



InCom WG 138

Mechanical and Electrical Engineering Lessons Learnt from Navigation Structures

Terms of Reference

Background

Navigation locks are located throughout the world. A number of different gate types are utilized for navigation structures with their own unique design features, including lock service gates, fill/empty gates, and dam gates. A variety of mechanical/electrical systems are used to operate these gates. Two typical methods are hydraulic cylinders or electrically operated gear driven machinery.

Some of the design considerations for selecting operating machinery include the type of gate, loading conditions, site conditions, operations, maintenance, and operator preference.

A number of mechanical/electrical design manuals and guidance exist for lock operating machinery. However, information on comprehensive “lessons learnt” from actual installations are limited. Problems with mechanical /electrical systems quickly emerge causing expensive unscheduled closures. A comprehensive “lessons learnt” on navigation operating machinery will help facilitate the design of new construction or rehabilitation, and in troubleshooting existing operational and maintenance issues.

Objective of the Working Group

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

Final Product

The intention will be to 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.

Matters to be Investigated

The report will use Case Studies to compile lessons learned on hydraulic machinery, electro-mechanical machinery, and electrical control systems and determine best practice to improve reliability and thus availability. Some of the issues that could be investigated include:

- a. Troubleshooting – Difficult for lock personnel to troubleshoot, programming of PLC is complicated.
- b. Exterior Mounted Components – Vulnerable to Sun, Water, and Flooding.
- c. Custom designed cylinders and other components with long lead times for service and delivery.
- d. Possibility of impact damage on machinery connections to the gate
- e. PLC versus hardwire systems, Use of Programmable Logic Controller replaces many parts and flexible for adopting changes.
- f. Hydraulic components provide for fewer moving parts, centralized HPU, accurate control of speed, shock absorbing, smooth operation and fewer installation/alignment issues and less pivot points for wear.
- g. Labour intensive maintenance.

The Working Group will review all areas of concern and prioritize them to prepare a shortlist of matters of critical concern to navigation operators and engineers and develop its report accordingly.

Desirable Background or Experience of Working Group Members.

The background and experience may include the following:

- a. Mechanical/Electrical Design engineers
- b. Lock operators
- c. Lock maintenance personnel
- d. Supply Industry representatives

Relevance for Countries in Transition

Mechanical and Electrical Engineering Lessons Learned on navigation structures are relevant for all countries, including Countries in Transition.