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Integration of a municipal solid waste gasification plant with solid oxide fuel cell and gas turbine

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Climate change, security of supply and depletion of fossil fuels have become increasingly well-known issues, and the combination of these three have caused worldwide attention on finding pathways of sustainable energy systems. The primary aim of present study is to investigate innovative power plant solutions that might allow the use of energy sources in a sustainable way and with greater thermodynamic performance than conventional technologies. An interesting source of producing energy with low pollutants emission and reduced environmental impact are the biomasses; particularly using Municipal Solid Waste (MSW) as fuel, can be a competitive solution not only to produce energy with negligible costs but also to decrease the storage in landfills. A Municipal Solid Waste Gasification Plant Integrated with Solid Oxide Fuel Cell (SOFC) and gas turbine has been studied and the plant is called Integrated Gasification SOFC and GT. Gasification plant is fed by MSW to produce syngas to be fed the anode side of a SOFC wherein it reacts with air and produces electricity. The exhausted gases out of the SOFC enter a burner for further fuel combusting and finally the off-gases are sent to a gas turbine to produce additional electricity. Thermodynamic and thermoeconomic of different plant configurations have been studied and the best layout was one found to be a regenerative gas turbine. Under optimized condition, the thermodynamic efficiency of 52% is achieved. Variations of the most critical parameters have been studied and analyzed to evaluate plant features and find out an optimized configuration.

Biography

Masoud Rokni completed his BSc and MSC from Lund University in Sweden wherein has also accomplished his Doctoral thesis as well as Docent degree. At 2003 he joined Wärtsilä Corporation in Finland on designing and building SOFC systems for power generation, first as specialist and then as system manager. He has published more than 100 papers in well-known peer reviewed journals and peer reviewed international conferences. He has supervised many Ph.D. students as well as master students. He is also teaching master courses Heat Transfer, Advanced Power Plants and Energy Systems besides several Ph.D. courses.

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