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Heat pipe based waste treatment system for biomass production from municipal waste

Waste management is one of the most crucial challenges that developed countries are currently facing. The environmental, economic and social effects of current waste treatments prove their inefficiency. Currently, domestic waste must be transported and disposed of in landfills or be burned in mass incinerators. Pyrolysis is a thermal treatment designed to recover energy, which can also contribute to reduce the biodegradable waste volume of landfills. However, current pyrolysis systems cannot cope efficiently enough with the changing heat transfer from the heated walls to the materials and they require the development of very high temperatures on the chamber walls to overcome the thermal resistance within the reactor. Methodology & Theoretical Orientation: An innovative pyrolysis system is introduced. The heat pipe based waste treatment for the Home Energy Recovery Unit (HERU) does not involve any pre-treatment of the waste stream. The HERU achieves high uniformity of the heat distribution within the chamber and high energy recovery. After the waste treatment the waste heat from the pyrolysis process is used to warm up water to cover domestic hot water demands. Findings: The COP of the HERU system can reach up to 9.4, while the carbon footprint of the unit was between 0.0782 to 0.3873 kgCO₂e per kg of treated waste. Conclusion & Significance: The HERU provides a green solution to the disposal of waste streams and at the same time a sustainable, renewable solution to power generation. Its implementation could reduce greenhouse gas emissions, diminish the biodegradable content of residual waste sent to landfill, generate fuels and help the government to achieve low emission levels.

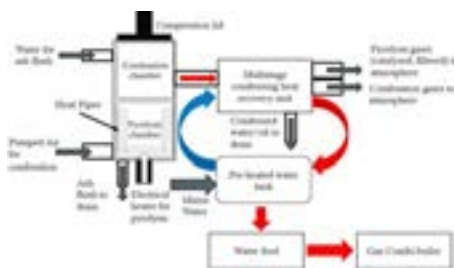


Figure 1: HERU system configuration

Biography

Dr Hussam Jouhara worked in academia and the industry, Hussam has unique expertise in working on applied heat exchangers and energy-related research activities with direct support from research councils and various UK and international industrial partners. He has extensive expertise in designing and manufacturing various types of heat exchangers, including heat pipes and heat pipe-based heat exchangers for low, medium and high temperature applications. His work in the field of heat pipe based heat exchangers resulted in novel designs for recuperators, steam generators & condensers and flat heat pipes. His latest invention relates to a new Waste to Energy system that converts municipal waste to fuel that can be used to heat our homes.

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