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The Ungoverned Space

Call for Improved Test & Maintenance to Comply with Regulations & Go Beyond

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SHIPS SINK.

One of the main causes for loss of ships is water ingress.

- Vessels operate in the harshest of environments
- Incredibly intense utilisation places great strain on vessel structure
- Huge impacts upon numerous areas – we will focus on water ingress via hatch-covers, doors, MTCs and compartments
WATERTIGHT SEAL INTEGRITY TESTING

- A vessel is not an indestructible, robust, monolithic structure, but complex, finely-made technology, to be handled with care.
- All seals experience dynamic stresses during operational lifetime.
- E.g., just a 4mm wear on the steel-to-steel contact is sufficient to damage rubber sealing gaskets beyond repair.
- Lack of proper servicing can lead to deterioration which can endanger the ship, assets, and lives of the crew through flooding and the potential of capsizing.
SEAL TYPES

Both surface and subsurface vessels have to contend with risks of flooding and Naval vessels have the additional issue of NBCW seals.

- **HATCH-COVERS** - In commercial shipping the big focus is on hatch-covers – 33% of cargo claims result from water ingress (Swedish P&I Club). Although not widely relevant for Navies, we can draw on the research that is readily available.

- **MULTIPLE CABLE TRANSITS (MCTS)** - Critical when different contractors are coming onboard to install new cables but not thinking it is also their responsibility to fill in the glands afterwards.

- **DOORS** - High pressure watertight doors are designed for pressures in excess of 100' (30.5m) (this is equivalent to a pressure of 299 kPa/ or 3 bar). A small 1m2 watertight door is often expected to be able to resist the weight of 30 tonnes of water, without buckling or allowing the protected compartment to flood.
MCT CASE STUDY: EMMA MAERSK

• Feb 2013, severe leakage occurred on the container ship, loaded with 14,000 containers, on the Suez Canal.

• Ingress of water in the aft part caused because of a mechanical break-down of a stern thruster, creating the shaft tunnel to flood.

• In a sudden blast, four cable penetration sealings in the watertight bulkhead gave way to the water pressure followed by a massive ingress of seawater.

• Shortly after this, the other three cable penetration sealings also failed, resulting in an even larger ingress of water into the engine room.

• This led to approximately USD 45 million worth of damages and towage cost.
SOLAS Reg II-1/13-1.1 [cargo ships]

- Where penetrations of watertight bulkheads and internal decks are necessary for access, piping, ventilation, electrical cables, etc., arrangements are to be made to maintain the watertight integrity.

SOLAS Reg II-1/21.3 [passenger ships]

- The watertight doors and all mechanisms and indicators connected therewith[sic] shall be periodically inspected at sea at least once a week.

(More regulations available upon request)
TRADITIONAL METHODS & LIMITATIONS

- Chalk testing
- High pressure hose testing
- Gas pressure test
ULTRASONIC TECHNOLOGY

- Used by dolphins and bats in nature, midwives in healthcare, sonar in defence
- Accurate, safe, easy method to identify leak site location and extent precisely
- For hatches, doors, MCTs, scuttles, shell doors, flanges, bulkheads, NCBW seals
- Adopted by the Royal Navy to identify incorrectly installed MCTs

SOLAS Reg II-1/11.1

- Initial Testing of Watertight Bulkheads etc “Where a hose test is not practicable [sic] it may be replaced by [sic] an ultrasonic leak test or an equivalent test. In any case a thorough inspection of the watertight bulkheads shall be carried out.”
HOW ULTRASONIC WATERTIGHT INTEGRITY INDICATORS WORK*

1. Magnets attach the generator to the hatch combing

3. Close the hatch-covers and begin testing the seals. Accurate to 0.06mm.

4. Results: Linear & Bar Graph reading shown on display for ease of use.

2. Use the receiver wand to take an open hatch value

*Images describing the Portascanner® model manufactured by Coltraco Ultrasonics
LIMITATIONS OF HANDHELD INSPECTIONS

- Usually only tested before or after several journeys or once a year
- A leak could occur at any point and continue unnoticed until the next inspection.
- Testing is only conducted while the vessel is static in dock/port
- But how is the vessel affected by its dynamic positions at sea?
- Under different load states, sea states, wind states, and dynamic movement
- These images show the stress and effect on a vessel during passage from Suez Canal to Singapore in severe weather conditions
- It would be beneficial to monitor leak sites as they develop whilst the vessel is at sea
THE FUTURE: 24/7 CONSTANT MONITORING

Hatch covers individually monitored

PERMASCANNER® DYNAMIC

Vessel Bridge

Communications linking results to network

Results sent to Coltraco's monitoring system

Cloud records, stores and emits data

Results sent to relevant personnel

Shore-based operator

Email results directly to safety manager

In the event of alarm direct SMS sent

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SAFESHIP® SOLUTIONS

WATERTIGHT INTEGRITY & FIRE SAFETY

A. Watertight & Room Integrity
   - Hatch Covers, MTCs, WT Doors
   - Portascan™ Watertight
   - Continuous Monitoring Solution
   - PermaScan™ Dynamic
   - PermaScan™ MCT
   - PermaScan™ WT Door
   - PermaScan™ O22 Hatches

B. Fire Suppression Systems
   - Liquid Level Indicators
   - PermaScan™ MAC Monitor
   - Continuous Monitoring Solution
   - PermaScan™ Main
   - Convert Liquid Level to Weight
   - PermaScan™

C. Pipework Integrity
   - Pipework Integrity Inspection
   - Portagage™

D. Flow rate and Bearing Monitoring
   - Flow Rate Testing
   - Portagage™
   - Monitoring Rotating Machinery
   - Portagage™
CONCLUSION

• Greatly reducing the chance of water ingress occurring
• By implementing safer and improved methods of watertight integrity testing
• It may be possible to save lives, asset and vessel integrity at sea.
• In the particularly risky conditions of the Naval world, surface and sub-surface vessels require all doors, hatches, MCTs and NBCW seals to be protected at all times.
• The introduction of a continuous watertight integrity monitoring system is the only reliable solution to obtain certainty that the seals are behaving the way they should whether the vessel is at dock or on operations at sea.
The 2 main causes of vessel loss:
1. Sinking – water ingress
2. Fires

This inspires Coltraco’s passion to create ultrasonic technology solutions:
1. Watertight integrity testing of doors, MCTs, hatch-covers, compartments etc
2. Fire extinguishing installation contents testing of CO2, FM-200®, Novec™1230, halons etc

Working with you to deliver the Safeship®
• Comply with regulations
• Improve safety
• Save time
• Cut costs

Enhancing life, asset and vessel safety at sea.
WHO WE ARE

Coltraco Ultrasonics
Thank you. Q&A.