Preface to the Second Edition

The efforts of the developers of innovations for EAFs have intensified significantly in the last several years. This was caused by tightening of economic and environmental requirements to steelmaking. Development of new processes and new types of the furnaces was a way to meet this challenge. 400 ton capacity furnaces with the 240–300 MVA transformers have been developed and implemented. Productivity of these furnaces exceeds 360 t/h. Even on 120-t EAFs productivity level has reached over 200 t/h. A new promising process namely continuous melting of scrap in liquid metal has been implemented not only in the conveyor furnaces (Consteel furnaces), but in the shaft furnaces as well. New methods of scrap charging in the shaft furnaces have been developed which have great technological and environmental advantages. Consteel furnaces started using not only the heat of off-gases for scrap preheating but the burners as well.

The absence of the unbiased comparative analysis of new furnaces and technological processes makes difficult choosing between them, since the advantages of innovations are advertised, whereas the deficiencies are concealed. Potential users of the abovementioned innovations really need such analysis. The authors' works regarding these important issues were not yet finished by the time of the first edition of this book. That is why the second edition became a necessity.

The promising process of continuous melting of scrap in liquid metal, its advantages, and limiting factors are reviewed in detail in the Chaps. 1, 6, and 7 of the second edition. The performance indices of the conveyor and shaft furnaces using this process as well as heating of scrap by off-gases are compared to those of the modern EAFs operating without scrap preheating. The root causes of low energy effectiveness of heating of scrap by off-gases are discussed, and rationale for turning away from such heating is given.

Developed by the authors design concepts of fuel-arc furnaces (FAF) with continuous scrap melting and its preheating up to 800 °C by powerful oxy-gas burners either on a conveyor or in a shaft are suggested. In FAF, electric energy consumption is reduced to 200 kWh/t with gas flow rate of 20 m^3/t. Such furnaces can successfully compete with the most advanced modern EAFs and replace them. In the new edition, the latest innovations and other up-to-date information are added to the Chaps. 1, 10, and 14, etc.

The authors express their gratitude to the readers who gave their feedback. All their observations and considerations are taken into account in the second edition of the book. The authors thank Ch. Baumann and I. Falkovich for their help and cooperation. Our special gratitude goes to G. Toulouevskaia for the great work she did for preparing of this publication.

The Authors

Preface to the First Edition

Selection of innovations for each plant as well as selection of directions of further development is one of the crucial problems both for the developers and for the producers of steel in EAF. Ineffective selection leads to heavy financial losses and waste of time. In practice, this happens quite frequently.

The main objective of this book is to help the readers avoid mistakes in selecting innovations and facilitate successful implementation of the selected innovations. The entire content of the book is aimed at achieving this objective. This book contains the critical analysis of the main issues related to the most widespread innovations in EAF. The simplified methods of calculations are used for quantitative assessment of innovations. These methods are explained by numerous examples. Considerable attention is given to the new directions of development which the authors consider to be the most promising.

In the process of writing of the book, its content was discussed with many specialists working at metallurgical plants and for scientific research and development organizations. The authors express deep gratitude for their valuable observations and considerations.

A number of the important issues covered in the book are debatable. The authors would like to thank in advance those readers who will consider it possible to take the time to share their observations. Their input will be really appreciated and taken into account in further work.

Our heartfelt thanks go to G. Toulouevskaia for her extensive work on preparation of the manuscript for publication.

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