

Calculation and exploitation of active anti-roll system

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Abstract. Today, more and more control systems of motion, are applied to different ships. Between the movement of the ship, the movement by rotation causes serious damage to the ship's equipment and their performance. There have been many efforts to invent or create certain equipment in order to eliminate these adverse effects.

However, few types of equipment have had the same impact on the stabilization of the rollers and systems with active wings stabilizers. In the recent years have been carried out more research for the improvement of systems of the stabilizer fins. The anti-roll fins are a stabilization, reducing the rolling in the hull of the vessel using the elevator fin general designed on both borders of the keel. The present paper will show the design model for analysis.

1.Introduction

The construction of the stabilizer fins: Active system with vanes a gyroscope sensitive senses the movement of the ship's driving and sends the signal to the driving system which, in turn, determines that the fins to move in a direction in such a manner as to cause the opposing forces of the roll. The gear is usually the electro-hydraulic actuator. The fins, which may be withdrawn in the hull of the ship, are located around the opening of the bilge pumps, in order to ensure maximum leverage for the forces acting on them.

A flap from the rear edge can be used to increase the lifting force generated. The ability of a system of the blades is usually expressed in terms of a constant angle which can cause with the ship which moves forward in water in a linear fashion to a certain speed.



Fig 1. Stabilizer fins

The force on a fins varies proportionally with the square of the speed of the ship while the GZ curve for the ship is independent of speed. However, it is unlikely that a system of wings assets to be very effective at speeds less than approximately 10 knots. In order to maintain the balanced status of the ship, roll-roll fins are attached to the sides of the ship. They generally have a rectangular shape and are attached in pairs on each side to ensure the necessary balance. The size of the fins depends on various factors, such as the length, width, the displacement of the ship. However, in comparison with the size of the vessel, the size of the fins is relatively low.

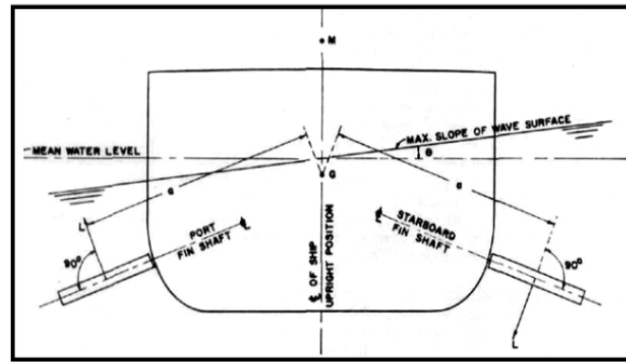


Fig.2 The construction of the stabilizer fins

The meaning of the movement of the system determines the pitch angle of the blades and the resulting movement of the ship. To do this, the control system of the stabilisers uses two giroscopae, one that regulates the movement of the vertical and other identifying the driving speed. After evaluating the angle of driving, speed, and acceleration of a ship, the control system sends the signal to the tilt angle required for the blades. However, it should be noted that at low speeds the power to stabilise the vanes drops, and when it is stationary, it is not possible to stabilize. In such conditions, the use of the anti-roll tanks.

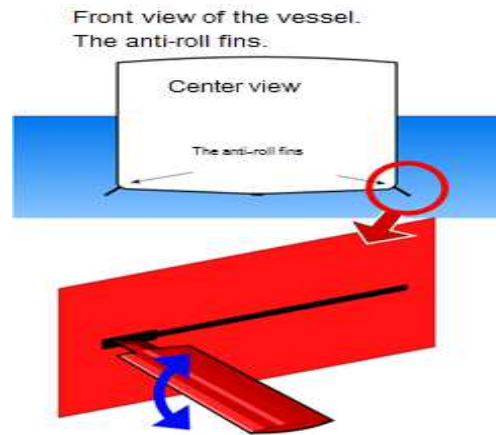


Fig.3 The front of the stabilizer fins

2. Components and data for stabilisers

1. Two fins forming part of the structure of the hull of the vessel

These fins are connected to the stabilisation of the fins on the side of the ship they are operated / controlled. Each unit of machines stabilisation provides the support and the means by which it can be mounted or remove the fin, locks and tilts up to +/- 25 degrees.

2. Two hydraulic power units located in the stabilization of PS and SB.
3. The control panel of the axle (BCP). Provides control and indicator for remote operation of the bridge. The panel is installed in the BMCC.
4. Two local units (L). They are located in each room of the stabilisers. These panels provide local indication and control
5. The main control unit (MCU). This panel can control the fins of the ECR with the same characteristics as the control unit of the axle.
6. The motion sensor unit of the roller (RMSU) measured roll acceleration of the ship and supplies the command signal to the algorithm for checking the roll and interfaces with the main control unit (MCU).
7. The angle of the fin.
8. The control unit (SCU) controls pumps and angles.

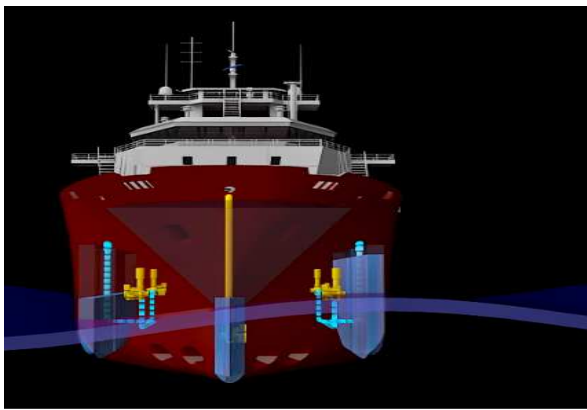


Fig.4 The stabilizers turned on.

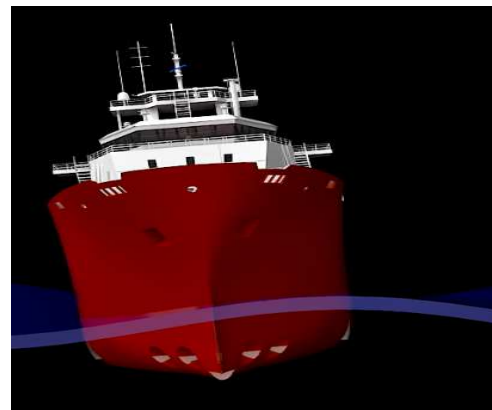


Fig.5 The stabilizers turned off

3. The simulation in Ansys program

Simulation in Ansys program is done with a simple ship shaped object as presented in figure 6. With fins.

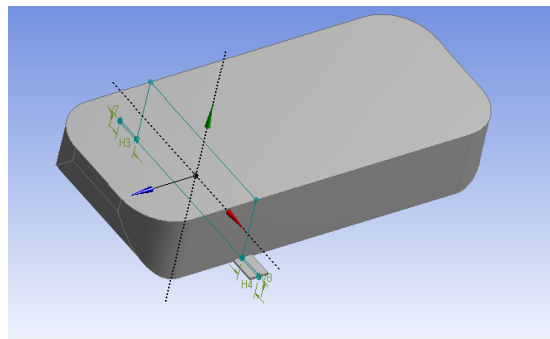


Fig.6 The ship with anti-roll fins in the Ansys program

Ansys CFX can easily solve the fluid domain around ship for any simulated speed and any other conditions. A model of result is presented below in figure 7. The present paper will show the design model for analysis for a ship speed of 6m/s. Below, some features for fluid flow are present: red zones with high velocity and blue zones with low velocity zones.

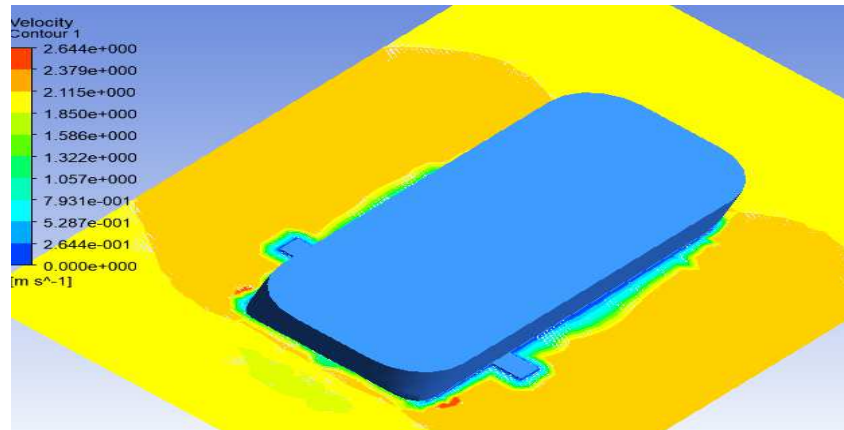


Fig.7 The result of the speed in the Ansys program

4. Conclusion

At present it is recommended that all ships shall be provided with a computer and a specific software itself, the ship, for the purpose of calculating the transverse stability and, where appropriate, the stress. This overview shows the importance of systems with the fins roll assets, as well as the program Ansys, preventing the emergence of the arithmetical errors. The calculations shall be carried out automatically while entering the data is minimal and the results obtained are almost instantaneous.

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