

Preface

Electroheat is the technology of converting electrical energy into heat, mostly in industrial applications.

Electroheat technologies have greatly contributed to the industrial development during the twentieth century. In fact, the first applications date back to the early decades of that century, regarding arc furnaces for manufacture of calcium carbide and electric steel melting and, later on, induction and resistance furnaces. But the development became particularly rapid, in terms of both applications and research, especially in the last 50 years.

In particular, the continuous increase of energy and labor costs has further increased the importance of these technologies making them play a crucial role in the industrial activity of all industrial countries.

Due to the variety of applications, in the past each technology was considered a single independent engineering discipline which was often known only within its own field of application and therefore in a small circle of users.

In reality, the characteristics of all electroheating applications in production processes arise from their common origin, i.e., the transformation of electrical energy into heat, and soon it appeared more appropriate to treat them as a homogeneous topic. Such opportunity emerged progressively in the last 50 years with the increase of applications in the industry of traditional electroheat techniques and the introduction of new technological processes [1–7].

This book is intended as a basic teaching text for students and teachers dealing with industrial applications of electroheat. It is based on a series of lectures given by the author and his colleagues for many years at the engineering faculty of Padua University in courses for electrical engineering, material science engineering, and chemical engineering. It is hoped that it will also be useful to industrialists, engineers, scientists, and technicians who are more generally interested in industrial applications, efficiency of heating processes, and energy saving.

This book is subdivided into two introductory chapters dealing with heat transfer and electromagnetic phenomena in electrotechnologies and five chapters where the traditional most widespread industrial electroheat technologies are presented.

With this subdivision, this textbook may be useful to different teachers either adopting it as reference text for a basic comprehensive teaching program, or for organizing shorter courses at undergraduate or higher technicians level by selecting the topics of their interest.

Since the field of electroheat is extremely wide, taking into account the necessity of limiting the extent of a general basic course, some highly specialized technologies, such as laser, plasma, electron beam, heat pumps, infrared heating, and others have been omitted and the reader must address to specialized books and papers.

Special thanks are due to Prof. A. Aliferov and his colleagues of the State Technical University NGTU of Novosibirsk for their contribution on the chapter on Submerged Arc Furnaces, to my colleague Prof. M. Forzan who read and made numerous useful comments on parts of the manuscript, and to Mr. L. Fauliri for his assistance in preparation of drawings and figures.

Finally, my greatest thank goes to my wife who patiently supported me during the many hours I devoted to the preparation of this volume, often infringing upon or restricting planned family activities.

In our familiar slang: *“Grazie Pippuni!”*

Basic Electroheat Books

1. UIE—International Union for Electro-heat: History of Electroheat, Vulkan-Verlag GmbH, Essen, Germany, 202 p. (1968), ISBN 978-3-8027-2946-1
2. Lauster, F. (ed.): Manuel d'Électrothermie industrielle, 315 p. Dunod, Paris (1968) (in French)
3. U.I.E. (International Union for Electroheat): Elektrowärme - Theorie und Praxis. In: Girardet, E. (ed.) Verlag W, 902 p., ISBN 3-7736-0355-X (1974) (in German)
4. Orfeuill, M. (ed.): Electrothermie industrielle, 803 p., ISBN 2-04-012179-X. Dunod, Paris (1981) (in French)
5. Barber, H. (ed.): Electroheat. Granada, London, 308 p. (1983)
6. Mühlbauer, A. (Herausgeber) (ed.): Industrielle Elektrowärme-technik, 400 pp., ISBN 3-8027-2903-X. Vulkan-Verlag Essen (1992) (in German)
7. Metaxas, A.C. (ed.): Foundations of Electroheat—A Unified Approach, 500 p., ISBN 0-471-95644-9. Wiley (1996)

Padua, Italy
July 2016

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Fundamentals of Electroheat

Electrical Technologies for Process Heating

Lupi, S.

2017, XVII, 620 p. 446 illus., 18 illus. in color.,

Hardcover

ISBN: 978-3-319-46014-7