

Preface

This book was conceived and designed to be a contribution to bridge the gap between Second Law of Thermodynamics derived concepts and their application to engineering practice by means of using the property exergy and the exergy balance as a tool for analyzing and improving the performance of energy conversion processes.

With the exergy analysis, it is possible to evaluate the performance of energy conversion processes not only on a thermodynamics basis but also by including economic and environmental aspects and impacts of the studied processes. This comprehensive approach of the energy resources utilization has, as one of the most important features, the identification of sustainable ways of energy resources utilization.

This idea has been deepened and improved during my graduate course on Exergy and Thermoeconomic Analysis, offered at the Mechanical Engineering Department of the Polytechnic School of the University of São Paulo since 1992, and some Efficiency Energy Use in Industrial Processes courses taught to engineers in the last 15 years.

Based on a detailed presentation of the fundamentals of the exergy concept, its calculation, graphical representations, and exergy balances evaluation, the book contains eight chapters dedicated to describe the application of detailed exergy and thermoeconomic analysis to power plants and polygeneration systems, petroleum production and refining plants, chemical plants, biofuel production routes, combined production of ethanol and electricity, aircraft systems design, environmental impact mitigation processes, and human body behavior. The presented case studies, developed by the author and his co-workers, aim at providing engineers with guidelines to the utilization of the exergy and thermoeconomic analysis to model, simulate, and optimize real processes and industrial plants.

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