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Exergy analysis of biomass CHP power plant

Z Baskaya
Unit International SA, Belgium

Exergy analysis is a useful tool for energy-related systems evaluation, showing the quality of energy and determines the locations, types and true magnitudes of energy losses. With the assessment of input and output flows in the systems of Biomass (Wood Chips) Cogeneration Heat and Power (CHP) Power Plant in Babina Greda, the points of exergy degradation are determined by using energy and exergy analyses, thus it allows us to make a quantitative evaluation of energy quality changes. The objective of the study is to determine the essential points and values of exergy destruction in CHP Power Plant as well as to define boundaries of method's use. A mathematical model is elaborated, used and evaluated as suitable for its application for the real power plant and may be used in the CHP Power Plant's future operation for efficiency assessment and improvements. The results are shown with Sankey and Grassmann diagrams; the largest exergy destruction occurs in the boiler (Steam Generator) in respect of percentage of usage input energy; the second largest exergy destruction is observed in heat exchangers of district heating (DH) system. Exergy efficiency of the Power Plant is influenced by the Power to Heat ratio and potential of the produced heat thus temperature. The results show that increased heat load or decreased temperature of heat which is delivered to consumer lowers the value exergy efficiency of the CHP Power Plant.

zafer.baskaya@unit.com.tr