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Book Review

The John Zink Hamworthy Combustion Handbook, 2nd edition, Volume 1: Fundamentals, edited by Charles E. Baukal, Jr., CRC Press, Boca Raton, FL, 2013.

The information on combustion technology is still not completely explored for each and every aspect of the combustion process. Industrial applications of the combustion process suffer from many challenges. Oil refining, power generation, and chemical process industries have stringent controls for air pollutant emissions resulting from the combustion process, and have been facing environmental and fuel-consumption issues in addition to the costs, that need to be addressed. The complete determination of these components requires the understanding of the combustion process. These include the fundamental concepts and detailed information on heat transfer, burners, kinetics, and the complex reactions that occur during the process.

This book is an expansion of its first edition with numerous improvements and unique modifications. More emphasis is given to practical industrial applications of combustion processes in this book. Color illustrations, photographs, and data compilation in the form of tables and graphs make it easy to understand for the reader. Tabular comparisons of different properties are very useful at many places, such as a good tabular comparison of thermal properties of different gases represented in Table 7.3.

The compilation of chapters covers the dispersed literature on combustion and related areas. The chapters on fundamentals of turbulent flow, heat transfer, etc., and applications of equipment design, including discussions of new trends in burner design, make the important link between theory and industrial relevance. In particular, the example of furnaces used by different industries discussed in chapter 2 is valuable. Chapter 3, 4, and 5 provide thorough introduction to basic concepts and are well linked to combustion processes.

A few shortcomings of the chapters are the need for more references in chapter 6 and the need for more industrial examples to support the discussion in chapter 7. The latter chapter could have also benefited from an appendix showing the nomenclature and Greek symbols used in the chapter. Chapter 9 covers a broad amount of territory and could have been simplified. On page 466, molybdenum oxide is represented as MnO_2 , which is manganese oxide.

The book covers the essentials of various types of burners, flares, and thermal oxidizers (incinerators). It also covers the combustion process,

environmental issues, controls, mathematical modeling, testing, troubleshooting, and maintenance. In-depth fundamentals on the important aspects such as computational fluid dynamics, pollution emissions, etc., are worth discussing. It compiles valuable information relating to gas burner design and operation and basic heat transfer.

Rapid developments in the combustion processes and increased demand for clean burner systems are making this book of unique importance to readers willing to understand the fundamental concepts. The authors have put together comprehensive references on the design and applications of industrial burners. In addition to a solid introduction to combustion and burner fundamentals, the authors explore a range of topics never before adequately covered in a handbook, including noise, burner controls, and emissions.

This book presents greater coverage of pollution emissions and general NO_x reduction techniques. Technologies to lower NO_x emissions and alternative approaches are very well documented. The comprehensive data and extensive series of tests to study the effect of fuel composition on NO_x emission are wonderful additions.

Demands on various safety aspects associated with combustion processes create tremendous challenges for engineers. Emphasis has also been given to the diagnostics, testing, training, and safety procedures included during operations that shed new light on addressing these problems. Control over pollution formation and different heat control levels and noise control levels are also discussed. This handbook gives an excellent overview of the most important theoretical and technical aspects and provides valuable information for industrial engineers, operators, researchers, and students.

A little more coverage on the type of equipment and material of construction used for burners that are compatible with temperature and design could have been beneficial to readers. More examples of industries using burners or eductor types and their comparison for specific industrial processes could also have been added.

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