

**Pemodelan emisi SO<sub>2</sub> dengan artificial neural network dan pemetaan konsentrasi SO<sub>2</sub> : studi kasus PLTU Suralaya = Modeling SO<sub>2</sub> emissions using artificial neural network and mapping SO<sub>2</sub> concentrations : case study Suralaya steam coal fired power plant / Niknik Bestar**

Niknik Bestar, author

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**Abstrak**

<b>ABSTRAK</b><br>SO<sub>2</sub> merupakan polutan udara yang sangat berkaitan dengan pembakaran batubara sebagai bahan baku energi dalam suatu pembangkit listrik. Dengan adanya fakta ini, maka dibutuhkan suatu model sebagai metode pendekatan sistem untuk memprediksi nilai emisi SO<sub>2</sub> yang dihasilkan berdasarkan karakteristik batubara, serta pemetaan konsentrasi SO<sub>2</sub> di lingkungan sekitar sumber emisi. Tujuan dari penelitian ini adalah untuk memodelkan emisi SO<sub>2</sub> menggunakan Artificial Neural Network (ANN) berdasarkan karakteristik batubara dan menganalisis konsentrasi SO<sub>2</sub> di wilayah PLTU Suralaya berdasarkan pemetaan pada musim hujan dan kemarau. Emisi SO<sub>2</sub> dimodelkan menggunakan ANN, sedangkan pemetaan konsentrasi SO<sub>2</sub> menggunakan software ArcGIS 9.3. Nilai validasi optimum hasil pemodelan emisi SO<sub>2</sub> menggunakan ANN adalah 83,2% dengan root mean square error sebesar 0,168, laju pembelajaran 0,2, jumlah hidden neuron 22, dan epoch 125.000. Nilai konsentrasi SO<sub>2</sub> rata-rata tahun 2008-2013 di Halaman PLTU Suralaya, Brigil, Perum PLTU Suralaya, Cipala Dua, Lebak Gede, Salira Indah, Gunung Gede, dan Sumuranja pada musim hujan dan kemarau masing-masing adalah 8,77 &#956;g/Nm<sup>3</sup> dan 9,01 &#956;g/Nm<sup>3</sup>, 4,22 &#956;g/Nm<sup>3</sup> dan 6,05 &#956;g/Nm<sup>3</sup>, 6,87 &#956;g/Nm<sup>3</sup> dan 7,04 &#956;g/Nm<sup>3</sup>, 4,25 &#956;g/Nm<sup>3</sup> dan 8,54 &#956;g/Nm<sup>3</sup>, 4,56 &#956;g/Nm<sup>3</sup> dan 6,27 &#956;g/Nm<sup>3</sup>, 4,70 &#956;g/Nm<sup>3</sup> dan 7,06 &#956;g/Nm<sup>3</sup>, 6,11 &#956;g/Nm<sup>3</sup> dan 8,03 &#956;g/Nm<sup>3</sup>, 5,05 &#956;g/Nm<sup>3</sup> dan 7,34 &#956;g/Nm<sup>3</sup>. Hasil tersebut menunjukkan, konsentrasi polutan SO<sub>2</sub> cenderung lebih tinggi pada musim kemarau dibandingkan musim hujan di kedelapan lokasi pemantauan kualitas udara. Nilai konsentrasi SO<sub>2</sub> masih jauh di bawah nilai baku mutu yang ditetapkan, yaitu sebesar 365 &#956;g/Nm<sup>3</sup> dan termasuk kategori baik menurut ISPU (Indeks Standar Pencemar Udara), yaitu pada rentang 0-50 dengan nilai konsentrasi SO<sub>2</sub> sebesar 0 &#956;g/Nm<sup>3</sup>-80 &#956;g/Nm<sup>3</sup> <hr>

<b>ABSTRACT</b><br>SO<sub>2</sub> is an air pollutant that is mainly related with the combustion of coal as an energy feedstock in a power plant. Based on this fact, a model as a system approach in order to predict and estimate the SO<sub>2</sub> emissions generated by coal characteristics and SO<sub>2</sub> concentrations mapping in emission source is required. The purpose of this study is modeling SO<sub>2</sub> emissions using Artificial Neural Network (ANN) based on coal characteristics and to analyze the concentrations of SO<sub>2</sub> based on mapping in Suralaya Steam Coal Fired Power Plant during rainy and dry season. SO<sub>2</sub> emissions were modeled using ANN, while mapping SO<sub>2</sub> concentrations is using software ArcGIS 9.3. Optimum validation value for SO<sub>2</sub> emissions model with ANN in this study is 83.2% with root mean square error is 0.168, learning rate 0.2, 22 of hidden neurons, and 125,000 epoch. The average value of SO<sub>2</sub> concentrations in the years 2008-2013 in Halaman PLTU Suralaya, Brigil, Perum PLTU Suralaya, Cipala Dua, Lebak Gede, Salira Indah, Gunung Gede, and Sumuranja during rainy and dry season respectively are 8.77 &#956;g/Nm<sup>3</sup> and 9.01 &#956;g/Nm<sup>3</sup>, 4.22 &#956;g/Nm<sup>3</sup> and 6.05 &#956;g/Nm<sup>3</sup>, 6.87 &#956;g/Nm<sup>3</sup> and 7.04 &#956;g/Nm<sup>3</sup>, 4.25 &#956;g/Nm<sup>3</sup> and 8.54 &#956;g/Nm<sup>3</sup>, 4.56 &#956;g/Nm<sup>3</sup> and 6.27 &#956;g/Nm<sup>3</sup>, 4.70 &#956;g/Nm<sup>3</sup> and 7.06 &#956;g/Nm<sup>3</sup>, 6.11 &#956;g/Nm<sup>3</sup> and 8.03 &#956;g/Nm<sup>3</sup>, 5.05 &#956;g/Nm<sup>3</sup> and 7.34 &#956;g/Nm<sup>3</sup>. The results show that SO<sub>2</sub> concentrations are higher during the dry season than the rainy season in all eight monitoring locations. The SO<sub>2</sub> concentrations are still far below the standard limit set by ISPU (Indeks Standar Pencemar Udara), which is 365 &#956;g/Nm<sup>3</sup> and falls into the good category according to ISPU, namely in the range of 0-50 with SO<sub>2</sub> concentration of 0 &#956;g/Nm<sup>3</sup>-80 &#956;g/Nm<sup>3</sup>.

and 8.54 &#956;g/Nm<sub>3</sub>, 4.56 &#956;g/Nm<sub>3</sub> and 6.27 &#956;g/Nm<sub>3</sub>, 4.70 &#956;g/Nm<sub>3</sub> and 7.06 &#956;g/Nm<sub>3</sub>, 6.11 &#956;g/Nm<sub>3</sub> and 8.03 &#956;g/Nm<sub>3</sub>, 5.05 &#956;g/Nm<sub>3</sub> and 7.34 &#956;g/Nm<sub>3</sub>. The result shows SO<sub>2</sub> concentrations are found to be higher in the dry season than in rainy season in all of eight locations of air quality monitoring. SO<sub>2</sub> concentrations value is found below the allowable standard (365 &#956;g/Nm<sub>3</sub>) and belong to good category according to ISPU (Standard Index of Air Pollutants), in range 0-50 with SO<sub>2</sub> concentrations value is 0 &#956;g/Nm<sub>3</sub>-80 &#956;g/Nm<sub>3</sub>.