

NX SHIP MODELING FOR AHTS SHIPS SAFETY MANAGEMENT

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Abstract:

The field of AHTS vessels is constantly evolving and represents a huge potential for offshore development. Offshore structures need AHTS vessels - an acronym for Anchor Handling Tug Supply Vessel. The present paper will present the NX modelling in NX software for AHTS ships.

Keywords: Siemens NX, AHTS ships, Elements, numerical simulations.

1. Introduction

AHTS-type ships appeared with the development of the industry around oil rigs. The name AHTS stands for Anchor Handling Tug Supply Vessel.

These ships were first designed in the mid-1950s, initially with the sole purpose of transporting the anchors of the platforms and the goods intended for them. They have been designed quite rudimentarily, often using modifications to existing projects. Thus, due to weather conditions and high loads, many of them were frequently in difficulty. There was even a time when it was desired to abandon this type of ship due to lack of efficiency and the increasing presence of incidents. Moreover, at that time shipowners were interested in investing in large ships such as oil tankers, which generated a commensurate profit.

This period has been a real challenge for offshore companies, which are trying to develop ancillary vessels to serve offshore drilling rigs. Over time, the specialization of these ships has increased as needed. The new ships have been equipped with technologies for various specific operations. Thus, fire extinguishers, oil stain cleaners in case of environmental disaster, etc. appeared on board.

Although this field is very diverse, AHTS vessels specialize in the following types of activities: towing oil drilling and operating platforms, transporting anchors to support these platforms and last but not least supplying these offshore platforms or other offshore installations.

The paper is developed around three major research directions:

□ Simulation using NX 12 Siemens software. □ Validation of numerical results based on experimental results obtained in the Applied Mechanical Engineering Laboratory.

□ Analysis of results and future study directions. Numerical research based on NX 12 software was conducted at the UMC home institution. Subsequently, the numerical simulations were processed for the chapters on Current Aspects of AHTS Ship-Specific Installations. Research in the Applied Mechanical Engineering Laboratory involves the practical performance of test specimens (1:10 scale). Regarding the practical part of the thesis, the test results on the GUNT WP310 machine were obtained in the Applied Mechanical Engineering Laboratory. The test specimens were made based on Autocad drawings made to scale (1:10). The measurements obtained are close in value to those in the numerical simulations, this confirming the numerical results obtained with the NX 12 Siemens. Numerically, the design and initial analysis of the various elements belonging to the AHTS ships was presented numerically.

From the first types of AHTS ships, operating decks were used with the primary purpose of transporting anchors and various parts used on the platform. The first decks of operations were quite

narrow, just enough to fit the old types of anchors, which were smaller than those currently used on oil rigs (Fig. 1).



Fig. 1 AHTS ship

Due to the incorrect positioning of the platform anchors on the deck, there were cases of sinking of these ships. The way of lifting the anchors was quite rudimentary, with only one drum on board on the entire platform. The special working conditions on the platforms, corroborated with precarious work protection measures, have often determined the occurrence of work accidents. The development of oil rigs has led to the development of a new generation of anchors and implicitly new types of AHTS ships and new operational platforms.

We will study the structure of the operational platform of an AHTS ship using the finite element method, using the NX 12 program from Siemens. The drawings in this paper will be made in the NX 12 program from Siemens, because we want to use one of the latest types of CAD software.

2. NX ship model

In this paper we will present a simple model, older than the AHTS type ship (fig. 2).

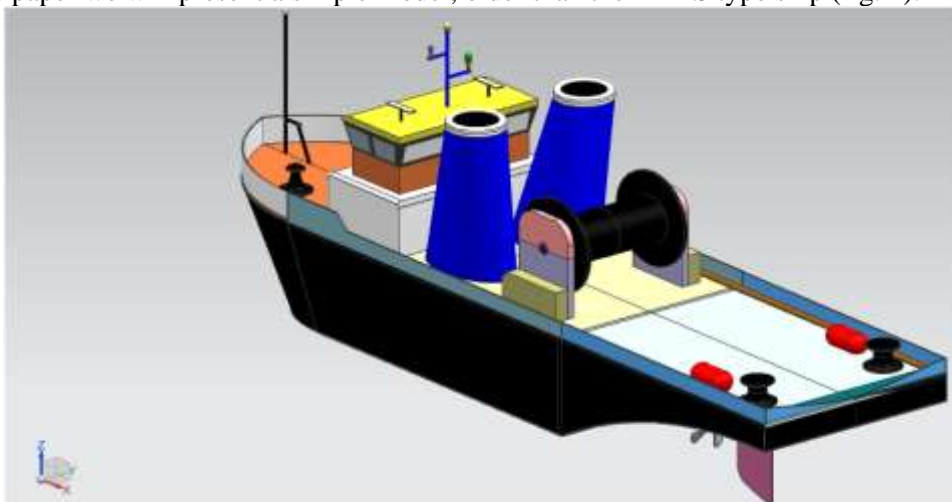


Fig. 2 AHTS ship model

Using the longitudinal and cross-sections, the main installations and the engine ('machine') in the hull can be seen (Figs. 3 and 4).

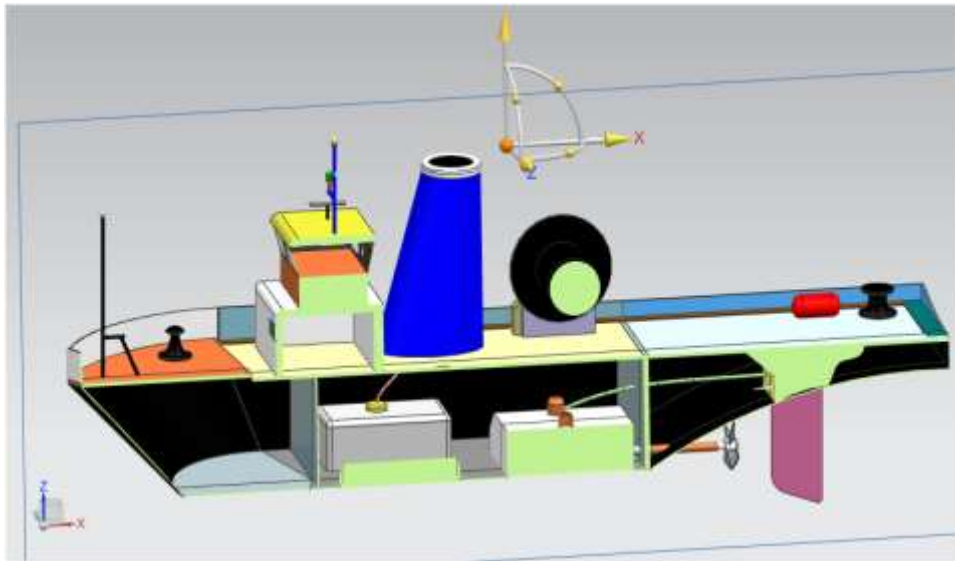


Fig. 3 Longitudinal section for AHTS ship

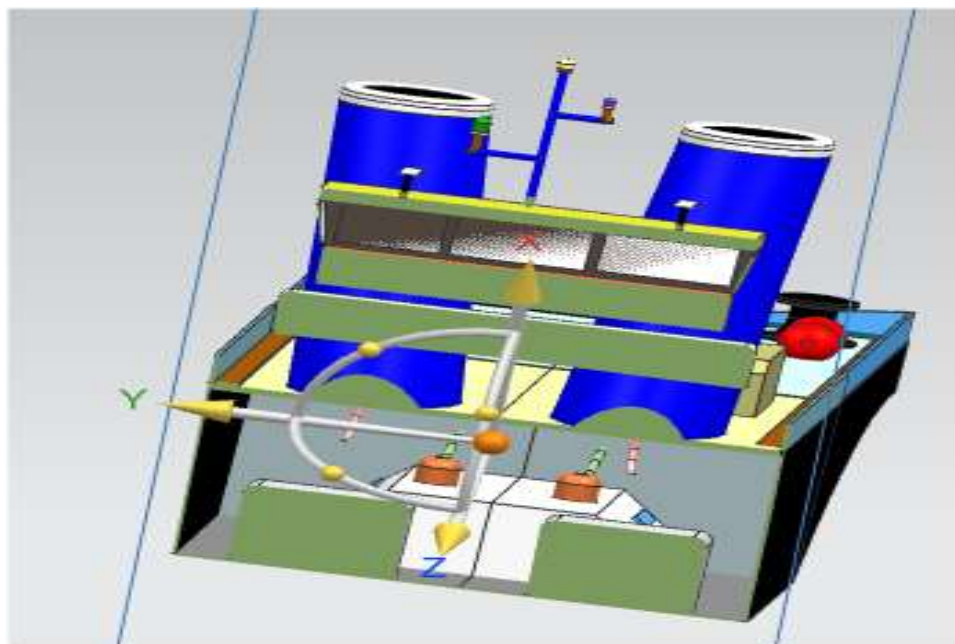


Fig. 4 Transversal section for AHTS ship

AHTS ships have evolved with technological advancement. Improvements and innovations have appeared in all aspects: the hull, propulsion equipment, on-board equipment, assistance facilities, guidance, compensation, etc.

Regarding the hull of the AHTS type ships, most of the modifications and innovations were made to the bow (front of the ship). These changes were driven by the need to move the ship in specific hostile environments, such as the North Sea, where waves and wind can reach impressive heights. Thus, today we have the bow type: Bulbous Bow, X-Bow.

Today's ships have sophisticated systems that allow them to operate at a fixed point. Among these we mention: DGPS (Differential Global Positioning System), Fun Beam (laser guidance system), Artemis (advanced radar system) etc.

In order for the ship to remain at a fixed point, propellers or thrusters must compensate for any displacement caused by external factors (wind, wave). This is done through an extremely complex system that includes the propulsion units, the distance and displacement measurement installations and the computers that manage the entire activity and act quickly to compensate for the movement of the ship.

Today, a priority role in shipbuilding is the safety factor (both of the crew and of the cargo).

3. Conclusions

Engineering constructions have been an important resource for the development of society as we know it today. It is very important to continue on this path and look for new ways to study and analyze engineering problems. The paper brings to light AHTS ships that can have various configurations and a multitude of purposes. A clear knowledge of AHTS vessels is required for efficient operation. The measurements obtained are close in value to those in the numerical simulations, this confirming the numerical results obtained with the NX 12 Siemens. Numerically, the design and initial analysis of the various elements belonging to the AHTS ships was presented numerically.

Optionally, opportunities can be identified and new constructive solutions can be found for future AHTS ship projects through the simulation methods presented and the practical validations presented. Based on these results validated in the Applied Mechanical Engineering Laboratory, any other operational situations can be analyzed for AHTS type ships.

The research carried out in this thesis shows many elements from AHTS type ships. All these data presented give a complete picture of the use of Siemens NX applications for AHTS ships.

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