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FURTHER TECHNICAL AND OPERATIONAL MEASURES FOR ENHANCING THE ENERGY EFFICIENCY OF INTERNATIONAL SHIPPING

Information on the difficulty of defining relevant, appropriate, and meaningful proxies for "transport work" for dynamically positioned (DP) ships used in offshore energy industry

Submitted by IOGP and IMCA

SUMMARY

Executive summary:	This document provides information on the practical difficulty of defining relevant, appropriate and meaningful proxies for "transport work" for dynamically positioned (DP) ships in the offshore industry and concludes that they would not be appropriate in this niche market. The co-sponsors have identified a number of complex technical and safety issues specific to offshore DP ships and recommend that the "transport" work proxy approach is not applied to this small and specialized sector of industry at the second stage of data analysis.
Strategic direction, if applicable:	3
Output:	3.7
Action to be taken:	Paragraphs 26
Related documents:	MEPC 72/1/1; MEPC 71/6/2, MEPC 71/17, MEPC 71/WP.8; MEPC 70/WP.8, MEPC 70/6, MEPC 70/3/2, MEPC 70/18; MEPC 69/21; MEPC 68/WP.10 and resolution MEPC.282(70)

Introduction

1 This document provides information on the difficulty of defining relevant, appropriate, and meaningful proxies for "transport work" for dynamically positioned (DP) ships used in offshore energy industry.

2 To facilitate discussions on how to address the problem, the International Marine Contractors Association (IMCA) has engaged with a selection of its members to collect data from a sample of 66 offshore DP ships. The data includes fuel consumption, hours underway, and distance travelled for the whole of 2017, reflecting the required data defined in appendix 3

of the *2016 Guidelines for the development of a ship energy efficiency management plan (SEEMP)* (resolution MEPC.282(70)). The results from this research are presented herein.

3 It is the view of IMCA that no "transport work" proxy for offshore DP ships is likely to be meaningful. This is due to the complex technical and safety requirements of the offshore oil and gas and renewable energy industries, which are markedly different from the mainstream shipping markets. Put simply, the offshore industry will appear to look very inefficient in transport mode because it is not a transportation market, it is a marine construction market.

Background

4 In July 2017, IMCA invited the Committee at its seventy-first session (MEPC 71) to consider the challenges of defining "transport work" proxies for offshore and marine construction ships – essentially DP ships, which is the term used by IMCA hereafter. Document MEPC 71/6/2 recommended that such ships should be excluded from the current discussions on "transport work" and that the Organization could consider proposals at a future date, should an interested party develop suitable "transport work" proxies.

5 At the Working Group on Air pollution and energy efficiency, established at MEPC 71, the view was expressed that special attention should be paid to ensure the appropriate usage and analysis of the data, since misleading conclusions may be derived in the absence of appropriate energy efficiency indicators (MEPC 71/WP.8, paragraph 55). Following consideration, the Group noted that the majority of delegations who expressed a view shared the concerns identified in document MEPC 71/6/2 and that an appropriate transport proxy for offshore and marine construction ships should be developed.

6 In the ensuing discussion, the following comments were, inter alia, made (MEPC 71/17, paragraph 6.14):

.1 rescue and salvage ships, hydrographic service ships and <u>other ships that do not carry cargo</u> should also be excluded; and

.2 other indicators for energy efficiency could be used and were already under consideration.

7 MEPC 71 noted the outcome of the discussion on offshore and marine construction ships. This included data submission to the IMO Ship Fuel Oil Consumption Database, and an appropriate transport proxy for these types of ships. MEPC 71 invited IMCA to submit proposals on how to deal with offshore and marine construction ships under the IMO data collection system.

Complex technical and safety issues specific to offshore DP ships

8 Unlike mainstream shipping, DP ships do not transport cargo or merchandise from port to port. Their mission is to construct offshore facilities, which involves a wide range of construction technologies and techniques. These include, amongst many others: (1) the laying of pipelines and wellhead control cables; (2) installing production hardware on the seabed; (3) the installation of very large production platforms; and (4) the installation of offshore renewable energy facilities. The component parts of these facilities are often transported offshore by other means, such as tugs and barges, depending on the scale of the works. The onboard mission equipment, such as large cranes, powerful winches, large pipelay tensioners, etc., all have high electrical power requirements.

9 This is a niche market representing a small segment of the world's fleet of ships. Consequently, these ships are highly specialized and more expensive to build and operate than traditional shipping. This is because they are designed with the sole purpose of their industrial mission efficiency. For example, there are sub-niches for specialized pipelay ships and specialist heavy-lift ships, and these are treated by the industry as completely different market sectors. The speed and efficiency of working offshore becomes the driving commercial factor, and by consequence the technical design of the ships.

10 Despite many technical variations, the industry shares one common technology, and that relates to Dynamic Positioning. DP enables the accurate positioning and station keeping of a ship offshore without the use of anchors. The technology entered the market in the late 1970s, was commercialized in the 1980s, and has been expanded, refined, and made more efficient with improving technology ever since.

11 From a naval architecture perspective, a container ship or oil tanker is designed to carry an optimum size of cargo great distances as speedily and efficiently as possible. A DP ship however has a very different design philosophy, as it is principally designed to be stationary offshore. This is because the ship must maintain extremely accurate positioning (with carefully controlled movement) for safe and efficient construction work. Consequently, a DP ship will have poor transit performance but excellent station-keeping performance.

12 A container ship or tanker will typically have a single large and powerful low speed diesel engine or steam turbine driving a single propeller through a mechanical shaft connection. A DP ship is very different in configuration, and will have multiple medium speed engines driving electrical generators which power multiple underwater thrusters located fore and aft. Computer systems then automatically control the power distribution and thruster performance to hold the ship dynamically in position in the prevailing weather and sea state conditions.

13 DP has brought huge operating efficiencies in working offshore by constantly maintaining a ship's position within a few metres for days or weeks at a time. But the risk of losing position through a system failure is very real, and failures can have a significant impact on the safety of the ship and offshore oil and gas production facilities. Consequently, the standard of technical design, equipment, onboard control and management systems are of a very high order of sophistication and are thoroughly checked and tested on a regular basis. One of the key design principles is system redundancy, with the engines split into two completely separate fire-proofed engine rooms, likewise the electrical switchboards, likewise the computer control systems, etc. This philosophy supports the requirement that no single system failure should cause an unacceptable loss of position, or a catastrophic effect leading to an uncontrolled situation. A DP ship therefore runs at a very high level of system readiness and is able to respond instantly at full power should an emergency arise.

14 A DP ship is by its very nature over-powered compared with ships of comparable size. This is due to several factors: (1) the ship needs to maintain position in significant weather and sea state conditions when it is not possible to change to a more favourable heading; (2) the large-scale nature of mission equipment, as electrical consumers impose a significant power demand; and (3) for safety reasons a high level of power must be constantly available to react immediately should a risk to the ship or offshore facility be detected. The result is a relatively high consumption of fuel per day to remain in a stationary safe working position.

"Transport work" for offshore DP ships

15 IMCA fully supports reducing the environmental impact of offshore DP ships by improving their energy efficiency. Nevertheless, efficiency indicators, including any potential "transport work" proxies applied to these ships must be appropriate and meaningful, otherwise the wrong conclusions could be derived from misleading results.

16 To this end, IMCA has engaged with its board member companies, which represent the seven largest offshore marine contractors in the world, to conduct research in response to the invitation by MEPC 71. Accordingly, IMCA has collected data for 2017 on a sample of 66 DP ships. The co-sponsors feel this is a good representative sample of the whole population, as it includes the full range of asset types, from very heavy construction ships to the lighter weight survey ships. Data was collected according to the IMO parameters of fuel oil consumption, hours underway, and distance travelled.

17 In order to develop our arguments, the Third IMO GHG Study 2014 provides a useful reference point on fuel oil consumption in the mainstream shipping industry. And although the data is not in the same format as the new IMO data collection system, it can be transposed using some simplified assumptions. IMCA fully appreciates that this work is not a detailed scientific study, but considers it sufficient to show the order of magnitude of the differences between the highly specialized DP market and the mainstream shipping transportation markets.

Results of analysis

18 In table 14 of the Third IMO GHG Study 2014, IMCA has, for comparative purposes, selected three different types of ships. Within each category, IMCA has then selected a ship size that has an important market share as shown in tables 72 and 73 of the Study. The selected data is shown in table 1, below.

Table 1: Selected Extracts from Table 14 of the Third IMO GHG Study 2014

Ship Type	Size	Unit	Sea Days	Speed, kt	Fuel used, tonnes
Bulk Carrier	100,000-199,999	dwt	202	11.7	9,800
Container	5,000-7,999	TEU	246	16.3	24,200
Oil Tanker	200,000 +	dwt	233	12.5	20,000

The above data has been converted into data comparable with the IMO fuel oil data collection system parameters and shown below in table 2. The average DP ship data from IMCA's study is also shown for comparative purposes:

Table 2: Transposition of Data from Table 1 Compared with IMCA DP Ship Data

Ship Type	Hrs at Sea	Fuel used m^3	Distance nm	Fuel m^3/nm	Fuel m^3/h
Bulk Carrier	4,848	10,000	56,722	0.18	2.06
Container	5,904	24,694	96,235	0.26	4.18
Oil Tanker	5,592	20,408	69,900	0.29	3.65
IMCA Dataset	3,103	5,225	4,695	1.11	1.68

19 The discrepancies are quite striking in the following ways (annex 1 shows the data graphically):

.1 the vastly different scale of businesses is very evident from the data showing the hours at sea, fuel used, and distance travelled. In this respect, DP ships represent a small fraction of the mainstream shipping industry statistics;

.2 the technical arguments detailed above are supported by the data showing the very limited distances travelled by DP ships. Indeed, the average speed of the DP ship in the dataset was only 1.5 knots, again only a fraction of the commercial transportation market;

.3 the technical arguments detailed above are fully supported by the apparent high fuel consumption of DP ships measured in m^3/nautical mile, compared with mainstream shipping. But of course, this is quite meaningless given the nature of a DP ship's working pattern; and

.4 the fuel usage for DP ships measured in m^3/h, appears to be more efficient than in the transportation sectors. But again, this is meaningless as we are comparing completely different asset classes and functionality.

20 Given this analysis, it is clear that within the spectrum of global shipping, the DP ship represents a very small niche which is not comparable with the vast majority of the shipping industry. IMCA agrees with the strategy of collecting and reporting data on DP ships but can see no meaningful metric, other than perhaps fuel consumed per hour, which can assist the industry in continuing with improvements in efficiency. The cost of fuel already provides ship owners with the economic incentive to further improve efficiency, a single metric on its own will have little relevance. IMCA therefore recommends that the "transport" work proxy approach is not applied to this small and specialized sector of industry.

Conclusions

21 In order to assist in the dialogue and join the debate, IMCA has, in a very short period of time, collected data that is useful in making recommendations on the applicability of "transport work" proxies or other such metrics. The results of this research show that the DP ship market is a very small niche with a very different modus operandi than the mainstream shipping transportation markets. As a result, any fuel consumption metrics cannot be comparable, and therefore the application of such proxies should not be extended to DP ships.

22 Since DP ships are not providing transportation of cargo, the concept of "transport work" is not appropriate. Defining "transport work" proxies will require extensive research. Some ships are unique to their market niche and may even require a unique proxy. IMCA does not recommend such a level of effort or administrative burden on a market that is not material in size to the global shipping industry.

23 Any "transport work" proxies or other efficiency indicators which may be applied to the sector must not compromise safety. And while there are potential ways of reducing the levels of DP system redundancy (and therefore fuel consumption) this would lead to significant safety concerns by the industry.

24 IMCA feels that its arguments resonate with other adjacent markets sectors, such as the offshore drilling market which employs similar technology on DP drilling rigs. Although these are excluded from the debate by virtue of MARPOL Annex VI – Chapter 4 – regulation 19 application.

25 The co-sponsors believe that the "transport" work proxy approach should not be applied to this small and specialized sector of industry at the second stage of data analysis.

Action requested of the Committee

26 The Committee is requested to consider the issues discussed in this document and to take action as appropriate.

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ANNEX

COMPARISONS OF SHIPS' SPEED, FUEL USED AND DISTANCE TRAVELLED