

Università degli Studi di
Napoli Federico II

Scuola Politecnica e
delle Scienze di Base



Corso di Studi in
Ingegneria Meccanica

Laurea Magistrale in Ingegneria Meccanica per l'Energia e l'Ambiente (LM-33)

Elaborato di Laurea

BIOMASS POWERED MICRO-CHP: MODELLING OF THE ENERGY CONVERSION PROCESS AND OPERATION UNDER VARIABLE LOAD DEMAND

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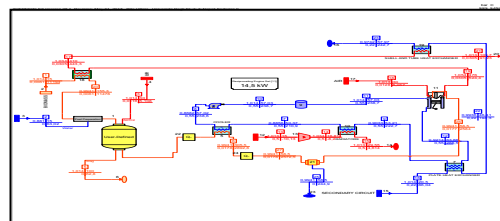
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SOMMARIO

The present work of thesis focuses the attention on the respect of the COP21 principles concerning the improvement of the energy efficiency, the reduction of the greenhouse gas emissions and the dependence on the deciduous traditional energy sources, considering the possibility of the biomasses exploitation as renewable energy source. After a brief description of the global, European and Italian current energy context, the processes and the technologies for the biomasses treatment have been examined. The central aim of the work is to model a real micro-CHP plant (ECO20) fed by lignocellulosic biomass, conceived and developed by the Italian Company CMD located in Caserta. It provides the coupling between a gasifier, addicted to the biomass conversion, and an internal combustion engine that processes the deriving syngas and a section for the waste heat recovery. Commercial software, such as *Thermoflex*[®] and *GT-Power*[®], are used for the scope: in this way, the performances of the plant can be provided when varying some influence variables. A validation of the model is made on experimental data. The final part shows the feasibility of a coupling between this cogeneration system and a real user: the savings in terms of primary energy and emissions have been quantified as well as the economic suitability of the investment, referring to the current regulatory frameworks. The same analysis, in preliminary phase, is conducted considering the plant in a trigeneration asset with the use of an absorption chiller fed with the hot water produced by the plant itself.



Anno Accademico 2016/2017