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OFFSHORE SUPPORT VESSELS
NOISE SITUATION AND PROPOSALS FOR NOISE REDUCING MEASURES

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INTRODUCTION

In connection with the increasing oilactivity offshore, different types of support vessels have been developed. Todays design concept for such ships, is shown on Fig. 1. During recent years the size and engine power of such ships are considerably increased. The same goes for the manoeuvrability which is obtained through two propellers, twin rudders and use of stern and bow thrusters. The propeller systems are to an increasing extent equipped for dynamic positioning (DP), which means that the ship may be kept at a fixed position only by use of active propeller thrust and without use of anchors or mooring.

NOISE SITUATION

The development towards higher power output and more use of thrusters, has caused a steady increase of noise levels onboard this type of ships. Based on full-scale measurements from 30 support vessels, the noise situation in the accommodation area, directly above the bow-thrusters in the fore ship, may be characterized by the average values as referenced in Table 1.

Abt. Table 1.: The results refer to cabins. Transit condition refer to the ship cruising ahead with at least 80 % engine power. Manoeuvring condition refer to the ship at manoeuvring/DP-condition with full power on the thrusters. - Main Deck is the lowest accommodation deck, directly above the bow-thruster room. -"All ships" incl. the 30 ships of the data base. "Reduction applied" covers 12 of the ships were some type of noise reducing measures were applied. "No reduction applied" incl. the remaining 18 ships with no use of noise reducing measures. - The scatter of the results is abt. +- 8 dB(A) for the lowest deck, depending on the position of the cabins relative to the thruster installations.

Deck-	All levels in dB(A)	Conditions	
		Transit	Manoeuvr.
Main-	All ships	60	83
	Reduction applied	55	79
	No reduct. applied	63	85
Shelter-	All ships	59	78
	Reduction applied	55	74
	No reduct. applied	62	80
Forecastle-	All ships	59	73
	Reduction applied	56	
	No reduct. applied	61	
Captains-	All ships	57	68
	Reduction applied	53	
	No reduct. applied	60	
Bridge-	All ships	66	72

Table 1: Average noise levels from 30 offshore support vessels.

Reference to noise criteria: The most usual required/recommended noise limit for cabins onboard ships is 60 dB(A). This limit is referred to by most of the European countries, US-Coast Guard and the United Nations International Maritime Organization (IMO). If this limit is compared to the levels of Table 1, the exceedings are more or less insignificant for the transit condition. However, in the manoeuvring condition, the exceedings are considerable, up to 25 dB(A) for the lowest accommodation deck. Taking into consideration that the thrusters in connection with DP-systems may be in operation continuously for weeks, on night and day service, this has caused serious complaints from the crew onboard such ships.

NOISE REDUCTION

As indicated in Table 1, noise reducing measures are applied for nearly 50 % of the ships. These measures have mostly consisted of simple floating floor constructions, with limited noise reducing effect. Only a few ships had extensive floating accommodation systems and resiliently mounted main engines and thrusters, with considerable noise reduction as a result. As an average level, the noise reduction is 6 dB(A) for the lowest deck, giving a resulting noise level of 79 dB(A). Based on data like this, the limit of 60 dB(A) may seem rather unrealistic to meet by practical means. Therefore, there is a trend today that the maritime authorities will specify a specific noise limit for the manoeuvring condition. Due to required recovery from possible temporary hearing loss, a noise limit of abt. 70 dB(A) is expected for the cabins. - Based on the above mentioned data material, the following noise reducing results have been experienced:

Resiliently mounted diesel engines/generators: The effect will be strictly dependent on the relative distance between diesel engines and accommodation spaces. With an arrangement as indicated on Fig. 1, the noise reducing effect goes up to 10-12 dB(A) for the nearest cabins, compared to a firmly mounted engine installation.

Resiliently mounted tunnel-thrusters: Various types of noise reducing measures and arrangements are available to reduce the noise excitation and transmission from tunnel-thrusters. However, many of these arrangements may be characterized as rather complicated and scarcely suitable for practical use onboard this type of ships. The use of such systems have therefore been limited. However, some experiences are available. The systems are mostly based on the principle as shown in Fig. 2, where a section of the tunnel, including the propeller unit, is mounted resiliently to the remaining tunnel. Compared to a firmly mounted tunnel, the noise reduction has varied from a couple of dB up to 8 dB(A) for the cabins on the lowest deck. To increase the reduction, not only a section but the whole tunnel may be mounted resiliently. Experience from ferries and smaller supply ships has shown that the reduction may be increased to 10-15 dB(A) by this type of installations.

Rotatable thrusters: Instead of tunnel-thrusters, rotatable thrusters (azimut thrusters) have to an increasing extent been taken into use in connection with offshore support vessels, see Fig. 3. Compared to a tunnel thruster of the same power range, a considerable noise reduction may be achieved, depending on the propeller geometry, with/without nozzle and the distance to the hull. However, if the rotatable thruster is fitted with a retraction system, the housing for the retraction system is most often placed in the accommodation area. Experience has shown that this housing represent a major transmission path for structureborne sound, which may neutralize the noise difference between rotatable and tunnel-thrusters.

Floating accommodation systems: Further noise reduction of up to 14 dB(A) has been obtained by use of floating floor constructions and wall/ceiling with no or resilient connections to the surrounding steel structure, see Fig. 4. Often, an inner window also has to be added. Since the hull side most often will be a major radiating surface, use of floating floor constructions only, without treating the lining/walls, have proved to give limited or no effect at all.

Damping layers: Due to space and weight limitations that may be required onboard such ships, different types of visco-elastic damping materials have been used instead of conventional floating floor constructions. Combined with a lining (walls/ceiling) with no or resilient connections to the steel structure, a noise reduction of up to 8 dB(A) has been measured. The damping layers have been of the constrained type.

CONCLUSION

Compared to the most usual national and international noise criteria for accommodation spaces onboard ships, the noise situation onboard offshore support vessels in transit condition is in general satisfactory. In the manoeuvring condition, the exceeding is considerable. However, by use of properly chosen noise reducing measures for the thruster and accommodation spaces, effective noise reduction may be obtained. Hence, for the cabins directly above the thruster installations, it may be a practicable task to reach noise levels below 70 dB(A).

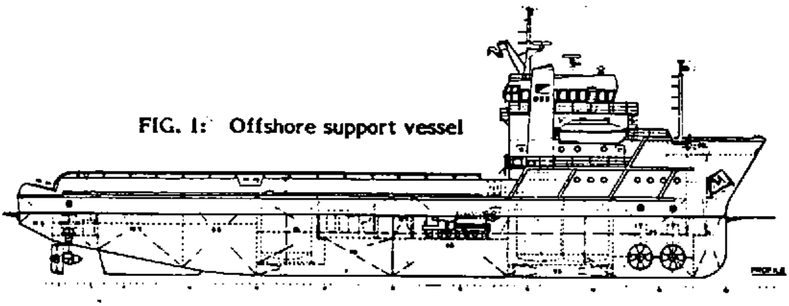

FIG. 1: Offshore support vessel

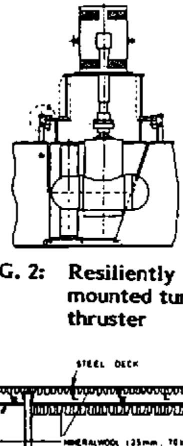

FIG. 2: Resiliently mounted tunnel-thruster

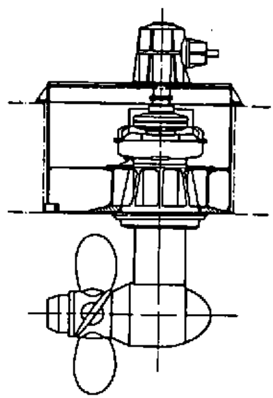

FIG. 3: Rotatable thruster

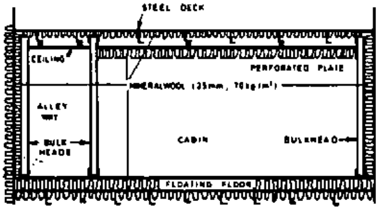

FIG: 4: Floating accommodation system