Analisis exergy, optimasi exergoeconomic dengan metode multiobjective, dan optimasi steam ejector pembangkit listrik tenaga panas Bumi Kamojang unit 4 = Exergy analysis, exergoeconomic optimization with multiobjective method, and steam ejector optimization of unit 4 Kamojang geothermal power plant

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Abstrak

Pada penelitian ini dilakukan lima jenis analisis pada PLTP Kamojang Unit 4, antara lain analisis exergy pada kondisi operasional, optimasi efisiensi exergy, optimasi ekonomi, optimasi exergoeconomic dengan tekanan wellhead sebagai variabel, dan optimasi steam ejector dengan aliran motive steam sebagai variabel. Perhitungan dilakukan dengan bantuan MATLAB. Karakteristik termodinamika uap panas bumi diasumsikan sama dengan karakteristik air yang didapatkan dari REFPROP. Tekanan wellhead 10 bar saat ini menghasilkan efisiensi exergy 31,91%. Optimasi efisiensi exergy menghasilkan tekanan wellhead 5,06 bar, efisiensi exergy 47,3%, dan biaya sistem US $3.957.100. Optimasi ekonomi menghasilkan tekanan wellhead 11 bar, efisiensi exergy 22,13%, dan biaya sistem US $2.242.200. Optimasi exergoeconomic menghasilkan 15 titik optimum. Optimasi steam ejector menghasilkan aliran motive steam 34,41 𝑘𝑔 𝑠 lebih kecil dari aliran operasional saat ini 40,61 𝑘𝑔 𝑠.

.....This study presents five analysis at Unit 4 Kamojang Geothermal Power Plant are exergy analysis at operational condition, exergy efficiency optimization, economic optimization, exergoeconomic optimization with wellhead pressure as a variable, and steam ejector optimization with mass flow of motive steam as a variable. Calculations are conducted by using the MATLAB. Thermodynamics characteristic of geothermal fluid assumed as water characteristic which get from REFPROP. Wellhead pressure operational condition 10 bar has exergy efficiency 31.91%. Exergy efficiency optimization has wellhead pressure 5.06 bar, exergy efficiency 47.3%, and system cost US$ 3,957,100. Economic optimization has well pressure 11 bar, exergy efficiency 22.13%, and system cost US$ 2,242,200. Exergoeconomic optimization has 15 optimum condition. Steam ejector optimization has mass flow of motive steam 34.41 𝑘𝑔 𝑠 smaller than the operational condition 40.61 𝑘𝑔 𝑠.