Accepted Manuscript

Demand Modelling in District Heating Systems within the Conceptual Design of a Waste-to-Energy Plant

Ondřej Putna, František Janošťák, Radovan Šomplák, Martin Pavlas

PII: S0360-5442(18)31591-3

DOI: 10.1016/j.energy.2018.08.059

Reference: EGY 13535

To appear in: Energy

- Received Date: 28 February 2018
- Accepted Date: 07 August 2018

Please cite this article as: Ondřej Putna, František Janošťák, Radovan Šomplák, Martin Pavlas, Demand Modelling in District Heating Systems within the Conceptual Design of a Waste-to-Energy Plant, *Energy* (2018), doi: 10.1016/j.energy.2018.08.059

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Demand Modelling in District Heating Systems within the Conceptual Design of a Waste-to-Energy Plant

- Ondřej Putna*, František Janošťák, Radovan Šomplák, Martin Pavlas 3 Institute of Process Engineering, Faculty of Mechanical Engineering, Brno University of 4 Technology (BUT), Technická 2896/2, 616 69 Brno, Czech Republic 5 6 ondrej.putna@vutbr.cz The paper deals with the issue of fluctuations in heat demand and how they are dealt with when 7 planning investments in the field of energy recovery of waste. The lifetime of Waste to Energy plants 8 (WtEP) is typically 20-30 years. Their construction is also a time and investment-intensive business 9 10 and requires a robust design with low sensitivity to future changes in key parameters. 11 The paper analyses the effect of fluctuations in heat demand on the accuracy of techno-economic models and their outputs. The aim is to determine the sensitivity of optimisation models to the applied 12 13 time step. The sensitivity of two different models is compared - a simple model of a WtEP cooperating with a gas boiler and a complex model of a WtEP integrated with a combined heat and 14 power plant. 15 Optimisation models, commonly used to design these facilities, perform calculations in certain time 16 17 steps, typically on an annual or monthly basis. The simplification from hour to month time step may cause inaccuracies. The paper offers alternative solutions to modelling methods of WtEP, using so-18 called correction coefficients. They help to increase the accuracy of the models while maintaining 19 20 acceptable calculation time. 21 22 Highlights Tracking short-term changes to important parameters for the WtE plant economy. 23 • Modelling the operation of an existing and newly considered thermal facility. 24 25 • Creating and applying correction coefficients for fluctuation parameters. 26 Keywords: Waste; Waste-to-Energy Plant; Cogeneration; Heat demand; Operation planning 27 28 29 Abbreviations 30 WtEP capacity [kt/y] 31 С amount of waste entering the boiler in the WtEP [t/h] 32 С D, D^{s}, D^{w} 33 total heat demand, demand for heat in form of steam, hot water [TJ] $d_{d}d^{s}_{d}d^{t}$ 34 average total heat demand, demand for heat in form of steam, hot water [GJ/h] 35 P_{max.min} maximum, minimum heat output of the WtEP [TJ] heat energy supplied from the WtEP, gas boiler [GJ/h] 36 *q*_{WtEP, GB,CHPP}
- 37 Q_{WtEP, GB,CHPP} heat energy supplied from the WtEP, gas boiler [TJ]
 38 R ratio of average monthly heat demand and maximum heat output of the plant [-]
 39 r dissipated heat [GJ/h]

Download English Version:

https://daneshyari.com/en/article/10136348

Download Persian Version:

https://daneshyari.com/article/10136348

Daneshyari.com