

PIANC Working Group 138

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Presentation Outline

- PIANC – What is this?
- Working Group 138 Background
- Terms Reference – Scope and Goal
- Components



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PIANC

Permanent International Association of Navigation Congresses

- “PIANC is the global organisation providing guidance for sustainable waterborne transport infrastructure for ports and waterways.”
- “PIANC is the forum where professionals around the world join forces to provide expert advice on cost-effective, reliable and sustainable infrastructure to facilitate the growth of waterborne transport.”
- “Members include national governments and public authorities, corporations and interested individuals. Providing expert guidance and technical advice PIANC provides guidance to public and private partners through high-quality technical reports. Our international working groups develop regular technical updates on pressing global issues to benefits members on shared best practices.”



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WG 138

Terms of Reference (Scope)

- Objective - Establish a mechanical and electrical engineering working group to assemble “lessons learnt” from navigation lock operating systems.
- Best practices for mechanical and electrical navigation systems



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WG 138

Terms of Reference (Scope)

- Product - Provide a comprehensive summary of lessons learned and best practices that can be incorporated into future lock operating machinery designs. The report will include a summary of relevant guidance documents from various countries. The working group will provide guidance on the choice of systems to use in future designs for navigation structures.



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Terms of Reference (Scope)

Matters to Be Investigated

- Ease of Troubleshooting
- Vulnerability of Exterior Mounted Components to Environment
- The use of custom designed components with long lead times
- Impact damage to machinery components
- PLC vs. relay based (hardwire)
- Hydraulic vs. electromechanical
- Design for less labor intensive maintenance



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Working Group 138 – Mechanical Electrical Lessons Learned

- Members – Mechanical and Electrical Design Engineers
- Backgrounds, mostly governmental but also private industry
- Primarily Europe, United States, Canada



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Working Group 138



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Schedule

- Started February 2010
- Completed June 2012



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Kriegenbrunn



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Hydraulic Drives

- Hydraulic Compact Drives – Self contained, movable



- Plug and Play
- Particularly suited to smaller locks



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Hydraulic Drives

- Maintainability
- Open vs Closed Hydraulic Systems
- Actuators
 - ▶ Cylinder Materials – Ceramic Coated
 - ▶ USACE Engineering Construction Bulletin 2009-3
- Position Sensing
- Seals
- Cylinder Supports



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Hydraulic Drives

- Hydraulic Fluid
 - ▶ Biodegradable
 - ▶ Mineral Oil
- Pumps
- Reservoirs
- Compensators/Breathers
- Manifolds
 - ▶ Coatings
- Piping/Hose/Connectors



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Hydraulic Drives

- Filters
- Heaters
- Rotary Actuators
- Position Indication/Sensing
 - ▶ Magnetoresistive
 - ▶ Magnetorestrictive
 - ▶ External to cylinder
- Supports



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Hydraulic Drives



- Ceramic Coated Cylinder at Chittendon Lock



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Mechanical Drives

- Systems
 - ▶ Miter Gate/Sector Gear Drives



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Mechanical Drives

- **Systems**

- ▶ Filling/Emptying Valve Drives



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Mechanical Drives

- **Systems**

- ▶ Vertical Lift Gate Drives



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Mechanical Drives

- **Systems**
 - ▶ Dam Gate Hoists



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Mechanical Drives

- **Systems**
 - ▶ Bulkhead Cranes and Emergency Gate Hoists



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Mechanical Drives

■ Components

- ▶ Self lubricating bushings
 - Appropriate use of materials, clearance, testing
- ▶ Gears and gear reducers
 - Lubrication, duty cycle
- ▶ Linear mechanical actuators



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Mechanical Drives

■ Components (Cont'd)

- ▶ Wire rope
 - Type and material selection
- ▶ Couplings
 - Type
- ▶ Brakes
 - Best practices
- ▶ Lubrication
 - Synthetic
 - Selection



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Mechanical Drives

- **Components**

- ▶ **Lifting Chains**

- Appropriate use of materials
 - Stainless Steel and Aluminum Bronze
 - Maintenance Free



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Other Drives and Systems

- Air Bubbler Deicing Systems
- Inflatable Dams
- Generator Systems
- Tow Haulage and Winch Systems
- Dewatering Systems
- Floating Mooring Bitts
- Ship Arrestors



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Air Bubbler Systems



- Best Practices for Components and Maintainability



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Inflatable Dams



- Best Practices
- Installations



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Tow Haulage Systems



- Best Practices
- Mechanical vs Hydraulic



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Lock Dewatering Systems

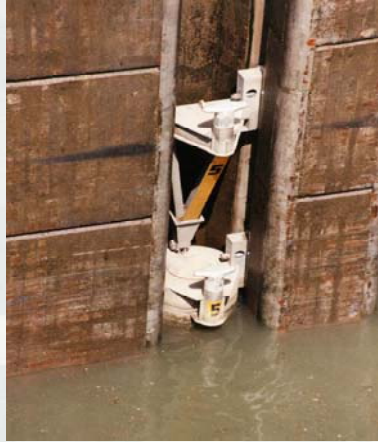


- Best Practices



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Floating Mooring Bitts



- Best Practices



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Ship Arrestor Systems



- Best Practices
- Cables vs Booms



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Electrical

- Motors
- Speed Control
 - ▶ Variable Frequency Drive Systems
- Safety
 - ▶ Interlocks
 - ▶ Interlock Failures Lessons Learned
- PLC and/or Relay (Hardwire) Systems



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Electrical

- Starters
- Sensors
- Limit Switches and Position Sensing



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Maintenance

- Design for less maintenance
- Maintenance Strategies
- Preventative Maintenance
- Fix as Fail
- Reliability and Availability



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Needs

- Case Studies – Reports
- More Lessons Learned



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Conclusion

- Provide Mechanical and Electrical Design Lessons Learned
- Compliment existing Engineering Guidance and Manuals



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Web Sites

- PIANC USA: www.pianc.us
- PIANC International: www.pianc-aipcn.org



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