Generally the mathematics behind the case histories will not be discussed at all. However, for those interested in the mathematical background, the equations are included in the notes.

Course Agenda – Day 5

Session 15 – Gas Turbine Rotordynamics

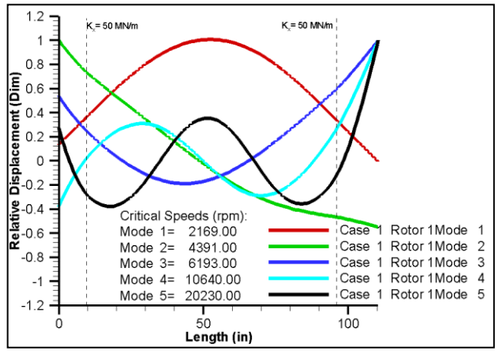
8:00 – 8:30 am – Talk 38 – Rotordynamic Modeling of Gas Turbine Engines – Paul Allaire
8:30-9:00 am – Talk 39 – Rotordynamics of Gas Turbine Engines: Updates on Squeeze Film Dampers – Tim Dimond (with Saeid Dousti)
9:00-9:30 am – Talk 40 - Three Dimensional Modeling of Gas Turbine Engine - Paul Allaire (with Jawad Chaudhry)
9:30-10:00 am – Talk 41 – Realistic Squeeze Film Damper Analysis for Jet Engines – Tim Dimond

10:00-10:15 am - Break

Session 16 – Identification and Magnetic Bearings

10:15-11:00 am – Talk 42 - New Method of Identification of Rotor and Fluid Film Bearing System Damping Characteristics – Tim Dimond (With Weimin Wang)
11:00-12:00 noon – Talk 43 - Introduction to Magnetic Bearings – Paul Allaire

* Small Agenda Changes May Occur In the Final Short Course Talks and Notes



Course Agenda – Day 1

8:30-9:15 am – Registration (On Site)

9:15 – 9:30 am – Introduction to Industry Seminar – Scott Hill, TurboCare

Session 1 – Introduction to Rotordynamics and Bearings I

9:30-10:00 am – Talk 1 – Introduction to Rotordynamics – Paul Allaire (Allaire's Notes -Section 1.1)

10:00-10:15 am – Break

Session 2 – Introduction to Rotordynamics and Bearings II

10:15-10:45 am – Talk 2 – Rotor Dynamic (API) Vibration Specifications – Tim Dimond (Allaire's Notes – Section 1.3)
10:45-11:30 am – Talk 3 – Single Mass Flexible Rotor (Jeffcott Rotor) on Rigid Bearings – Paul Allaire (Allaire's Notes – Section 2.1)
11:30-12:00 noon – Talk 4 - Critical Speeds, Mode Shapes and Unbalance Response of Compressor Rotor – Tim Dimond

12-00-1:00 pm – Lunch (Provided On Site)

Session 3 – Rotordynamic Modeling and Assessment

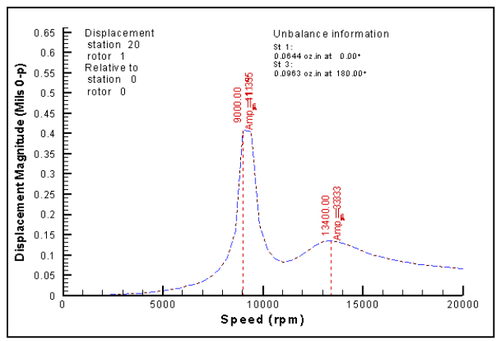
1:00-1:45 pm – Talk 5 – Case History and Lateral Rotordynamic Assessment of Large Alternator/Flywheel Rotor – Tim Dimond
1:45-2:30 pm – Talk 6 – - Support Flexibility Effects in Compressor Critical Speeds and Unbalance Response – Tim Dimond

2:30-3:15 pm – Talk 7 – Stability of Jeffcott Rotor with Cross Coupled Effects - Steam Whirl, Alford Forces, Aerodynamic Excitation – Paul Allaire (Allaire's Notes – Section 2.4)

3:15-3:30 Break

Session 4 – Rotor Dynamic Modeling and Problems

3:30-4:15 pm Talk 8 - Rotor Rub Characteristics of Rotating Machinery – Paul Allaire
4:15-5:00 pm Talk 9 – Torsional Analysis of Large Alternator/Flywheel Rotor with Motor Excitation and Fatigue Life - Tim Dimond



Course Agenda – Day 2

Session 5 – Fixed Pad Fluid Film Bearing – Types and Characteristics

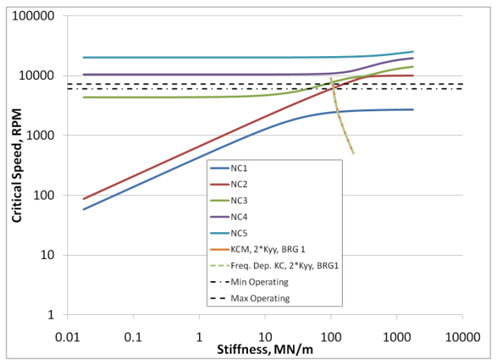
8:00 – 8:45 am – Talk 10 – Properties of Fixed Fluid Pad Bearings – Paul Allaire (Allaire's Notes –Section 4.10)
8:45-9:30 am – Talk 11 – Dynamics of Fixed Pad Fluid Bearings – Paul Allaire (Allaire's Notes – Section 4.11)
9:30-10:00 am – Talk 12 – Gearbox Bearing Instability in Fixed Pad Bearings and Repair Case History – Tim Dimond

10:00-10:15 am – Break

Session 6 – Tilting Pad Bearings/Bearing Case Histories and Repairs

10:15-11:00 am – Talk 13 – Tilting Pad Bearing Properties – Paul Allaire (Allaire's Notes – Section 4.12)
11:00-12:00 noon– Talk 14 – Case Study – Bearing Redesign – Sandye Simmons

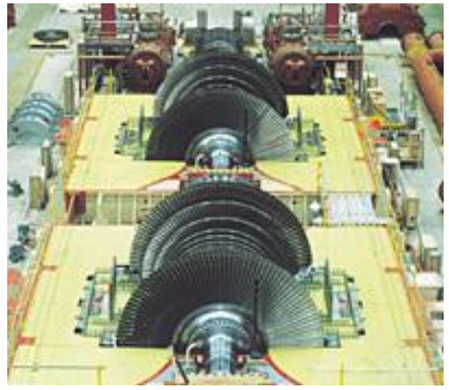
12-00-1:00 pm – Lunch (Provided On Site)



Session 7 – Tilting Pad Bearing Fluid Film Bearings – Types and Characteristics

1:00-1:45 pm – Talk 15 - Tilting Pad Bearing Dynamic Properties – Tim Dimond
1:45-2:30 pm – Talk 16 - Compressor Stability in Tilting Pad Bearings – Non-synchronous or Synchronous Tilt Pad Bearing Model? – Tim Dimond
2:30-3:00 pm – Talk 17 – Advanced Design of Tilting Pad Bearings – Paul Allaire (with John Nicholas)

3:00-3:15 pm Break



Session 8 – API Specifications and Rotor Stability

3:15-3:45 pm Talk 18 - API Specifications – Paul Allaire
3:45-4:20 pm – Talk 19 - Stability of Compressor with Seal Cross Coupling – Tim Dimond
4:20-5:00 pm – Talk 20 – Compressor Stability with Seal Cross Coupling and Optimized Tilting Pad Bearings – Tim Dimond

Course Agenda – Day 3

Session 9 – Rotor Repair and Modeling

8:00-9:00 am – Talk 21 – Rotor Shaft Repair – Tom Smith
9:00-9:30 am – Talk 22 – Modeling of Geared Systems Including Bearings and Shaft Dynamics – Tim Dimond
9:30-10:00 am – Talk 23 – Gearbox Issues with Tilting Pad Bearing Starvation and Fix – Paul Allaire (with John Nicholas)

10:00 -10:15 am - Break

Session 10 – Geared Systems

10:15-11:00 am – Talk 24 – Gearbox Vibration with Tilt Pad Bearing - Paul Allaire (with John Nicholas)
11:00-11:30 am – Talk 25 – Analysis of Test Rig with Gearbox – Tim Dimond

11:30-12:00 pm – Lunch (Provided On Site)

12:00-3:00 pm – TurboCare Facility Tour and Discussions

Course Agenda – Day 4

Session 11 – Advanced Finite Element Modeling of Rotors

8:00-8:45 am – Talk 26– Free Undamped Vibration of Multimass Rotor Systems – Finite Element Modeling – Paul Allaire (Allaire's Notes – Section 6.2)
8:45-9:30 am – Talk 27 – Critcal Speed Maps, Campbell Diagrams and Modal Analysis of Rotors – Finite Element Modeling – Tim Dimond (Allaire's Notes – Section 6.3)
9***:30-10:00 am – Talk 28*** – Modeling Proportionally Damped Rotors – Paul Allaire (Allaire's Notes – Section 6.4)

10:00-10:15 am - Break

Session 12 – Seals and Seal Effects in Industrial Rotors

10:15-11:00 am - Talk 29 – Vibration and Stability on Fixed Pad Bearing Rotors – Gas Expanders, Gas Turbines, Boiler Feed Pumps, Nuclear Main Coolant Pumps, Compressors - Paul Allaire (Allaire's Notes – Section 6.5)
11:00-11:30 am - Talk 30 - Laby, Honeycomb, Hole Pattern Seals – Advanced Analysis Methods and Improvements – Paul Allaire
11:30-12:00 noon – Talk 31 - Case History of Compressor Instability Due to Internal Seals and Solution – Paul Allaire (From Joy Martin, Chester Lee of Solar Turbines)

12-00-1:00 pm – Lunch (Provided On Site)

Session 13 – Squeeze Film Dampers and Vibration Reduction Methods

1:00-1:30 pm – Talk 32 - Squeeze Film Damper Construction and Operation/Use of O-Rings as Centering Springs – Tim Dimond (with Saeid Dousti)
1:30-2:15 pm – Talk 33 - Squeeze Film Damper for Vibration Reduction in Steam Turbines – Paul Allaire (with John Nicholas)
2:15-3:00 pm – Talk 34 – Nonlinear Transient Analysis of Compressor on Tilting Pad Bearings and Squeeze Film Dampers – Tim Dimond (with Jianming Cao)

3:00-3:15 pm - Break

Session 14 – Brush Seals and Other Topics

3:15-3:45 pm - Talk 35 – Brush Seals - Analysis of Leakage Flow and Rotordynamic Coefficients – Paul Allaire
3:45-4:30 pm – Talk 36 –– Unbalance Response with Finite Elements - Paul Allaire (Allaire's Notes – Section 6.6)
4:30-5:00 pm – Talk 37 – Optimum Rotor Balancing of Rotors – Tim Dimond (with Bin Huang)