Waste Water Engineering By B C Punmia

The steady increase in industrialization, urbanization and enormous population growth are leading to production of huge quantities of wastewaters that may frequently cause environmental hazards. This makes waste water treatment and waste water reduction very important issues. The book offers a collection of studies and findings concerning waste water treatment, minimization and reuse.
An In-Depth Guide to Water and Wastewater Engineering This authoritative volume offers comprehensive coverage of the design and construction of municipal water and wastewater facilities. The book addresses water treatment in detail, following the flow of water through the unit processes and coagulation, flocculation, softening, sedimentation, filtration, disinfection, and residuals management. Each stage of wastewater treatment--preliminary, secondary, and tertiary--is examined along with residuals management. Water and Wastewater Engineering contains more than 100 example problems, 500 end-of-chapter problems, and 300 illustrations. Safety issues and operation and maintenance procedures are also discussed in this definitive resource. Coverage includes: Intake structures and wells Chemical handling and storage Coagulation and flocculation Lime-soda and ion exchange softening Reverse osmosis and nanofiltration Sedimentation Granular and membrane filtration Disinfection and fluoridation Removal of specific constituents Drinking water plant residuals management, process selection, and integration Storage and distribution systems Wastewater collection and treatment design considerations Sanitary sewer design Headworks and preliminary treatment Primary treatment Wastewater microbiology Secondary treatment by suspended and attached growth biological processes Secondary settling, disinfection, and postaeration Tertiary treatment Wastewater plant residuals management Clean water plant process selection and integration
Sustainable Technologies for Water and Wastewater Treatment discusses relevant sustainable technologies for water and wastewater treatment pertaining to a nanoscale approach to water treatment and desalination, membrane-based technologies for water recovery and reuse, the energy and water nexus, degradation of organic pollutants, nascent technologies, bio and bio-inspired materials for water reclamation and integrated systems, and an overview of wastewater treatment plants. The book focuses on advanced topics including in situ generation of hydroxyl radicals, which can aid in the indiscriminate oxidation of any contaminant present in wastewater, making advanced oxidation processes commercially viable. Features: A comprehensive review of current and novel water and wastewater treatment technologies from a sustainability perspective All the sustainable technologies, such as desalination, wastewater treatment, advanced oxidation processes, hydrodynamic cavitation, membrane-based technologies, sonosorption, and electrospun fibers Discussion on reference materials for important research accomplishments in the area of water and environmental engineering Theoretical aspects covering principles and instrumentation A summary on sustainability, including life cycle assessment (LCA), energy balance and large-scale implementation of advanced techniques This book is aimed at professionals, graduate students, and researchers in civil, chemical, environmental engineering, and materials science.
As the global population grows and many developing countries modernize, the importance of water supply and wastewater treatment becomes a much greater factor in the welfare of nations. Clearly, in today ' s world the competition for water resources coupled with the unfortunate commingling of wastewater discharges with freshwater supplies creates additional pressure on treatment systems. Recently, researchers focus on wastewater treatment by difference methods with minimal cost and maximum efficiency. This volume of the Wastewater Engineering: Advanced Wastewater Treatment Systems is a selection of topics related to physical-chemical and biological processes with an emphasis on their industrial applications. It gives an overview of various aspects in wastewater treatments methods including topics such as biological, bioremediation, electrochemical, membrane and physical-chemical applications. Experts in the area of environmental sciences from diverse institutions worldwide have contributed to this book, which should prove to be useful to students, teachers, and researchers in the disciplines of wastewater engineering, chemical engineering, environmental engineering, and biotechnology. We gratefully acknowledge the cooperation and support of all the contributing authors.
A Textbook of Municipal Solid Waste Analysis
A-B processes: Towards Energy Self-sufficient Municipal Wastewater Treatment
Water and Wastewater Engineering
Sustainable Water Engineering
Advanced Materials and Technologies for Wastewater Treatment
Pollution of waterbodies and the environment by petroleum industry is of particular concern in Nigeria. This problem can be addressed by the application of constructed wetlands (CWs) which is a nature-based system that is simple to construct, have low operational and maintenance costs in terms of supply of energy and its periodic maintenance. The application of CWs in Nigeria for polishing of petroleum refinery wastewater is an unprecedented research. This PhD thesis focused on some specific objectives which were characterization of treated secondary refinery wastewater, design, construction, operation and monitoring of planted (T. latifolia, C. alternifolius and C. dactylon) and unplanted vertical subsurface flow, horizontal subsurface flow and hybrid CWs for the removal of suspended solids, nutrients, heavy metals, organic matter and organic pollutants. The CWs effectively treated the petroleum contaminated wastewater to effluent compliance limits. In this study, T. latifolia planted CWs had consistently higher removal efficiencies for all the measured parameters than C. alternifolius and C. dactylon planted CW systems. Therefore, in order to improve the wastewater quality discharged by Kaduna Refining and Petrochemical Company (KRPC) Nigeria, meet stringent guidelines and protect the recipient streams, installation of CWs at the effluent discharge point of KRPC is strongly recommended.
This book provides useful information about bioremediation, phytoremediation, and mycoremediation of wastewater and some aspects of the chemical wastewater treatment processes, including ion exchange, neutralization, adsorption, and disinfection. Additionally, this book elucidates and illustrates the wastewater treatment plants in terms of plant sizing, plant layout, plant design, and plant location. Cutting-edge topics include wet air oxidation of aqueous wastes, biodegradation of nitroaromatic compounds, biological treatment of sanitary landfill leachate, bacterial strains for the bioremediation of olive mill wastewater, gelation of arabinoxylans from maize wastewater, and modeling wastewater evolution.
Introductory technical guidance for civil and environmental engineers and other professional engineers and construction managers interested in domestic water treatment and wastewater collection and treatment. Here is what is discussed: 1. ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS 2. ADVANCED WASTEWATER TREATMENT 3. AREA DRAINAGE SYSTEMS 4. DOMESTIC WASTEWATER TREATMENT 5. DOMESTIC WATER DISTRIBUTION 6. DOMESTIC WATER TREATMENT 7. HYDRAULIC DESIGN DATA FOR CULVERTS 8. HYDRAULIC DESIGN OF SEWERS 9. LOW IMPACT DEVELOPMENT 10. OILY WASTEWATER COLLECTION AND TREATMENT 11. DRAINAGE PIPE STRENGTH, COVER AND BEDDING 12. PRELIMINARY WASTEWATER TREATMENT 13. PRIMARY WASTEWATER TREATMENT 14. PUMPING STATIONS FOR WATER SUPPLY SYSTEMS 15. SLUDGE HANDLING, TREATMENT AND DISPOSAL 16. SMALL FLOW WASTE TREATMENT SYSTEMS 17. TREATED WATER STORAGE 18. WASTEWATER COLLECTION AND PUMPING.
This is a book for those operating and studying biological wastewater treatment plants. It introduces the state-of-the-art in process systems analysis (modelling and simulation, monitoring and diagnosis, process control and instrumentation) and in particular its application to wastewater treatment. While the emphasis is on biological nutrient removal, there is discussion of anaerobic treatment, and the principles apply to any treatment process. For the computer literate there is also a collection of MATLAB programs and functions that are mentioned throughout the book. They will run on both the professional and student editions of MATLAB Version 5. Contents Modelling Plant Dynamics, Basic Modelling, Advanced Modelling Empirical or Black-Box Models, Experiments and Data Screening, Principles of Parameter Estimation, Fitting and Validating Models, Simulators Diagnosis Diagnosis - an Introduction, Quality Management, Model Based Diagnosis, Knowledge Based Systems Control Goals and Strategies, Disturbances Manipulated Variables, Feedback Control, Model Based Control, Batch Plant Control, Plant Wide Control, Benefit Studies Instrumentation Primary Sensors, Analysers Actuators and Controllers The Future
Onsite Wastewater Treatment and Disposal Systems

Membrane-based Hybrid Processes for Wastewater Treatment
Wastewater Engineering: Advanced Wastewater Treatment Systems
Treatment and Reutilization
Ensuring safe and plentiful supplies of potable water (both now and for future generations) and developing sustainable treatment processes for wastewater are among the world's greatest engineering challenges. However, sustainability requires investment of money, time and knowledge. Some parts of the world are already working towards this goal but many nations have neither the political will nor the resources to tackle even basic provision and sanitation. Combining theory and practice from the developing and developed worlds with high- and low-tech, high- and low-cost solutions, this book discusses fundamental and advanced aspects of water engineering and includes: water resource issues including climate change, water scarcity, economic and financial aspects requirements for sustainable water systems fundamentals of treatment and process design industrial water use and wastewater treatment sustainable effluent disposal sustainable construction principles With integrated theory, design and operation specifications for each treatment process, this book addresses the extent to which various treatment methods work in theory as well as how cost effective they are in practice. It provides a nontechnical guide on how to recover and reuse water from effluent, which is suitable for those in water resource management, environmental planning, civil and chemical engineering.
The books currently available on this subject contain some elements of physical-chemical treatment of water and wastewater but fall short of giving comprehensive and authoritative coverage. They contain some equations that are not substantiated, offering empirical data based on assumptions that are therefore difficult to comprehend. This text brings together the information previously scattered in several books and adds the knowledge from the author's lectures on wastewater engineering. Physical-Chemical Treatment of Water and Wastewater is not only descriptive but is also analytical in nature. The work covers the physical unit operations and unit processes utilized in the treatment of water and wastewater. Its organization is designed to match the major processes and its approach is mathematical. The authors stress the description and derivation of processes and process parameters in mathematical terms, which can then be generalized into diverse empirical situations. Each chapter includes design equations, definitions of symbols, a glossary of terms, and worked examples. One author is an environmental engineer and a professor for over 12 years and the other has been in the practice of environmental engineering for more than 20 years. They offer a sound analytical mathematical foundation and description of processes. Physical-Chemical Treatment of Water and Wastewater fills a niche as the only dedicated textbook in the area of physical and chemical methods, providing an analytical approach applicable to a range of empirical situations
Rules of Thumb for Water and Wastewater Engineers A unique resource that helps water engineers make quick evaluations and estimate design decisions Water and wastewater treatment are essential processes in the water economy and as such, vital to the health and success of any community. At its core, the essence of this process is converting one analysis (source water, which can come from wells, lakes, sea, wastewater or even treated wastewater) into goal water. The process is generally separated by industrial and municipal processes according to intention of the produced water. Relying on a contaminant-classified approach, Rules of Thumb for Water and Wastewater Engineers provides engineers with the necessary skills to ascertain the best methodology for a broad range of impurities in an H2O source. Within these bounds, the manual offers guidelines for important areas of management: potable water treatment, municipal wastewater treatment, industrial water treatment, and industrial wastewater treatment. As the first step to water treatment is to identify both consumers and contaminants, this program gives engineers a resource to easily reference the appropriate chapter for a given contaminant, and thereby evaluate situations quickly and estimate design decisions at a glance before a more detailed approach is taken. Rules of Thumb for Water and Wastewater Engineers readers will also find: Tools that provide quick way to evaluate a situation and make quick decisions Two chapters on removing dissolved materials, a complex topic that deserves much attention Rules of thumb developed over the course of over 20 years of experience by the author Illustrations and figures to help elucidate points made throughout the text Rules of Thumb for Water and Wastewater Engineers is a useful reference for environmental engineers, chemical engineers, municipal engineers, chemists, and industries including the paper and food industry.
Advanced Materials and Technologies for Wastewater Treatment discusses the methods and technologies of physical, chemical, biological, and thermo-catalytic treatment techniques. It includes the treatment of waste generated by municipal, agro-industry, and other industries including chemical, biomedical, pharmaceutical, textile, and other sectors. FEATURES Covers implementation of advanced water and wastewater treatment techniques, with a focus on pollutant or pathogen removal Includes qualitative and quantitative analyses Focuses on physical, chemical, and biological treatment technologies Discusses the advancements of materials and technologies applicable to both potable water and wastewater from industrial and municipal sources Explores future challenges and viable solutions This book is aimed at chemical and environmental engineers and researchers seeking a thorough treatment of innovative water treatment materials and techniques for practical applications.
Handbook of Water and Wastewater Treatment Plant Operations
Ecological Engineering for Wastewater Treatment
Fundamentals and Scale up Issues
An Introduction to Water and Wastewater Engineering
Wastewater Treatment Engineering
This book outlines the technologies and techniques used in the oil & gas industry's shift from treating produced water as a "waste stream" to an integrated water management approach. Produced water is formed underground and brought to the surface during oil & gas (O&G) production and exploration and production (E&P) operations. It is usually a complex mixture of inorganics and organics and contributes to the largest volume waste stream of O&G and E&P operations. Traditionally, produced water has been considered a waste and conventional management strategies include disposal (typically by injection into depleted wells or permitted disposal wells), recycling (direct reuse within the E&P operation) and reuse (treatment and reuse offsite for food crop irrigation, livestock watering or industrial use). The O&G industry is going through a paradigm shift where scarcity of water, economics of water management, declining oil costs, and increasing focus on environmental and ecological stewardship are shifting the focus toward integrated water management in E&P operations. Water is no longer a problem to be delegated to a third-party disposal or treatment vendor, but is becoming a cornerstone of O&G production. This is a summary of produced water characteristics, regulations and management options, produced water treatment fundamentals, and a detailed discussion of process equipment and advantages/disadvantages of currently available treatment processes. It provides a guide for selecting appropriate technologies for the desired application and points toward the optimization of current technologies and the use of combined treatment processes to meet reuse and discharge limits and critically, more stringent environmental regulations.
★ABOUT THE BOOK: An attempt has been made in this book to explain the fundamentals of Sanitary Engineering, Sewage, Lab. Testing Treatment and disposal of industrial waste water. The subject as a whole is a complicated one. But it is beloved that the basic ideas are exposed in this book, the reader will be able to have a clear idea of the subject. This book is written in Metric units. The subject-matter explained in simple and easy language assisted by-explanatory and neatly drawn sketches where necessary. This book covers the syllabi prescribed by various university of India-B.E. College Shibpur, jadavpur University, Burdman University, North Bengal University, Bombay University etc. This book will therefore be useful to students preparing for Degree, Diploma and Industrial Engineering examination or for examinations governed by various professional bodies. ★OUTSTANDING FEATURES: All the text has been explained in a simple language. This book will be useful for various branches, competitive examinations, engineering services and ICS Examinations. Number of problems have been solved in detail. Subject matter is supported by very good diagrams. The price of this book itself is a big consideration. ★RECOMMENDATIONS: A Text book is for Degree, Diploma and Industrial Engg. Students, Competitive Examination, ICS, and AMIE Examinations In S.I Units and A.I.M.E. (India) Students and Practicing Civil Engineers. ★ABOUT THE AUTHOR: Dr. M.N. Maulik B.Sc. (Cal), B.Sc. Engineering (Civil) (London) Ph.D (Ind.) Assistant Professor Civil Engineering Department Jalpaiguri Govt. Engineering College Jalpaiguri, West Bengal ★BOOK DETAILS: ISBN: 978-81-89401-38-2 Pages: 176 + 8 Edition: 12th,Year-2018 Size: 5.4 x 8.5 ★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
This text series of Water and Wastewater Engineering have been written in a time of mounting urbanisation and industrialisation and resulting stress on water and wastewater systems. Clean and ample sources of water for municipal uses are becoming harder to find and more expensive to develop. The text is comprehensive and covers all aspects of water supply, water sources, water distribution, sanitary sewerage and urban stormwater drainage. This wide coverage is helpful to engineers in their every day practice.
The principle of the conventional activated sludge (CAS) for municipal wastewater treatment is primarily based on biological oxidation by which organic matters are converted to biomass and carbon dioxide. After more than 100 years' successful application, the CAS process is receiving increasing critiques on its high energy consumption and excessive sludge generation. Currently, almost all municipal wastewater treatment plants with the CAS as a core process are being operated in an energy-negative fashion. To tackle such challenging situations, there is a need to re-examine the present wastewater treatment philosophy by developing and adopting novel process configurations and emerging technologies. The solutions going forward should rely on the ways to improve direct energy recovery from wastewater, while minimizing in-plant energy consumption. This book begins with a critical overview of the energy situation and challenges in current municipal wastewater treatment plants, showing the necessity of the paradigm shift from removal to recovery in terms of energy and resource. As such, the concept of A-B process is discussed in detail in the book. It appears that various A-B process configurations are able to provide possible engineering solutions in which A-stage is primarily designed for COD capture with the aim for direct anaerobic treatment without producing excessive biosludge, while B-stage is designated for nitrogen removal. Making the wastewater treatment energy self-sustainable is obviously of global significance and eventually may become a game changer for the global market of the municipal wastewater reclamation technology. The principal audiences include practitioners, professionals, university researchers, undergraduate and postgraduate students who are interested and specialized in municipal wastewater treatment and process design, environmental engineering, and environmental biotechnology.
Sustainable Water and Wastewater Processing
Sustainable Desalination and Water Reuse
Municipal Wastewater Treatment
Wastewater Treatment Systems
Wastewater engineering
Municipal solid waste (MSW) has become a tenacious problem, mainly due to the absence of adequate expertise and experience, thereby leading to its improper handling and management. This results in considerable environmental pollution and health hazards. Looking towards the pathetic situation of solid waste management, it can be established that the MSW has become a major challenge for the cities across the globe. A Textbook of Municipal Solid Waste Analysis covers the analysis techniques, methods, guidelines, standards, and protocols aimed at effective management and reduction of MSW. To facilitate understanding, both theoretical and practical approaches of MSW analysis are extensively covered. Contents are supplemented by questions for the readers to realize better comprehension of each chapter. The book is intended to provide students, teachers, scientists, and field practitioners with comprehensive analysis techniques and strategies for reducing MSW generation, and in applying the concept of resource recovery and waste-to-energy. A Textbook of Municipal Solid Waste Analysis would be a valuable resource not only to academic and industry professionals, engaged in treatment and analysis of MSW but also as a complete, solution-oriented enchiridion to the scientific community. Key Features: · A better understanding of MSW analysis will contribute to safe and economical MSW management. · Exhaustive collection of MSW analysis techniques and help the readers to understand experimental procedures in a concise manner. · The book addresses various MSW treatment processes involved and the parameters to be considered prior to selecting a particular process. · A must-have book in the context of both Indian and global conditions for arriving at practical solutions pertaining to MSW analysis and treatment. · Comprehensive discussion on MSW analysis methods and techniques and thus will serve as a guide and inspiration for future researches into the realm of MSW analysis. Short Contents: Preface Acknowledgements From the Experts' Desk Laboratory Safety Rules 1. Sampling and Analysis of Municipal Solid Waste 2. Physical Analysis of Municipal Solid Waste 3. Chemical Analysis of Municipal Solid Waste 4. Biological Analysis of Municipal Solid Waste 5. Identification and Selection of Municipal Solid Waste Treatment Technologies Appendices Bibliography Index About the Authors Audience: Undergraduate and Post Graduate student of environmental science and engineering courses, environmental scientists, engineers and planners, government officials and landfill operators in municipalities, planning and development authorities, pollution control boards Shelving: Environmental Science/Engineering / Civil Engineering / Chemical Engineering / Chemical Sciences / Industrial Chemistry / Chemistry
Membrane-Based Hybrid Processes for Wastewater Treatment analyzes and discusses the potential of membrane-based hybrid processes for the treatment of complex industrial wastewater, the recovery of valuable compounds, and water reutilization. In addition, recent and future trends in membrane technology are highlighted. Industrial wastewater contains a large variety of compounds, such as heavy metals, salts and nutrients, which makes its treatment challenging. Thus, the use of conventional water treatment methods is not always effective. Membrane-based hybrid processes have emerged as a promising technology to treat complex industrial wastewater. Discusses the properties, mechanisms, advantages, limitations and promising solutions of different types of membrane technologies Addresses the optimization of process parameters Describes the performance of different membranes Presents the potential of Nanotechnology to improve the treatment efficiency of wastewater treatment plants (WWTPs) Covers the application of membrane and membrane-based hybrid treatment technologies for wastewater treatment Includes forward osmosis, electrodialysis, and diffusion dialysis Considers hybrid membrane systems expanded to cover zero liquid discharge, salt recovery, and removal of trace contaminants
A thorough analysis of public policy and the Clean Water Act'seffect on water quality in the U.S. Using water quality data and historical records from the past 60years, this book presents the measured impact of the 1972 CleanWater Act on domestic waterways-ecologically, politically, andeconomically. Municipal Wastewater Treatment supports thehypothesis that the Act's regulation of wastewater treatmentprocesses at publicly owned treatment works (POTW) and industrialfacilities has achieved significant success. The authors' case ispresented in: * Background information on the history of water pollution controland water quality management * Chapters addressing long-term trends in biochemical oxygen demandloadings from municipal wastewater plants and the "worst-case"dissolved oxygen levels in waterways downstream of point sourcesbefore and after the Clean Water Act * Nine case study assessments of long-term trends of pollutantloading water quality and environmental resources associated withPOTW discharges Using long-term trends in dissolved oxygen as the key indicator ofwater quality improvements, this book provides a detailedretrospective analysis of the effectiveness of the water pollutioncontrol policies and regulations of the 1972 Clean Water Act. Thesuccesses of the Act that have been achieved over the past 30 yearsare placed in the historical context of the "Great SanitaryAwakening" of the 19th century and changes in public policies forwater supply and water pollution control that have evolved duringthe 20th century to protect public health and the intrinsic valueof aquatic resources. Case study sites include the ConnecticutRiver, Hudson-Raritan Estuary, Delaware Estuary, Potomac Estuary,Upper Chattahoochee River, Ohio River, Upper Mississippi River, andWillamette River. Complete with end-of-chapter summaries and conclusions, MunicipalWastewater Treatment: Evaluating Improvements in National WaterQuality is an essential book for engineers, scientists, regulators,and consultants involved in water quality management and wastewatertreatment, as well as students of environmental engineering,environmental science, and public policy.
Fundamentals of Wastewater Treatment and EngineeringCRC Press
Evaluating Improvements in National Water Quality
Design Manual
Waste Water Engineering
Hydrodynamic Design and Assessment of Water and Wastewater Treatment Units
Physical-Chemical Treatment of Water and Wastewater
"This manual contains overview information on treatment technologies, installation practices, and past performance."--Intro.
Water reuse management is one of the challenges all water scarce countries have to deal with in the coming decades. The present book highlights non-conventional solutions within the field of wastewater treatment and reuse predominantly for professionals and decision makers. It focuses on technologies which are reliable, sustainable, low cost and suitable for rural and sub urban areas. In addition, particularly innovative on-site concepts are presented.
As the worlds population has increased, sources of clean water have decreased, shifting the focus toward pollution reduction and control. Disposal of wastes and wastewater without treatment is no longer an option. Fundamentals of Wastewater Treatment and Engineering introduces readers to the essential concepts of wastewater treatment, as well as t
The Handbook of Water and Wastewater Treatment Plant Operations is the first thorough resource manual developed exclusively for water and wastewater plant operators. Now regarded as an industry standard, this fourth edition has been updated throughout, and explains the material in easy-to-understand language. It also provides real-world case studies and operating scenarios, as well as problem-solving practice sets for each scenario. Features: Updates the material to reflect the developments in the field Includes new math operations with solutions, as well as over 250 new sample questions Adds updated coverage of energy conservation measures with applicable case studies Enables users to properly operate water and wastewater plants and suggests troubleshooting procedures for returning a plant to optimum operation levels Prepares operators for licensure exams A complete compilation of water science, treatment information, process control procedures, problem-solving techniques, safety and health information, and administrative and technological trends, this text serves as a resource for professionals working in water and wastewater operations and operators preparing for wastewater licensure exams. It can also be used as a supplemental textbook for undergraduate and graduate students studying environmental science, water science, and environmental engineering.
Rules of Thumb for Water and Wastewater Engineers
Evolution of Sanitation and Wastewater Technologies through the Centuries
Greenhouse Gas Emissions from Ecotechnologies for Wastewater Treatment
treatment, disposal, reuse
Treatment and Reuse
Most of the technological developments relevant to water supply and wastewater date back to more than to five thousand years ago. These developments were driven by the necessity to make efficient use of natural resources, to make civilizations more resistant to destructive natural elements, and to improve the standards of life, both at public and private level. Rapid technological progress in the 20th century created a disregard for past sanitation and wastewater and stormwater technologies that were considered to be far behind the present ones. A great deal of unresolved problems in the developing world related to the wastewater management principles, such as the decentralization of the processes, the durability of the water projects, the cost effectiveness, and sustainability issues, such as protection from floods and droughts were intensified to an unprecedented degree. New problems have arisen such as the contamination of surface and groundwater. Naturally, intensification of unresolved problems has led to the reconsideration of successful past achievements. This retrospective view, based on archaeological, historical, and technical evidence, has shown two things: the similarity of physicochemical and biological principles with the present ones and the advanced level of wastewater engineering and management practices. Evolution of Sanitation and Wastewater Technologies through the Centuries presents and discusses the major achievements in the scientific fields of sanitation and hygienic water use systems throughout the millennia, and compares the water technological developments in several civilizations. It provides valuable insights into ancient wastewater and stormwater management technologies with their apparent characteristics of durability, adaptability to the environment, and sustainability. These technologies are the underpinning of modern achievements in sanitary engineering and wastewater management practices. It is the best proof that "the past is the key for the future". Evolution of Sanitation and Wastewater Technologies through the Centuries is a textbook for undergraduate and graduate courses of Water Resources, Civil Engineering, Hydraulics, Ancient History, Archaeology, Environmental Management and is also a valuable resource for all researchers in the these fields. Authors: Andreas N. Angelakis, Institute of Iraklion, Iraklion, Greece and Joan B. Rose, Michigan State University, East Lansing, MI, USA
Ecotechnologies for wastewater treatment (EWWT) have been used as a cost-effective alternative to conventional wastewater treatment methods for improving the removal of organic carbon, nutrients and pathogenic microorganisms from wastewater. However, due to biochemical transformations of organic matter and nutrients EWWT are net sources of CO2, CH4 and N2O greenhouse gases (GHGs), which may be transferred into the atmosphere contributing to global warming. Greenhouse Gas Emissions from Ecotechnologies for Wastewater Treatment provides scientific information about greenhouse gas, such as CO2, CH4 and N2O, generation and emissions from different municipal EWWT. The main EWWT considered in this book are anaerobic ponds, facultative ponds, duckweed-based ponds, and a freshwater natural wetland perturbed by anthropogenic activities such as wastewater discharge and nutrients from agricultural run-off. The book includes a full literature review of recent publications about GHGs emissions from EWWT. It also introduces the calculation of GHGs flux using a static chamber technique. Besides, the book presents information on the influence of environmental factors such as temperature, pH, DO, and nutrients on GHG emissions produced in EWWT under tropical conditions. This book will be a useful reference for researches and students interested in the broader area of water and climate change subjects. The publication may also be of interest to policy makers concerned with climate change, water sector planning, and wastewater treatment.
Sustainable Water and Wastewater Processing covers the 12 most current topics in the field of sustainable water processing, with emphasis given to water as a resource (quality, supply, distribution, and aquifer recharge). Topics covered include emerging sustainable technologies for potable and wastewater treatment, water reuse and recycling, advanced membrane processes, desalination technologies, integrated and hybrid technologies, process modeling, advanced oxidative and catalytic processes, environmentally, economically and socially sustainable technology for water treatment, industrial water treatment, reuse and recovery of materials, and emerging nanotechnology and biotechnology for water processing. Responding to the goals of sustainability requires the maximum utilization of all water resources, water processing with restricted energy costs and reduced greenhouse gas production. Following these trends, this book covers all the important aspects of sustainable water processing and support. Covers cutting-edge topics of water process engineering, sustainability and energy efficiency Fills the transfer knowledge gap between academia and industry by analyzing the associated environmental, economic and sustainability challenges of water processing Includes theoretical and applied research and technological and industrial solutions for sustainable, economic and large scale water treatment, recycling and reutilization Analyzes potentiality and economic feasibility of already commercialized processes
Publisher's Note: Products purchased from Third Party sellers are not guaranteed by the publisher for quality, authenticity, or access to any online entitlements included with the product. A thoroughly revised, in-depth guide to water and wastewater engineering This fully updated guide integrates water theory with practical strategies, design techniques, and real-world applications. Designed for both students and professionals, the book covers all aspects of water and wastewater engineering as well as water treatment and facility design. You will get new information on water quality standards, corrosion control, piping materials, and energy efficiency. Water and Wastewater Engineering, Second Edition opens with a review of environmental engineering fundamentals before moving on to cover advanced water treatment processes, including reverse osmosis, membrane filtration, UV disinfection, and biological nutrient removal. A new case study analyzing the water contamination in Flint, MI helps to demonstrate the concepts covered. •Explains the latest technologies, regulations, and climate issues•Contains a brand-new chapter on direct and indirect potable reuse•Written by an experienced environmental engineering educator
Theory and Practice
Wastewater Engineering
Sustainable Technologies for Water and Wastewater Treatment
Its Treatment and Reuse in Water-Scarce Countries
Handbook of Nanomaterials for Wastewater Treatment
Over the past half century, reverse osmosis (RO) has grown from a nascent niche technology into the most versatile and effective desalination and advanced water treatment technology available. However, there remain certain challenges for improving the cost-effectiveness and sustainability of RO desalination plants in various applications. In low-pressure RO applications, both capital (CAPEX) and operating (OPEX) costs are largely influenced by product water recovery, which is typically limited by mineral scale formation. In seawater applications, recovery tends to be limited by the salinity limits on brine discharge and cost is dominated by energy demand. The combination of water scarcity and sustainability imperatives, in many locations, is driving system designs towards minimal and zero liquid discharge (M/ZLD) for inland brackish water, municipal and industrial wastewaters, and even seawater desalination. Herein, we review the basic principles of RO processes, the state-of-the-art for RO membranes, modules and system designs as well as methods for concentrating and treating brines to achieve MLD/ZLD, resource recovery and renewable energy powered desalination systems. Throughout, we provide examples of installations employing conventional and some novel approaches towards high recovery RO in a range of applications from brackish groundwater desalination to oil and gas produced water treatment and seawater desalination.
The book on Physico-Chemical Treatment of Wastewater and Resource Recovery provides an efficient and low-cost solution for remediation of wastewater. This book focuses on physico-chemical treatment via advanced oxidation process, adsorption, its management and recovery of valuable chemicals. It discusses treatment and recovery process for the range of pollutants including BTX, PCB, PCDDs, proteins, phenols, antibiotics, complex organic compounds and metals. The occurrence of persistent pollutants poses deleterious effects on human and environmental health. Simple solutions for recovery of valuable chemicals and water during physico-chemical treatment of wastewater are discussed extensively. This book provides necessary knowledge and experimental studies on emerging physico-chemical processes for reducing water pollution and resource recovery.
Handbook of Nanomaterials for Wastewater Treatment: Fundamentals and Scale up Issues provides coverage of the nanomaterials used for wastewater treatment, covering photocatalytic nanocomposite materials, nanomaterials used as adsorbents, water remediation processes, and their current status and challenges. The book explores the major applications of nanomaterials for effective catalysis and adsorption, also providing in-depth information on the properties and application of new advanced nanomaterials for wastewater treatment processes. This is an important reference source for researchers who need to solve basic and advanced problems relating to the use of nanomaterials for the development of wastewater treatment processes and technologies. As nanotechnology has the potential to substantially improve current water and wastewater treatment processes, the synthesis methods and physiochemical properties of nanomaterials and noble metal nanoparticles make their performance and mechanisms efficient for the treatment of various pollutants. Explains the properties of the most commonly used nanomaterials used for wastewater

treatment Describes the major nanoscale synthesis and processing techniques for wastewater treatment Assesses the major challenges for using nanomaterials on a mass scale for wastewater treatment

This comprehensive textbook highlights the fundamental concepts and design principles related to water and wastewater engineering. Problems and issues arising from the lack of sustainable conventional treatment practices and potential methods for resolving problems are discussed in detail. The book starts with an introduction to water resources and the need for water and wastewater treatment, followed by evaluation of water demand in terms of quantity and quality. Mass transfer and transformation processes that are necessary for understanding the complexity of water pollution issues and treatment processes are discussed in detail. Pedagogical features include learning objectives, chapter-wise study outlines, detailed solutions to important problems and self-evaluation exercises with answers. Case studies for specific water treatment requirements are provided to enable the students to choose and apply only relevant treatment processes in their design.

Onsite Wastewater Treatment Systems Manual

Physico-Chemical Wastewater Treatment and Resource Recovery

Water Supply and Wastewater Removal

Water and Wastewater Engineering: Design Principles and Practice, Second Edition

Fair, Geyer, and Okun's, Water and Wastewater Engineering

Wastewater treatment works have the potential to generate unpleasant odours, which can results in annoyance and consequently have a detrimental effect on a local population. As a result 'odour control and prevention' has become an important consideration both in the management of existing facilities and in the design and gaining of planning consent for new works. Odours in Wastewater Treatment provides readers with a detailed discussion on the basic principles involved in the formation of volatile compounds in wastewater treatment. Accounts are given of recent developments in the sampling and measurement of odours, practical examples in the prediction and dispersion of odorous emissions are offered and an overview of the technologies currently used to contain and treat odorous compounds presented. Contents Introduction Odours associated with wastewater treatment Odour sampling and measurement Assessment and prediction of nuisance odours Odour control and treatment

The new science of ecological engineering is winning increasing acceptance all over the world. Established industrial economies like Sweden and the United States are investing more in it as initial skepticism and regulatory hurdles are giving way to burgeoning investments by companies and municipalities, increased research activity, and great inter

Water and wastewater treatment normally take place in a series of continuous flow units, each designed to perform a step of the intended purification process - typically involving coagulation or flocculation, sedimentation or filtration, and disinfection. The flow pattern governs the residence/contact time, turbulence levels, collisions and shear to which different fluid portions are subjected in their passage through the unit. The efficiency of a given unit depends as much on the relevant physical, chemical or biological reaction as on the flow pattern taking place inside. This combined effect of flow features on process efficiency is often overlooked in teaching the design of water and wastewater treatment units, and so it is not uncommon to find treatment units in operating in a cost-ineffective way, causing health and environmental problems. This book introduces engineering students to concepts and practical measures associated with the rational design of treatment units, leading to more realistic and potentially optimal solutions for new units as well as for retrofitting existing units. Key basic concepts and suitable analytical tools are described, illustrated and worked through using tutorials, practical examples and proposed problems. Engineering undergraduates and graduates should benefit from the book while undertaking standalone modules on the topic and/or supplementary classes of existing courses on unit treatment processes. The book may also be useful for technical and engineering staff involved in designing and/or retrofitting units for better cost-effectiveness and footprint reduction of the water and wastewater treatment sector.

Treatment of Petroleum Refinery Wastewater with Constructed Wetlands

Waste Water

Water Supply, Waste Water Treatment and Sewage Disposal

Efficient Management of Wastewater

Recommendations from Value Engineering Studies on Wastewater Treatment Works