Port of Emden pilots

NON-STOP

DUAL Ports

NSC Transport Group

11th of March 2021
1. Introduction to NPorts and Port of Emden
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Niedersachsen Ports

Our ports

Norden

Wilhelms-haven

Emden

NSC Transport Group | INTERREG NON-STOP & DUAL Ports: Port of Emden pilots

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Port of Emden

Key characteristics

- 1.163 ha (of which 963 ha land and 201 ha water)
- Tidal outer port / non-tidal inner port
- Nodal point between hinterland and river Ems
- 3 locks, 1 pumping station
- Fluid Mud
- Recirculation dredging
Fluid Mud and principles of recirculation

Suspended material: The organic components of suspended material increase the buoyancy rate because of low specific weight (aerobe conditions)

Fluid Mud: Microbial slime connects the particles → highly concentrated state, Fluid Mud (aerobe conditions)

Consolidated sediment: Prolonged sedimentation due to microbial decomposition (anaerobe conditions)

Consolidation

Resuspension
New smart digital Operations Needed for a Sustainable Transition Of Ports
NON-STOP as a whole

Framework

› Overall budget: 4.7 Mio. € (50% co-financed by European Regional Development Fund (ERDF) in North Sea Region Programme 2014 – 2020)


INTRODACING, TESTING AND MONITORING INTELLIGENT TECHNOLOGIES AND PROCESSES IN THE STORAGE, DEPLOYMENT, SHARING AND TRANSMISSION OF DATA RELATED TO MARINE CONDITIONS, SEA/LANDSIDE OPERATIONS AND ENERGY PRODUCTION/CONSUMPTION/DISTRIBUTION IN PORTS.
Port of Emden pilot in NON-STOP
Intelligent sediment and water management
Project goal No. 1

Reducing sediment influx from river Ems into inner port

Lock operation

Operation of pumping station
Project goal No. 2

Supporting long-term hinterland drainage capacities

Climate change demands further strengthening of drainage system
› Port of Emden already used for draining away excessive water volumes from the city of Aurich via Ems-Jade-Channel into river Ems
› But can the integration of the Port of Emden as one crucial element in the hinterland drainage system be optimized?

Key question: effects of more freshwater influx on Fluid Mud bacteria?

Measures in order to answer the question:
• Microbiological investigation (March 2021 – February 2022)
• Sensor-based water monitoring infrastructure (partly within master thesis)
• Additional water inlets as well as water outlets (i.e. pumps)
• Digital system integration through dashboard concept

Source: NLWKN Aurich, 2018
Project goal No. 3

Long-term support of recirculation dredging

- Holistic sensor-based monitoring concept to frequently observe and assess living conditions of bacteria
- Effective coordination of “cog wheel mechanisms” (drainage, locks, pumping station, shipping, tide, …)
- User-friendly data platform with recommended actions

Source: https://shavitech.com/download-dashboard-software-for-your-mac-os-x/
INTERREG DUAL Ports

Developing Low carbon Utilities, Abilities and potential of regional entrepreneurial Ports

- Overall budget: 8,69 Mio. €
- Project partners: Belgium, Scotland, Denmark, the Netherlands, Sweden & Germany
- 16 Pilot projects with the guiding goal “decarbonization of ports”
Port of Emden pilots in DUAL Ports (1)

Intelligent track field lighting

before

after
Execution of construction work

› Assembly of poles outside of track field
  - no constraints for the structure gauge
  - consistent lighting above all loading rails

› Installation of 65 wire lamps (14 light bridges) and 16 pole lamps based on latest LED technology with intelligent light control

› Preliminary design (2016)
› Inauguration (Feb. 2019)
**Energy savings**
via the application of individually controllable lamps with latest LED technology

- LED technology allows for energy savings of approx. 30% through significantly higher luminous efficacy as opposed to conventional illuminants.

- Light is only emitted dependent on the actual demand through the separate control of each individual lamp.

- Light will automatically be switched on and off because of LED technology there are no operational constraints; switching operations have only very little effects on life span of LEDs.

- LED illuminants have a significantly longer life span thus allowing for an optimal eco-balance.

Based on LEDs and sensor-based automation:

- Energy savings of 43 %
- CO₂ savings of 43,1 %
Port of Emden pilots in DUAL Ports (2)

Innovative and sustainable treatment of polluted sediments

Baseline:
• Recirculation dredging in Port of Emden partly constrained due to polluted sediments in certain port areas (historically grown as a result of different construction activities over centuries)
• Required water depths cannot entirely be safeguarded because polluted sediments could be mobilized and thus dispensed into the other non-polluted port areas

➢ demand for remediation of polluted sediments to finally establish necessary water depths in respective areas

Questions:
• What spectrum of pollutants can be found in sediments and what are the different pollutant loads?
• Do all polluted sediments need to be entirely removed or are there also other possibilities?
Initial steps

Basic questions

What are the necessary water depths in the polluted port areas?

What are the challenges and dynamics in terms of Fluid Mud?

What are potential sites for sediment removal?

BUT: existing information on type and degree of pollution in sediments not sufficient
Pollutant cadastre

- 69 drillings in total (3 different sections covered)
- Pollutants: TBT, PAH, PCB and heavy metals
- Sediment loads ranging from Z0 (low) to > Z2 (very high)

Identified pollutant load determines options:
- Material can be treated in-situ via recirculation and thus remain in the system (section 1)
- Material can be removed and deposited locally in Wybelsumer Polder (section 1)
- Material needs to be removed as well as treated and deposited farther away on land (sections 2 and 3)

- significant reduction in the amount of sediment removal
- significant CO₂ – savings

Next steps:
- Innovative approaches to remedy locally and reuse previously polluted sediments
- Realising in-situ treatment via recirculation
Thank you for your attention!

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