ABSTRAK

STUDI LABORATORIUM CANGKANG TELUR SEBAGAI *ACCELERATOR* BERBASIS BIOMATERIAL SEMEN PEMBORAN

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Cangkang telur merupakan limbah organik yang kaya akan kalsium karbonat ($CaCO_3$), dengan kandungan mencapai lebih dari 90%. Selama ini, kebutuhan $CaCO_3$ pada industri semen umumnya dipenuhi dari batu kapur, namun eksploitasi batu kapur memiliki dampak lingkungan yang cukup besar. Oleh karena itu, diperlukan alternatif yang ramah lingkungan dan berkelanjutan. Penelitian ini bertujuan untuk mengevaluasi potensi bubuk cangkang telur sebagai *accelerator* berbasis biomaterial.

Metode yang digunakan dalam penelitian ini adalah uji laboratorium eksperimental. Bubuk cangkang telur dalam variasi konsentrasi 1%, 3%, dan 5% BWOC diuji meliputi densitas, rheology, *free water*, API *filtration loss*, *thickening time*, dan *compressive strength*. Hasil pengujian kemudian dibandingkan dengan slurry tanpa aditif dan slurry dengan $CaCO_3$ konvensional.

Hasil penelitian menunjukkan bahwa penambahan bubuk cangkang telur mampu mempercepat *thickening time* serta menurunkan nilai *free water*, *filtration loss*, dan *compressive strength*. Efek penambahan paling optimal untuk parameter *thickening time* ditemukan pada konsentrasi 3% BWOC. Penambahan 1% sudah menunjukkan percepatan *thickening time*, sementara pada konsentrasi 5% terjadi sedikit penurunan kinerja akibat kelebihan partikel padat. Dengan demikian, limbah cangkang telur terbukti berpotensi sebagai akselerator alternatif yang ramah lingkungan dalam aplikasi semen pemboran

Kata kunci: *accelerator,* cangkang telur, semen pemboran, *thickening time*

ABSTRACT

LABORATORY STUDY OF EGGSHELL AS AN ACCELERATOR FOR OIL WELL CEMENT

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Eggshell is an organic waste rich in calcium carbonate ($CaCO_3$), with a content exceeding 90%. Traditionally, the demand for $CaCO_3$ in the cement industry has been fulfilled using limestone; however, limestone exploitation has significant environmental impacts. Therefore, an environmentally friendly and sustainable alternative is needed. This study aims to evaluate the potential of eggshell powder as a biomaterial-based accelerator.

The research method employed was an experimental laboratory test. Eggshell powder was added at concentrations of 1%, 3%, and 5% BWOC and tested for density, rheology, free water, API filtration loss, thickening time, and compressive strength. The results were compared with slurry without additives and slurry with conventional $CaCO_3$.

The results show that the addition of eggshell powder can accelerate thickening time, reduce free water and filtration loss, and increase compressive strength. The most optimal effect was found at a concentration of 3% BWOC. The 1% concentration already showed significant improvements in physical performance, while at 5%, a slight decline in performance occurred due to excess solid content. Thus, eggshell waste has proven potential as an environmentally friendly alternative accelerator in oil well cement applications.

***Keywords**: accelerator, eggshell, oil well cement, thickening time*