Verification of Wind Sensor Position

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풍향 · 풍속계의 위치 적합성 판단

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Abstract : The anemometer on the radar mast of the vessel is equipped to measure wind direction and speed. This project was carried out to verify the position of anemometer which makes anemometer measure exact wind direction and speed. FLUENT was used to perform this analysis.

Key words : Anemometer, FLUENT

1. Introduction

The anemometer on the radar mast of the vessel is equipped to measure wind direction and speed. This project was carried out to verify the position of anemometer which make anemometer measure exact wind direction and speed. Under certain condition, the anemometer initially positioned could not predict correct wind direction. Hence, we felt necessity of analysis on flows surrounding the anemometer.

CFD(Computational Fluid Dynamics) using commercial code, FLUENT6.2 was used to perform this analysis. This verification has been done for container vessel, crude oil tanker and LNG carrier. Initial position of anemometer was located on the edge of radar mast top platform. But, because of incorrect report for wind direction, the position moved to the top end of radar mast.

2. Main Subject

2.1 Theories

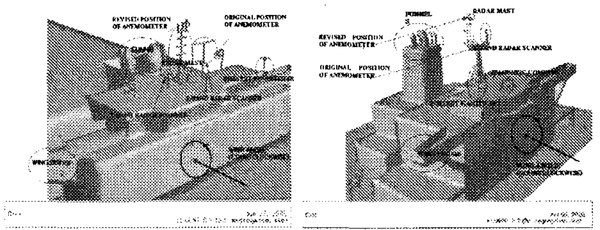
Flow fluctuation can result from collisions between straight wind and structures of the vessels. These structures are represented as complex instruments on the radar mast/wheel house and rear funnels as per wind directions. The exact modeling for such structures has great effect on simulation.

Fluctuating energy of flow can be represented as turbulence kinetic energy. Turbulence kinetic energy results in flow fluctuation and vortex. In order to track turbulence mechanism, standard turbulence model was considered in this analysis.

2.2 Models

Selected ship : 9,200 TEU container ship, 115K DWT crude oil tanker.

Modeling carried out by commercial pre-processor called GAMBIT.



Containership　　Crude Oil Tanker

Fig. 1 Modeling of the Ship

2.3 Calculation Conditions

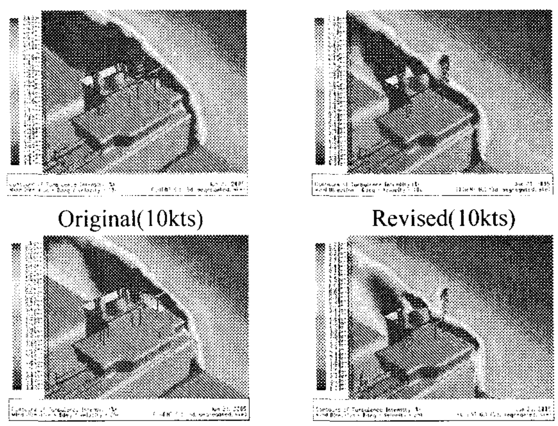
In this report, used the relative wind speed and wind angles comply with counterclockwise.

2.4 Results

2.4.1 Containership

The more the relative velocity the more the region of the high turbulence intensity.

Revised position was more distantly located than original position in the region of the high turbulence intensity.



Original(10kts)　　Revised(10kts)

Original(25kts)　　Revised(25kts)

Fig. 2 Modeling of the Ship

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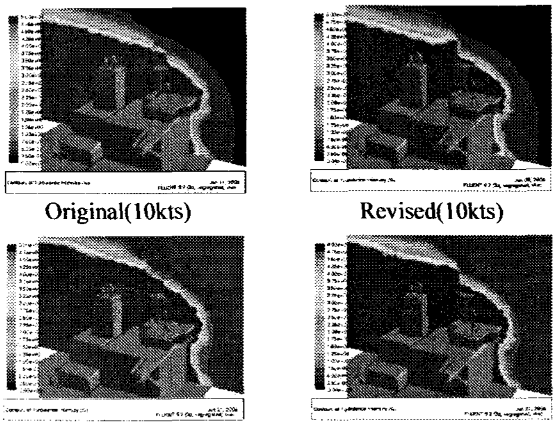
2.4.2 Crude Oil Tanker

In case of 25knots, the region which had more than 5% turbulence intensity was broader than those at 10knots.

At an angle of 180 of original position, it was needed that the position of anemometer had to be vertically ascended over 1m to avoid high level of turbulence effect and at an angle of 180 of revised position, it was needed that the position of anemometer had to be vertically ascended over vertical 3m in order to avoid high level of the turbulence effect



Original(10kts) Revised(10kts)

Original(25kts) Revised(25kts)

Fig. 3 Modeling of the Ship

Turbulence is getting stronger with the approach of red zone. Strong turbulence has a chance for lowering performance. But, anemometer is located in blue zone in this ship. So the position of wind sensor has a little chance for lowering performance.

4. Conclusion

In case of 25knots, the region which had more than 5% turbulence intensity was broader than those at 10knots.

In case of container ship, revised position had a less opportunity that was affected by strong turbulence than original position.

In case of crude oil tanker,there has no problem from the viewpoint of performance in present design position of wind sensor.