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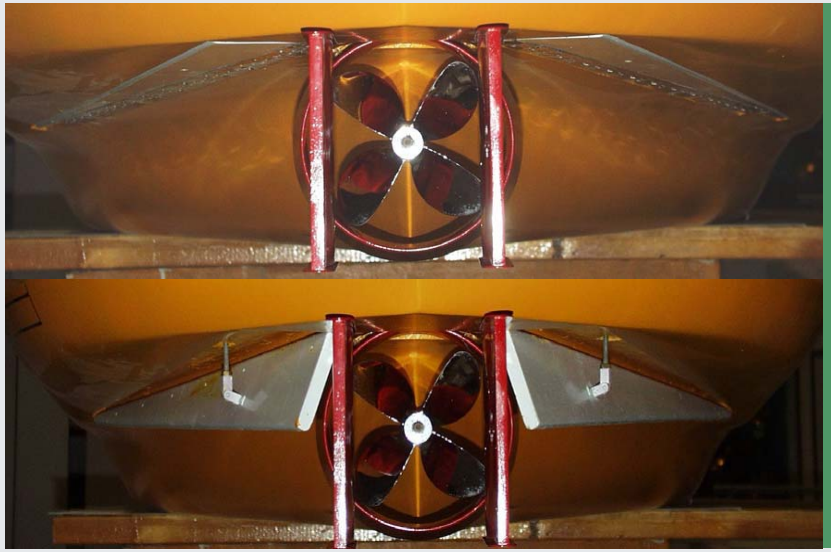

Parallel Workshop 2 – Hydrodynamic measures to reduce the CO_2 emissions from inland navigation

Juha Schweighofer

via donau – Österreichische Wasserstraßen-Gesellschaft

Strasbourg, April 12th, 2011

Presentation 1: Transport efficiency in shallow water

CO_2 reduction by fleet modernisation and improvement of transport efficiency, considering effects of shallow water

Thomas Guesnet, DST

Main messages of presentation

- Ship type and scale: as large as waterway allows
- Propulsion: much to gain by change to other concepts
- Reduction of ship weight has only minor effect
- Hull form optimisation (adjustable tunnel, separation)
- Operational measures: eco-sailing can save a lot of fuel
- Minimum water depths key to emission reduction

Presentation 2: Hull form optimisation using CFD

CO_2 emission reduction by hull form optimisation using CFD (Computational Fluid Dynamics)

Karola van der Meij, MARIN

Main messages of presentation

- Development of numerical methods has been significant
- CFD a proven tool for seagoing vessels
- For IWW vessels in the initial stage
- Time consuming and expensive
- But an existing ship may be improved by appr. 20%

Presentation 3: Air lubrication

Air lubrication as a means to reduce cost and CO_2 emissions of inland shipping

Peter van Terwisga, Damen Shipyards Group

Main messages of presentation

- Frictional resistance is significant and often neglected in optimisation
- Change of kinematic viscosity changes friction
- Challenge: provision of air-bubble layer over the hull
- Application areas: in particular e.g. double-hull vessels or vessels without severe draught limitations
- Savings in fuel consumption: approximately 15%

Presentation 4: Contra rotating propellers

CO_2 emission reduction by diesel-electric propulsion with contra rotating propellers

Hideki Shuto, IHI Marine United

Main messages of presentation

- Contra rotating propeller (CRP)
- Efficiency improvement of 10%
- 5 years recovery costs
- Status IWT: tank tests performed
- Diesel-electric further development necessary

Parallel Workshop 2: Hydrodynamic measures to reduce the CO_2 emissions from inland navigation (1)

Main conclusions

- Ship type and scale:
  - Large vessels may have 80 - 90% less CO_2 emissions/tkm than small vessels (e.g. Peniche)
  - CO_2 emissions/tkm of small vessels are close to the ones of road transport
- Propulsion:
  - Up to 30% savings are possible (e.g. Kort nozzle at high propeller loads)

Parallel Workshop 2: Hydrodynamic measures to reduce the CO_2 emissions from inland navigation (2)

Main conclusions

- Reduction of ship weight has only minor effect
- Hull form optimisation:
  - up to 20% savings are possible (e.g. change of appendages and stern)
- Air lubrication:
  - up to 15% savings are possible
- CRP + Diesel electric drive:
  - up to 15% savings may be reached

Parallel Workshop 2: Hydrodynamic measures to reduce the CO_2 emissions from inland navigation (3)

Main conclusions

- In general the emission reduction potential is largely depending on the size, the state of the vessel, its equipment as well as the operational area and operational mode
- Many vessels are already equipped with some technologies presented (e.g. nozzle) as well as they have been designed using classical optimisation techniques (e.g. model testing) having only very little potential for reduction of CO_2 emissions

Parallel Workshop 2: Hydrodynamic measures to reduce the CO_2 emissions from inland navigation (4)

Main conclusions

- The emission reduction potential of the existing fleet may be roughly estimated at 10% for the application of hydrodynamical measures alone
- Measures for reduction of CO_2 emissions may be cost intensive (e.g. CRP) and valuable cargo space or deadweight might be lost (e.g. air lubrication)

Parallel Workshop 2: Hydrodynamic measures to reduce the CO_2 emissions from inland navigation (5)

Main conclusions

- Proper estimation of the emission reduction and the economical viability by case by case consideration
- Provision of sufficient water levels:
  - Shallow water effects (resistance) are reduced
  - Larger vessels and amounts of cargo possible

  => significant reduction of CO_2 emissions/tkm!