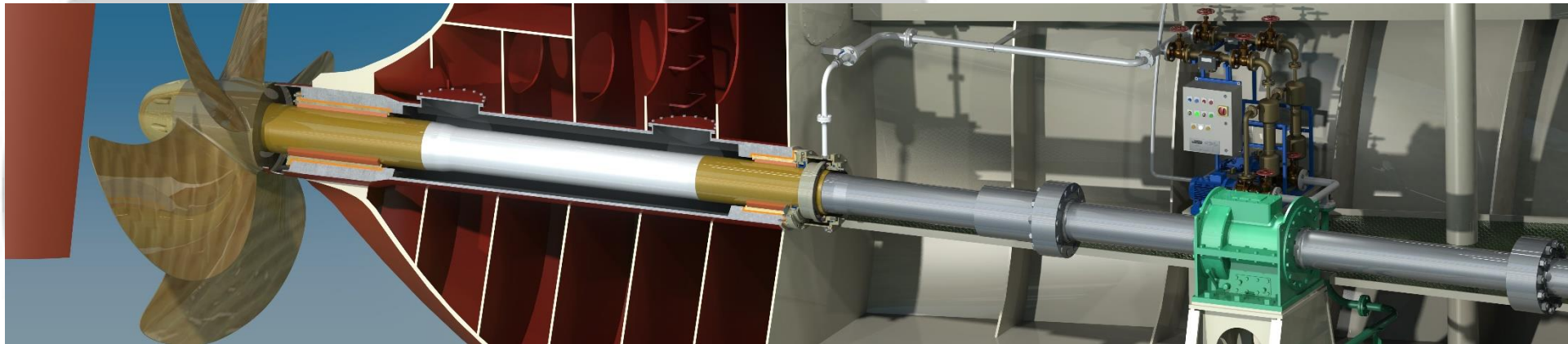


# The Zero Emission Vessel

## *Below the Waterline*



*Presented by:*  
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**Thordon Bearings Inc.**  
**March, 2020**

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# Overview

- Current Situations
- Problems with oil/sea interfaces in propeller shaft lines
- The seawater lubricated shaft choice
- Ship owner and operator benefits
- The COMPAC System

# Going Green...

## Below the Waterline

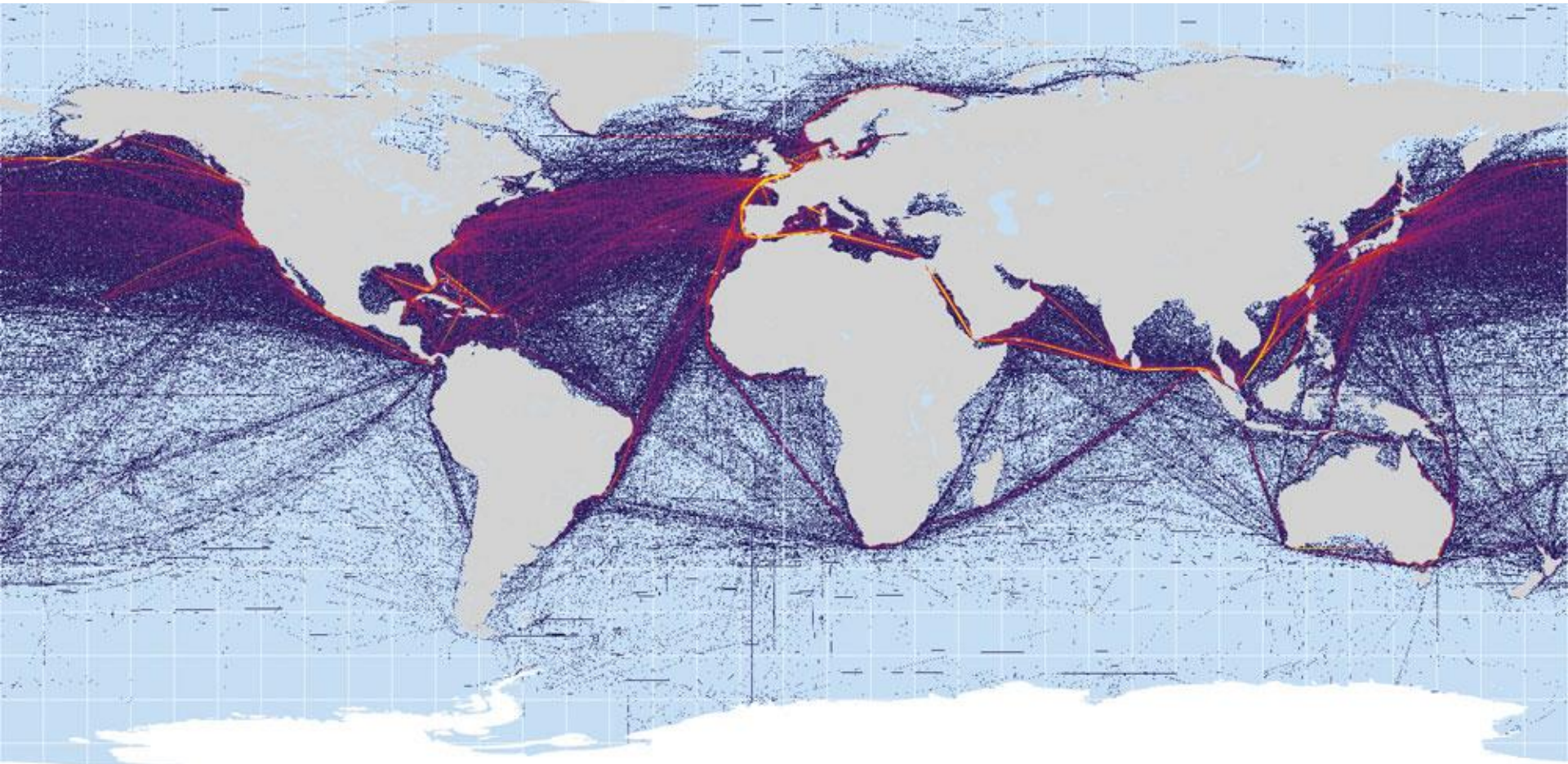


# Oil discharges from commercial ships... a serious problem



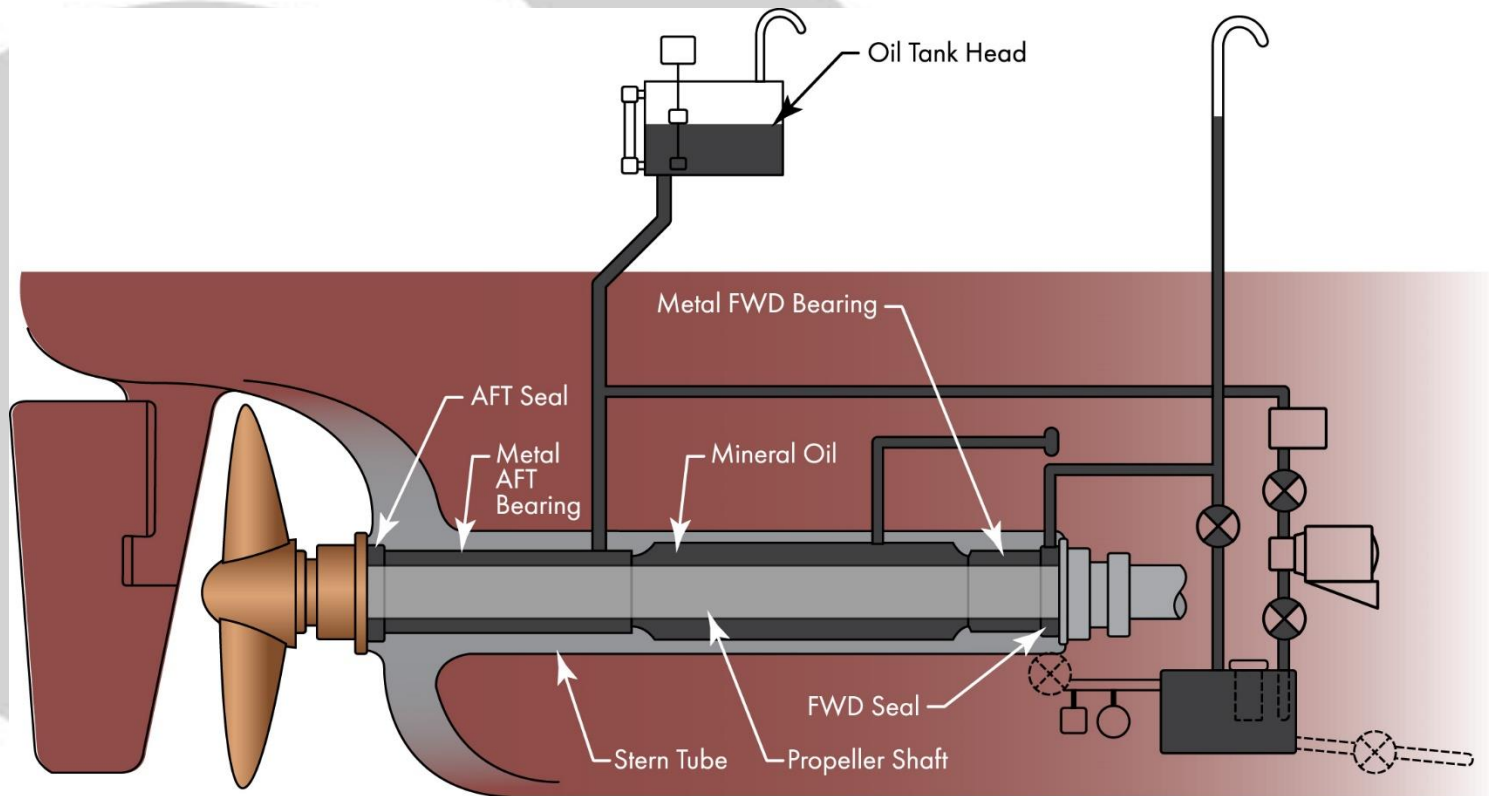


# Evolving Legislation

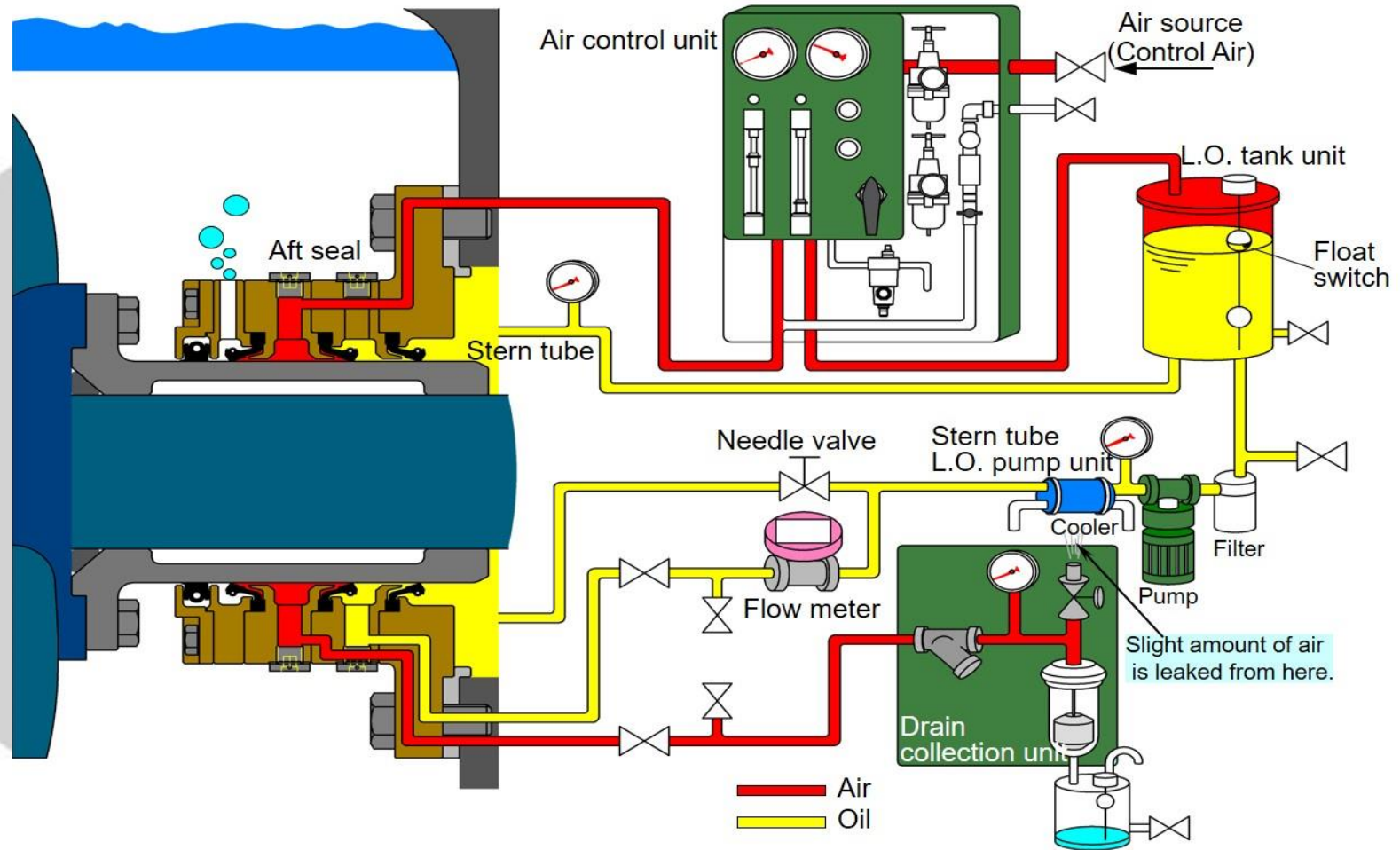


# Propeller Shafts Lubricated With Oil

- Typical stern tube system has 1500 to 3000 litres of mineral oil

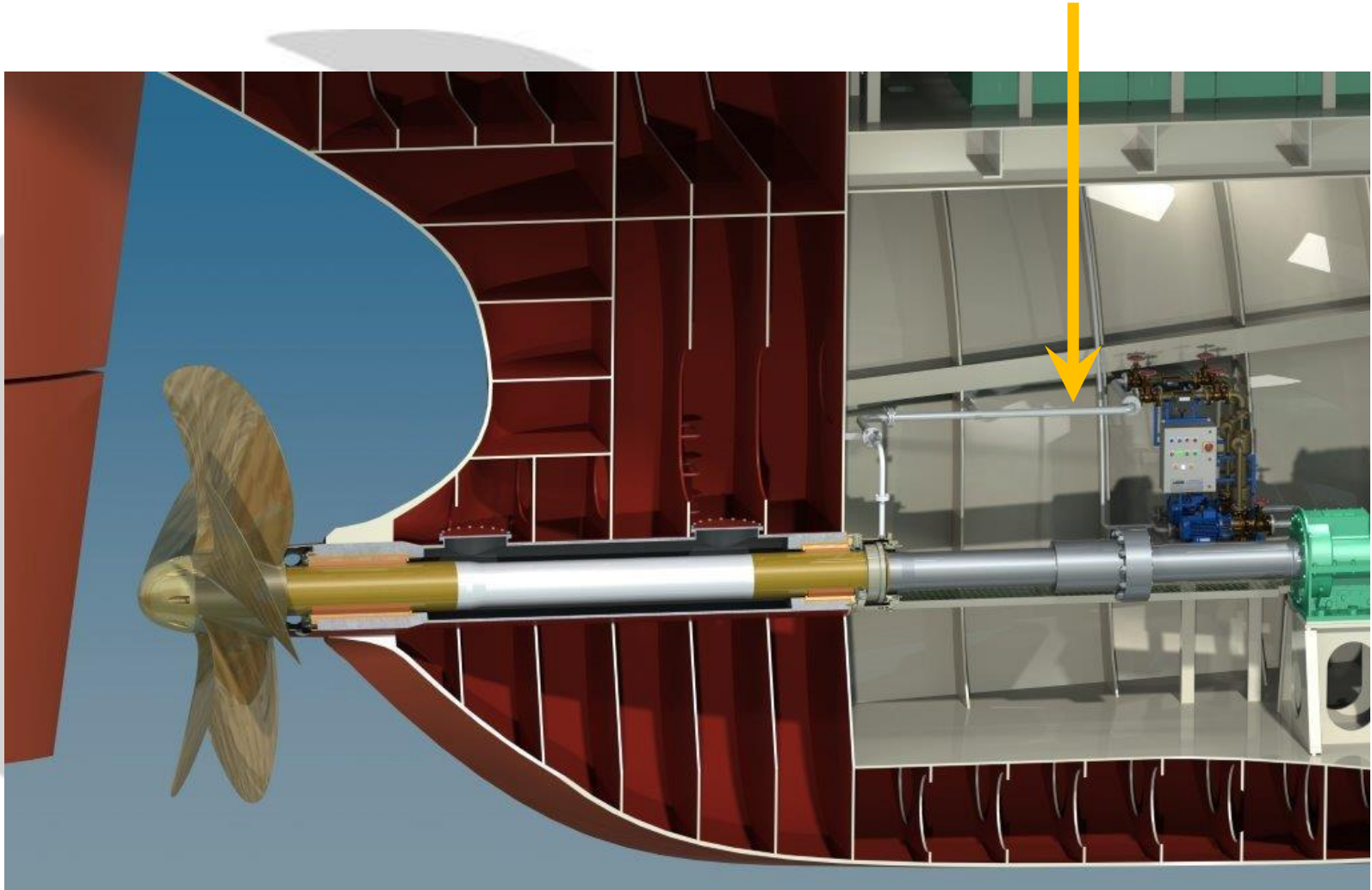


# Propeller Shafts Lubricated With Oil and AirSeal







# Only one Seawater Pipe





# Compliance with the VGP Solutions for Ship Owners

## Cost Comparison of Propeller Shaft Lubricants

<b>Mineral Oil</b> (Sealed system requiring FWD and AFT seal)	 US \$1.25/L (US \$4.73/U.S. gal)
<b>Environmentally Acceptable Lubricants (EAL's)</b> (Sealed system requiring FWD and AFT seal)	 US \$10.50/L (US \$39.75/U.S. gal)
<b>Seawater</b> (Open system requiring only FWD seal)	US \$0.00/L (US \$0.00/U.S. gal)

Rev.1

# Benefits of Water Lubrications

- Reduced Operating Costs
  - no purchase of oil; no storage of oil
  - no sampling of oil; no disposal of oil
  - no labour required to top up header tanks (due to the leakage)
- No Aft seal to maintain
- (water lubricated FWD seal only)
- No emergency AFT seal repairs
  - No risk of rope/line damage to AFT seal as there is no AFT seal

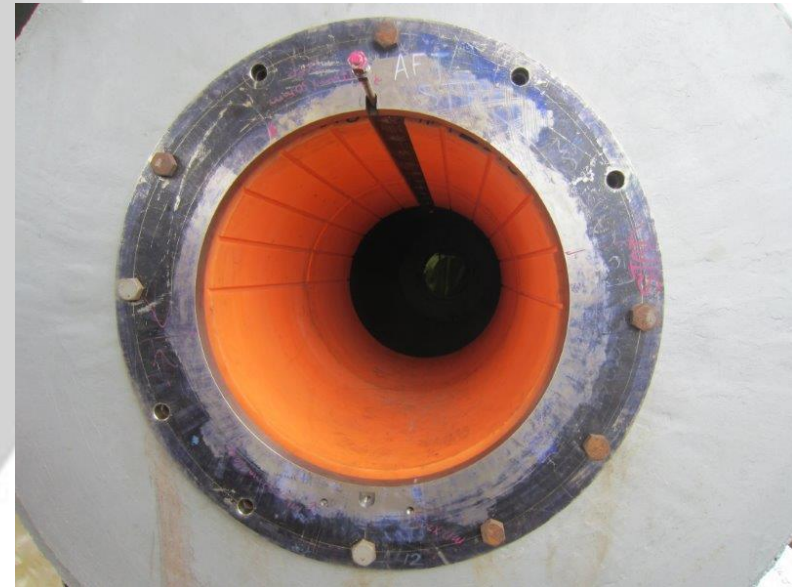
# Benefits of Water Lubrications

- Long predictable bearing wear life
  - Lifetime bearing wear life guarantee
  - Proven with wear data
  - Winner of Sperry Award
- Survivability
  - Non catastrophic failure mode with seawater lubrication allows vessel to get back to port
  - Maintenance of seawater lubricated propeller shaft bearing system is virtually none
- Zero Pollution Risk (zero fines)



# Thordon COMPAC Bearings

- Class approved design for pressures to 0.6MPa (87 psi)
- Fitted in bronze carrier or installed directly into stern tube



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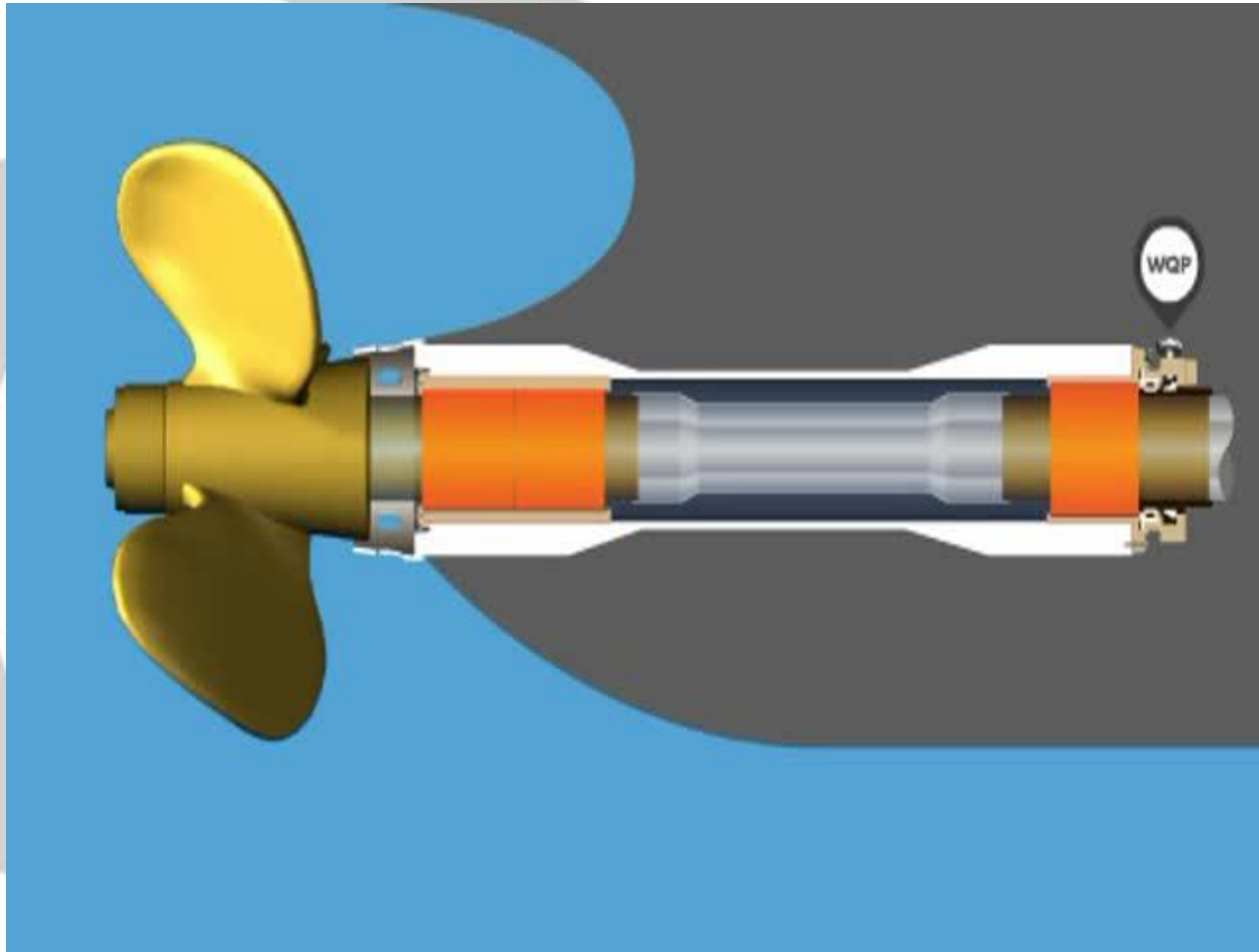
# Thordon Water Quality Package

- Designed to provide a clean supply of water to the water lubricated bearings
  - Controlled environment
    - Flow is monitored and low flow alarms provided
  - Removes abrasives
  - Improves bearing wear life
  - Self contained unit
  - Several configurations available



**THORDON**

# Seawater Lubricated Propeller Shaft Bearings





# Seawater Lubricated Propeller Shaft Bearings

**Over 2,000 vessels with Thordon  
propeller shaft bearings installed**



# COMPAC seawater lubricated propeller shaft bearing systems



**Groupe Desgagnés  
(Canada): Two 15,100dwt  
dry cargo vessels**



**COSCO (China): Three  
62,000dwt bulk carriers**



**MSC Cruises (Italy): Two  
154,000gt cruise ships**



**Lomar Shipping (UK): Two  
37,000dwt container ships**



**Matson Navigation (U.S.A.):  
Two 3600TEU container  
ships**

# The Future

- Ships with lowest operating costs bring highest profitability for ship owners
- Crews are happiest when there is virtually no maintenance to ship's equipment
- A seawater lubricated propeller shaft bearing system is the only system that guarantees compliance and has **ZERO Emissions** below the waterline.



# Dirty Beach



# Clean Beach



# Questions?

Thank you

