Evaluation of Road Pavement Performance Using Recycled Asphalt Technology

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Abstract

This study aims to evaluate the performance of road pavements using recycled asphalt technology. With the increasing volume of vehicles and the need for road infrastructure, the application of recycled asphalt is a sustainable solution that can reduce the cost and environmental impact of new asphalt production. The method used is Systematic Literature Review (SLR), which allows for in-depth analysis of various related studies. The results show that recycled asphalt not only improves the durability of road pavements, but also results in significant construction cost savings. Despite the challenges in terms of quality and potential problems, the technology has proven to be more environmentally friendly with significant carbon emission reductions compared to new asphalt. Thus, this research is expected to provide guidance for civil engineering practitioners in designing and implementing more efficient and sustainable road pavement projects. These findings underscore the importance of applying recycled asphalt technology in an effort to create more sustainable infrastructure in the future.

Keywords: *Recycled Asphalt, Road Pavement, Performance*

Introduction

The rapid growth of the transportation sector in Indonesia in recent years has led to an increasing need for adequate road infrastructure. Good and safe roads are essential to support community mobility and the economy. However, with the number of vehicles continuing to increase, many roads are deteriorating faster than expected, leading to significant maintenance and repair costs for the government and the community. In this context, recycled asphalt technology is emerging as a promising solution, offering a more sustainable alternative to the construction of new roads and the improvement of existing roads. (Biomantara, K., & Herdiansyah, H. 2019).

Recycled asphalt refers to the process of reusing asphalt from roads that are no longer used and processing it for use in new projects. This process not only helps to reduce the volume of waste generated from dismantled road infrastructure, but also reduces the need for new raw materials. With more and more research showing the potential for cost savings and energy efficiency, the use

of recycled asphalt is becoming increasingly relevant. However, its application in road pavement projects still faces challenges related to the quality and performance of recycled asphalt (Yanuar, A. 2020). In addition to economic factors, environmental aspects are also a major concern in the use of recycled asphalt. In an era where awareness of climate change is on the rise, reducing the carbon footprint of the construction process is a top priority. Many studies show that the use of recycled asphalt can contribute to the reduction of greenhouse gas emissions, making it a more environmentally friendly option than new asphalt. However, it is important to conduct a thorough evaluation of the environmental impact and long-term performance of the use of recycled asphalt under various geographical and climatic conditions.

On the other hand, the quality and performance of recycled asphalt can also vary depending on the source and treatment method. Some studies show that asphalt produced from sources that are of high quality tend to show better performance, while those taken from sources of low quality can face problems such as cracking and deformation. Therefore, it is necessary to conduct a comprehensive analysis to understand the various factors that affect the performance of recycled asphalt. This study aims to explore and evaluate the performance of road pavements using recycled asphalt technology, as well as provide recommendations for best practices in the field (Asmawan, D. 2021).

With this background, this research is expected to contribute to the development of science in the field of civil engineering and provide guidance for practitioners in designing and implementing more sustainable road pavement projects. Through a systematic and analytical approach, this study aims to answer relevant questions regarding the effectiveness of the use of recycled asphalt in various contexts and conditions.

Methodology

This study uses the Systematic Literature Review (SLR) approach to evaluate the performance of road pavements using recycled asphalt. The SLR method was chosen because of its ability to collect, analyze, and synthesize various previous studies in a systematic and structured manner. The process begins with the identification of relevant literature sources through searches in various databases, including scientific journals, technical reports, and dissertations related to the use of recycled asphalt in road construction. Inclusion and exclusion criteria are established to ensure that the selected studies provide relevant and quality information.

After identifying and selecting studies that meet the criteria, the data obtained is analyzed to extract important information related to the performance, advantages, and weaknesses of recycled asphalt. This method of analysis allows researchers to identify patterns, trends, and gaps in existing research, as well as provide a comprehensive overview of the effectiveness of recycled asphalt in the context of road pavement. The results of this analysis will be the basis for providing clear recommendations for developers and practitioners in the field of civil engineering in implementing this technology effectively.

Results and Discussion

The results of this study show that recycled asphalt can provide satisfactory performance in various road pavement applications. From the analysis carried out, it was found that roads that use recycled asphalt show good resistance to high traffic loads. For example, some studies have shown that road pavements made from recycled asphalt can resist deformation better compared to traditional pavements, thereby reducing the frequency of repairs and maintenance required. This is very important, considering that road maintenance costs can be a significant burden for the government and the community.

However, this study also noted that the quality of recycled asphalt is greatly influenced by the processing process and the source of the material. Several studies have shown that recycled asphalt produced from high-quality roads tends to provide better performance than those taken from less than optimal sources. Therefore, it is important for practitioners to ensure that the recycled asphalt sources used meet certain quality standards before being implemented in road pavement projects. This shows the need for stricter regulations regarding the source and process of asphalt recycling.

In the context of the environment, the use of recycled asphalt shows great potential to reduce negative impacts on the environment. Several studies show that the asphalt recycling process can reduce carbon emissions by up to 30% compared to the production of new asphalt. This reduction mainly comes from the energy savings obtained during the production process. However, further studies are still needed to thoroughly evaluate the environmental impact of the use of recycled asphalt in various geographical and climatic conditions, so that better technical guidance can be produced for implementation in the field.

Another aspect to consider is the long-term performance of roads built with recycled asphalt. Some studies have noted that the roads experience problems such as cracking and deformation, especially in extreme weather conditions. This indicates that while recycled asphalt has many advantages, it is important to conduct regular testing and monitoring of road performance to ensure that they meet safety and performance standards. This study recommends the development of clear technical guidelines and standards for the use of recycled asphalt in road construction, so that its quality and performance can be maintained.

Finally, the study concluded that despite the challenges, the use of recycled asphalt technology has great potential to improve road pavement performance. Collaboration between academics, practitioners, and policymakers is needed to optimize the use of this technology. Recommendations for further research include exploration of new technologies in the recycling process as well as the development of additional materials that can improve the quality of recycled asphalt.

Conclusion

Overall, this study shows that the use of recycled asphalt in road pavement can be a sustainable and economical alternative. Despite the challenges in its implementation, the benefits offered, such as cost savings, reduced environmental impact, and good performance, make the technology feasible for wider adoption in civil engineering practice. It is hoped that the results of this research can encourage more effective implementation of recycled asphalt technology, as well as become the basis for further research in this field.

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