Master thesis

Security grid's effect on hydrodynamics of bow thrusters

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September 26, 2022

Abstract

The aim of the work is to study the influence of the security grid on the steady and unsteady loading in the bow thrusters.
questions are as follows:

- What is the influence of the security grid on the flow filed
- Difference between resolved security grid simulation and volume force implementation as security grid.
- Effect of different shape of the security grid
- What is the influence of the grid for the unsteady loading and pressure on the propeller

The mesh and implementation of volume force to represent security grid has been developed by Mr. Kazemi and will be provided. The turbulence models to be used for bow thruster are: URANS $k\omega SST$ and hybrid models such as SLH and DDES and for channel flow is LES. The setup for the cavitation modeling in bow thruster has been tested by Mr. Kazemi and is available.

1 The work includes the following steps:

1.1 Literature review

- Overview of the LES channel flow.
- Overview of the literature on security grid.
- Overview of the literature on bow thrusters.

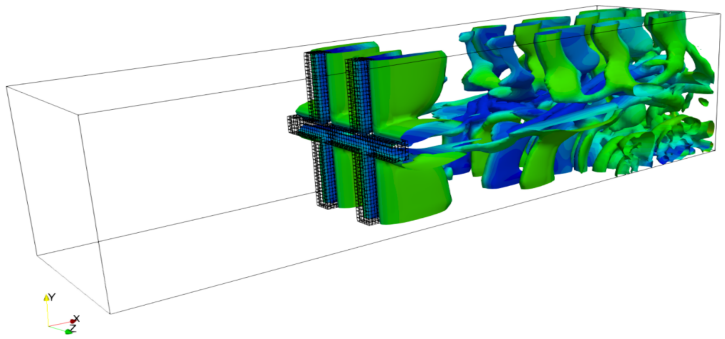

Figure 1: Q-criteria of channel with security grid

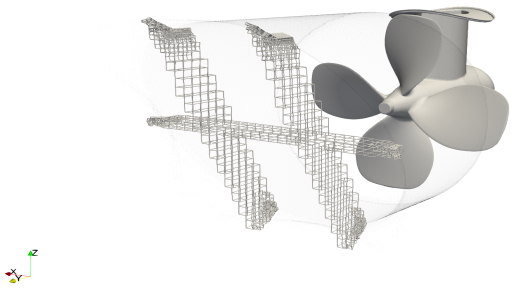

Figure 2: Bow thruster with security grid

1.2 Simulation

- Developing a case for wall resolved LES channel flow.
- Grid independence study for channel flow.
- Validating channel flow data with literature.
- Using volume force to represent security grid in channel flow. (Implementation already exist)
- Simulation of wall resolved LES channel flow with security grid.
- Simulation with different shape and size for the security grid using both methods
- As the final step, simulating bow thruster with elected shape and size according to previous simulation.

1.3 The possible content of the thesis

- Introduction. Motivation of the work aims.
- Theoretical background. Governing equations. Turbulence Models.
- Numerical Methods.
- Results. Analysis of graphs.
- Conclusion
- References.

The thesis in hard copy form should be submitted at least one week before the defending.

1.4 Meetings

The appointment is every two weeks.

1.5 Referencs

1. N. Kornev: Introduction into paper Unsteady hydrodynamic effects in a bow thruster. Will be delivered.
2. N. Kornev: Materials on protecting grid influence in bow thrusters. Will be delivered.
3. N. Kornev: Leiqas project description