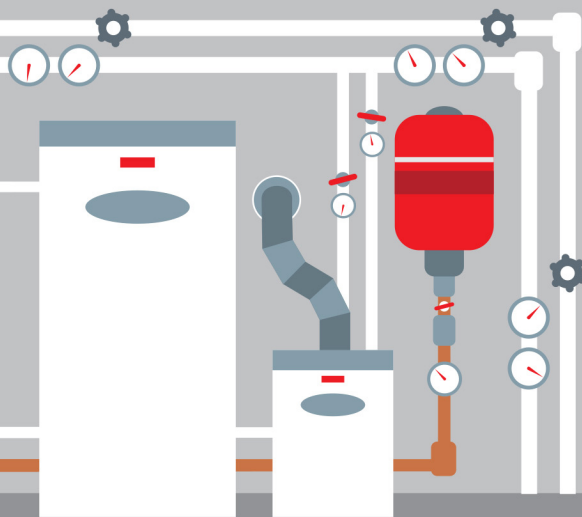


ELECTRICAL ENGINEERING DEVELOPMENTS

Heating Systems

Design, Applications and Technology



Elias Moore
Editor

NOVA

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HEATING SYSTEMS

DESIGN, APPLICATIONS AND TECHNOLOGY

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ELIAS MOORE

EDITOR



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CONTENTS

Preface		vii
Chapter 1	Decarbonising Heating Systems: The Role of Low Temperature District Heating <i>Kapil Narula</i>	1
Chapter 2	Residential Heating System Selection Using MCDM Techniques <i>Yavuz Ozdemir and Sahika Ozdemir</i>	33
Chapter 3	Designing a Logistics System to Ensure Efficient Distribution of LPG Energy <i>Yavuz Ozdemir</i>	65
Chapter 4	Skin-Systems for Heating Extra-Long Pipelines <i>Michail Strupinskiy and Nikolay Khrenkov</i>	95
Index		113

PREFACE

Heating Systems: Design, Applications and Technology first discusses the development of different types of district heating systems, highlighting the main features of low temperature district heating and discussing its potential for supplying decarbonised heat.

As buildings consume about 40% of the world's annual energy consumption globally, the authors focus on the evaluation of residential heating system alternatives using fuzzy numbers. Multi-criteria decision making techniques, fuzzy AHP and fuzzy ANP methods are used for evaluation and the results of both algorithms are compared.

Research is presented which is aimed at designing a logistics system for X Gas Company to ensure efficient distribution of liquefied petroleum gas, which begins with the ordering process and ends with the placement of stations in Istanbul-Turkey, taking into account the storage, preparation, loading and delivery operations of X Gas Company.

In closing, three types of electro heating skin-systems are presented and the main features of skin heating systems are considered. The advantages of these systems for heating extra-long pipelines transporting oil, gas, water and other liquids are explored.

Chapter 1 - It is estimated that heating and cooling contribute to approximately half of the global final energy demand. This is likely to increase in the future due to increase in urbanisation and climate

conditioned buildings. Boilers using coal, oil and natural gas contribute to the majority of heat supply which results in large GHG emissions. It is therefore essential that heating (and cooling) supply is decarbonised in a carbon constrained world. District heating (DH) system is an effective way of supplying heat in cities having areas with high heat demand density. This chapter examines the role of low temperature district heating (LTDH) in decarbonising heating systems. It presents an overview of the heating demand and supply and emphasises the need for decarbonising heating systems in the background of recent global commitments to mitigate climate change. The chapter discusses the development of different types of DH systems. It highlights the main features of a LTDH and discusses its potential for supplying decarbonised heat. The main advantages of LTDH over existing DH systems are explained which include lower heat losses, higher exergy efficiency, better utilisation of low temperature sources and higher system efficiency. Due to its multiple advantages, LTDH can contribute significantly in decarbonising the heating sector. The impact of lowering supply temperature in a DH system is quantified using a simulation. A small DH system with 50 households where heat is supplied by a centralised heat pump is simulated. The results of the simulation show that there is a reduction in energy consumption and peak electricity load as the temperature of the DH system is reduced. The impact of lower temperature on exergy efficiency of the DH system is also shown. The chapter identifies the main challenges and discusses some solutions for lowering the temperatures in existing DH systems. Some of the possible ways of implementation of LTDH are discussed followed by examples of LTDH across the world. The chapter concludes that LTDH can play an important role in decarbonising DH systems in the future.

Chapter 2 - Using energy effectively is one of the most important issues and problems that countries should take up. As a parallel of increasing energy demands worldwide and still mostly using fossil fuels, energy saving issues have gained much importance in recent years for all areas of life. It is a fact that construction is also an important role in the emergence of the energy and environmental problem that we see as the problem of our centenary. As buildings consume about 40% of the world's

annual energy consumption globally, this study will focus on the evaluation of residential heating system alternatives using fuzzy numbers. Multi-Criteria Decision Making (MCDM) techniques, fuzzy AHP and fuzzy ANP methods are used for evaluation and the results of both algorithms are compared. The main contribution of this paper is to select residential heating system alternatives using numerical methods with experts' view.

Chapter 3 - LPG (liquefied petroleum gas) is a fuel-efficient, high-heat valuable and scarce resource. This research is aimed at designing a logistics system for X Gas Company to ensure efficient distribution of LPG, which begins with the ordering process and ends with the placement of stations in Istanbul-Turkey, taking into account the storage, preparation, loading and delivery operations of X Gas Company. Because gas as energy is a scarce resource, the primary performance indicators are distribution, time, cost, and stocklessness. Thus, the ultimate goal is to increase retailer and consumer satisfaction. The aim of this study is to develop a systematic approach using engineering tools and optimization software. One of the biggest problems in this study is the "Vehicle Routing Problem". The optimal route was found using an optimization software for the Vehicle Routing Problem and the routing costs were reduced. After the design of the routing system, a decision support system has been submitted in order to respond to future changes related to the current system. Finally, the designed program was run for different scenarios and the results were analyzed. In light of these studies, it has been proven that a high amount of saving improvement is possible within the current system.

Chapter 4 - Three types of electro heating skin-systems are presented in the article. The main features of skin heating systems are considered. The advantages of these systems for heating extra-long pipelines transporting oil, gas, water and other liquids are shown.