

PROPORSI OPTIMUM BETON RINGAN (*LIGHTWEIGHT CONCRETE*)  
DENGAN PENAMBAHAN FOAM DAN SERABUT KELAPA  
MENGUNAKAN METODE TAGUCHI

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ABSTRAK

Perkembangan konstruksi saat ini semakin berkembang pesat, namun harga material bangunan juga semakin mahal, sehingga diperlukan material alternatif yang murah dan dapat digunakan sebagai bahan konstruksi. Beton ringan atau *light-weight concrete* merupakan salah satu alternatif material pra-cetak yang dibuat untuk menggantikan beton normal yang memiliki harga yang lebih mahal dibandingkan beton ringan tersebut. Di satu sisi, Indonesia adalah negara tropis dengan berbagai macam tumbuhan, salah satunya adalah pohon kelapa yang tumbuh subur di berbagai daerah. Selain itu di daerah perkotaan saat ini banyak sekali dijumpai pedagang kelapa muda yang menghasilkan limbah berupa serabut kelapa.

Pada penelitian kali ini, penulis membuat beton ringan berserat menggunakan campuran semen portland, air, pasir, *foam*, dan bahan *admixture* berupa serabut kelapa serta penambahan zat kimia berupa *damdex*. Metode yang digunakan adalah metode Taguchi dengan penetapan 4 bahan 4 variasi. *Sand/cement* (s/c): 0.75, 0.80, 0.85, 0.90, *Water/Cement* (w/c): 0.50, 0.60, 0.70, 0.80, *Foam* (%): 25, 35, 45, 55, Serabut kelapa (%): 5, 7.5, 10, 15, *Superplasticizer* (%): 2% dari berat semen. Pengujian yang dilakukan yaitu uji kuat tekan dan uji berat jenis.

Hasil penelitian, berdasarkan nilai kuat tekan yang optimum *mix design* 14 dengan nilai rata-rata kuat tekan 4,72 MPa, dan nilai berat jenis minimum *mix design* 9 dengan nilai rata-rata berat jenis 773,33 kg/m<sup>3</sup>. Setelah menggunakan menggunakan metode Taguchi, kebutuhan bahan proporsi campuran optimum dari hasil pengujian kuat tekan per m<sup>3</sup> sebagai berikut, pasir sebanyak 495 kg/m<sup>3</sup>, air sebanyak 330 liter/m<sup>3</sup>, *foam* sebanyak 550 liter/m<sup>3</sup>, serabut kelapa sebanyak 27,5 kg/m<sup>3</sup>, semen sebanyak 522,5 kg/m<sup>3</sup>, dan penambahan *damdex* sebanyak 10,45 liter/m<sup>3</sup> dan kebutuhan campuran optimum dari hasil pengujian berat jenis per m<sup>3</sup> sebagai berikut, pasir sebanyak 440 kg/m<sup>3</sup>, air sebanyak 275 liter/m<sup>3</sup>, *foam* sebanyak 450 liter/m<sup>3</sup>, serabut kelapa sebanyak 55 kg/m<sup>3</sup>, semen sebanyak 495 kg/m<sup>3</sup>, dan penambahan *damdex* sebanyak 9,9 liter/m<sup>3</sup>.

Kata kunci : Beton ringan, Serabut kelapa, *Foam*, Metode Taguchi, Kuat tekan, Berat jenis.

**PROPORTION OF OPTIMUM LIGHT CONCRETE  
(LIGHTWEIGHT CONCRETE) WITH ADDITION OF FOAM AND  
COCONUT FIBER USING THE TAGUCHI METHOD**

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**ABSTRACT**

The development of construction is currently increasing, but the price of building materials is also increasingly expensive, so alternative cheapest materials are needed to be used as construction materials. Lightweight concrete is one of the precast alternative materials made to replaced normal concrete which has more expensive price than the lightweight concrete. One side, Indonesia is a tropical country with various kinds of plants, which one is coconut trees that flourish in various regions. In addition, in urban areas there are now many young coconut traders who produce waste in the form of coconut fibers.

In this study, the authors made lightweight concrete using a mixture of portland cement, air, sand, foam, and a mixture of coconut fuel and chemicals that containing damdex. The method is used the Taguchi method with the determination of 4 ingredients 4 variations. Sand / cement: 0.75, 0.80, 0.85, 0.90, Water / Cement (b / c): 0.50, 0.60, 0.70, 0.80, Foam (%): 25, 35, 45, 55, Coconut fiber (%): 5, 7.5, 10, 15, Superplasticizer (%): 2% by weight of cement. Tests were compressive strength and density tests.

The results of the study, based on the compressive strength of the optimal mix design 14 with an average value compressive strength is 4.72 Mpa, and the value of the mixed design specific gravity minimum 9 with a weighted average value is 773,33 kg/m<sup>3</sup>. After using using the Taguchi method, the optimal material comparison requirements from the test results of compressive strength per m<sup>3</sup> as follows, sand as much as 495 kg/m<sup>3</sup>, air as much as 330 liter/m<sup>3</sup>, foam as much as 550 liter/m<sup>3</sup>, coconut fibers as much as 27,5 kg/m<sup>3</sup>, cement as much as 522,5 kg/m<sup>3</sup>, and spend damdex as much as 10,45 liter/m<sup>3</sup> and the optimum mixture needs from the results of testing the specific gravity per m<sup>3</sup> as follows, 440 kg/m<sup>3</sup> of sand, 275 liter/m<sup>3</sup> of air, as much foam 450 liter/m<sup>3</sup>, coconut fiber as much as 55 kg/m<sup>3</sup>, cement as much as 495 kg/m<sup>3</sup>, and increasing damdex as much as 9,9 liter/m<sup>3</sup>.

**Keywords:** Lightweight concrete, Coconut fiber, Foam, Taguchi method, Compressive strength, Specific gravity.