

# Modifikasi model perhitungan laju korosi CO<sub>2</sub> pada baja karbon dalam lingkungan aqueous dan rekomendasi mitigasinya untuk aplikasi pada fasilitas proses minyak dan gas = Modified CO<sub>2</sub> corrosion rate calculation model for carbon steel in aqueous environment and its mitigation recommendation for oil and gas processing facilities application

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## Abstrak

[<b>ABSTRAK</b><br>

Korosi memiliki dampak yang sangat besar terhadap ekonomi dan lingkungan pada berbagai infrastruktur, terkait dengan kegagalan operasi dan aset. Masalah yang umum terjadi pada jaringan pipa minyak dan gas saat ini adalah korosi internal yang disebabkan oleh media korosif yang umumnya mengandung karbon dioksida (CO<sub>2</sub>) dalam larutan aqueous. Karenanya, diperlukan cara untuk mengevaluasi korosi CO<sub>2</sub> pada baja karbon terkait laju korosi agar dapat memenuhi umur operasi.

Dalam penelitian ini, model Norsok yang telah dimodifikasi digunakan untuk memprediksi laju korosi pada lingkungan CO<sub>2</sub>, dan mempertimbangkan data parameter seperti suhu, tekanan parsial CO<sub>2</sub>, dan laju aliran untuk menghitung shear stress dan laju korosi. Software ini dibuat dengan menggunakan bahasa pemrograman visual basic (Microsoft Visual Studio ? VB), kemudian dengan menggabungkan basis pengetahuan mekanisme korosi CO<sub>2</sub> dan aturan tertentu maka akan dihasilkan suatu sistem pakar.

Berdasarkan perhitungan shear stress dan laju korosi, kemudian rekomendasi dapat diajukan untuk mempertimbangkan, apakah baja karbon masih dapat digunakan atau penggunaan baja karbon dengan memberikan inhibitor atau penggantian baja karbon dengan Corrosion Resistance Alloys.

Hasil perhitungan modifikasi model Norsok menunjukkan bahwa hasil perhitungan laju korosi tampak lebih realistis dibandingkan dengan model Norsok asli, dan dapat digunakan untuk mengevaluasi baja karbon yang mengalami korosi CO<sub>2</sub> dengan tingkat kepercayaan lebih tinggi.

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<b>ABSTRACT</b><br>

Corrosion has a great detrimental effect to economy and environment in almost all infrastructures, in regards of operations shutdown and asset facilities failure. A common problem in oil and gas process piping and transport pipeline nowadays is internal corrosion caused by corrosive media containing mainly carbon dioxide (CO<sub>2</sub>) in aqueous solutions. Therefore, there is a need to evaluate CO<sub>2</sub> corrosion of carbon steel in terms of corrosion rate in order to meet its life expectancy in

such environment.

In this paper, a modified Norsok model was used to predict corrosion rate in CO<sub>2</sub> environment, and consider typical data parameter used such as temperature, CO<sub>2</sub> partial pressure, and flow rate or fluid velocity to calculate shear stress and corrosion rate. By combining knowledge base related to CO<sub>2</sub> corrosion mechanism and its logic algorithm with certain rules resulted in such expert system which utilize visual basic (Microsoft Visual Studio-VB) programming language to develop a software.

Based on calculated shear stress and corrosion rate, then recommendations can be proposed whether carbon steel still can be used or carbon steel with inhibitor injection or carbon steel replaced by Corrosion Resistance Alloys.

The modified Norsok calculation model results show that the calculated corrosion rates are likely more realistic compared to the original Norsok model, and can be used to evaluate carbon steel which suffered CO<sub>2</sub> corrosion with highly confident. Corrosion has a great detrimental effect to economy and environment in almost all infrastructures, in regards of operations shutdown and asset facilities failure. A common problem in oil and gas process piping and transport pipeline nowadays is internal corrosion caused by corrosive media containing mainly carbon dioxide (CO<sub>2</sub>) in aqueous solutions. Therefore, there is a need to evaluate CO<sub>2</sub> corrosion of carbon steel in terms of corrosion rate in order to meet its life expectancy in such environment.

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