

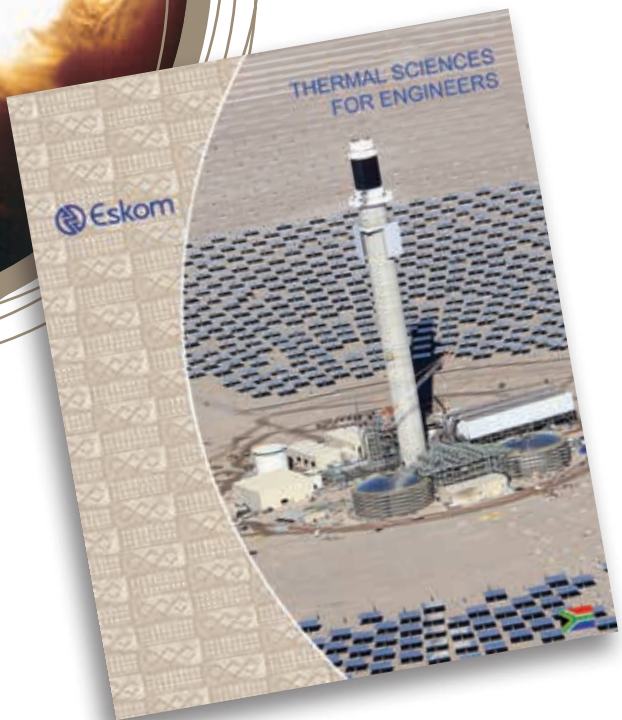
Eskom Power Series

Volume 11

Thermal Sciences for Engineers

Who should read this book?

The book will serve as a refresher to the engineer who has been out of touch with the subject of thermal sciences for a while, and as a learning tool to the trainee engineer.



What does this book cover?

Thermal science is a ternary subject that comprises thermodynamics, fluid mechanics and heat transfer. Noting that thermodynamics is energy transformation, fluid mechanics is energy transportation, and heat transfer is movement of energy due to temperature differences, it is easy to see that in almost all engineering applications these three sciences occur simultaneously. The biggest shortcoming faced by engineers is to treat each subject separately without seeing how they interact.

The key objective of Thermal Sciences for Engineers (Volume 11 in the Eskom Power Series) is to present the three key disciplines that influence the technical part of the generating and new build businesses. More importantly, the application of the essential theory to operating plant and new designs is discussed using language familiar to Eskom engineers. To an extent, examples are provided where engineering judgement is needed and guidelines to resolve such incidents are provided.

Applications of thermal sciences in practice, where energy transformation, transportation and heat transfer occur are presented under the topic, field applications. Examples include the development of a theory that could be used to cast better quality turbine blades; wind turbine technology; the development of the Betz limit (likened to the Carnot efficiency) together with the analysis of wind data; and finally the use of atmospheric radiation to generate power in central receiver systems. In the final example, the basic equations are developed using vector theory and encoded in an Excel-based code called SOLAR (developed by the author). SOLAR is used to determine the heliostat field cosine efficiency as a function of date and time of day. A design example on the determination of the receiver wall thickness and the maximum receiver temperature is also presented.

Contents of the book:

Chapter 1:	Basic Concepts and Definitions
Chapter 2:	Thermodynamics
Chapter 3:	The Working Fluid
Chapter 4:	Application of the First and Second Laws to the Conversion of Energy
Chapter 5:	Fluid Statics and Dynamics
Chapter 6:	Conduction Heat Transfer
Chapter 7:	Convection Heat Transfer
Chapter 8:	Solar and Atmospheric Radiation Heat Transfer
Chapter 9:	Steam Turbines
Chapter 10:	Special Topics: Field Applications

Plus an Appendix and a SOLAR CD

What other books are available?

Volume 1: The Planning, Design and Construction of Overhead Power Lines (pp 772), ISBN No. 978-0-620-33042-8

Volume 2: Fundamentals and Practice of Overhead Line Maintenance (pp 258), ISBN No. 0-620-30906-7

Volume 3: The Practical Guide to Outdoor High Voltage Insulators (pp 224), ISBN No. 0-620-31074-X

Volume 4: Inductive Instrument Transformers and Protective Applications (pp 860), ISBN No. 0-620-37865-4

Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers (pp 337), ISBN No. 978-0-620-38294-6

Volume 6 (Part 1): High Voltage Overhead Power Lines: Theoretical Calculations and Formulae for Conductor Installations (pp 349), ISBN No. 978-0-620-42834-7

Volume 6 (Part 2): High Voltage Overhead Power Lines: Theoretical Calculations and Formulae for Transmission Line Towers (pp 378), ISBN No. 978-0-620-46585-4

Volume 7: Corona in Transmission Systems: Theory, Design and Performance (pp 528), ISBN No. 978-0-620-49388-8

Volume 8: Power Quality in Electrical Power Systems: A Holistic Approach (pp 665), ISBN No. 978-0-9921781-2-3

Volume 9 (Part 1): HVDC Power Transmission: Basic Principles, Planning and Converter Technology (pp 832), ISBN No. 978-0-9921781-0-9

Volume 10: Thermodynamics for Students and Practising Engineers (pp 262), ISBN No. 978-0-992-17811-6

What books are in development?

- The Engineer's Toolkit
- HVDC Power Transmission (Part 2)
- Power Station Chemistry Book
- High Voltage Overhead Power Lines: Construction Works
- Fly Ash Properties and Utilisation Book (Parts 1 to 6)
- Insulating Fluid for the Electrical Engineering Industry
- AC Substation Design Handbook
- Coal Classification and Utilisation Book

Where can I purchase copies?

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