

INTISARI

Operasi industri minyak dan gas bumi rutin melakukan pekerjaan stimulasi injeksi larutan asam (*acidizing*) di sumur-sumur produksi. Larutan asam akan membersihkan endapan-endapan *scale* yang menyumbat areal sekitar lubang sumur sehingga fluida reservoir dapat mengalir kembali tanpa hambatan. Pipa sumur produksi rentan mengalami kebocoran karena korosi internal setelah pekerjaan stimulasi asam. Pencegahan untuk mengurangi laju korosi harus dilakukan, salah satunya dengan cara menambahkan inhibitor korosi ke dalam pipa. Penelitian ini bertujuan untuk mengetahui pengaruh inhibitor molibdat terhadap laju korosi pipa di lingkungan fluida sumur produksi pasca *acidizing*.

Penelitian ini menggunakan pipa baja karbon API 5L Grade B, NPS 4 *schedule* 40 dengan diameter luar 4,5 inchi (114,3 mm) dan tebal 0,237 inchi (6,02 mm). Pipa dipreparasi menjadi spesimen yang digunakan untuk beberapa pengujian antara lain, uji komposisi kimia, uji struktur mikro, uji kekerasan, uji tarik dan uji korosi. Uji korosi dilakukan dengan 2 metode, yakni metode polarisasi potensio dinamik dan metode kupon. Uji korosi polarisasi potensiodinamik dilakukan di 2 lingkungan fluida sumur produksi yang berbeda pasca *acidizing* dan larutan 3,5% NaCl yang mengandung inhibitor molibdat konsentrasi 0,1; 0,3; 0,5; 0,7 dan 0,9%. Uji korosi dengan kupon dilakukan di lingkungan yang sama dengan kandungan inhibitor molibdat konsentrasi 0,5%. Hasil uji korosi metode kupon dijadikan pembandingan atas hasil uji korosi polarisasi potensiodinamik.

Laju korosi pipa di lingkungan fluida sumur produksi 1 dan 2 masing-masing sebesar 2,71 mpy dan 3,17 mpy. Laju korosi pipa di lingkungan larutan 3,5% NaCl sebesar 4,36 mpy. Hasil penelitian menunjukkan bahwa penurunan laju korosi pipa sejalan dengan meningkatnya konsentrasi inhibitor molibdat dalam larutan. Konsentrasi inhibitor molibdat yang paling efektif di lingkungan fluida sumur produksi 1 dan larutan 3,5% NaCl adalah 0,7% sedangkan di lingkungan fluida sumur produksi 2 adalah 0,9%. Rata-rata efektivitas penghambatan laju korosi sebesar 93%. Laju korosi pipa dengan pengujian kupon lebih besar 12% dibandingkan dengan hasil pengujian polarisasi potensiodinamik. Hasil penelitian ini dapat disimpulkan bahwa penambahan inhibitor dalam lingkungan korosif merupakan metode yang efektif dalam melindungi pipa dari serangan korosi.

Kata Kunci: laju korosi, inhibitor molibdat, stimulasi, *acidizing*, pipa baja

ABSTRACT

Operation in oil and gas industry regularly performs stimulation work by injecting acid solutions (acidizing) in production wells. Acid solution will clean scale deposit that clog wellbore area so that the fluid from the reservoir could flow without any restriction. Production line becomes susceptible to leakage due to internal corrosion post acidizing work. Prevention program to reduce the corrosion rate must be done, one of the methods is by injecting corrosion inhibitor into the pipeline. The objective of this research is to investigate the effect of molybdate inhibitor to pipe corrosion rate in production well fluid post acidizing work.

This research used an API 5L Grade B carbon steel pipe, NPS 4 pipe schedule 40 with an outer diameter of 4.5 inches (114.3 mm) with thickness of 0.237 inches (6.02 mm). Pipe was prepared into some specimens for some tests, the tests were chemical composition test, metallography test, hardness test, tensile test and corrosion test. There were two methods for corrosion tests, they were potentiodynamic polarization and coupon. Corrosion tests by potentiodynamic polarization was performed in two different production fluid wells post acidizing (well 1 and 2) and in 3.5% NaCl solution with molybdate inhibitor concentration 0.1, 0.3, 0.5, 0.7 and 0.9%. Corrosions test by coupon was performed in the same fluids as other test with 0.5% of inhibitor concentration. Corrosion rate from coupon test results were compared to the corrosion rate from potentiodynamic polarization tests.

Corrosion rate of the pipe in production fluid well 1 and 2 are 2.71 mpy and 3.17 mpy respectively. Corrosion rate of the pipe in 3.5% NaCl solution is 4.36 mpy. Result shows that the corrosion rate is reduced with increasing inhibitor concentration. The most effective molybdate inhibitor concentration in the production well production fluid 1 and 3.5% NaCl solution is at 0.7% while the most effective one in well production fluid 2 is at 0.9%. The average corrosion rate inhibition effectivity is about 93%. Corrosion rate from coupon test is 12% higher than rate from potentiodynamic polarization test. This research concludes that the additional inhibitor in corrosive fluid is an effective method in protecting pipe from corrosion.

Keywords: corrosion rate, inhibitor, molybdate, stimulation, acidizing, steel pipes