Optimasi Multi-Objektif dan Artificial Neural Network-Genetic Algorithm pada Sistem Multi Generasi dengan Energi Panas Bumi = Multi-objective Optimization and Artificial Neural Network-Genetic Algorithm on Multi-Generation Systems with Geothermal Energy

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Abstrak

Optimasi multi-objektif adalah salah satu alat untuk mengambil keputusan yang optimal dimana terjadi trade-off antara dua atau lebih objektif yang saling bertentangan. Pada studi ini optimasi multi-objektif dijalankan untuk sistem multi generasi panas bumi. Metode yang dipakai adalah artificial neural network-genetic algorithm (ANN-GA) dan genetic algorithm (GA), dimana keduanya nanti akan diperbandingkan. Digunakan software Engineering Equation Solver (EES) dan MATLAB. Batasan (constraint) yang dipakai adalah konsentrasi ammonia (YB), temperature geotermal (TGEO) dan mass extraction ratio (MER). Nilai optimal terbaik dari optimasi multi-objektif metode ANN-GA adalah exergy destruction 3955.51 kW, sum unit cost of the product (SUCP) 97.84 $/GJ dan exergoenvironmental 724.92 mPt/s, nilai optimal ANN-GA tersebut dicapai pada YB 0.415, TGEO 130.02oC dan MER 0.399. Sedangkan nilai optimal terbaik dari optimasi multi-objektif metode GA adalah exergy destruction 3522.59 kW, SUCP 93.86 $/GJ dan exergoenvironmental 813.29 mPt/s, nilai optimal ini didapat pada YB 0. 0.477, TGEO 159.79oC dan MER 0.203. Analisa life cycle analysis (LCA) yang ada dalam studi ini dari software SIMAPRO menunjukkan dampak lingkungan dari steel adalah 156 mPt/kg, steel low alloy 247 mPt/kg dan cast iron 227 mPt/kg. .....Multi-objective optimization is a tool for making optimal decisions where there is a trade-off between two or more conflicting objectives. In this study, multi-objective optimization is carried out for the geothermal multi-generation system. The methods used are artificial neural network-genetic algorithm (ANN-GA) and genetic algorithm (GA), both of which will be compared later. Engineering Equation Solver (EES) and MATLAB software are used. The constraints used are ammonia concentration (YB), geothermal temperature (TGEO) and mass extraction ratio (MER). The best optimal values from the multi-objective optimization of the ANN-GA method are exergy destruction 3955.51 kW, sum unit cost of the product (SUCP) 97.84 $/GJ and exergoenvironmental 724.92 mPt/s, the optimal values for ANN-GA were achieved at YB 0.415, TGEO 130.02oC and MER 0.399. While the best optimal value of the multi-objective optimization GA method is exergy destruction 3522.59 kW, SUCP 93.86 $/GJ and exergoenvironmental 813.29 mPt/s, this optimal value is obtained at YB 0. 0.477, TGEO 159.79oC and MER 0.203. Life cycle analysis (LCA) that is done in this study from SIMAPRO software showed the environmental impact from steel is 156 mPt/kg, steel low alloy is 247 mPt/kg and cast iron is 227 mPt/kg.