PENGARUH VARIASI SERAT MIKRO DAN PENAMBAHAN PASIR SILIKA TERHADAP KINERJA *ENGINEERED CEMENTITIOUS COMPOSITES* (ECC)

Adelfa Nanda Pratama Araazaq, Muhammad Rizky Fadillah

Jurusan Teknik Sipil, Politeknik Negeri Sriwijaya

ABSTRAK

Engineered Cementitious Composites (ECC) merupakan material komposit berbasis semen yang memiliki daktilitas tinggi serta kemampuan mengendalikan retak melalui mekanisme multiple *microcracking*. Penelitian ini bertujuan untuk menganalisis pengaruh penambahan serat mikro *Polyamide* 6.6 terhadap *workability*, kuat tekan, dan pola keruntuhan beton ECC. Variasi kadar serat yang digunakan adalah 0%, 0,5%, 0,75%, dan 1% dari volume campuran dengan umur pengujian 7, 14 dan 28 hari. Metode penelitian yang digunakan adalah eksperimen laboratorium melalui pengujian *slump flow*, kuat tekan, dan pengamatan pola keruntuhan pada benda uji silinder. Hasil penelitian menunjukkan bahwa penambahan serat mikro mempengaruhi kinerja beton ECC. Kuat tekan optimum pada umur 28 hari diperoleh pada variasi serat 0,5% sebesar 37,48 MPa, meningkat 8,61% dibandingkan beton ECC normal sebesar 34,50 MPa. Sementara itu, peningkatan kadar serat menjadi 0,75% dan 1% menyebabkan kuat tekan menurun menjadi 34,17 MPa dan 31,62 MPa. Pengamatan pola keruntuhan menunjukkan bahwa seluruh benda uji mengalami *columnar failure* dan *cone and split failure*. Namun, beton ECC berserat menghasilkan retak-retak mikro yang lebih kecil dan tersebar akibat mekanisme *fiber bridging* yang mampu menghambat propagasi retak, sedangkan beton ECC normal menunjukkan keruntuhan yang lebih getas dengan retak makro yang berkembang secara dominan. Hasil penelitian menunjukkan bahwa penambahan serat mikro *Polyamide* 6.6 pada kadar optimum dapat meningkatkan kuat tekan, daktilitas, dan kemampuan pengendalian retak beton ECC.

Kata Kunci: *Engineered Cementitious Composites* (ECC), serat mikro, sifat mekanik, pola keruntuhan.

THE EFFECT OF MICROFIBER VARIATIONS AND SILICA SAND ADDITION ON THE PERFORMANCE OF ENGINEERED CEMENTITIOUS COMPOSITES (ECC)

Adelfa Nanda Pratama Araazaq, Muhammad Rizky Fadillah

Department of Civil Engineering, Sriwijaya State Polytechnic

ABSTRACT

Engineered Cementitious Composites (ECC) are cement-based composite materials characterized by high ductility and the ability to control cracking through a multiple microcracking mechanism. This study aims to analyze the effect of Polyamide 6.6 microfibers on the workability, compressive strength, and failure patterns of ECC. The fiber volume fractions used were 0%, 0.5%, 0.75%, and 1% of the total mixture volume, with testing conducted at curing ages of 7, 14 and 28 days. The research employed an experimental laboratory method involving slump flow tests, compressive strength tests, and observations of failure patterns on cylindrical specimens. The results indicate that the addition of microfibers significantly affects the performance of ECC. The optimum compressive strength at 28 days was achieved with a fiber content of 0.5%, reaching 37.48 MPa, which represents an increase of 8.61% compared to normal ECC with a compressive strength of 34.50 MPa. However, increasing the fiber content to 0.75% and 1% resulted in a reduction in compressive strength to 34.17 MPa and 31.62 MPa, respectively. Failure pattern observations showed that all specimens exhibited columnar failure and cone-and-split failure modes. Nevertheless, fiber-reinforced ECC produced smaller and more distributed microcracks due to the fiber-bridging mechanism, which effectively restrained crack propagation. In contrast, normal ECC exhibited more brittle behavior characterized by dominant macrocrack development. The findings demonstrate that the incorporation of Polyamide 6.6 microfibers at an optimum dosage can enhance the compressive strength, ductility, and crack-control capability of ECC.

Keywords: *Engineered Cementitious Composites (ECC), microfibers, mechanical properties, failure patterns.*