

Analisis Keandalan Pipa Sambungan Akibat Korosi Eksternal Pada Jalur Pipa Transmisi Gas Dengan Menggunakan Simulasi Monte Carlo = Reliability Analysis of Tee Pipe due to External Corrosion in Gas Transmission Pipeline using Monte Carlo Simulation

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Abstrak

Jaringan pipa adalah salah satu sarana transportasi minyak dan gas yang paling aman dan ekonomis sehingga pipa tidak boleh mengalami kegagalan saat beroperasi. Pipa sambungan dalam suatu pipeline adalah pipa dengan geometri yang paling sering dijumpai. Jalur pipa transmisi biasanya ditanam didalam tanah (underground) sehingga rentan terhadap korosi eksternal. Oleh karena itu perlu dilakukan analisis keandalan, terutama pada geometri sambungan. Pengujian keandalan dilakukan dengan menggunakan simulasi Monte Carlo. Untuk mengetahui pengaruh tanah terhadap laju korosi pipa maka dilakukan pengukuran pH, resistivitas tanah dan laju korosi pipa pada setiap segmen.

Hasil dari pengukuran laju korosi pipa sambungan kemudian dibandingkan dengan laju korosi pipa sambungan. Pengamatan mikrostruktur dilakukan untuk mengetahui penyebab perbedaan laju korosi kedua jenis pipa tersebut. Nilai resistivitas tanah pada segmen I berada pada level very corrosive (<500 -cm), segmen II berada pada level corrosive (500-1000 -cm), dan segmen II berada pada level moderately corrosive (1000-2000 -cm). Nilai pH berada pada rentang 5-7 untuk semua segmen. Laju korosi pipa sambungan meningkat seiring penurunan nilai resistivitas tanah, dengan range nilai antara 0.03-0.75 mm / year. Keandalan pipa sambungan pada segmen adalah 34,53%, segmen II adalah 64,04%, dan segmen III adalah 99,78%.

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Pipeline is one mean of oil and gas transportation which is the most safe and economical so that the pipe should not fail during operation. Tee pipe in the pipeline is a pipe which geometry is the most frequently encountered. Transmission pipelines are usually planted in the ground (underground) so that it is susceptible to external corrosion. Therefore it is necessary to perform the reliability analysis, especially in a tee geometry. Reliability testing was done using Monte Carlo simulations. To determine the influence of soil on the rate of corrosion of pipes, the measurements of pH, soil resistivity and corrosion rate of pipes on each segment were carried out.

Results of tee pipe corrosion rate measurements were then compared with the corrosion rate of the straight pipe. Microstructural observations was performed to determine the cause of differences in the corrosion rate of the two types of pipe. Soil resistivity values in the segment I was at the very corrosive level (<500 -cm), segment II at the corrosive level (500-1000 -cm), and segment II at the moderately corrosive level (1000-2000 -cm). pH value was in the range 5-7 for all segments. Tee pipe corrosion rate increases with the decreasing of soil resistivity values, ranging between 0.03-0.75 mm / year. Reliability tee pipe segment was 34,53%, segment II was 64,04%, and segment III was 99,78%.