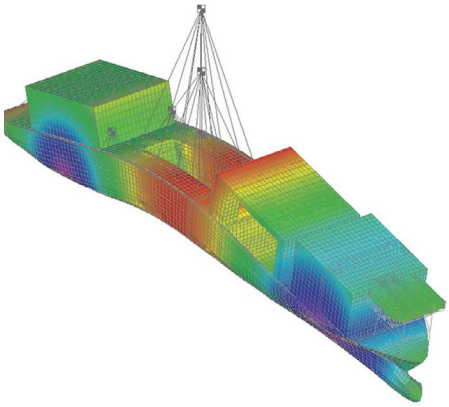
NOISE AND VIBRATION ANALYSIS, MITIGATION AND MEASUREMENT FOR OFFSHORE STRUCTURES

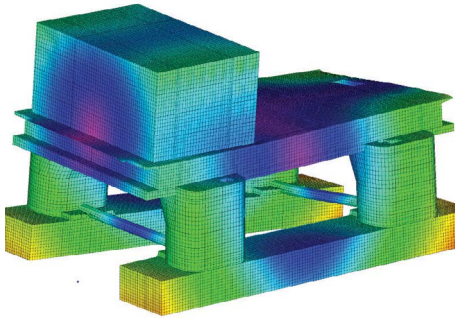
Noise and vibration analysis, mitigation and measurement help improve operational safety in terms of personnel task performance, habitability, proper functioning of equipment and asset structural integrity at sea.

Appropriate noise and vibration levels can enhance operational safety by improving task performance, habitability, proper functioning of sensitive equipment, such as sensors and modern monitoring technologies, as well as whole-body structural integrity at sea.

Because vibration can be global (vibration of the entire structure), local (vibration of selective structural components) or a mix of both, it has to be considered in a comprehensive way. Proper levels of vibration need to be maintained to limit an increased rate of fatigue failure in structural members and the malfunction of machinery and equipment.

Personnel task performance is a key component of operational safety, and a critical component of task performance is habitability, which includes noise and whole-body vibration. Designing for performance and habitability goals allows for improvement of productivity, morale, safety, and comfort, and it reduces potential risk of fatigue and human error. Noise and vibration performance goals are best achieved if noise and vibration analysis and mitigation are considered in early design stages. The cost of correcting a potential noise and/or vibration issue can be up to 10 times as expensive after construction than if incorporated into the design during the preliminary design stage.





ABS CAPABILITY FOR NOISE AND VIBRATION ANALYSIS, MITIGATION AND MEASUREMENT

ABS developed the capability for onboard noise and vibration analyses to address growing concerns and offers a number of services for noise and vibration analysis and measurement.

Onboard Noise Analysis

The analysis model considers major noise and vibration sources, such as main engines, auxiliary equipment, propellers, etc. The HVAC system, including duct dimensions, routes, insulation, etc., can also be modeled and analyzed. The ultimate compartment noise level is the combination of the machinery noise and the HVAC noise. Analysis results are evaluated against the relevant noise limit. If the predicted results exceed allowable noise limit, ABS can propose mitigation options for reducing noise levels.

Onboard Noise Measurement

ABS provides onboard noise measurement services to support verifying compliance with the International Maritime Organization (IMO) code on noise which requires physical onboard measurements as well as voluntary class notations such as the ABS Habitability Notations.

Whole-body Free Vibration Analysis

The objective of whole-body free vibration analysis is to avoid resonance of the global offshore structure. Using a global Finite Element model, engineers model and resolve issues that impact the structure.

Whole-body Forced Vibration Analysis

Whole-body forced vibration analysis calculates the responses of the structure resulting from main engine, propeller and/or thruster vibration. The forced vibration responses near accommodation areas, the vicinity of excitation areas and the areas of specific concern can be investigated in detail. Analysis results can be evaluated against acceptance criteria in ABS HAB notations, and internationally recognized codes, such as, ISO 2631-2 (2003) and ISO 20283-5 (2016). If the predicted results exceed allowable vibration limit, ABS can propose mitigation options for reducing vibration levels.

Fast Local Vibration Analysis

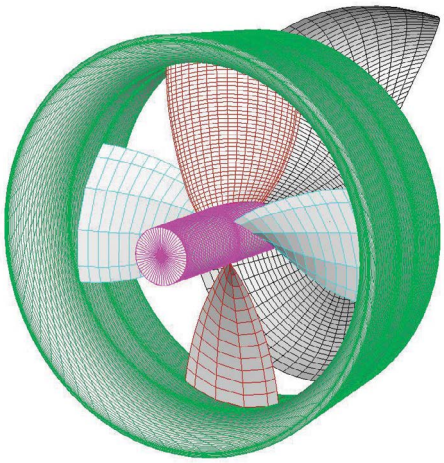
This analysis checks the natural frequencies of three kinds of panels (plate panels, stiffener panels and girder panels) in the area of interest, such as accommodation areas and the vicinity of excitation sources. The calculated natural frequencies of these panels are evaluated to avoid coinciding with primary excitation frequencies.

Extended Local Vibration Analysis

At this level, the local vibration analysis is more comprehensive than the simplified method, encompassing the detailed examination of substructures such as decks, machinery, platforms, or the superstructure with adequate mass and flexibility.

Vibration Measurement for Habitability

The ABS vibration team offers two measurement services for habitability and machinery. Habitability measurements help verify if the vibration level is acceptable to crew habitability criteria according to different standards, such as ABS HAB(OS) or HAB(MODU) or ISO 20283-5 (2016). Machinery vibration measurements gauge and evaluate the external mechanical vibration behavior of generating sets at the measuring points according to ABS Ship Vibration Guidance Notes or ISO 8528-9.



ABS noise and vibration analysis, mitigation and measurement services are based on a **three-stage approach** to support the design improvement process.

STEP 1	• Collect required design information • Identify the possible worst scenario for analysis • Define baseline parameters • Obtain client agreement on the scenario and design parameters
STEP 2	• Define suitable technical approach with the client • Develop numerical model in accordance with the agreed approach • Perform numerical analysis • Review and evaluate the analysis results
STEP 3	• Provide options for mitigation plan(s) with clients if required • Reevaluate the mitigation plan and improve the design • Perform full-scale measurement during sea trial to validate the numerical analysis and design improvement

For additional information on **Noise and Vibration Control** services, please contact us at GlobalOffshore@eagle.org.

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