At the end of this workshop participants will be able to:

- Demonstrate a sound understanding of the fundamentals of seal selection
- Understand environmental considerations related to seals
- See how the experts repair and rebuild seals for outstanding performance
- Troubleshoot seals
- Maximise mechanical seal life
- Classify various seals, including special seal types
- Explain considerations related to the materials used in seal construction
### DAY ONE

**FUNDAMENTALS AND PRINCIPLES**
- Definition of zero leakage
- Mechanics of sealing
- Purpose of sealing
- Basics regarding speed and pressure
- Basic seal requirements
- Seal friction
- Wear and seal life
- Texture
- Seal balance criterion - balance ratio, pressure distribution
- Seal applications
- Operating capabilities, advantages and limitations

**SEAL DESIGN AND CLASSIFICATION**
- Identifying seal components and their function
- Primary sealing components - seal head, seal seat, springs for face loading, metal bellows
- Secondary sealing components - elastomeric O-rings, V-rings, U-cup rings, wedge rings
- Inside and outside seals
- General arrangement modes
  - Single: cartridge, component, split, stationary
  - Duplex: tandem, back-to-back
- Static and dynamic seals
- Rotating and stationary seal heads
- Sealing face conditions
- Seal pre-loading

**SPECIAL SEAL TYPES**
- Bellows
- Bushing, labyrinth, diaphragm
- Gas, motion, slurry
- Carbon seals
- Liquid ring and liquid barrier seals
- Inflatable, ferrofluidic
- Positive action type
- Self- adhesive compression seals

**MATERIALS OF SEAL CONSTRUCTION**
- General considerations
- Properties of elastomers
- Elastomeric materials
- Plastic polymers
- Cemented carbides
- Miscellaneous sealing materials
- Material compatibility

**SEALS FOR SPECIFIC/SPECIAL APPLICATIONS**
- Hydraulic
- Pneumatic
- High temperature
- Large diameter

### DAY TWO

**ENVIRONMENTAL CONSIDERATIONS AND CONTROL**
- Abrasives, heat, dry operation
- Flushing, recirculation, quenching
- Convection, cooling, jacketing
- Buffer and barrier fluid
- Dead end lubrication, grease packing, circulating face lubrication
- API 610 environmental control schemes

**AUXILIARY EQUIPMENT**
- Cyclone separators
- Pressurization units
- Air-coolers and heat exchangers
- Rotameters and flow controllers
- Leakage detectors
- Filters and strainers

**SEAL HANDLING AND INSTALLATION**
- General considerations
- Seat squareness

**SEAL FAILURES**
- Factors influencing seal life
- Factors affecting seal performance
- Seal malfunction and probable causes
- Friction and wear
- Adhesion, abrasion
- Corrosion and surface fatigue

**SEAL SELECTION AND STANDARDS**
- Seal selection guides
- Standards-ISO, British, DIN, ASME

**TROUBLESHOOTING FAILED SEALS**
- At the pumping site
- At the equipment teardown
- Discoloration, chipping, cracking, rubbing, elastomer swelling, stickiness, hardness - what do these mean?

**HOW TO MAXIMISE MECHANICAL SEAL LIFE**
- Preparing the pump - mechanically, hydraulically
- Controlling temperature in the stuffing box
- Controlling pressure in the stuffing box
- What seal to choose?
- What face combination and elastomer?

**SUMMARY, OPEN FORUM & CLOSING**