

2nd Edition

MANUAL  
*on the*  
CAUSES *and* CONTROL  
*of*  
ACTIVATED SLUDGE  
BULKING *and* FOAMING



David Jenkins  
Michael G. Richard  
Glen T. Daigger

# Manual On The Causes And Control Of Activated Sludge Bulking And Foaming

**M Woodhall**



## **Manual On The Causes And Control Of Activated Sludge Bulking And Foaming:**

**Manual on the Causes and Control of Activated Sludge Bulking and Foaming** D. Jenkins, M. G. Richard, G. T. Daigger, 1986

**Manual on the Causes & Control of Activated Sludge Bulking & Foaming** D.- Richard Jenkins (M.G.), 1986

**Manual on the Causes and Control of Activated Sludge Bulking and Foaming** David Jenkins, Michael G. Richard, Glen T. Daigger, 1984\*     *Manual on the Causes and Control of Activated Sludge Bulking, Foaming, and Other Solids Separation Problems, 3rd Edition* David Jenkins, Michael G. Richard, Glen T. Daigger, 2003-08-27

The most common activated sludge operating problems causing poor plant performance are related to solids separation. Especially common are bulking and foaming. Without a proper scientific foundation to support the efforts of wastewater treatment plant management, many attempts to thwart bulking and foaming have failed. *Manual on Solving Activated Sludge Bulking, Foaming, and Other Solids Separation Problems* provides the critical scientific and practical underpinnings needed to understand and combat these problems. The third edition of this flagship text is a comprehensive concise guide to the microbiological and technical aspects of controlling all types of solid separation problems. The scientific theory is applied to real world scenarios, greatly increasing the number of real world examples of successful control methods. New information is also included on filamentous organism growth and its application in the control of sludge bulking and foaming. Now plant operators, regulators, and wastewater engineers have a complete guide for battling these formidable design and operating problems.

**Manual on the Causes and Control of Activated Sludge Bulking, Foaming and other Solids Separation Problems** Michael G. Richard, Glen T. Daigger, 2003-08-31

The most common activated sludge operating problems causing poor plant performance are related to solids separation. Especially common are bulking and foaming. Without a proper scientific foundation to support the efforts of wastewater treatment plant management, many attempts to thwart bulking and foaming have failed. *Manual on the Causes and Control of Activated Sludge Bulking, Foaming, and other Solids Separation Problems* provides the critical scientific and practical underpinnings needed to understand and combat these problems. The third edition of this flagship text is a comprehensive concise guide to the microbiological and technical aspects of controlling all types of solid separation problems. The scientific theory is applied to real world scenarios, greatly increasing the number of real world examples of successful control methods. New information is also included on filamentous organism growth and its application in the control of sludge bulking and foaming. Now plant operators, regulators, and wastewater engineers have a complete guide for battling these formidable design and operating problems. Features of the Manual include: Discussion of the mechanisms of the bioflocculation involved in the formation of activated sludge flocs. Many new case histories of the practical diagnosis and resolution of activated sludge solids separation problems. Re-examination of the filament backbone concept of floc structure with additional focus on strong flocs that are devoid of filamentous organisms. Analysis of bulking and foaming caused by nocardioform organisms and *Microthrix parvicella* with emphasis on their origins and control methods. New photographs and

descriptions of filamentous organisms responsible for bulking and foaming Results of recent studies of activated sludge and previously unknown microorganisms and the potential use of molecular biological tools in diagnosing bulking and foaming problems Manual on the Causes and Control of Activated Sludge Bulking and Foaming, Second Edition David

Jenkins, Michael G. Richard, Glen T. Daigger, 1993-05-03 This manual describes methods for diagnosing and rectifying activated sludge solids separation problems which are one of the most common causes of permit violations in activated sludge wastewater treatment plants The book is written in an easy to understand format that will help you resolve real life problems Lab techniques theoretical considerations design and control methods and case histories are provided The clear discussions make it ideal not only for practitioners and consultants but also for students and professors Every environmental consulting company wastewater treatment plant laboratory and university should have at least one copy of this hands on practical manual *Activated Sludge Separation Problems* Valter Tandoi, Simona Rossetti, Jiri Wanner, 2017-09-15

*Activated Sludge Separation Problems Theory Control Measures Practical Experiences Second Edition* describes the most common activated sludge separation problems and explains the main reasons for the growth of the different filamentous microorganisms in activated sludge The book summarizes the identification techniques for important groups of activated sludge microorganisms both based on conventional microscopic analysis and using the biological molecular tools available today FISH and PCR This new edition with 70% new and updated material also provides explanation of basic activated sludge process principles and of parameters necessary for process control and operation The theory of secondary clarifiers is described to the extent necessary for understanding the construction and operation of secondary clarifiers The activated sludge reactor and secondary clarifiers are treated as one system and the interactions are explained The wide range of experiences around the world is documented and the methods to avoid the proliferation of these organisms are presented and critically reviewed *Activated Sludge Separation Problems* consists of six chapters presenting up to date technical and scientific aspects of these processes The new edition also features an extended list of literature references for further reading The book will be a valuable help for students of environmental engineering wastewater specialists plant operators and designers of activated sludge plants It is also useful for specialists in wastewater operation laboratories especially for those studying activated sludge separation properties **Activated Sludge** Jiri Wanner, 2014-07-22

The result of over 25 years of research this book is a concise guide to the microbiological and technical aspects of bulking and foaming control It stresses practical control measures based on kinetic and metabolic selection theories and supported by case histories Topics include biochemical processes in wastewater treatment evaluation of separation problems settling and foaming principles bulking and foaming control methods and system design More than 100 tables and figures illustrate complex processes and over 500 references provide a detailed compendium of available resources Cross references provide background of a problem its connection to similar problems and their solutions **Activated Sludge: Developments And Sustainable Solutions**

Nicholas F Gray,2023-02-27 Activated sludge is the most widely used biological wastewater treatment process globally to date although its high energy demand makes it a major contributor of greenhouse gas emissions Over recent decades it has been constantly modified and retrofitted to treat ever higher loads or improve effluent standards which have often resulted in even greater carbon emissions Conventional activated sludge treatment is at a crossroads where new sustainable solutions are required if we are to protect the quality of our rivers and meet net zero carbon targets The book details current operation and design with special emphasis on the biological aspects of the process From the microbial kinetics to the fascinating process of floc formation and development the book explores the development of our understanding of the process looking at new sustainable designs including biological nutrient removal and new aeration systems Sludge separation problems and control options are explained with a trouble shooting guide to non bulking problems Environmental issues including noise odor aerosols micro plastics and nanoparticles are all reviewed as is pathogen removal and the problem of antibiotic resistant genes and bacteria The development of membrane bioreactors has increased process reliability and effluent quality while integrated fixed film activated sludge processes are more efficient and compact The book concludes by exploring how activated sludge can become more sustainable for example by carbon harvesting and byproduct recovery This interdisciplinary book is essential reading for both engineers and scientists whether training at university or practitioners and consultants in the wastewater industry Related Link s

**Biological Wastewater Treatment** Mogens Henze,Mark C. M. van Loosdrecht,G. A. Ekama,Damir Brdjanovic,2008-09-01 For information on the online course in Biological Wastewater Treatment from UNESCO IHE visit [http://www.iwapublishing.co.uk/books/biological\\_wastewater\\_treatment\\_online\\_course\\_principles\\_modeling\\_and\\_design](http://www.iwapublishing.co.uk/books/biological_wastewater_treatment_online_course_principles_modeling_and_design) Over the past twenty years the knowledge and understanding of wastewater treatment have advanced extensively and moved away from empirically based approaches to a first principles approach embracing chemistry microbiology physical and bioprocess engineering and mathematics Many of these advances have matured to the degree that they have been codified into mathematical models for simulation with computers For a new generation of young scientists and engineers entering the wastewater treatment profession the quantity complexity and diversity of these new developments can be overwhelming particularly in developing countries where access is not readily available to advanced level tertiary education courses in wastewater treatment Biological Wastewater Treatment addresses this deficiency It assembles and integrates the postgraduate course material of a dozen or so professors from research groups around the world that have made significant contributions to the advances in wastewater treatment The book forms part of an internet based curriculum in biological wastewater treatment which also includes Summarized lecture handouts of the topics covered in book Filmed lectures by the author professors Tutorial exercises for students self learning Upon completion of this curriculum the modern approach of modelling and simulation to wastewater treatment plant design and operation be it activated sludge biological nitrogen and phosphorus removal secondary settling tanks or biofilm systems can be embraced

with deeper insight advanced knowledge and greater confidence      *The Causes and Control of Activated Sludge Bulking and Foaming* United States. Environmental Protection Agency,1987      *Handbook of Water and Wastewater Microbiology*

Duncan Mara,Nigel J. Horan,2003-08-07 Access to safe water is a fundamental human need and therefore a basic human right Kofi Annan United Nations Secretary General Edited by two world renowned scientists in the field The Handbook of Water and Wastewater Microbiology provides a definitive and comprehensive coverage of water and wastewater microbiology With contributions from experts from around the world this book gives a global perspective on the important issues faced in the provision of safe drinking water the problems of dealing with aquatic pollution and the processes involved in wastewater management Starting with an introductory chapter of basic microbiological principles The Handbook of Water and Wastewater Microbiology develops these principles further ensuring that this is the essential text for process engineers with little microbiological experience and specialist microbiologists alike Comprehensive selection of reviews dealing with drinking water and aquatic pollution Provides an understading of basic microbiology and how it is applied to engineering process solutions Suitable for all levels of knowledge in microbiology from those with no background to specialists who require the depth of information      *FISH Handbook for Biological Wastewater Treatment* Per Halkjaer Nielsen,Holger Daims,Hilde Lemmer,Idil Arslan-Alaton,Tugba Olmez-Hanci,2009-07-14 The FISH Handbook for Biological Wastewater Treatment provides all the required information for the user to be able to identify and quantify important microorganisms in activated sludge and biofilms by using fluorescence in situ hybridization FISH and epifluorescence microscopy It has for some years been clear that most microorganisms in biological wastewater systems cannot be reliably identified and quantified by conventional microscopy or by traditional culture dependent methods such as plate counts Therefore molecular biological methods are vital and must be introduced instead of or in addition to conventional methods At present FISH is the most widely used and best tested of these methods This handbook presents all relevant information from the literature and based on the extensive experience of the authors advice and recommendations are given for reliable FISH identification and quantification The overall purpose of the book is to help scientists consultants students and plant operators to get an overview of important microorganisms in biological wastewater treatment and to explain how FISH can be used for detecting and quantifying these microbes A proper and reliable identification of dominant microorganisms is of great importance for research and new developments in the wastewater treatment industry and it is important for optimization and troubleshooting of operational problems in present wastewater treatment plants The book encompasses an overview of dominant microorganisms present in the wastewater treatment systems which oligonucleotide probes gene probes to select for detection of these microbes by FISH how to perform FISH detailed protocols how to quantify the microbes and how to solve common problems of FISH The book addresses several functional groups nitrifiers denitrifiers polyphosphate accumulating organisms glycogen accumulating organisms bacteria involved in hydrolysis and fermentation filamentous

bacteria from bulking sludge and scum forming bacteria A comprehensive collection of FISH images showing dominant representatives of these groups helps readers to use FISH in the context of wastewater treatment      *Wastewater Bacteria* Michael H. Gerardi, 2006-04-20 A practical guide to wastewater bacteria and the roles they perform in wastewater treatment Communicating material in a practical manner for operators and technicians who regulate and troubleshoot their wastewater treatment processes *Wastewater Bacteria* discusses the effective control and proper operation of aerobic activated sludge and anaerobic anaerobic digesters biological treatment units to ensure that an adequate active and appropriate population of bacteria is present in each treatment unit It is a hands on guide to understanding the biology and biological conditions that occur at each treatment unit Avoiding unnecessary technical jargon and chemical equations *Wastewater Bacteria* the fifth book in the *Wastewater Microbiology Series* explores and explains Bacteria and the wastewater environment Enzymes and sludge production Nitrogen phosphorus and sulfur bacteria Floc formation and filamentous organisms Nitrification and denitrification Sulfate reduction fermentation and methane production Toxicity Foam and malodor production The goal of *Wastewater Bacteria* is to enable plant operators to achieve the twofold basic objectives of wastewater treatment to degrade organic wastes to a level where a significant dissolved oxygen demand is not exerted upon receiving waters and to remove nutrients to levels where photosynthetic organisms in receiving waters are limited in their growth This straightforward manual equips plant technicians to meet these objectives with essential information to understand the biological processes and organisms involved in wastewater treatment      **Activated Sludge - 100 Years and Counting** David Jenkins, Jiri Wanner, 2014-05-31 *Activated Sludge 100 Years and Counting* covers the current status of all aspects of the activated sludge process and looks forward to its further development in the future It celebrates 100 years of the Activated Sludge process from the time that the early developers presented the seminal works that led to its eventual worldwide adoption The book assembles contributions from renowned world leaders in activated sludge research development technology and application The objective of the book is to summarise the knowledge of all aspects of the activated sludge process and to present and discuss anticipated future developments The book comprises invited papers that were delivered at the conference *Activated Sludge 100 Years and Counting* held in Essen Germany June 12th to 14th 2014 *Activated Sludge 100 Years and Counting* is of interest to researchers engineers designers operations specialists and governmental agencies from a wide range of disciplines associated with all aspects of the activated sludge process Authors David Jenkins University of California at Berkeley USA Jiri Wanner Institute of Chemical Technology Prague Czech Republic      **The Microbiology of Activated Sludge** Robert J. Seviour, L. Blackall, 2012-12-06 This book has been a long time in preparation Initially it grew out of our frustrating attempts over the past ten years to identify the filamentous bacteria seen in large numbers in most activated sludge plants and the realization that we know very little about them and the other microbial populations in these systems Unfortunately this book does not provide many answers to the problems these filamentous bacteria can cause but we hope it

might encourage microbiologists and engineers to communicate more with each other and to spend some time trying to understand the taxonomy ecology and physiology of activated sludge microbes It is now very timely for example to try to provide these filamentous bacteria with proper taxonomically valid names and to determine their correct place in bacterial classifications This book is not meant to compete directly with the books by Gray 1989 1990 nor the excellent manual published by Jenkins and coworkers 1993b which has been invaluable to us and others trying to identify filamentous bacteria Wanner's book 1994a also provides an excellent account of the problems of bulking and foaming caused by filamentous bacteria These publications and others by Eikelboom's group have made an enormous contribution to the study of filamentous bacteria and will continue to do so

Biodegradation Technology Developments Robert L. Irvine, Subhas K. Sikdar, 1997-12-09 FROM THE INTRODUCTION This three volume series Bioremediation Principles and Practice provides state of the art description of advances in pollution treatment and reduction using biological means identify and address at a fundamental level broad scientific and technological areas that are unique to the subject or theme and that must be understood if advances are to be made and provide a comprehensive overview of new developments at the regulatory desk top bench scale pilot scale and full scale levels The series covers all media air water and soil sediment and blends the talents knowledge and know how of academic industrial governmental and international contributors The series addresses the removal of both hazardous and nonhazardous contaminants from the liquid solid and gas phase using biological processes This includes the biological treatment of wastes of municipal and industrial origin bioremediation of leachates soils and sediments and biofiltration for contaminated gases

Biotechnology and Bioengineering Eduardo Jacob-Lopes, Leila Queiroz Zepka, 2019-11-06 Biotechnology and Bioengineering presents the most up to date research on biobased technologies It is designed to help scientists and researchers deepen their knowledge in this critical knowledge field This solid resource brings together multidisciplinary research development and innovation for a wide study of Biotechnology and Bioengineering

**Environmental, Safety, and Health Engineering** Gayle Woodside, Dianna Kocurek, 1997-05-26 A complete guide to environmental safety and health engineering including an overview of EPA and OSHA regulations principles of environmental engineering including pollution prevention waste and wastewater treatment and disposal environmental statistics air emissions and abatement engineering and hazardous waste storage and containment principles of safety engineering including safety management equipment safety fire and life safety process and system safety confined space safety and construction safety and principles of industrial hygiene occupational health engineering including chemical hazard assessment personal protective equipment industrial ventilation ionizing and nonionizing radiation noise and ergonomics

**Environmental Engineers' Handbook, Second Edition** David H.F. Liu, Bela G. Liptak, 1997-08-29 Protecting the global environment is a single minded goal for all of us Environmental engineers take this goal to task meeting the needs of society with technical innovations Revised expanded and fully updated to meet the needs of today's engineer working in



industry or the public sector the Environmental Engineers Handbook Second Edition is a single source of current information It covers in depth the interrelated factors and principles that affect our environment and how we have dealt with them in the past are dealing with them today and how we will deal with them in the future This stellar reference addresses the ongoing global transition in cleaning up the remains of abandoned technology the prevention of pollution created by existing technology and the design of future zero emission technology B la G Lipt k speaks on Post Oil Energy Technology on the AT T Tech Channel

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