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AIRBORNE SOUND PROPAGATION INDUCED BY A CRUISE SHIP THROUGH SIMULATION AND CORRELATION WITH REAL MEASUREMENTS

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The publication of the Lloyd's Register (LR) notation 'Procedure for the Determination of Airborne Noise Emission from Marine Vessels', in addition to port and civil regulations, may in the future result in shipowners requesting certification of the airborne noise levels emitted by their vessels. This certification may be required for access to particular areas of natural interest or to certain ports.

This study models the sound propagation induced by a cruise ship using three different software tools, starting with a database of measurements and calculations on the sound power generated by the main sources (fans, exhaust gases) in accordance with ISO 9614-1 and 9614-2. The results compared with real measurements in the far field showed the need to calibrate the models through a campaign of measurements of on-board sources in terms of sound power and pressure.

The experimental measurements of sound pressure and power in the vicinity of the main sources present on board the vessel, determined through an initial measurement campaign, were used as input for the numerical models. These models were developed using the three commercial software packages, estimating in advance the noise levels measured at different distances from the vessel (in particular in the positions indicated in the Class Notation). In a subsequent phase of the study, the estimated data were compared with those calculated through a second experimental measurement campaign performed under the operating conditions indicated by the Notation and at progressive distances from the vessel.

The simulations make it possible to estimate the contribution of the individual sources for any desired point and then intervene ad hoc to improve comfort levels in specific positions on board. The improvement in comfort levels can be obtained by optimising interventions on the sources to a minimum.

The development of this approach has resulted in a predictive tool with a degree of accuracy in the range required by ISO 9613 and therefore capable of assessing the airborne noise emitted, comparing it with the limits imposed by the LR regulations or, in general, by port and civil regulations. This approach is also a useful tool for estimating the noise level in external passenger areas and therefore also useful for a project aimed at improving on-board comfort.

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