

ABSTRAK

STUDI PENAMBAHAN LIMBAH CAIR TEMPE SEBAGAI INHIBITOR KALSIUM KARBONAT (CaCO₃) MENGGUNAKAN METODE *SEEDED EXPERIMENT*

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Perindustrian dalam bidang minyak bumi berkembang pesat di Indonesia sering mengalami permasalahan seperti pengerasan. Salah satu kerak yang terbentuk pada pipa-pipa industri adalah kalsium karbonat (CaCO₃). Kerak pada pipa-pipa industri akan memperkecil diameter dan menghambat aliran fluida dapat menyebabkan pipa tersebut pecah. Penelitian ini dilakukan dengan pengujian inhibitor limbah cair tempe pada kalsium karbonat (CaCO₃) menggunakan *seeded experiment*. Pada variasi konsentrasi larutan pertumbuhan 0,05; 0,075; dan 0,1 M serta variasi inhibitor 5, 15, 25, 35, dan 45%. Optimasi waktu simpan inhibitor dilakukan pada variasi waktu simpan 1, 3, dan 7 hari. Limbah cair tempe dengan waktu simpan 1 hari digunakan sebagai inhibitor. Efektifitas tertinggi terdapat pada konsentrasi larutan pertumbuhan 0,05 M dan konsentrasi inhibitor 45%, diperoleh persen efektifitas sebesar 73,88%. Limbah cair tempe dianalisis menggunakan *high performance liquid chromatography* (HPLC) dan *spectrophotometer infrared* (IR) dengan diperoleh hasil bahwa limbah cair tempe mengandung asam laktat dan terdapat gugus OH-hidroksi dan CO-karbonil. Analisis menggunakan *Scanning Electron Microscopy* (SEM) dan *X-Ray Diffraction* (XRD) menunjukkan bahwa kerak CaCO₃ tanpa penambahan inhibitor terdiri dari kristal fasa kalsit dan aragonit, sedangkan setelah penambahan inhibitor menjadi lebih rapuh dan terdiri dari kristal fasa kalsit, aragonit dan vaterit. Analisis menggunakan *Particle Size Analyzer* (PSA) menunjukkan bahwa distribusi ukuran partikel kerak CaCO₃ menjadi lebih kecil dengan adanya penambahan inhibitor

Kata kunci : Kerak, CaCO₃, inhibitor, limbah cair tempe

ABSTRACT

STUDY OF ADDITION OF WASTE TEMPE AS AN INHIBITOR OF CALCIUM CARBONATE (CaCO₃) SCALE USING SEEDED EXPERIMENT METHOD

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The industry in the petroleum sector is growing rapidly in Indonesia, often experiencing problems such as displacement. One of the scales formed on industrial pipes is calcium carbonate (CaCO₃). Scale on industrial pipes will reduce the diameter and impede the flow of fluids which can cause the pipe to burst. This research was conducted by testing the inhibitor of tempe liquid waste on calcium carbonate (CaCO₃) using a seeded experiment. At the concentration variation of the growth solution 0.05; 0.075; and 0.1 M and inhibitor variations of 5, 15, 25, 35, and 45%. The optimization of the inhibitor storage time was carried out at variations of 1, 3, and 7 days of storage time. Tempe liquid waste with a storage time of 1 day was used as an inhibitor. The highest effectiveness was found in growth solution concentration of 0.05 M and inhibitor concentration of 45%, the percentage of effectiveness was 73.88%. Tempe liquid waste was analyzed using high performance liquid chromatography (HPLC) and infrared spectrophotometer (IR) with the results obtained that tempe liquid waste contains lactic acid and contains OH-hydroxy and CO-carbonyl groups. Analysis using Scanning Electron Microscopy (SEM) and X-Ray Diffraction (XRD) showed that the CaCO₃ crust without the addition of inhibitor consisted of calcite and aragonite crystals, whereas after the addition of inhibitors it became more brittle and consisted of calcite, aragonite and vaterite crystals. Analysis using the Particle Size Analyzer (PSA) showed that the particle size distribution of the CaCO₃ scale became smaller with the addition of inhibitors.

Key words : Scale, CaCO₃, inhibitor, Tempe Liquid Waste