

InCom Workgroup 192: Developments in the Automation and Remote Operation of Locks and Bridges

AIPCN BELGIQUE Séminaire d'Automne du SPW et du Groupe de Travail Francophone (11ème édition)

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Introduction General Aspects

Objective

The main objective of the new PIANC InCom Work Group 192 was to update the 2008 WG 96 report on 'Developments in the Automation and Remote Operation of Locks and Bridges' to reflect technological advancement and new considerations related to remote operation.



Work Group 192 Members at Saint-Lambert Lock in Montreal, Canada

Introduction General Aspects

• Site Investigations:

- October 2016 Montreal, Canada
- February 2017
- May 2017
- September 2017
- February 2018
- June 2018
- September 2018

Brussels, Belgium

- Lyon, France
- Pittsburg, USA
 - Scotland
 - Koblenz, Germany
 - St. Catharines, Canada



June 2018 Visit to Oberwesel Lock, Germany



September 2018 Visit to Welland Canal Lock 1, Canada

The report gives the latest update on the recent developments in automation and remote operation of locks and bridges and possible ways how to deal with this. This means that it does not give a one-fits-all solution but different examples on how countries or organizations can deal with this

Topics Included in the Report

- New developments in remote operation of structures
- Physical security including perimeter protection, and access control
- Network security including protection of data, intrusion prevention/detection (hackers)
- Integration of SCADA and process control with other systems such as traffic management, RIS, ERP
- Scanning & video technology including high-Definition cameras and advanced image processing
- Simulation technology for training & certification of operators
- Standardization of processes and procedures
- Communication technology
- Automation systems

Topics <u>not</u> Included in the Report

- Cybersecurity
- RIS
- Smart Shipping
- Big Data Analysis





Highlights of the Report

- Business Case Development
- Organizational Implementation
- Operational Implementation
- Technical Implementation
- Safety
- Security
- Information Management

Highlights of the Presentation

- Business Case Development
- Organizational Implementation
- Operational Implementation
- Technical Implementation



I. Business Case



Business Case

Business case development for remote operation

Initiating a remote operation project requires careful consideration in the form of a business case. The following topics outline the content included in the business case:





II. Organizational Implementation



Organizational implementation

Remote operation ≠ only a technical matter ≠ business as usual

Structure **Processes** Performance Translation of the new organizational **Remote control process is the core** More direct way to measure structure into organization charts and process of the organization. It performance by centralizing relationship hierarchies, with the eliminates the manual and physical operations. Group level targets will appropriate spans of control and processes for a more automated ensure positive contribution management layers. ones Governance Resources Culture Remote control operation requires a Structure applied to remote control **Thorough change management** different skill set with more emphasis organizations are more central due to is important for the transition on collaboration. The headcount, automation. New KPI's need to be workload, and associated FTE developed requirements can be optimized

Roles

Clear roles and responsibilities are a must for process optimization with operators working together and depending on each other



Infrastructure

Emphasis on data quality, core systems in use and their fitness



III. Operational Implementation



Operator requirements

When determining the required amount of operators and optimal workload in a remote control centre, several factors need to be taken into account:



Training requirements

The transition from local operation to remote control operation implies a distinct skill set and comes with additional training requirements for remote operators:



Using remote control systems

- Familiarizing with the characteristics of the structures and surrounding traffic
- Risk preparedness
- Mock drills
- Basic IT skills training

Working in a remote control centre

- Ability to work in teams
- Setting up formal protocols and hierarchy

Remote control operations

- Nautical legislation and other applicable laws
- Radio communication
- Basic understanding of working principles of locks and bridges
- Lock and bridge operation
- Basic local incident management
- Basic understanding of vessel manoeuvring

Training requirements

The transition from local operation to remote control operation implies a distinct skill set and comes with additional training requirements for remote operators: AWATAR SIMULATOR (DVW)



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Training requirements

🖕 CameraPlanner





IV. Technical Implementation



System architecture

Decomposition view...



changes to...

System architecture

... a systems view



System architecture



Technical implementation System architecture Mainte nance mplemen tation = Life Cyle Management

System architecture



System architecture



System architecture CEMT II Operational since 2006 Canal 30 km 10 bridges and 4 locks

RCC Kampenhout

KANAAL LEUVEN-DIJLE

System architecture



CEMT II Operational since 2015 11 locks and bridges Expansion in 2021 – 15 locks and bridges

RCC RIJKEVORSEL Canal Dessel – Turnhout - Schoten

System architecture

RCC Aalst Dender

- Max CEMT Va
- Predominantly Leisure crafts
- Operational planned in 2022
- 9 bridges 3 locks



System architecture



RCC Zemst

- Operational since 2016
- 24h/7d service
- Remote operation of 11 bridges, 1 lock
- CEMT VIB
- Max Width 24m
- Max Length 18om
- Max Depth 8,8m

System architecture

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RCC Zemst

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System architecture



330 Flemish hydraulic structures remotely operated by 2032



V. Information Management



Information Management

- Data that used to be entered manually for reporting purposes, can be often be collected automatically
- Remote control systems and centres are collecting and using a lot of data that might be valuable for other purposes
- Since remote control systems already require large investments in information technology and data transmission capabilities, it is usually only a small extra effort to use this same infrastructure to collect, analyse, and store the data collected.



Remote Control Monitoring Centre – Aschaffenburg, Germany

Information Management

- Big Data Analysis
 - Traffic Monitoring
 - Real-time lock and bridge status data can be provided to skippers and inland waterborne transport service providers for improving traffic planning
 - Waterway authorities can use data for data logging of navigation statistics such as lock and bridge passage, nature of goods passing each corridor, direction and routes of all vessels
 - CCTV images, AIS, radar, RIS information and radio communication could be logged in order to analyse incidents and investigate accidents.
 - Water Level Data Collection and Management
 - Water levels from a whole region can be assessed and combined with weather forecasts
 - Health Monitoring
 - Sensor data can be stored and used as valuable information by the waterway authorities for predictive maintenance and early detection of malfunctions
 - Asset Management



Technologic developments are accelerating the remote operation evolution and remote operation is becoming more and more advanced



Artificial intelligence and Internet Of Things can boost asset management and the overall analysis of waterway infrastructure



Organizations evolve to the cyberphysical waterway (CPW) where physical and software components are deeply intertwined



Smart autonomous shipping allow for a smarter view on corridor traffic



Enhanced traffic management according to the blue wave and corridor management by focussing on smart mobility and smart objects projects

