



47TH TURBOMACHINERY & 34TH PUMP SYMPOSIA
HOUSTON, TEXAS | SEPTEMBER 17-20, 2018
GEORGE R. BROWN CONVENTION CENTER

Fundamentals of Mechanical Seals

Fluid Sealing Association



TURBOMACHINERY LABORATORY
TEXAS A&M ENGINEERING EXPERIMENT STATION



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Operating Principles of Mechanical Seals

Session 1

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Presenter

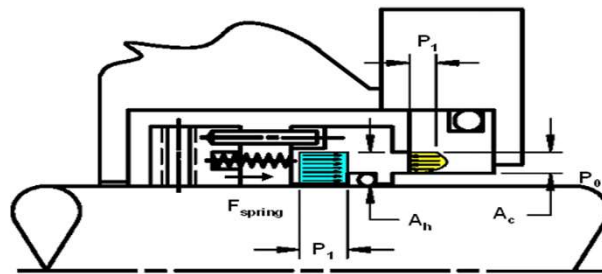
- **Steven Bullen - A.W. Chesterton Co.**

- □ Steven Bullen completed his formal education as a Mechanical Engineering Design Technician in 2001 whilst working in his first employment designing, manufacturing and specifying sealing devices for rotating equipment. Steven has worked in the Sealing industry for over 18 years holding various positions in Design & Test Engineering, Production Engineering, Application Engineering, Sales Management and Product Management. He has supported a myriad of customers & industries. Before leaving Europe he was the Mechanical Seals Divisional Chairman for the European Sealing Association. He is currently Chesterton's Global Product Manager – Mechanical Seals.

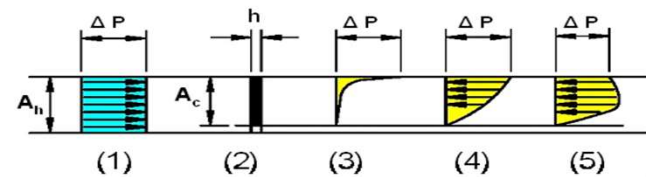


Effective forces in a Mechanical Seal

- Axial and radial forces
- Closing and opening forces
- Hydro static and hydrodynamic forces



A_h = hydraulically loaded area
 A_c = contact area
 P_1 = sealed pressure
 P_0 = pressure at the atmosphere side of the seal face



- (1) Hydraulic closing force
- (2) Lubricating film thickness h
- (3) Pressure curve in static condition of the pump
- (4) Linear pressure drop
- (5) Pressure curve with hydrodynamic component





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Dual Gas Seals Materials of Construction Secondary Seals



Presenter

Brian Kalfrin – John Crane

Brian Kalfrin is a Regional Engineer for John Crane in Pasadena, Texas. He has over 17 years of experience with mechanical seals and related equipment. Mr. Kalfrin is responsible for troubleshooting and diagnostic failure analysis and root cause analysis for seal and sealing system applications. He is involved in evaluating new seal applications as well as optimizing existing sealing solutions to meet reliability and emission requirements. Mr. Kalfrin has been actively involved with training internal John Crane engineers as well as external customers and seal users.

Mr. Kalfrin received his BS degree in Mechanical Engineering from Drexel University. He is a member of the Texas A&M Pump Symposium Advisory Committee.



Session 2

- Dual gas lubricated seals
 - Critical design features
 - Secondary seal friction
 - Variations in designs and equipment fit
- Materials of construction
 - Face material
 - Metal parts
 - Elastomers
- Secondary seals
 - Characteristics, composition, chemical resistance and design





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API Seal Piping and Failure Analysis

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Presenter

Michael Huebner – Flowserve Corporation

Mr. Huebner is a Principle Engineer at Flowserve Corporation in Deer Park, Texas. Mr. Huebner has been involved with the design and application of centrifugal pumps, mechanical seals, and fluid handling equipment for over 30 years. At Flowserve, he has been responsible with new product development, research, product testing, field service, and technical support. He has published numerous articles in publications and journals including in the Pump Handbook and the Encyclopedia of Tribology. He has held positions both in the U.S. and Europe.

Mr. Huebner has taught extensively around the world on topics of mechanical seals, pump operations, failure analysis, and API 682. He continues to support training internally, at end users, and at major symposiums and conferences. Mr. Huebner received his BA in Engineering Technology from Texas A&M University. He is a member of the API 682 Task Force on mechanical seals and the ASME B73 Committee for centrifugal pumps. He is on the Texas A&M Pumps Users Symposium Advisory Committee and is a member of ASME.



Session 3

- API Seal Piping Plans
 - Environmental controls for mechanical seals
 - Most common piping arrangements
 - Single seals, process and atmospheric
 - Dual seals
 - Liquid seals, pressurized and non pressurized
 - Gas seals, pressurized
- Seal Failure Analysis
 - Failure modes for :
 - Seal faces
 - Elastomers
 - Drive components
 - Metal parts





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Seal Chamber Design - Installation Energy Consumption of Sealing Systems and Life Cycle Costs

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Presenter

Henri Azibert – Fluid Sealing Association

- Henri V. Azibert started his career as counsel for the State Rating Bureau for the Division of Insurance for the Commonwealth of Massachusetts. He then joined the A.W. Chesterton Company where he had responsibility for all the mechanical seal and mechanical packing engineering staff and product lines. For the past four years he has been retained as the Technical Director for the Fluid Sealing Association.
- He received his Baccalauréat from Lycée Louis Le Grand, a B.A. in Political Science from the University of Massachusetts, a Jurisprudence Doctor from Boston College, and a Masters degree in Mechanical engineering from Northeastern University.
- Mr. Azibert was granted over thirty patents on mechanical seal designs and improvements. He is a member of the API 682 and 3A Mechanical Seal Standard Task forces, has been a member of the Texas A&M Pump Symposium Advisory Board; he has chaired several committees for the Fluid Sealing Association.



Session 4

- Seal chamber design
 - Impact on seal performance
- Seal Installation
 - Component seals
 - Cartridge seals
 - Split seals
- Energy Consumption of Sealing Systems
 - Frictional wear
 - Thermal losses
- Life Cycle Costs
 - Acquisition costs are a very small fraction of the life cycle costs

