ClassNK Activities Related to Stability in Collaboration with NAPA

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ABSTRACT

ClassNK has developed an application called "ClassNK Manager" in collaboration with NAPA Group. The application is designed to support ship designers carry out stability calculation based on NAPA 3D model and create the relevant booklets in compliance with statutory rules. The primary objective of the cooperation is to assist the naval architect in performing regulatory engineering calculations in a way that makes designs safer and makes the classification process faster.

Keywords: *Stability Booklet, Application, ClassNK, NAPA*

1. INTRODUCTION

Designing market competitive ships in a short period of time with minimal resources is a. demanding task in the current situation of shipbuilding industry. In order to add higher values to new building ships, more detailed studies are required in the design phase while design conditions.

Regarding statutory rules, regulations are becoming more complicated, e.g. SOLAS 2009, and they require accurate treatment of 3D geometries. Therefore, there is also a strong need of 3D systems from the viewpoints of statutory calculations and class approval.

For classification societies, it is important to support shipyards. ClassNK has been developing an application called "ClassNK Manager" based on the NAPA 3D model for stability calculation collaborating with NAPA group.

2. HISTORY OF COLLABORATION BETWEEN CLASSNK AND NAPA

ClassNK began using NAPA System in 2005. In order to improve customer service, from 2008, ClassNK started to collaborate with NAPA group to develop a new concept application which assist designer to prepare the stability booklet in accordance with rules. The fundaments of the project lied in designing the application to be so user friendly that no specific training would be needed.

From 2011, ClassNK also start to collaborate with NAPA group to develop the interface system to achieve Data Linkage between the ClassNK software for Harmonised CSR and NAPA Steel using the NAPA 3D model.

Furthermore, ClassNK and NAPA group developed "ClassNK-NAPA Green" which helps owners and operators better monitor and optimize the efficiency of vessel operations.

In 2014, ClassNK acquired NAPA in order to ensure that innovation in software benefits the entire maritime industry and make new innovations available to everyone.

3. OUTLINE OF THE APPLICATION

The developed application, "ClassNK Manager", is based on the NAPA Manager concept which comprises a framework for modelling a work process on top of the NAPA 3D model bringing the accuracy and efficiency of the ship design package into an easy-to-use and practical form. The NAPA Manager concept is widely used in the design work at world's leading shipyards and design consultancies.

The key function of ClassNK Manager associated with stability is outlined below.

2.1 Intact Stability

The GM limit curve in accordance with 2008 IS Code can be created easily. The output of calculation results related to the Stability Information and Loading Manual for approval can be issued easily with a good and useful format. In general, very short time will be available to make the Stability Information and Loading Manual loaded onboard, because those cannot be made without the result of inclining experiment or lightweight measurement and they should be prepared to comply with the convention rule before the ship's delivery. This tool will be useful to issue these documents within a short period of time.

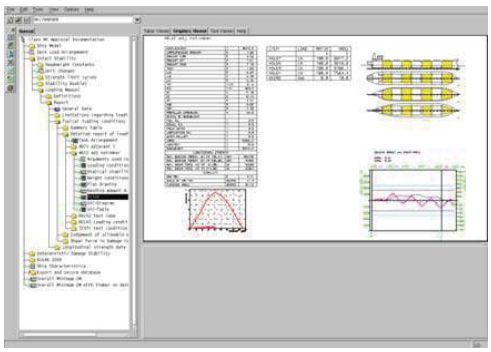

Figure 1 Loading Condition View

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When timber deck cargoes are loaded, the buoyancy of the timber deck cargo can be taken into account in accordance with Paragraph 3.5.3 "Calculation of stability curves for ships carrying timber deck cargoes" in 2008 IS Code. The shape of timber deck cargo can be easily defined and used to calculate stability taking the reserve buoyancy of the timber deck cargo into account. The alternative stability criteria for timber deck cargo can be selected for each loading condition for stability calculation.

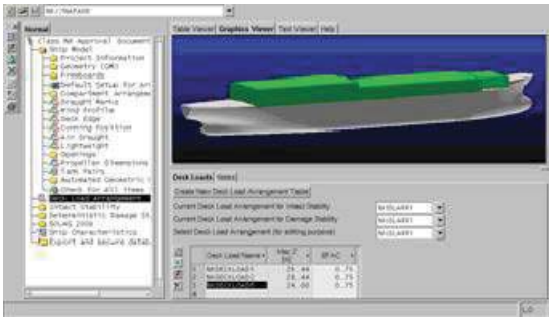

Figure 2 Input of Timber Deck Cargo

2.2 Damage Stability

The calculation results of Deterministic Damage Stability can be printed in a good and useful format easily. The permeability of the flooded compartments can be easily defined in

accordance with the convention rules, and the damage cases can be generated.

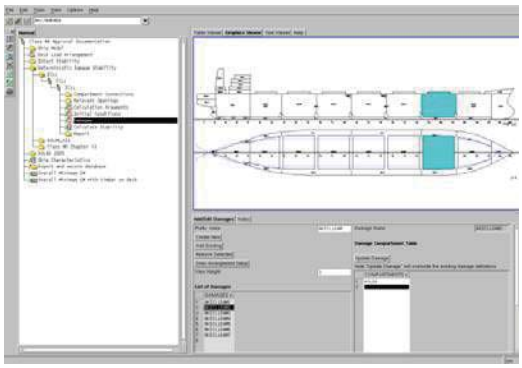

Figure 3 Input of ICLL Damage Case

2.3 2009 SOLAS Damage Stability

Probabilistic damage stability regulated in SOLAS II-1, Part B-1 and double bottom damage stability regulated in SOLAS II-1, Part B-2 can be calculated in accordance with the requirements. Zone damages can be created automatically based on the subdivision table defined by the user.

The buoyancy of timber deck cargo can be justifiably credited in damage stability calculations required by SOLAS II-1, when the integrity of the lashed timber deck cargo complies with the provisions of Chapters 3 and 4 of the CODE OF SAFE PRACTICE FOR SHIPS CARRYING TIMBER DECK CARGOES, 1991 (Resolution A.715(17)).

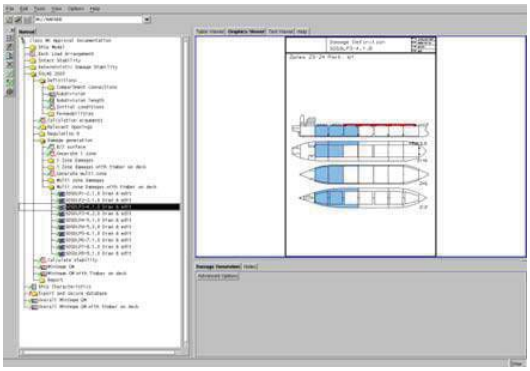

Figure 4 SOLAS 2009 multi-zone Damage

2.4 Creation of Grain Loading Booklet

Grain Heeling Moment can be calculated in accordance with International Grain Code by easy input. The output of calculation related Grain Loading Booklet for approval can be issued easily with a good and useful format in accordance with International Grain Code. In general, very short time will be available to make the Grain Loading Booklet loaded onboard, because those cannot be made without the result of inclining experiment or lightweight measurement and they should be prepared to comply with the convention rule before the ship's delivery. This tool will be useful to issue Grain Loading Booklet within a short period of time.

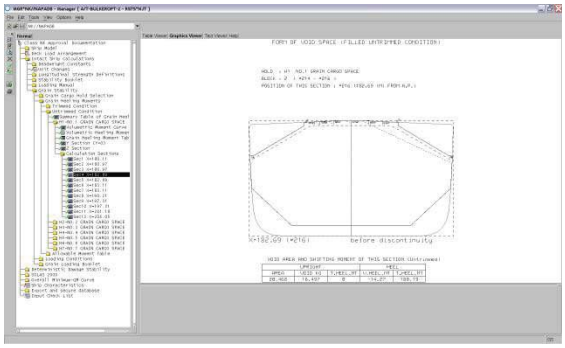

Figure 5 Creation of Grain Loading Booklet

2.5 Compliance Check of Statutory requirements

New loading conditions are often created by the owner's request before ship's delivery. However, the compliance of statutory requirements for these conditions are not checked at designed stage.

We created the function which is used for easy checking of the compliance of stability requirements for new loading conditions. After creating new loading conditions, the end-users can find the compliance of stability requirements visually.

Figure6 Compliance check of intact stability

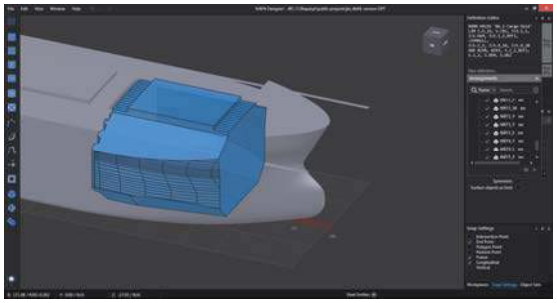

Figure 7 NAPA Designer offers intuitive tools for modelling

4. CONTINUOUS IMPROVEMENT OF THE CLASSIFICATION PROCESS

The further development of the application is aligned to making the classification process between the naval architect and the approving body as smooth as possible. Key elements in realizing these requirements are,

- Understanding the ship design process and the needs of the different stakeholders involved in the shipbuilding project
- Implementing new features through a market driven approach when designing the user experience to ensure that the tools provided fit the need of the user community as a whole
- Ensuring that the engineering methods comply with the existing domain of rules and modern computation models
- Serving naval architecture in practice

While the application today covers the needed regulatory domain, creation of the geometry model has so far been assumed to be pre-existing. With the exception of some domain specific modelling for objects such as down flooding openings, deck edges the product model is assumed to be existing prior to using the application. Current development is ongoing for making the creation of the geometry model easier and faster by creating a new workflow for the statutory compliance domain using the NAPA Designer.

The loading computer of the vessel is based on the same data as used in basic design of the vessel. Analogically to stability calculations for basic design, classification work is needed for the loading computer. Today, the loading computer is often created from scratch in the detail design stage of the vessel and is based on the final ('as built') calculations done at the delivery stage of the vessel. As the relevant information is already available in a standard format hosted by the product model of the vessel, the creation of the loading computer can be made significantly more efficient than it currently is using a single product model of the vessel.

The mission of both the cooperating companies is to provide excellent tools and services to the marine industry in the field of regulatory analysis of ships. The development of the tools and services is tightly connected with changing rules and new methodologies constantly developing in the IMO and in research globally, for example second generation intact stability criteria and amendments to the SOLAS Chapter II – 1 Subdivision and Damage Stability Regulation to name a few.

5. CONCLUSIONS

Ship design is getting into higher levels year by year while the design cycle is getting shorter and requirements such as statutory rules and design conditions are getting more complicated. In this circumstance, the

enhancement of efficiency of ship design and its approval have becoming more important.

ClassNK and NAPA group have developed "ClassNK Manager" based on the NAPA System. The application will support ship designers to carry out stability calculations based on NAPA 3D model in accordance with statutory rules.

"ClassNK Manager" is integrated into "Statutory Compliance Manager" in order to contribute to improve efficiency of ship design and to speed the classification approval process.

Authors expect that "Statutory Compliance Manager" will contribute to enhance the efficiency of stability calculation in accordance with the complicated statutory rules.

6. REFERENCES

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