



INTISARI

Limbah popok bayi sekali pakai merupakan residu sulit terurai yang terus meningkat seiring pertumbuhan penduduk, sementara kebutuhan akan material perkerasan seperti paving block juga semakin tinggi. Berangkat dari permasalahan tersebut, penelitian ini diformulasikan untuk mengevaluasi kinerja teknis serta kelayakan biaya paving block dengan substitusi agregat halus menggunakan abu hasil pembakaran limbah popok bayi dari TPS3R Resikplus Yogyakarta. Variasi substitusi yang digunakan yaitu 0%, 2%, 4%, 6%, 8%, dan 10% dari berat pasir, dengan rasio semen:agregat halus 1:5 dan nilai Faktor Air Semen (FAS) 0,5. Penelitian ini bertujuan menilai pengaruh substitusi terhadap kuat tekan, ketahanan aus, daya serap air, korelasi antara usia perawatan dengan kuat tekan, serta hubungan antara kadar abu dan kinerja teknis, disertai analisis biaya produksi.

Metode penelitian dilakukan melalui pendekatan eksperimental di laboratorium. Tahapan meliputi pengadaan dan pengujian karakteristik material, perencanaan campuran, pembuatan dan perawatan benda uji menggunakan curing kain basah, serta pengujian kuat tekan pada umur 7, 14, dan 28 hari, sedangkan ketahanan aus dan daya serap air diuji pada umur 28 hari. Analisis statistik menggunakan uji outlier Dixon untuk validasi data kuat tekan dan korelasi Spearman untuk menilai hubungan antarvariabel teknis. Selain itu, dilakukan perhitungan biaya produksi per meter persegi untuk membandingkan kelayakan ekonominya dengan paving block konvensional.

Hasil penelitian menunjukkan bahwa peningkatan kadar abu cenderung menurunkan kinerja teknis paving block. Kuat tekan tertinggi terdapat pada variasi 0% sebesar 31,95 MPa, sedangkan substitusi terbaik dalam campuran abu adalah 2% dengan kuat tekan 24,39 MPa. Korelasi menunjukkan hubungan negatif signifikan antara kadar abu dan kuat tekan, serta hubungan positif terhadap daya serap air. Biaya produksi paving block dengan substitusi 2% mencapai Rp 60.380/m², lebih tinggi 7% dibandingkan paving konvensional. Dengan demikian, substitusi abu popok hingga 2% dinilai layak secara teknis dan ekonomis untuk aplikasi Mutu D, sekaligus mendukung upaya pengurangan limbah popok di TPA.

Kata kunci: Limbah Popok Bayi, Paving Block, Kinerja Teknis, Analisis Biaya, Substitusi Agregat Halus



ABSTRACT

Disposable baby diapers are a type of non-biodegradable waste that continues to increase along with population growth, while the demand for paving materials such as paving blocks is also increasing. Based on these issues, this study was formulated to evaluate the technical performance and cost feasibility of paving blocks with fine aggregate substitution using ash from the incineration of baby diapers from TPS3R Resikplus Yogyakarta. The substitution variations used were 0%, 2%, 4%, 6%, 8%, and 10% of the sand weight, with a cement:fine aggregate ratio of 1:5 and a Cement Water Ratio (CWR) of 0.5. This study aims to assess the effect of substitution on compressive strength, abrasion resistance, water absorption, the correlation between curing age and compressive strength, and the relationship between ash content and technical performance, accompanied by a production cost analysis.

The research method was conducted through an experimental approach in the laboratory. The stages included procurement and testing of material characteristics, mixture planning, manufacture and maintenance of test specimens using wet curing cloth, and compressive strength testing at 7, 14, and 28 days, while abrasion resistance and water absorption were tested at 28 days. Statistical analysis used the Dixon outlier test to validate the compressive strength data and Spearman's correlation to assess the relationship between technical variables. In addition, the production cost per square meter was calculated to compare its economic feasibility with conventional paving blocks.

The results of the study indicate that an increase in ash content tends to reduce the technical performance of paving blocks. The highest compressive strength was found in the 0% variation at 31.95 MPa, while the best substitution in the ash mixture was 2% with a compressive strength of 24.39 MPa. The correlation shows a significant negative relationship between ash content and compressive strength, as well as a positive relationship with water absorption. The production cost of paving blocks with 2% substitution reached Rp 60,380/m², which is 7% higher than conventional paving. Thus, diaper ash substitution of up to 2% is considered technically and economically feasible for Quality D applications, while also supporting efforts to reduce diaper waste in landfills.

Keywords: Baby Diaper Waste, Paving Blocks, Technical Performance, Cost Analysis, Fine Aggregate Substitution.