ABSTRAK

PENGARUH VARIASI FAKTOR AIR SEMEN (FAS) DAN SERAT *POLYPROPYLENE* TERHADAP SIFAT FISIK DAN SIFAT MEKANIK *SELF COMPACTING MORTAR* (SCM)

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Perkembangan teknologi material konstruksi menuntut inovasi mortar yang memiliki kemampuan alir tinggi, kekuatan optimal, dan durabilitas baik. *self compacting mortar* merupakan mortar yang mampu mengalir dan memadat secara mandiri tanpa pemadatan eksternal sehingga meningkatkan efisiensi dan kualitas pekerjaan konstruksi. Penelitian ini bertujuan untuk menganalisis pengaruh variasi FAS sebesar 0,30; 0,35; 0,40; dan 0,45 serta penambahan serat *polypropylene* sebesar 0,00%; 0,02%; 0,04%; 0,06%; dan 0,08% terhadap sifat fisik dan mekanik mortar dengan *superplasticizer* sebesar 2% dari berat semen. Pengujian meliputi *workability, density, absorption, voids*, kuat tekan, dan kuat lentur pada umur 28 hari.

Hasil menunjukkan bahwa FAS berperan dominan terhadap *workability*. FAS 0,30 dan 0,35 tidak memenuhi kriteria SCM, sedangkan FAS 0,40 dan 0,45 memenuhi rentang *slump flow* 24–26 cm. Penambahan PPF terbukti efektif menurunkan nilai *absorption* dan *voids*. Penurunan paling signifikan terjadi pada FAS 0,40 dengan kadar PPF 0,08%, nilai *absorption* mengalami penurunan sebesar 81,67%, serta *voids* mengalami penurunan sebesar 81,53% dari mortar tanpa PPF. Nilai *density dry* tertinggi terjadi pada FAS 0,45 dengan kadar PPF 0,06% yaitu sebesar 2,17 gr/cm³, sedangkan nilai *density SSD* tertinggi terjadi pada FAS 0,45 dengan kadar PPF 0% yaitu sebesar 2,28 gr/cm³. Kuat tekan paling optimum terjadi pada FAS 0,4 dengan kadar 0,08% yaitu 46,25 MPa atau meningkat 7,91% dari mortar tanpa PPF, sedangkan kuat lentur paling optimum terjadi pada FAS 0,45 dengan kadar PPF 0,04% yaitu 12,54 MPa atau meningkat 3,85% dari mortar tanpa PPF. Kombinasi terbaik diperoleh pada campuran dengan FAS 0,40 dan PPF 0,08% karena memberikan keseimbangan sifat fisik dan mekanik yang optimal.

Kata kunci: *self compacting mortar*, faktor air semen, serat *polypropylene*, kuat tekan, kuat lentur.

ABSTRACT

THE EFFECT OF WATER CEMENT RATIO AND POLYPROPYLENE FIBER VARIATION ON THE PHYSICAL AND MECHANICAL PROPERTIES OF SELF COMPACTING MORTAR (SCM)

By

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The development of construction material technology requires innovation in mortar with high flowability, optimal strength, and good durability. Self compacting mortar is a type of mortar capable of flowing and consolidating under its own weight without external vibration, thereby improving construction efficiency and quality. This study aims to analyze the effect of water cement ratio variations of 0.30, 0.35, 0.40, and 0.45 and polypropylene fiber additions of 0.00%, 0.02%, 0.04%, 0.06%, and 0.08% on the physical and mechanical properties of mortar with 2% superplasticizer by weight of cement. The tests included workability, density, water absorption, voids, compressive strength, and flexural strength at 28 days.

The results indicate that the water–cement ratio (w/c ratio) plays a dominant role in workability. Mixtures with w/c ratios of 0.30 and 0.35 do not meet the Self-Compacting Mortar (SCM) criteria, while those with w/c ratios of 0.40 and 0.45 satisfy the slump flow range of 24–26 cm. The addition of polypropylene fiber (PPF) has been proven effective in reducing absorption and voids. The most significant reduction occurred at a w/c ratio of 0.40 with 0.08% PPF, where absorption decreased by 81.67% and voids decreased by 81.53% compared to mortar without PPF. The highest dry density was observed at a w/c ratio of 0.45 with 0.06% PPF, reaching 2.17 g/cm³, while the highest saturated surface dry (SSD) density occurred at a w/c ratio of 0.45 without PPF, reaching 2.28 g/cm³. The optimum compressive strength was achieved at a w/c ratio of 0.40 with 0.08% PPF, reaching 46.25 MPa, representing an increase of 7.91% compared to mortar without PPF. Meanwhile, the optimum flexural strength was obtained at a w/c ratio of 0.45 with 0.04% PPF, reaching 12.54 MPa, or an increase of 3.85% compared to mortar without PPF. Overall, the best combination was achieved in the mixture with a w/c ratio of 0.40 and 0.08% PPF, as it provides the most optimal balance of physical and mechanical properties.

Keywords**:** self compacting mortar, water cement ratio, polypropylene fiber, compressive strength, flexural strength.