PIANC Working Group 138

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Presentation Outline

- PIANC – What is this?
- Working Group 138 Background
- Terms Reference – Scope and Goal
- Components
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 benefit members on shared best practices.”

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
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.

WG 138
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
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
Schedule

- Started February 2010
- Completed June 2012

Kriegenbrunn
Hydraulic Drives

- Hydraulic Compact Drives – Self contained, movable
  - Plug and Play
  - Particularly suited to smaller locks

Hydraulic Drives

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

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

Hydraulic Drives

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

- Ceramic Coated Cylinder at Chittendon Lock

Mechanical Drives

- Systems
  - Miter Gate/Sector Gear Drives
Mechanical Drives

- Systems
  - Filling/Emptying Valve Drives

Mechanical Drives

- Systems
  - Vertical Lift Gate Drives
Mechanical Drives

- Systems
  - Dam Gate Hoists

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Mechanical Drives

- Systems
  - Bulkhead Cranes and Emergency Gate Hoists
Components
- Self lubricating bushings
  - Appropriate use of materials, clearance, testing
- Gears and gear reducers
  - Lubrication, duty cycle
- Linear mechanical actuators

Components (Cont’d)
- Wire rope
  - Type and material selection
- Couplings
  - Type
- Brakes
  - Best practices
- Lubrication
  - Synthetic
  - Selection
Mechanical Drives

- **Components**
  - Lifting Chains
    - Appropriate use of materials
    - Stainless Steel and Aluminum Bronze
    - Maintenance Free

Other Drives and Systems

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

- Best Practices for Components and Maintainability

Inflatable Dams

- Best Practices
- Installations
Tow Haulage Systems

- Best Practices
- Mechanical vs Hydraulic

Lock Dewatering Systems

- Best Practices
Floating Mooring Bitts

- Best Practices

Ship Arrestor Systems

- Best Practices
- Cables vs Booms
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

Needs

- Case Studies – Reports
- More Lessons Learned
Conclusion

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

Web Sites

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