



DOCTORAL RESEARCH TOPIC:

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Research on the integration of waste heat from supermarkets into district heating systems

RESEARCH FIELD:

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Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

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Energy efficiency is one of the EU's key long-term strategic objectives in the energy sector. At EU level, the heating and cooling sector is the most important end-use energy sector, consuming around 50% of the EU's total energy demand. The EU Heating and Cooling Strategy promotes the use of district heating and cooling (DHC) systems to mitigate the climate change impacts of energy infrastructure. The sector is also set to increase the use of waste heat, as it promotes the diversification of heat production methods and the high potential of waste heat. Such integration would reduce fossil fuel dependency problems while being consistent with the principles of the circular economy. Waste heat from supermarkets is currently not collected in Lithuania, but there are already examples in other European countries. Therefore, there is an increased need to „employ“ waste heat in order to increase energy efficiency and enhance energy security, which would at the same time contribute to the EU's objectives.

The efficient use of waste heat from supermarkets requires a systematic approach, covering technological, economic and infrastructural aspects. Although supermarkets generate a large amount of waste heat, there is a lack of studies, methodologies providing technological solutions for collecting low temperature heat and transforming it into usable heat for DH systems, and research on the efficiency of the equipment used is becoming necessary. The problem of inconsistency in the flow and supply of waste heat, which depends on the season, time of day and energy demand, must also be addressed. This calls for the development of an integrated technological and economic model that allows for the efficient and economical use of waste heat from supermarkets in DH systems.

**The aim is** to develop and verify a technological and economic model to assess the use of waste heat from supermarkets in district heating systems.

The following tasks will be addressed in the theme:

- To analyse the current waste heat potential of supermarkets in the EU by determining how much heat is generated in a given temperature range and to review the current scientific methodologies used in this field.
- Analyse existing technologies that can efficiently capture and convert low temperature heat from supermarkets (heat pumps, heat exchangers). Develop a model to analyse their performance.
- Develop a dynamic model that includes the integration of waste heat into the DH system. This would include the identification of technical requirements, possible needs for the modernisation of the DH system, control of the heat flow rates, seasonal variations in demand.
- Developing a technical, economic model to assess investment and cost projections, potential prices, and the cost-effectiveness of different scenarios.

- Evaluate the application of the developed model and methodology to several supermarkets.

A model for the use of waste heat from supermarkets in DH systems will be developed and verified, allowing such systems to be modelled, analysed in terms of technical and economic criteria, which would contribute to the wider use of low-temperature heat sources and promote the transition of cities towards sustainable energy supply solutions.

SCIENTIFIC SUPERVISOR:

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