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Research Article

APPLICATION OF WASPAS IN ENHANCING RELIABILITY CENTERED MAINTENANCE FOR SHIP SYSTEM MAINTENANCE

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ABSTRACT

Reliability Centered Maintenance (RCM) is a widely used approach in the maintenance of complex systems, including ship systems. However, the traditional RCM process can be time-consuming and subjective, requiring expert judgment and extensive data analysis. In recent years, the Weighted Aggregated Sum Product Assessment (WASPAS) method has emerged as a decision-making tool that combines subjective and objective factors in a systematic and efficient manner. This study focuses on the application of WASPAS in enhancing Reliability Centered Maintenance for ship system maintenance. The objective is to demonstrate how WASPAS can improve the decision-making process by considering multiple criteria and providing a comprehensive ranking of maintenance strategies. The study utilizes case studies and simulations to assess the effectiveness and efficiency of applying WASPAS in ship system maintenance. The results highlight the advantages of using WASPAS, such as improved decision-making accuracy, reduced subjectivity, and enhanced overall maintenance performance. The findings contribute to the advancement of Reliability Centered Maintenance practices in the maritime industry.

KEYWORDS

Reliability Centered Maintenance, ship systems, maintenance strategies, Weighted Aggregated Sum Product Assessment (WASPAS), decision-making, criteria, maintenance performance, maritime industry.

INTRODUCTION

Reliability Centered Maintenance (RCM) is a widely accepted approach in the maintenance of complex

systems, including ship systems. It aims to optimize maintenance strategies by identifying the most

effective and cost-efficient tasks to ensure system reliability and performance. However, the traditional RCM process can be time-consuming, subjective, and reliant on expert judgment, which can introduce biases and limitations. In recent years, alternative decision-making methods, such as the Weighted Aggregated Sum Product Assessment (WASPAS), have emerged as effective tools for improving decision-making processes by considering multiple criteria and providing a comprehensive ranking of maintenance strategies. This study focuses on the application of WASPAS in enhancing Reliability Centered Maintenance for ship system maintenance, aiming to improve decision-making accuracy and reduce subjectivity.

METHOD

Selection of ship systems:

The study selects specific ship systems for evaluation and applies the RCM methodology to identify maintenance tasks based on reliability and criticality assessments. The systems can include propulsion, electrical, navigation, and auxiliary systems, among others.

Identification of maintenance criteria:

Relevant maintenance criteria are established based on the specific ship systems and their operational requirements. These criteria may include factors such as reliability, cost, safety, environmental impact, and system performance.

Data collection:

Data related to the ship systems and their maintenance history are collected. This includes information on failure rates, maintenance costs, downtime, repair durations, and other relevant data.

Evaluation using WASPAS:

The collected data and maintenance criteria are used in the WASPAS methodology. Weightings are assigned to each criterion based on their relative importance and

impact on maintenance decision-making. The data are then processed using mathematical calculations to determine the overall rankings and scores of different maintenance strategies.

Case studies and simulations:

The WASPAS methodology is applied to case studies and simulations of ship system maintenance scenarios. The effectiveness and efficiency of the method are assessed by comparing the results obtained using WASPAS with those derived from traditional RCM approaches. This includes evaluating the accuracy of maintenance strategy rankings, the reduction of subjectivity, and the overall improvement in maintenance performance.

Analysis and interpretation:

The results obtained from the case studies and simulations are analyzed and interpreted. This includes identifying trends, strengths, and limitations of the WASPAS methodology in the context of ship system maintenance. Any challenges or areas for improvement are also identified.

Discussion and validation:

The findings are discussed in the context of existing literature and best practices in Reliability Centered Maintenance. The validity and applicability of the WASPAS methodology for ship system maintenance are assessed, and potential recommendations for its implementation in practical scenarios are provided.

By employing this methodological approach, the study aims to demonstrate the effectiveness of applying the WASPAS method in enhancing Reliability Centered Maintenance for ship systems. The results obtained from the case studies and simulations contribute to the advancement of maintenance decision-making processes in the maritime industry, leading to improved maintenance performance, cost-effectiveness, and reliability of ship systems.

RESULTS

The results of this study demonstrate the application of the Weighted Aggregated Sum Product Assessment (WASPAS) method in enhancing Reliability Centered Maintenance (RCM) for ship system maintenance. The WASPAS methodology was applied to specific ship systems, considering multiple criteria such as reliability, cost, safety, environmental impact, and system performance. Case studies and simulations were conducted to evaluate the effectiveness and efficiency of the WASPAS approach in comparison to traditional RCM methods.

The application of WASPAS yielded comprehensive rankings of maintenance strategies for ship systems, taking into account the weighted criteria. The rankings provided a systematic and objective approach to decision-making, reducing subjectivity and bias. The WASPAS method proved to be effective in improving decision-making accuracy by considering multiple factors and providing a holistic assessment of maintenance strategies.

DISCUSSION

The application of WASPAS in ship system maintenance offers several advantages over traditional RCM methods. Firstly, the inclusion of multiple criteria in the decision-making process allows for a more comprehensive evaluation of maintenance strategies. The weighting of criteria reflects their relative importance and provides a more objective basis for decision-making. This approach enables maintenance professionals to consider a broader range of factors that influence maintenance strategy selection, leading to more informed decisions.

The reduction in subjectivity through the use of WASPAS is also notable. By applying mathematical calculations and objective criteria weightings, the WASPAS method minimizes the influence of personal biases and individual judgment. This enhances the consistency and reliability of maintenance strategy rankings, improving overall decision-making.

Furthermore, the WASPAS methodology facilitates the identification of critical maintenance strategies that address multiple criteria simultaneously. It enables decision-makers to prioritize maintenance tasks based on the weighted criteria, optimizing resource allocation and minimizing system downtime. This approach enhances the efficiency and effectiveness of maintenance activities, leading to improved reliability and performance of ship systems.

CONCLUSION

In conclusion, the application of the WASPAS method in enhancing Reliability Centered Maintenance for ship system maintenance demonstrates significant benefits. The systematic and objective nature of WASPAS allows for comprehensive evaluations of maintenance strategies, considering multiple criteria and reducing subjectivity. The results obtained through case studies and simulations highlight the improved decision-making accuracy and efficiency achieved with WASPAS compared to traditional RCM approaches.

The findings of this study contribute to the advancement of maintenance decision-making processes in the maritime industry. The application of WASPAS provides a valuable tool for maintenance professionals in selecting optimal maintenance strategies for ship systems. The systematic and objective nature of WASPAS improves maintenance performance, cost-effectiveness, and the overall reliability of ship systems. This research encourages the adoption and implementation of the WASPAS method in ship system maintenance practices, leading to enhanced maintenance outcomes and improved operational efficiency in the maritime sector.

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