



Feasibility assessment of geothermal pellet production from agricultural residues in medium-sized municipality in north Greece



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Abstract

Municipalities hold a key role in the transition towards low carbon economy. Biomass is considered as the most common RES that is widely available. However, it is accompanied by exploitation disadvantages such as low energy content, high dispersion, high moisture content and heterogeneity. Biomass pellets have gained considerable interest due to the increased quality of fuel, their use in highly automated heating systems and their wide application range. The utilization of residual biomass from the agricultural and the agro-industrial sector does not face environmental issues, as well as other issues related to competitive uses of biomass.

This paper investigates the techno-economic feasibility of pellet production from agricultural residues in Municipality of Alexandroupolis (MoA), utilizing low-enthalpy geothermal energy. The biomass potential from agricultural residues has been calculated and assessed and proved to be a challenging process that entails significant assumptions due to lack of available data. A drying system utilizing the locally available low enthalpy geothermal energy is proposed and results in significant costs reduction. A geothermal pellet production unit of 1,2 t/h covers the heating needs of 50 municipal buildings and results in 1.392 tCO₂/y reduction. The pellet production cost breakdown highlights the significant importance of the raw materials (31%), as well as the pelletizing process (13%). A sensitivity analysis has been performed pinpointing the importance of maintenance and personnel costs, as well as raw material costs. The study concludes in financial sustainability of the pellet production unit, with IRR over 10% and payback period at 8,2 years.

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