

Design of an Integrated Waste Wood to Heat and Hydrogen Conversion System: A Parametric Study

Gisèle Abi Chahla^a, Assaad Zoughaib^a and Romain Farel^b

^aMines ParisTech, PSL Research University, Center for Energy efficiency of Systems, Palaiseau, 91120, France, gisele.abi_chahla@mines-paristech.fr

^bParis-Saclay Energy Efficiency (PS2E), Les Loges-en-Josas, 78354, France

Abstract:

Waste wood valorization may be done in many ways leading to chemical components production such as H₂ or methane but also into heat and/or electricity. In an eco-industrial park, heat recovery from the conversion process (wood to Hydrogen) may lead to better economical results. In this paper, we introduce a methodology leading to the design of an energy integrated waste wood to hydrogen conversion process in order to improve its economical performance when integrated in an eco-industrial park valorising its excess heat. The methodology is based on process modelling followed by its energy integration leading to a heat exchanger network synthesis. The process investment cost is calculated as a function of its operating conditions while the process revenue is evaluated using hydrogen and excess heat sales income. The parametric study is done using a Modelica based model while the heat exchangers network synthesis is done using a MILP algorithm implemented in the CERES platform.

Keywords:

Process integration, Process design, Wood to hydrogen conversion