The Method of Determining the Radius of Techno-economic Feasibility of Waste Heat for the Planning of the District Heating System

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Abstract

The heating sector is one of the most energy-intensive sectors, accounting for almost 50% of final energy consumption at the level of the European Union. Looking at where that energy comes from, it is noticeable that almost 70% of that energy comes from fossil fuels. In this context, the question arises as to how this dependence on fossil fuels can be reduced, and one of the answers to that question is the utilization of waste heat, not only from industry but also from urban heat sources. Urban heat sources such as the refrigeration system of supermarkets, cooling systems of supermarkets and shopping malls, data centres, and power substations are well known and recognized as systems that can be a reliable source of heat for the district heating system, but what represents a difficulty is their spatial dispersion and therefore spatial planning a district heating system is more demanding and requires considering many factors. In this paper, a methodology is offered that systematically helps in planning the integration of urban heat sources in district heating systems, considering several criteria. The criteria can be divided into criteria characteristic of heat sources: heat source temperature, waste heat potential, and criteria characteristic of the district heating system: temperature regime of the heat network, heat demand, and plot ratio. The main outcome of the paper is to determine the radius of techno-economic feasibility of waste heat, , at different temperature regimes of the district heating network (high-, medium-, low-, and neutral-temperature regimes), different heat demands (environments with the low and high demand), and different plot ratios (high and low population environments). The method has been implemented and tested in the case of the City of Zagreb.