Proposal for MsC Thesis (September 2018)

Project: Effective Decision Making via Intelligent Data Integration for Conceptual Ship Design (EDIS

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Background:

Effectively gathering, understanding and handling the large amount of data involved during the ship design value chain is a challenge. It consists of not only data from the ship and its equipment, but a wider scope that should include stakeholders' expectations, subjective stylistic preferences, owner's requirements, previous design data, regulations, suppliers, shipyards, sea trial and operational data. The integration of all those data flows into a common working platform is paramount for the ship designer, it will require a high level of automation to make naval architects' job more effective.

Objective:

The student will be involved with Ulstein's Design & Engineering department at Ulstein Design & Solutions AS (UDS) and its work will be coordinated and supervised by employees at Ulstein International AS (UIN). The overall objective of this MSc thesis is to integrate two disciplines, hydrodynamic design and propulsion system design, into a common platform, allowing more effective vessel design simulations at early stages, by building a communication bridge between them. The sub-goals have been identified for the present MSc thesis:

- ⇨ Model the fuel consumption of a vessel design by integrating several factors as hydrodynamic hull design, power station arrangement, propulsion system arrangement, supplier's data and operational profile and practices;

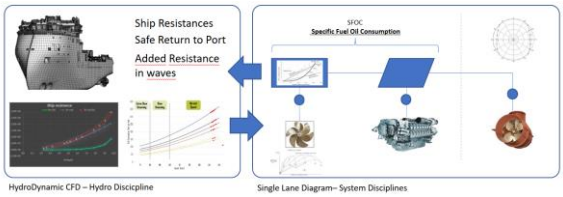

figure 1:Project Study Case

- ⇨ Assess the robustness of the model;
- ⇨ Identified factors and model response surface;

The student will have access to a «Multi-Physical Assessment» software (ex: Amessim). The student will collaborate with the Hydrodynamic and System department at UDS to develop the model and further extend his/her collaboration to UIN, regarding Robust design and Response Surface Methodology.

Case study:

The case study focuses on the estimation of the fuel oil consumption (FOC) applied to Vessel Exploration at early design phases.

Tasks:

UDS: Discipline Hydrodynamic – Nicolas Bathfield / System – Frode Sollid

- Implement in Amesim a Speed Power prediction routine that allows to link calm water results to open water curve for propulsor and derive the resulting delivered power curve. Derive FOC for different system architectures.
- Investigate the possibilities to complete the SPP model by introducing simulations of combinator mode operations. Derive FOC.
- Simulate for Ship acceleration using a given combinator curve. Derive FOC.
- Include Safe Return to Port (SRTP) calculations based on the simple STAWAVE model. Derive FOC/Derive Angle of rudder.
- Investigate the possibilities to complete the SRtP model by replacing the STAWAVE model by evaluation via third party software (such as ShipX) (Optional)
- Investigate the possibilities to run Dynamic Position simulations coupling a third-party software (such as ShipX) to the single line diagram. Test several single line diagrams for a given vessel ad derive the corresponding DP cap values, (study of redundancy scenarii),
- Comparison of FOC applied to equipment configurations for different operation profiles and error conditions.

UIN: Jose Jorge Garcia / Dimitri Denimal

Literature review (suggested):

- ⇨ Identify existing “Multi-Physical Assessment” software available on market;
- ⇨ Propose a comparison matrix based on the different software functionalities;

Further, Ulstein aims to extend the implementation of a FOC model to the Response Surface Modelling, including the following tasks:

- ⇨ Design of Experiment applied to Fuel Oil Consumption;
- ⇨ Response Surface Modelling (limited to case);
- ⇨ Robustness Analysis;
- ⇨ Implement Exploration loop.

Bibliography:

Topics	References
Functional Mock up	[1]–[4]
Design Response Optimization	[5]–[10]
AMESIM	[11], [12]

Table 1: Summary Topics / Bibliography

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Further Information

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