

## **Power Plant Engineering By P K Nag Solution Manual**

Extensively revised and updated, this new edition of a classic resource provides powerplant engineers with a full range of information from basic operations to leading-edge technologies, including steam generation, turbines and diesels, fuels and fuel handling, pollution control, plant electrical systems, and instrumentation and control. New material covers various energy resources for power generation, nuclear plant systems, hydroelectric power stations, alternative and cogeneration energy plants, and environmental controls. With over 600 drawings, diagrams, and photographs, it offers engineers and technicians the information needed to keep powerplants operating smoothly into the 21st century.

Thermal Engineering of Nuclear Power Stations: Balance-of-Plant Systems serves as a ready reference to better analyze common engineering challenges in the areas of turbine cycle analysis, thermodynamics, and heat transfer. The scope of the book is broad and comprehensive, encompassing the mechanical aspects of the entire nuclear station balance of plant from the source of the motive steam to the discharge and/or utilization of waste heat and beyond. Written for engineers in the fields of nuclear plant and thermal engineering, the book examines the daily, practical problems encountered by mechanical design, system, and maintenance engineers. It provides clear examples and solutions drawn from numerous case studies in actual, operating nuclear stations.

This historic book may have numerous typos and missing text. Purchasers can usually download a free scanned copy of the original book (without typos) from the publisher. Not indexed. Not illustrated. 1910 edition. Excerpt: ...Hc absorbed by the air in passing through the cooling device, B.T.U. per hour, is  $H_t = H_c + H_r$ . (102) Neglecting radiation and other minor losses, the heat  $H_a$  absorbed by the air must be equal to the heat given up by the circulating water, or  $H_a = H_w$ . (103) Example: Determine the quantity of air passing through the cooling tower per hour and the circulating water lost by evaporation in a power plant operating under the following conditions: Engines indicate 500 H.P. and consume 20 lbs. steam per I.H.P. hour; temperature of the injection water, discharge water and outside air, 90, 122 and 72 F., respectively; barometer 29.5; relative humidity of air entering and leaving tower 70 and 90 per cent respectively; vacuum at condenser 25 inches. Determine also the weight of water evaporated in per cent of that circulated and of the condensed steam. In the problem, These values are obtained from Steam Tables and from Air Tables (Table 58). Substitute these values in equations (96) to (103) thus: (96),  $p = 29.5 - 0.79 \times 0.7 = 28.95$ . (96a),  $p = 29.5 - 2.74 \times 0.9 = 27.03$ . (97),  $w = H \times 0.0747 \times V_0 = 0.0722 \times y_0$ . (97a),  $w = 0.001224 \times 0.7 \times V_0 = 0.000857 \times V_0$ . By assumption,  $t_2$  being 10 to 20 degrees lower than  $t_1$  (in average practice when the range  $t_2 - t_1$  is greater than 30 degrees.  $t$  Marks and Davis: the values in Table 58 are Regnault's.  $Og V = 28.95 \times 460 + 112 \times 27.03 \times 460 + 72 \times 0 = 1.152$ ; that is, each cu. ft. of dry air entering the cooling-tower is increased in volume to 1.152 cu. ft. as it leaves. (98a),  $w_2 = 0.003978 \times 0.9 \times 1.152 \times V_t = 0.004125 \times V_0$ . (98b),  $w_3 = 0.004125 \times V_0 - 0.000857 \times V_0 = 0.003268 \times V_0$ . The total heat to be abstracted from the steam (see equation (84), page 347) is  $H - 500 \times 20 (1120.1 - 122 + 32) = 10,300,000$  B.T.U. per hour. (99), But  $W (122 - 90) \dots$

An Introduction to Thermal Power Plant Engineering and Operation

Current Literature in Agricultural Engineering

Power Plants in the Industry

Accountants' Index

*Practical Power Plant Engineering offers engineers, new to the profession, a guide to the methods of practical design, equipment selection and operation of power and heavy industrial plants as practiced by experienced engineers. The author—a noted expert on the topic—draws on decades of practical experience working in a number of industries with ever-changing technologies. This comprehensive book, written in 26 chapters, covers the electrical activities from plant design, development to commissioning. It is filled with descriptive examples, brief equipment data sheets, relay protection, engineering calculations, illustrations, and common-sense engineering approaches. The book explores the most relevant topics and reviews the industry standards and established engineering practices. For example, the author leads the reader through the application of MV switchgear, MV controllers, MCCs and distribution lines in building plant power distribution systems, including calculations of interrupting duty for breakers and contactors. The text also contains useful information on the various types of concentrated and photovoltaic solar plants as well as wind farms with DFIG turbines. This important book:*

- Explains why and how to select the proper ratings for electrical equipment for specific applications
- Includes information on the critical requirements for designing power systems to meet the performance requirements
- Presents tests of the electrical equipment that prove it is built to the required standards and will meet plant-specific operating requirements

Written for both professional engineers early in their career and experienced engineers, *Practical Power Plant Engineering* is a must-have resource that offers the information needed to apply the concepts of power plant engineering in the real world.

*Fossil-fuel power plants account for the majority of worldwide power generation. Increasing global energy demands, coupled with issues of ageing and inefficient power plants, have led to new power plant construction programmes. As cheaper fossil fuel resources are exhausted and emissions criteria are tightened, utilities are turning to power plants designed with performance in mind to satisfy requirements for improved capacity, efficiency, and environmental characteristics. Advanced power plant materials, design and technology provides a comprehensive reference on the state of the art of gas-fired and coal-fired power plants, their major components and performance improvement options. Part one critically reviews advanced power plant designs which target both higher efficiency and flexible operation, including reviews of combined cycle technology and materials performance issues. Part two reviews major plant components for improved operation, including advanced membrane technology for both hydrogen (H<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>) separation, as well as flue gas handling technologies for improved emissions control of sulphur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), mercury, ash and particulates. The section concludes with coverage of high-temperature sensors, and monitoring and control technology that are essential to power plant operation and performance optimisation. Part three begins with coverage of low-rank coal upgrading and biomass resource utilisation for improved power plant fuel flexibility. Routes to improve the environmental impact are also reviewed, with chapters detailing the integration of underground coal gasification and the application of carbon dioxide (CO<sub>2</sub>) capture and storage. Finally, improved generation performance is reviewed with coverage of syngas and hydrogen (H<sub>2</sub>) production from fossil-fuel feedstocks. With its distinguished international team of contributors, *Advanced power plant materials, design and technology* is a standard reference for all power plant engineers and operators, as well as to academics and researchers in this field. Provides a comprehensive reference on the state-of-the-art gas-fired and coal-fired power plants, their major components and performance improvement options Examines major plant components for improved operation as well as flue gas handling technologies for improved emissions control Routes to improve environmental impact are discussed with chapters detailing the integration of underground coal gasification*

*Completely revised and updated, this tenth edition of a bestseller covers both management and technical strategies for slashing energy costs by as much as 40 percent in industrial facilities. It discusses cogeneration, gas distributed generation technologies, steam system*

optimization, geothermal heat pumps, energy outsourcing, electricity purchasing strategies, and power quality case studies. It also provides guidelines for life cycle costing, electrical system optimization, lighting and HVAC system efficiency improvement, mechanical and process system performance, building energy loss reduction, financing energy projects, and more.

*Agricultural Engineering, Current Literature Proceedings*

*Problems in Thermodynamics and Steam Power Plant Engineering*

*A Bibliography of Accounting Literature. Supplement*

This book makes intelligible the wide range of electricity generating technologies available today, as well as some closely allied technologies such as energy storage. The book opens by setting the many power generation technologies in the context of global energy consumption, the development of the electricity generation industry and the economics involved in this sector. A series of chapters are each devoted to assessing the environmental and economic impact of a single technology, including conventional technologies, nuclear and renewable (such as solar, wind and hydropower). The technologies are presented in an easily digestible form. Different power generation technologies have different greenhouse gas emissions and the link between greenhouse gases and global warming is a highly topical environmental and political issue. With developed nations worldwide looking to reduce their emissions of carbon dioxide, it is becoming increasingly important to explore the effectiveness of a mix of energy generation technologies. Power Generation Technologies gives a clear, unbiased review and comparison of the different types of power generation technologies available. In the light of the Kyoto protocol and OSPAR updates, Power Generation Technologies will provide an invaluable reference text for power generation planners, facility managers, consultants, policy makers and economists, as well as students and lecturers of related Engineering courses.

- Provides a unique comparison of a wide range of power generation technologies - conventional, nuclear and renewable
- Describes the workings and environmental impact of each technology
- Evaluates the economic viability of each different power generation system

Our lives and the functioning of modern societies are intimately intertwined with electricity consumption. We owe our quality of life to electricity. However, the electricity generation industry is partly responsible for some of the most pressing challenges we currently face, including climate change and the pollution of natural environments, energy inequality, and energy insecurity. Maintaining our standard of living while addressing these problems is the ultimate challenge for the future of humanity. The objective of this book is to equip engineering and science students and professionals to tackle this task. Written by an expert with over 25 years of combined academic and industrial experience in the field, this comprehensive textbook covers both fossil fuels and renewable power generation technologies. For each topic, fundamental principles, historical backgrounds, and state-of-the-art technologies are covered. Conventional power production technologies, steam power plants, gas turbines, and combined cycle power plants are presented. For steam power plants, the historical background, thermodynamic principles, steam generators, combustion systems, emission reduction technologies, steam turbines, condensate-feedwater systems, and cooling systems are covered in separate chapters. Similarly, the historical background and thermodynamic principles of gas turbines, along with comprehensive discussions on compressors, combustors, and turbines, are presented and then followed with combined cycle power plants. The second half of the book deals with renewable energy sources, including solar photovoltaic systems, solar thermal power plants, wind turbines, ocean energy systems, and geothermal power plants. For each energy source, the available energy and its variations, historical background, operational principles, basic calculations, current and future technologies, and environmental impacts are presented. Finally, energy storage systems as required technologies to address the intermittent nature of renewable energy sources are covered. While the book has been written with the needs of undergraduate and graduate college students in mind, professionals interested in widening their understanding of the field can also benefit from it.

List of members in v. 1-10.

Powerplant Technology

**PRACTICAL BOILER OPERATION ENGINEERING AND POWER PLANT, FOURTH EDITION**

Power Plant Engineering

Advanced Power Plant Materials, Design and Technology

The fourth edition of the book is richer in contents presenting updated information on the fundamental aspects of various processes related to thermal power plants. The major thrust in the book is given on the hands-on procedure to deal with the normal and emergency situations during plant operation. Beginning from the fundamentals, the book, explores the vast concepts of boilers, steam turbines and other auxiliary systems. Following a simple text format and easy-to-grasp language, the book explicates various real-life situation-related topics involving operation, commissioning, maintenance, electrical and instrumentation of a power plant. **NEW TO THE FOURTH EDITION**

- The text now incorporates a new chapter on Environmental and Safety Aspects of Thermal Power Plants.
- New sections on Softener, Water Treatment of Supercritical Boiler, Wet Mode and Dry Mode Operation of Supercritical Boiler, Electromatic Pressure Relief Valve, Pressure Reducing and Desuperheating (PRDS) System, Orsat Apparatus, and Safety Interlocks and Auto Control Logics in Boiler have been added in related chapters.
- Several sections have been updated to provide the reader with the latest information.
- A new appendix on Important Information on Power Generation has been incorporated into the text. Dealing with all the latest coverage, the book is written to address the requirements of the undergraduate students of power plant engineering. Besides this, the text would also cater to the needs of those candidates who are preparing for Boiler Operation Engineers (BOE) Examination and the undergraduate/postgraduate students who are pursuing courses in various power training institutes. The book will also be of immense use to the students of postgraduate diploma course in thermal power plant engineering.

**KEY FEATURES**

- Covers almost all the functional areas of thermal power plants in its systematically arranged topics.
- Incorporates more than 500 self-test questions in chapter-end exercises to test the student's grasp of the fundamental concepts and BOE Examination preparation.
- Involves numerous well-labelled diagrams throughout the book leading to easy learning.
- Provides several solved numerical problems that generally arise during the functioning of thermal power plants.

This book has been specially tailored for the student of WBSCTE. It covers a wide spectrum of power generation techniques. Generating power is a complex affair. Thus, special care has been taken to present the subject matter in this book so that the students are able to comprehend this complex subject easily. **KEY FEATURES**

- Exhaustive coverage in accordance with the updated syllabus of WBSCTE
- Equal emphasis on theoretical concepts and practical applications
- Discusses latest topics in the areas of conventional and non-conventional power plants
- Discusses economics of power generation like determination of cost of power generation, plant capacity factor and plant use factor
- Every chapter has a Summary, Review questions, Solved examples and MCQs

Designed for courses in powerplant technology, powerplant engineering, and energy conversion, this text covers fossil, nuclear and renewable-energy powerplants with equal emphasis, giving students an understanding of the spectrum of power generation systems. It

is suitable as a supplement to courses in energy analysis.

Questions and Answers

Power Plant Engineering (WBSCTE)

A Text Book of Power Plant Engineering

Boiler Operation Engineering

Meant for the undergraduate course on Power Plant Engineering studied by the mechanical engineering students, this book is a comprehensive offering on the subject. It has detailed coverage on hydro-electric, diesel engine and gas turbine power plants. Plenty of solved examples, questions and illustrations make this a very student friendly text.

Power Plant Synthesis provides an integrated approach to the operation, analysis, simulation, and dimensioning of power plants for electric energy production. Fundamental concepts of energy and power, energy conversion, and power plant design are first presented, and then the operation and simulation of conventional electricity production systems are then examined. Hybrid power plants and cogeneration are covered, with operating algorithms, optimization, and dimensioning methods explained. The environmental impacts of energy sources are compared, with real-life case studies included to show the synthesis of the specific topics covered.

Power Plant Performance discusses the different procedures and practices involved in the operation of power plants. The book is divided into three parts. Part I covers general considerations such as steam cycles; the sampling, analysis, and assessment of coal; and pumping – its related terminology, types of pumps, and the determination of sizes and efficiency. Part II tackles the important measurements in power plants such as temperature and gas and water flow. Part III deals with the operation of power plant components such as the boiler, turbine, and condensers. Part IV covers related topics such as steam turbine heat consumption tests; plant-operating parameters; and the costs of outages. The text is recommended for professionals involved in the development, maintenance, and operation of power plants, especially those who would like to be familiar with Power Plant Performance

Pow Plant Engg

A Guide for Early Career Engineers

Standard Handbook of Powerplant Engineering

This book provides a reference to analysis techniques of common cooling water system problems and a historical perspective on solutions to chronic cooling water system problems, such as corrosion and biofouling. It covers best design practices for cooling water systems that are required to support the operation of all electric power plants. Plant engineers will gain better understanding of the practical issues associated with their cooling water systems and new designs or modifications of their systems should consider the actual challenges to the systems. The book is intended for graduate students and practicing engineers working in both nuclear and fossil power plants and industrial facilities that use large amounts of cooling water.

The main aim of this study is to present power plants for all fields of industry. The chapters collected in the book are contributions by invited researchers with long-standing experience in different research areas. I hope that the material presented here is understandable to a wide audience, not only energy and mechanical engineering specialists but also scientists from various disciplines. The book contains seven chapters in two sections: (1) "Power Plants

ABOUT THE BOOK: Power Plant Engineering is a fast developing Branch of mechanical Engineering & its study is essential for the successful execution & maintenance of several mechanical Engineering. Works. The author has made an earnest attempt to bring out a book on the subject which may be recognized as a complete text book in all respects. OUTSTANDING FEATURES: -All topics included in the chapters have been thoroughly described. -Every topic has been written in most logical sequence maintaining the natural flow to keep the students interested. -Topics of applications of Power plant engg. have been developed in sequence. The students would be able to get the fundamental concept about all topics included in power plant engineering upto the final year in mechanical engineering, -A large number of solved problems on different topics are included. -Numerical problems with answers, as well as theoretical questions have been included for the students to practice. -The coverage of topics in the book is based on syllabi of universities in Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Maharashtra, Punjab and West Bengal & other major universities. -Clear & simple figures have been included in each chapter for better understanding & also to enable students to draw / reproduce these in the examination easily. -In the entire book SI system of units is used. RECOMMENDATIONS: A textbook for all Engineering Branches, Competitive Examination, ICS, and AMIE Examinations

ABOUT THE AUTHOR: G.K. PATHAK M.E., Senior Faculty Member, MIT-Pune-38 & D.K. CHAVAN B.E.(Mech.) Chartered Engineer Professor In Mechanical Engg. Department M.M.M College Of Engineering Pune-52 BOOK DETAILS: ISBN : 978-81-89401-42-9 Pages: 1110 + 30 Edition: 2nd, Year -2017 Size: L-23.8 B-18.1 H-4.0 PUBLISHED BY: STANDARD BOOK HOUSE Since 1960 Unit of Rajsons Publications Pvt Ltd Regd Office: 4262/3A Ground Floor Ansari Road Daryaganj New Delhi-110002 +91 011 43551185/43551085/43751128/23250212 Retail Office : 1705-A Nai Sarak Delhi-110006 011 23265506 Website: www.standardbookhouse.com A venture of Rajsons Group of Companies

Plant Engineers and Managers Guide to Energy Conservation

For Power Plant Professionals

Power Plant Synthesis

Thermal Engineering of Nuclear Power Stations

**This Text-Cum-Reference Book Has Been Written To Meet The Manifold Requirement And Achievement Of The Students And Researchers. The Objective Of This Book Is To Discuss, Analyses And Design The Various Power Plant Systems Serving The Society At Present And Will Serve In Coming Decades India In Particular And The World In General. The Issues Related To Energy With Stress And Environment Up To Some Extent And Finally Find Ways To Implement The Outcome.Salient Features# Utilization Of Non-Conventional Energy Resources# Includes Green House Effect# Gives Latest Information S In Power Plant Engineering# Include Large Number Of Problems Of Both Indian And Foreign Universities# Rich Contents, Lucid Manner**

**Pow Plant EnggTata McGraw-Hill Education**

**This comprehensive volume provides a complete, authoritative, up-to-date reference for all aspects of power plant engineering. Coverage ranges from engineering economics to coal and limestone handling, from design processes to plant thermal heat balances. Both theory and practical applications are covered, giving engineers the information needed to plan, design, construct, upgrade, and operate power plants. Power Plant Engineering is the culmination of experience of hundreds of engineers from Black & Veatch, a leading firm in the field for more than 80 years. The authors review all major power generating technologies, giving particular emphasis to current approaches. Special features of the book include: \* More than 1000 figures and lines drawings that illustrate all aspects of the subject. \* Coverage of related components and systems in power plants such as turbine-generators, feedwater heaters, condenser, and cooling towers. \* Definitions and analyses of the features of various plant systems. \* Discussions of promising future technologies. Power Plant Engineering will be the standard reference in the professional engineer's library as the source of**

**information on steam power plant generation. In addition, the clear presentation of the material will make this book suitable for use by students preparing to enter the field.**

**Power Generation Technologies**

**Gas Turbines and Jet Propulsion**

**Balance-of-Plant Systems**

**Engineering of Power Plant and Industrial Cooling Water Systems**

*This book is intended to meet the requirements of the fresh engineers on the field to endow them with indispensable information, technical know-how to work in the power plant industries and its associated plants. The book provides a thorough understanding and the operating principles to solve the elementary and the difficult problems faced by the modern young engineers while working in the industries. This book is written on the basis of 'hands-on' experience, sound and in-depth knowledge gained by the authors during their experiences faced while working in this field. The problem generally occurs in the power plants during operation and maintenance. It has been explained in a lucid language.*

*A unique, fix-it-fast reference for boiler operators, inspectors, maintenance engineers, and technicians. Thoroughly updated to reflect the current ASME Boiler Code. Makes an ideal study aid for those taking the Boiler Operator's Exam--includes over 3,000 questions with answers, 150 solved numerical problems, and 410 helpful illustrations.*

*Coal- and gas-based power plants currently supply the largest proportion of the world's power generation capacity, and are required to operate to increasingly stringent environmental standards. Higher temperature combustion is therefore being adopted to improve plant efficiency and to maintain net power output given the energy penalty that integration of advanced emissions control systems cause. However, such operating regimes also serve to intensify degradation mechanisms within power plant systems, potentially affecting their reliability and lifespan. Power plant life management and performance improvement critically reviews the fundamental degradation mechanisms that affect conventional power plant systems and components, as well as examining the operation and maintenance approaches and advanced plant rejuvenation and retrofit options that the industry are applying to ensure overall plant performance improvement and life management. Part one initially reviews plant operation issues, including fuel flexibility, condition monitoring and performance assessment. Parts two, three and four focus on coal boiler plant, gas turbine plant, and steam boiler and turbine plant respectively, reviewing environmental degradation mechanisms affecting plant components and their mitigation via advances in materials selection and life management approaches, such as repair, refurbishment and upgrade. Finally, part five reviews issues relevant to the performance management and improvement of advanced heat exchangers and power plant welds. With its distinguished editor and international team of contributors, Power plant life management and performance improvement is an essential reference for power plant operators, industrial engineers and metallurgists, and researchers interested in this important field. Provides an overview of the improvements to plant efficiency in coal- and gas-based power plants Critically reviews the fundamental degradation mechanisms that affect conventional power plant systems and components, noting mitigation routes alongside monitoring and assessment methods Addresses plant operation issues including fuel flexibility, condition monitoring and performance assessment*

*Journal of the American Society of Mechanical Engineers*

*Power Plant Life Management and Performance Improvement*

*A Bibliography of Accounting Literature to December, 1920*

*Nuclear Power Plant Engineering*