

## **Review by opponent of the Diploma thesis**

Topic: **Analysis of the Reduction of Emissions from Ships in Europe**

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Opponent: **Jan Gerstberger**

The Thesis describes air pollutant and greenhouse gases emissions of the ships in the perspective of overall emissions, overall transport emissions and cars emissions.

The main aim of the thesis is to analyze ships emissions comparing with the emissions of the cars, possibility of ship's emissions reduction and the costs of the reduction with the outlook on the future growth of the freight works.

The thesis is logically structured it begins with overall description of overall emissions, transport emissions, car emissions and maritime transport emissions. After detailed description of taken measures, reduction options and emissions abatement curves thesis continue with Cost-Benefit analysis of the emission reduction including description of the particular measures incl. their costs. In the last part the thesis discusses data and their meaning with focus on measures which can be taken with no cost and with overall cost of all possible measures.

What I miss in the Thesis is discussion why measures with positive NPV haven't been taken yet by the shipowners.

In my opinion, instructions present in thesis assignment sheet (Zadání diplomové práce) have been fully met.

The appearance of the thesis is outstanding and the frequency of typos is negligible.

All used data and assumptions are clearly linked to their source.

The structure of the thesis is clear, all figures and formulas are clearly described.

The thesis shows in a very clear form economic evaluation of emission reduction measures, so it may be very useful for discussion of the limits for ships emissions for the future.

I recommend grade this thesis

## **A – Excellent**

Using the ECTS grading scale and I recommend work for defense.

I have several questions:

- 1) One of the Measures to reduce the GHG emissions of the ship is Propeller upgrade described in 3.3.3.2 The principle is that larger propeller working at lower speed is more energy efficient. Is there something what prevents to take this measure? Are there some technical difficulties to take this measure on existing ships?
- 2) Waste Heat Recovery system is another suggested measure. Could you quantify how much of the engine power is wasted via exhaust gases and what is the temperature of the exhaust gases?
- 3) Solar Power for various purposes is mentioned as another measure in chapter 3.3.3.8 Cost of the PV mentioned in the text is 830 – 1100 thousand EUR per 40-50 kW, this means about EUR 20 thousand per kW. Usual nowadays price of the ground mounted system is less the EUR 1 thousand per kW. Is there some reason why the system is so expensive or is it typo or some kind of error?
- 4) Propeller polishing is mentioned in chapter 3.3.3.10 Does it mean that nowadays propellers aren't cleaned/polished periodically

Prague, June 15, 2020  
Jan Gerstberger