

Prediksi laju korosi CO₂ pada pipa gas bumi = Corrosion rate prediction of CO₂ corrosion in natural gas pipe

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Deskripsi Lengkap: <https://lib.ui.ac.id/detail?id=20457356&lokasi=lokal>

Abstrak

Prediksi yang dilakukan pada penelitian ini yakni melibatkan simulasi CFD Computational Fluid Dynamics dengan memperhatikan fenomena transport pada bulk gas bumi dan laju korosi yang disebabkan CO₂. Proses korosi terjadi pada permukaan dinding dalam pipa. Fenomena transport yang terjadi mengacu pada neraca massa, neraca energi, neraca momentum dan reaksi elektrokimia. Pipa sepanjang 8 meter dengan diameter 16 inci digunakan sebagai model simulasi dan hanya diambil seperdelapan bagian dari pipa dikarenakan silinder mempunyai simetri yang tak hingga. Reaksi elektrokimia yang terjadi melibatkan reaksi katodik dan reaksi anodik. Pada penelitian kali ini, perubahan terbesar laju korosi CO₂ yakni pada variasi konsentrasi persen mol CO₂ yakni sekitar $6,09 \times 10^{-5}$ mm/yr. sedangkan pada variasi suhu dan laju aliran massa sekitar $1,92 \times 10^{-5}$ mm/yr dan 2×10^{-6} mm/yr. Pipa transmisi telah terpasang 2 tahun dengan tebal 11,999 mm jika laju korosi CO₂ digunakan dalam perhitungan ketebalan pipa dan tidak memperhatikan external corrosion akibat air laut. K.

.....In this paper, new method of prediction is presented. This method involves Computational Fluid Dynamic CFD simulation which involves transport phenomenon occurred at natural gas and corrosion rate occurred at the inner surface of transmission natural gas pipe. Transport phenomena are based on several conservation law i.e conservation of mass, conservation of momentum, conservation of energy and Electrochemical reaction. Pipe with 8 meter long and 16 inches in diameter is used for the model simulation and one eighth part will be used since cylinder has infinite symmetry. Electrochemical reaction which is occurred, involves anodic reaction and cathodic reaction. At this research, effect of variation CO₂ mole fraction has the most contribution to the CO₂ corrosion rate. The difference between each variation is $6,09 \times 10^{-5}$ mm yr. However, the effect of variation temperature and mass flow rate is about $1,92 \times 10^{-5}$ mm yr and 2×10^{-6} mm yr respectively. Natural Gas pipe has been installed for 2 years. Its thickness is about 11,999 mm since it gets internal corrosion CO₂ corrosion and neglecting the external corrosion caused by sea water.