CHALMERS
UNIVERSITY OF TECHNOLOGY

Department of Mechanics and Maritime Sciences
Division of Marine Technology

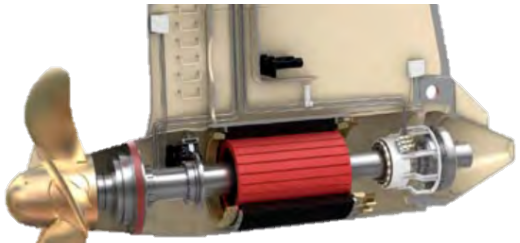
Hydrodynamics of Propeller-Integrated Electric Motor for Planing Boats

Background:

Shipping is recognized as a major cause of air pollution in Europe such that there is a risk of emissions of SO2 and NOx could exceed the emissions of these pollutant from all other sources in EU by 2020. Aside of the air pollution of SO2 and NOx, the emission of CO2 from boats and ships is significant. For instance, a medium-size motor boat with a 60 horse power gasoline engine emits about 25 kg CO2 per hour with its best cruising speed 20 MPH. If the boat is used for 200 hours per year, the annual CO2 emission is 5 tons. In Sweden, the number of motor boats with power higher than 10 HP is about 300 000. A solution to these issues can be offered by the application of electric motor drives, such as podded propellers. The integrated electric motor drives the shaft, saving space on board and eliminates the need for a gearbox.

Objectives:

The main objective of this project is to develop propeller-integrated motor drive concept in order to reduce CO2 emission and improve harbor and marine environments. The drive systems we will study is in the range of 40 - 100 kW of peak power.



A generic configuration of a POD unit Manufactured by Rolls-Royce.

Methodology:

This study will be carried out at different sophistication levels using an analytical method, a potential flow tool and finally a fully viscous RANS approach using the CFD code STAR-CCM+ for understanding the interaction effect between the propeller, POD unit and the hull. The effect of POD to propeller diameter ratio, the relative orientation of the POD and the propeller as well as application of multiple POD units for propulsion of a planing hull will be investigated using the aforementioned tools.

Contact (Supervisor and Examiner at Chalmers):

Arash Eslamdoost, Assistant Professor
arash.eslamdoost@chalmers.se