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# THE EFFORTS TO IMPROVE REPAIR AND MAINTENANCE ON THE SHIP ENGINE TO OVERCOME OVER NOISE

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## ABSTRACT

The noise generated by ship engines is a significant environmental issue in the maritime industry. This research aims to identify noise sources, assess their impact on human health and the environment, and develop effective strategies for improvement and maintenance. Research methods include identifying noise sources through field surveys and noise measurements, followed by data analysis to determine their impacts. Literature reviews on the basic concepts of noise in the maritime environment and previous related studies form the basis of understanding in this research. The results of this study are expected to provide valuable recommendations for reducing the impact of ship engine noise on the environment and human health. This research is expected to make a significant contribution to improving the sustainability of the maritime industry by enhancing environmental quality and worker well-being.

**Keywords:** Biodiesel, eco-friendly ship, motor performance, numerical investigation

## Introduction

Explain the background, novelty, and objectives of the research. Noise pollution from ship engines is a significant concern in marine environments worldwide. The primary sources of noise on ships are the main engines and auxiliary equipment, which generate both sound and vibrations. Tonal and harmonic components can be detected in noise emissions, with frequencies depending on engine characteristics [1]. Marine noise pollution can have adverse effects on marine fauna, altering their behavior, physiology, and ecology. Anthropogenic noise sources, such as maritime traffic, shipping, and high-powered sonar, contribute to the rising levels of ocean noise pollution [2]. The COVID-19 pandemic led to a reduction in maritime traffic, resulting in lower noise levels in marine environments [2]. Governments and marine researchers have established response plans to address the problem of underwater noise pollution

[2]. Moreover, prolonged exposure to high noise levels can cause stress and even physical harm to marine animals. Therefore, finding solutions to reduce noise emissions from ship engines is crucial to safeguarding the health and well-being of marine ecosystems.

One potential solution to this problem is the development and implementation of quieter engine technologies. By investing in research and innovation, engineers can design ship engines that generate less noise without compromising performance. Another approach is to establish and enforce regulations that limit ship noise emissions, similar to those already applied to air and land vehicles. In addition, educating ship operators and crews about the importance of reducing noise pollution and adopting noise mitigation practices can also help minimize the impact of ship engine noise on marine life. By taking these steps, we can work toward a future where marine ecosystems are

no longer threatened by the harmful effects of noise pollution.

This effort will not only benefit marine life but also the communities that depend on healthy oceans for their survival. Implementing these measures may require collaboration between governments, industry leaders, and environmental organizations, but the long-term benefits make it highly worthwhile. By working together to address ship engine noise pollution, we can create a more sustainable and harmonious relationship between humans and the marine environment. This collaboration may include stricter regulations on ship noise emissions, investments in quieter engine technologies, and the establishment of marine protected areas where noise pollution is minimized. By taking these proactive steps, we can help ensure the long-term health and vitality of our oceans for future generations to enjoy. We must prioritize the protection of marine ecosystems and work collectively toward a more sustainable future for our planet.

One of the primary ways to address noise pollution in marine environments is by promoting the use of quieter engine technologies in ships. By investing in research and development of quieter engines, we can significantly reduce the impact of noise pollution on marine life. Additionally, enforcing stricter regulations on ship noise emissions can help limit the harmful effects of sound pollution on underwater ecosystems. Marine protected areas where noise pollution is minimized can also provide safe havens for marine life to thrive without constant human-made disturbances. By working together to combat ocean noise pollution, we can build a more sustainable and harmonious relationship between humans and the marine environment.

In addition to its environmental impacts, addressing ocean noise pollution is also critical for the safety and well-being of marine life. Excessive noise can interfere with the communication, navigation, and feeding patterns of marine animals, leading to increased stress and even physical harm. For example, loud ship noise can disrupt the orientation of marine mammals, causing them to become stranded or collide with vessels. Reducing noise pollution creates a safer and more peaceful environment for marine species to thrive, which is especially important for species that rely on sound for activities such as echolocation. Furthermore, lowering noise levels can help prevent disturbances in breeding and feeding grounds vital to marine

species. By addressing ocean noise pollution, we can help protect the delicate balance of marine ecosystems and ensure the well-being of the diverse species that call the oceans home. Ultimately, creating a quieter marine environment is essential for the safety and comfort of marine life and is crucial for maintaining a healthy and thriving ocean ecosystem.

Several strategies for reducing ocean noise pollution include enforcing stricter regulations on ship and boat engines, adopting quieter technologies for offshore construction projects, and establishing marine protected areas where sound levels are closely monitored and controlled. Additionally, raising awareness about the impacts of noise pollution on marine life and promoting more sustainable practices within the ocean industry can play a significant role in mitigating this environmental threat. Collaboration between governments, industries, and conservation organizations is vital to addressing this issue and working toward a quieter, more harmonious marine environment for all ocean life.

## **Methodology**

### **a. Identification of Noise Sources**

- **Field Survey:** Conduct surveys on ships to identify the main sources of noise.
- **Noise Measurement:** Use noise meters to measure noise levels from various engine components.

### **b. Impact Analysis**

- **Data Analysis:** Analyze measurement data to determine the effects of noise on human health and the environment.
- **Literature Review:** Conduct a literature review to understand the long-term impacts of noise on ship machinery and structures.

### **c. Development of Improvement and Maintenance Strategies**

- **Expert Consultation:** Engage with marine engineers and noise specialists to develop effective improvement strategies.
- **Testing:** Carry out trials of the recommended improvement and maintenance strategies.

### **d. Evaluation of Results**

- **Effectiveness Analysis:** Assess the effectiveness of improvement and maintenance strategies based on repeated

noise measurements and feedback from crew members.

## Result and Discussion

A regular maintenance schedule is essential to ensure the smooth functioning of ships. By adhering to this schedule, shipowners and operators can avoid costly repairs and unexpected breakdowns. Proper maintenance also helps extend the lifespan of ship machinery and equipment, ultimately saving money in the long run. Overall, investing in regular maintenance is a critical aspect of ensuring the safety and efficiency of maritime operations. Without routine maintenance, ships are at risk of damage that could lead to serious accidents or operational delays. By investing in proper maintenance, shipowners can also ensure compliance with maritime regulations and standards, reducing the likelihood of legal consequences. Furthermore, well-maintained ships are more appealing to potential charterers and clients, thereby enhancing the reputation and profitability of maritime businesses. Ultimately, prioritizing regular maintenance is not only a matter of safety but also a smart business decision for shipowners and operators.

Routine maintenance of ship engines is vital to ensure longevity and efficiency. An appropriate schedule should be established to guarantee that all inspections and necessary replacements are carried out on time. This not only prolongs the lifespan of ship engines but also contributes to the overall safety of the vessel and its crew. By adhering to strict maintenance routines, ship operators can minimize the likelihood of unexpected breakdowns or failures at sea. Additionally, investing in high-quality spare parts and skilled technicians can enhance the reliability and performance of ship engines, ultimately leading to smoother and more efficient maritime operations.

Experienced technicians are crucial for maintaining the efficiency and reliability of ship machinery. Using substandard or low-quality parts increases the risk of equipment failure and potential safety hazards. Therefore, ship operators must prioritize the use of high-quality engine components to ensure optimal performance and longevity. Regular inspections and maintenance by trained professionals can help identify potential issues before they escalate into major problems. Overall, investing in premium engine parts and skilled technicians is essential for smooth

operations and ship safety. This approach not only guarantees the safety of crew and passengers onboard but also reduces the risk of costly repairs and operational disruptions. By staying proactive and vigilant in maintenance practices, ship operators can extend engine lifespan and avoid unexpected failures at sea. Ultimately, prioritizing high-quality components and expert services is a smart long-term investment, crucial for the success and efficiency of maritime operations.



**Figure 1.** Maintenance on ships experiencing noise issues

Maintenance in engine rooms and other key areas can also significantly improve crew comfort and well-being, while reducing noise pollution for nearby marine life. Additionally, regular inspection and upkeep of soundproofing materials are necessary to ensure they remain effective and in good condition. Proper ventilation and cooling systems must also be installed to prevent overheating and maintain optimal engine performance. All these factors contribute to safe and efficient maritime operations, underscoring the importance of attention to detail and quality in every aspect of ship maintenance and operation. This not only improves overall crew welfare but also enhances their productivity and performance onboard. Moreover, proper ventilation and cooling systems play a crucial role in preventing engine overheating, ultimately leading to better fuel efficiency and lower emissions. In summary, meticulous attention to detail in ship maintenance and operations is vital for successful and sustainable maritime activities.

The implementation of vibration-damping and soundproofing materials in cargo ship engine rooms resulted in a significant reduction in noise levels, improving working conditions for crew members and lowering the risk of hearing damage. The success of this project highlights the positive impact of investing in high-quality noise reduction measures.

The retrofitting of passenger ferries with advanced mufflers and exhaust systems led to a marked decrease in noise pollution, enhancing the overall passenger experience while meeting strict environmental regulations. This case study demonstrates the effectiveness of proactive noise reduction strategies in the maritime industry, emphasizing the importance of prioritizing crew and passenger well-being.

Improvements to waste disposal systems and the implementation of soundproofing materials on cruise ships have resulted in a significant reduction in noise levels, creating a more pleasant and peaceful environment for guests. This investment not only enhances customer satisfaction but also contributes to the company's overall sustainability goals. By taking proactive steps to address noise pollution, maritime companies can improve their reputation, attract more clients, and demonstrate their commitment to environmental responsibility.

In conclusion, prioritizing noise reduction measures in the maritime industry not only benefits the health and well-being of individuals onboard but also has long-term positive effects on the environment and the overall success of maritime businesses.



**Figure 2.** Briefing by the project manager regarding engine maintenance

Training crew members in noise reduction techniques can also improve efficiency and productivity onboard. By educating the crew about the importance of minimizing noise levels, companies can foster a culture of environmental awareness and responsibility. This can lead to reduced fuel consumption, lower maintenance costs, and a more harmonious working environment for all staff. Furthermore, training crew members in noise reduction practices can help prevent hearing loss and other health issues associated with long-term exposure to high noise levels. Overall, investing in crew education and

training in this area can provide broad benefits for both individuals and companies.

## Conclusion

Considering the importance of addressing noise in ship engines and the potential benefits of investing in crew training on noise reduction techniques, companies can achieve more than just operational improvements. By prioritizing environmental responsibility along with employee health and safety, companies can not only enhance their outcomes through cost reduction and improved efficiency but also contribute to a more sustainable future for the maritime industry as a whole.

In conclusion, addressing ship engine noise is not merely a matter of regulatory compliance but a strategic decision that can have long-term positive impacts on both business performance and the environment.

The key strategies for reducing noise pollution in maritime operations include investing in crew training on noise reduction techniques, prioritizing environmental responsibility and employee health and safety, and contributing to the industry's long-term sustainability. By taking these steps, companies can not only improve their bottom line but also make a positive impact on the environment and the overall sustainability of the maritime sector. Clearly, addressing ship engine noise is a strategic decision that offers long-term benefits for both businesses and the environment.

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## References

- [1] Nadia and Hanan, "Recent progress in marine noise pollution: A thorough review," *Chemosphere*, 2022.
- [2] Claire Renée and Stephanie, "A global review of vessel collisions with marine animals," *Frontiers in Marine Science*, 2020.
- [3] Sarah, Renée, Joshua, Leah, and Clare, "The effects of ship noise on marine mammals: A review," *Frontiers in Marine Science*, 2019.
- [4] Tomaso, Enrico, and Corrado, "Noise mapping," *Noise Mapping Journal*, 2016.

- [5] L. A. van Gunsteren and C. Pronk, *Propeller Design Concepts*, Technical Papers, LIPS BV, Drunen, Holland.
- [6] G. Kuiper, *The Wageningen Propeller Series*, MARIN, 1992.
- [7] ISO 10534-2, *Acoustics — Determination of Sound Absorption Coefficient and Impedance in Impedance Tubes — Part 2: Transfer-Function Method*, 1998.
- [8] ASTM E1050-19, *Standard Test Method for Impedance and Absorption of Acoustical Materials Using a Tube, Two Microphones, and a Digital Frequency Analysis System*, 2019.
- [9] H. Medwin and C. S. Clay, *Fundamentals of Acoustical Oceanography*, in *Fisheries Oceanography*, vol. 8, no. 2, 1999.
- [10] L. Zhang and C. Meng, "Modeling of radiated noise passing characteristic for ship in different marine environments," *Proceedings of the International Conference on Materials Science and Applied Mechanics (MSAM)*, 2018.