

# Optimasi Pemilihan Material Terpilih (Duplex 22Cr, Super Duplex 25Cr dan Austenitic 28Cr) untuk Implementasi Teknologi CO<sub>2</sub> Enhanced Oil Recovery di Indonesia Menggunakan Pendekatan Analisis Tekno-Ekonomi = Optimization the Selection of Selected Materials (Duplex 22Cr, Super Duplex 25Cr and Austenitic 28Cr) for Implementing of the Technology CO<sub>2</sub> Enhanced Oil Recovery in Indonesia Using a Techno-Economic Analysis Approach

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## Abstrak

Program CO<sub>2</sub> EOR adalah upaya meningkatkan produksi minyak dari lapangan tua, menahan laju produksi turun dan untuk penurunan emisi karbon di Indonesia yang cenderung menuju tekanan dan temperatur tinggi dan membawa pengotor yang relatif tinggi (CO<sub>2</sub>, H<sub>2</sub>S, ion klorida) pemicu korosi dini pada flowline dan tubing.

Berdasarkan hasil preliminary assessment, material Austenitik 28Cr dan super duplex 25Cr diusulkan untuk menjadi kandidat material potensial untuk kondisi seperti itu. Uji C-Ring dilakukan untuk mengetahui perilaku korosinya (SSC) dan kerentanan retak tegangan sulfida. Tes C-Ring dilakukan kondisi 2,55% H<sub>2</sub>S (31,48 psia) dan 50% CO<sub>2</sub> (617,25 psia).

Terlepas dari resistansi SSC yang baik untuk kedua material, resistansi pitting yang berbeda terlihat pada kedua material. Super duplex 25Cr rentan terhadap korosi pitting dan bentuk pitting cenderung lebih besar tetapi lebih dangkal dari austenitik 28Cr. Material austenitik 28Cr memiliki kerapatan pitting yang lebih kecil, tetapi lebih dalam dan terisolasi. Tidak ditemukan perambatan retak yang berasal dari pitting pada kedua material tersebut.

Hasil analisa keekonomian material Superduplex 25Cr dan Austenitik 28Cr masing-masing positif untuk NPV, ROR = 9,98% dan 8,54%. POT = 25Cr (6,47 tahun) dan 28Cr (7,48 tahun). PIR = 25Cr (1,9127) dan 28Cr (1,7206).

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Based on the preliminary assessment results, austenitic 28Cr & super duplex 25Cr are proposed to be option materials for such conditions. The C-Ring test was conducted to determine its corrosion behavior (SSC) and susceptibility to SSC. The C-Ring test was carried out under conditions of 2.55% H<sub>2</sub>S (31.48 psia) & 50% CO<sub>2</sub> (617.25 psia).

Apart from good SSC resistance for both materials, different pitting resistance is seen in both materials.

Super duplex 25Cr is prone to pitting corrosion and pitting forms tend to be larger but shallower than austenitic 28Cr. The austenitic 28Cr has a lower pitting density but is deeper and insulated. No crack propagation was found from pitting in the two materials.

The economic analysis of Superduplex 25Cr and Austenitic 28Cr are positive for NPV, ROR = 9.98% & 8.54%, respectively. POT = 25Cr (6.47 years) & 28Cr (7.48 years). PIR = 25Cr (1.9127) & 28Cr (1.7206) CO<sub>2</sub> EOR program is an effort to increase oil production from mature fields, to keep the decreasing production rate and to reduce CO<sub>2</sub> emissions in Indonesia which tend to lead to high pressures & temperatures and carry impurities (CO<sub>2</sub>, H<sub>2</sub>S, chloride ions) that prompt early corrosion occurrence of flowline and tubing.

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