

# Pengaruh konsentrasi H<sub>2</sub>O<sub>2</sub> dan laju alir gas umpan terhadap proses penyisihan gas buang mesin diesel melalui membran serat berongga = The effect of concentration of H<sub>2</sub>O<sub>2</sub> and feed gas flow rate on removal of diesel engine exhaust through hollow fiber membrane

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## Abstrak

Beberapa polutan udara yang mencemari lingkungan antara lain seperti nitrogen oksida (NO<sub>x</sub>), sulfur dioksida (SO<sub>2</sub>), dan karbon monoksida (CO). Teknologi kontaktor membran merupakan teknologi alternatif dalam menyisihkan gas NO<sub>x</sub>, SO<sub>2</sub>, dan CO karena keunggulannya berupa luas area spesifik yang tinggi. Penelitian ini akan mempelajari proses penyisihan gas buang mesin diesel berupa NO<sub>x</sub>, SO<sub>2</sub>, dan CO menggunakan pelarut H<sub>2</sub>O<sub>2</sub> dan NaOH pada modul membran serat berongga berbahan polisulfon. Gas buang mesin diesel akan dialirkan pada bagian tube membran, sedangkan pelarut H<sub>2</sub>O<sub>2</sub> dan NaOH berada di bagian shell dan bersifat statis. Variabel bebas yang diuji pada penelitian ini adalah laju alir gas umpan dan konsentrasi pelarut H<sub>2</sub>O<sub>2</sub>. Berdasarkan hasil uji, efisiensi penyisihan gas NO<sub>x</sub>, SO<sub>2</sub>, dan CO tertinggi pada laju alir gas 100 mL/menit dan konsentrasi H<sub>2</sub>O<sub>2</sub> 0,5 M berturut-turut, yaitu sebesar 99,56%, 99,79%, dan 99,28%, fluks perpindahan massa NO<sub>x</sub>, SO<sub>2</sub>, dan CO tertinggi pada laju alir gas 200 mL/menit dan konsentrasi H<sub>2</sub>O<sub>2</sub> 0,5 M berturut-turut, yaitu sebesar 1,13 x 10<sup>-6</sup> mmol/cm<sup>2</sup>.s, 9,42 x 10<sup>-7</sup> mmol/cm<sup>2</sup>.s, dan 8,93 x 10<sup>-7</sup> mmol/cm<sup>2</sup>.s serta NO<sub>x</sub>, SO<sub>2</sub>, dan CO loading tertinggi pada laju alir gas 200 mL/menit dan konsentrasi H<sub>2</sub>O<sub>2</sub> 0,05 M berturut-turut, yaitu sebesar 1,72 x 10<sup>-4</sup> mmol NO<sub>x</sub>/mmol H<sub>2</sub>O<sub>2</sub>.s, 1,3 x 10<sup>-4</sup> mmol SO<sub>2</sub>/mmol H<sub>2</sub>O<sub>2</sub>.s, dan 1,2 x 10<sup>-4</sup> mmol CO/mmol H<sub>2</sub>O<sub>2</sub>.s.

.....Some air pollutants that affect the environment include nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), and carbon monoxide (CO). Membrane contactor technology is an alternative technology in NO<sub>x</sub>, SO<sub>2</sub>, and CO gases because of its advantages, such as high specific area. This study investigates removing exhaust gases from diesel engines in the form of NO<sub>x</sub>, SO<sub>2</sub>, and CO using H<sub>2</sub>O<sub>2</sub> and NaOH solvents on hollow fiber membrane modules made of polysulfone. The exhaust gas of the diesel engine will be in the membrane part of the tube, while the solvent H<sub>2</sub>O<sub>2</sub> and NaOH are in the shell and are static. The independent variables tested in this study were the gas feed flow rate and the concentration of H<sub>2</sub>O<sub>2</sub>. Test results, the highest absorption efficiency of NO<sub>x</sub>, SO<sub>2</sub>, and CO gas was at a gas flow rate of 100 mL/min and H<sub>2</sub>O<sub>2</sub> 0.5 M, respectively, which are 99.56%, 99.79%, and 99.28%, the highest mass transfer flux of NO<sub>x</sub>, SO<sub>2</sub>, and CO at a gas flow rate of 100 mL/min and H<sub>2</sub>O<sub>2</sub> 0.5 M, respectively, namely 1.13 x 10<sup>-6</sup> mmol/cm<sup>2</sup>.s, 9.42 x 10<sup>-7</sup> mmol/cm<sup>2</sup>.s, and 8.93 x 10<sup>-7</sup> mmol/cm<sup>2</sup>.s, and also highest NO<sub>x</sub>, SO<sub>2</sub>, and CO loading at a gas flow rate of 100 mL/min and H<sub>2</sub>O<sub>2</sub> 0.05 M, respectively, namely 1.72 x 10<sup>-4</sup> mmol NO<sub>x</sub>/mmol H<sub>2</sub>O<sub>2</sub>.s, 1.3 x 10<sup>-4</sup> mmol SO<sub>2</sub>/mmol H<sub>2</sub>O<sub>2</sub>.s, and 1.2 x 10<sup>-4</sup> mmol CO/mmol H<sub>2</sub>O<sub>2</sub>.s.