Studi Eksperimen Karakteristik Dinamik Balok Beton dengan Agregat Cangkang Kelapa Sawit di Bawah Pembebanan Semi-Siklik = Experimental Study On Concrete Beam Dynamic Characteristic With Oil Palm Shell Aggregate Under Semi-Cyclic Loading

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Abstrak

Dengan sekitar 48,42 juta ton produksi kelapa sawit pada tahun 2019, Indonesia menjadi produsen terbesar kelapa sawit terbesar di dunia. Dengan demikian, pemanfaatan cangkang kelapa sawit sebagai pengganti agregat kasar tentu dapat mengurangi limbah yang dihasilkan industri kelapa sawit. Pada penelitian ini, penulis mengamati nilai lendutan, regangan, rasio redaman dan frekuensi alami dari balok beton bertulang dengan agregat kasar cangkang kelapa sawit (Oil Palm Shell/OPS) berukuran 15 x 25 x 300 cm³ (dengan jarak 2,7 meter dari tumpuan ke tumpuan). Balok OPS akan diuji dengan metode destruktif, dengan konfigurasi four-point loading, dan protokol pembebanan semi-siklik. Pada tahap eksperimennya, penelitian ini dibantu dengan sistem Digital Image Correlation (DIC), yang dapat mengamati lendutan dan regangan melalui analisis subset foto permukaan sampel. Adapun data pengukuran percepatan balok dengan accelerometer dapat digunakan untuk diolah penulis menjadi rasio redaman dan frekuensi alami yang merupakan karakteristik dinamik balok OPS. Disimpulkan hasil pengamatan karakteristik dinamik sampel menunjukan terjadinya downtrend pada nilai frekuensi alami dan rasio redaman balok setiap selesainya siklus pembebanan, dengan penurunan signifikan hanya terjadi pada nilai rasio redaman balok. Selain itu DIC disimpulkan cukup akurat untuk mengamati lendutan balok.
..... With around 48.42 million tonnes of palm oil production in 2019, Indonesia is the world's largest producer of palm oil. Therefore, the use of oil palm shells as a substitute for coarse aggregate can certainly reduce the waste generated by the palm oil industry. This research will observe the deflection, strain, and natural frequency of a reinforced concrete beam with oil palm shell (OPS) coarse aggregate, measuring 15 x 25 x 300 cm³. The OPS beam will be tested using a destructive method, with a four-point loading configuration, and a semi-cyclic loading protocol. This research was assisted by the Digital Image Correlation (DIC) system, which can observe the deflection and strain through analysis of a subset of sample surface photos both non-destructive and contactless. The measurement of the acceleration of the beam with an accelerometer is carried out to be processed into damping ratio and natural frequency which is the dynamic characteristic of the OPS beam. It was concluded a downtrend happened both on the natural frequency and damping ratio value of the beam after the loading test. The downtrend was more significant on damping ratio rather than on the natural frequency. In addition, DIC was concluded to be quite accurate for observing beam deflection.