

Chapter 11

Book Reviews: Water Environment



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Abstract The authors have reviewed six technical books published by the Water Environment Federation (WEF), Alexandria, VA, USA, in 2014–2018. These six books are (1) *Wastewater Biology: The Microlife*, Third Edition, 2017; (2) *Guidelines for Grit Sampling and Characterization*, 2016; (3) *Activated Sludge and Nutrient Removal, Manual of Practice No. OM-9*, Third Edition, 2018; (4) *The Nutrient Roadmap*, 2015; (5) *Wet Weather Design and Operation in Water Resource Recovery Facilities*, 2014; and (6) *Operation of Water Resource Recovery Facilities Study Guide*. (2018). All six reviewed books are in the professional area of

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L. K. Wang, M.-H. S. Wang, Y.-T. Hung, N. K. Shammam (eds.),
Environmental and Natural Resources Engineering, Handbook of Environmental
Engineering 19, https://doi.org/10.1007/978-3-030-54626-7_11

wastewater treatment and resources recovery. In each book review, the authors introduce the publisher, authors, editors, and previous old editions of the book if they exist. Each book is reviewed and discussed in terms of its technical coverage, professional level, area of applications, affordability to readers, advantages, disadvantages, suitability for international distribution, recommended readership, possible improvements, etc.

Keywords Book review · Water Environment Federation · Environmental engineering · Environmental science · Natural resources · Wastewater treatment · Water resources recovery · Wastewater biology · Grit sampling · Grit characterization · Activated sludge · Nutrient removal · Wet weather design · Water resource recovery · Facilities · Study guide

**1 *Wastewater Biology: The Microlife, Third Edition (2017).*
Water Environment Federation (WEF), WEF Press,
601 Wythe Street, Alexandria, VA 22314, USA, 445 pp.,
\$95, softcover, ISBN: 978-1-57278-337-9**

This book is about the unique microbial world encountered within a biological water resource recovery facility (WRRF). With more than 12 chapters, the authors provide extensive information regarding different types of microlife, measurement techniques, and the operating conditions that affect the microorganisms [1].

Wastewater Biology: The Microlife, Third Edition is an essential reference for wastewater operators and engineers.

For more than 20 years, *Wastewater Biology: The Microlife* has served as an essential resource for operator training and engineers. This new edition explores the organisms that are considered the most important in the treatment of wastewater and disease transmission and provides the readers with the knowledge needed to regulate and control treatment processes properly.

The third edition offers detailed information on bacteria, protozoa, rotifers, nematodes and other metazoans, filamentous organisms, pathogens, and parasites. This new edition also includes a discussion of the microscope and photomicroscopy as well as other tools, equipment, and procedures that are necessary for examining, identifying, and enumerating these life forms.

Key features of the third new edition:

- New! Generously illustrated with more realistic visuals
- New! Now includes 13 color plates to assist in identifying the microlife
- New! Extensive discussion of the tools, equipment, and procedures necessary for proper treatment

- New! Discussion of the microscope and photomicroscopy
- Expanded! The most up-to-date material on the microorganisms critical to disease transmission and the treatment of wastewater
- New! Available as an e-book

Table of Contents:

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- Chapter 2: Microorganisms
- Chapter 3: The Microscope
- Chapter 4: Bacteria
- Chapter 5: Protozoa
- Chapter 6: Rotifers
- Chapter 7: Nematodes and Other Metazoa
- Chapter 8: Filamentous Organisms
- Chapter 9: Indicator Bacteria
- Chapter 10: Wastewater Pathogens
- Chapter 11: Wastewater Parasites
- Chapter 23: Photomicroscopy
- Appendix A Test Procedures and Methods
- Glossary

Both Appendix A (Test Procedures and Methods) and Glossary sections are very useful.

The book has something for all stakeholders involved in wastewater treatment, including design engineers, microbiologists, facility managers, and operators.

As the world grapples with the challenges of population growth, urbanization, and water scarcity, the effects will be felt on WRRFs and mostly the microorganisms that are at the thick of the action. This book will be an ideal reference companion for WRRF managers and technicians who deal with various operational challenges.

**2 *Guidelines for Grit Sampling and Characterization (2016).*
Water Environment Federation (WEF) Task Force. WEF
Press, 601 Wythe Street, Alexandria, VA 22314-1994,
USA, www.wef.org, 105 pp., \$125, softcover, ISBN:
978-1-57278-330-0.**

This special publication is a typical example of how a group of water professionals unselfishly compile their knowledge and experience together for dissemination to their colleagues [2].

Thirty-five environmental engineers and scientists formed a Grit Sampling and Characterization Task Force and jointly prepared this special publication. It was conducted under the leadership of Task Force Chair Kendra Sveum and Vice Chair

Lucas Botero under the direction of the Municipal Design Subcommittee of the Technical Practice Committee in which 30 more water professionals helped review the manuscript before its publication. The work of these volunteers is especially noteworthy because grit sampling and characterization are small, narrow subjects, which are normally ignored by engineers and managers.

In this publication, the currently used grit sampling and characterization methods are introduced and reviewed, and modeling and expectations are discussed.

The book consists of four chapters. Chapter 1 introduces the grit characteristics, historical and current definitions of wastewater solids, and the roles of service utilities, consulting engineers, testing companies, and grit removal equipment manufacturers. Chapter 2 describes the various methods and equipment used for obtaining a grit sample, such as bucket sampling, single-point pumped sampling, multiple-port vertical sampling, vertically integrated slotted sampling, manifold pumped sampling, siphon cross-channel sampling, and complete influent mixing/sampling. Chapter 3 covers various methods for pretreatment, solids determination, settling velocity determination, grit particle size and shape analysis, and calculations. Chapter 4 focuses on international practices, design/operational expectations, grit characterization modeling, and future expectations.

This book is meant for utility owners, consulting engineers, and grit equipment manufacturers who want to understand the implications and selection of a grit sampling and characterization method for proper grit chamber design and grit removal optimization. The book is not intended to address various types of grit removal equipment and grit slurry processing equipment, evaluate the equipment performance, or discuss the grit removal and slurry processing costs.

For further improvement of this excellent publication, practical examples should be added in Chapter 3, Section 5 “Calculations,” so licensed wastewater operators with a high school education can be included as intended readers. Normally, operators at a resource recovery facility will operate the grit chambers and take grit samples for analysis.

3 *Activated Sludge and Nutrient Removal, Manual of Practice No. OM-9, Third Edition (2018). Water Environment Federation (WEF), 601 Wythe Street, Alexandria, VA 22314-1994, USA, 450 pp., \$125, softcover, ISBN: 978-1-57278-340-9.*

This extensively revised third edition of *Activated Sludge and Nutrient Removal, Manual of Practice No. OM-9*, reflects best practices and the latest advances. This is one of the best books ever published by WEF. The book is not only a primary reference for the design and operation of the activated sludge process but also an

excellent supplemental college textbook for environmental biotechnology courses [3].

This book was published by the Water Environment Federation (Alexandria, VA) and prepared by a WEF task force under the direction of the Plant Operations and Maintenance Subcommittee of the Technical Practice Committee (TPC). Congratulations are deserved for task force chair Barton Jones, the 26 task force members, TPC chair Eric Rothstein, the 28 TPC control group members, and the 15 outstanding biological wastewater treatment experts for a job well done.

The table of contents of this book introduces the knowledge to be learned by readers and gives credits to the dedicated scholars who have contributed to the book chapters. Some of the chapter topics are activated sludge process fundamentals, process control methods for the secondary clarifier, advanced concepts in nutrient removal, and process simulators.

All topics in the book are important for design, operation, and learning of the activated sludge process and nutrient removal. Contributing authors are all experienced and qualified biotechnologists, professional engineers, or educators. The task force chair/editor did an excellent job; all chapters are very smooth in terms of presentation although each chapter is contributed by different authors.

This five-star book includes an updated process control section, with step-by-step examples for calculations; a new laboratory chapter, with detailed directions for common process control tests; and an introduction to using modeling for process control. Design engineers, facility managers, operators, educators, students, and researchers may find this book very useful because they may be guided through selecting an appropriate sludge age, calculating wasting rates, optimizing return activated sludge flow, managing clarifier blankets, and setting dissolved oxygen and oxidation-reduction potential set points.

This book has many other useful features and benefits. For instance, both US customary and international metric units are adopted. There are ample figures, tables, equations, and practical examples for illustration and explanation of theories, principles, biochemistry, microbiology, and engineering applications of activated sludge process and nutrient removal. Practice questions with answers have been added to the end of each chapter to help the reader enhance his or her understanding of the material and retain information vital to solving performance problems and improving operations. The book also discussed such modern activated sludge processes as membrane bioreactors and sequencing batch bioreactors. Updated references are provided in each chapter for further study by researchers.

The reviewers cannot find any shortcomings. However, future items to include to further enhance these resources are a list of symbols and acronyms, conversion factors, a glossary, and examples of other modern secondary clarification, such as secondary dissolved air flotation clarification.

4 *The Nutrient Roadmap. Water Environment Federation (2015), WEF Press, 601 Wythe Street, Alexandria, VA 22314-1994, USA, 184 pp., softcover, \$105., ISBN: 978-1-57278-314-0*

This is a reference book prepared by the Nutrient Roadmap Task Force of the Water Environment Federation (WEF) for guiding decision-makers to retool their wastewater treatment plants (WWTPs) into water resource recovery facilities (WRRFs) that not only produce clean plant effluent but also recover phosphorus and nitrogen for reuse in an environmentally conserving manner. The reviewers give credits to Dr. Samuel S. Jeyanayagam, Task Force Chair, and his 83 task force members for publication of this nutrient removal/recovery roadmap [4].

The book has seven chapters covering the important subjects of nutrient roadmap purpose, nutrient removal/recovery drivers and trends, staff education, financing, planning, the US regulatory requirements, receiving water environment, WRRF existing performance, nutrient sources and characteristics, process models and modifications/additions, effluent limits, permit conditions, water-nutrient-energy nexus, nutrient removal/recovery systems, nonpoint source control technologies, point source control technologies, mainstream treatment, sidestream treatment, bio-solids management and recovery options, water recycle, other resources recovery, alternatives evaluation steps, risks identification and management, and case studies. Although all seven chapters are equally important, Chapter 4 (“Resource Recovery”), Chapter 5 (“Alternatives Evaluation”), and Chapter 7 (“Case Studies”) actually show the readers what the nutrient removal/recovery roadmap is. An experienced environmental engineer may adopt the roadmap for determination of a feasible nutrient removal/recovery system for his/her clients.

It should be noted, however, the book is a timely, high-level overview document that provides useful guidance to only experienced decision-makers and other knowledgeable parties, such as regulatory managers, public health professionals, professors, and researchers. For an in-depth technological discourse, the readers are directed to other publications, including the USEPA manuals and the WEF Manuals of Practice and special publications listed at the end of each chapter.

For international adoption and distribution, the book has adopted both the US customary units and the international metric units. Further improvements of the book may include (1) addition of a glossary of terms section and (2) inclusion of some international regulatory requirements for nutrient removal/recovery. Overall it is a five-star, excellent reference book.

5 *Wet Weather Design and Operation in Water Resource Recovery Facilities*. Water Environment Federation (2014), 601 Wythe Street, Alexandria, VA 22314, USA, 306 pp., \$130, softcover, ISBN: 978-1-57278-304-1.

This special publication was prepared by the Wet Weather Design and Operation in Water Resource Recovery Facilities Task Force of the Water Environment Federation (WEF) and the WEF Technical Practice Committee Control Group [5].

Forty-three experts on wet weather facility design and operation contributed 16 chapters covering design considerations, integrated systems approach for design and operation, site selection and facility arrangement, facility hydraulics and pumping, support systems, occupational health and safety, modeling for wet weather, on-site storage and flow equalization, preliminary treatment, primary treatment, biological treatment, high-rate treatment, disinfection, and residuals. All chapters are grouped around planning and configuration for wet weather events and facility processes.

Both US customary units and metric units are used side-by-side—except in the figures. The text presentation style is consistent throughout the entire book. Every chapter has a list of updated references and/or suggested readings. The book also presents many useful planning examples or case studies for wet weather facility design and operation.

Overall, this is a five-star book, which provides professionals involved in the design and operation of water resource recovery facilities (WRRFs) with a comprehensive reference of modern practices for dealing with the unique challenges associated with wet weather conditions. For detailed design calculations, the book refers readers to another book, *Design of Municipal Wastewater Treatment Plants* (WEF MOP No. 8). For additional planning reference, readers are referred to a guidebook, *Guide for Municipal Wet Weather Strategies*.

6 *Operation of Water Resource Recovery Facilities Study Guide* (2018), Water Environment Federation (WEF), 601 Wythe Street, Alexandria, VA 22314-1994, USA, www.wef.org, 300 pp., \$85, softcover, ISBN: 978-1-57278-338-6

This study guide was prepared by a WEF Task Force of the Technical Practice Committee Control Group (Chair Eric Rothstein and Vice Chair D. Medina) and authored by B. Ahmed, J. A. Brown, V. deSilva, G. Grissop, N. Jensen, M. Kasi, I. LaRue, D.M. Mason, and N. Naureen [6].

The study guide is a companion to two other WEF publications: (1) the seventh edition of *Operation of Water Resource Recovery Facilities*, Manual of Practice

(MOP) 11, and (2) a WEF video, *Water Resource Recovery Facility 3D Virtual Tour*. The video, manual, and study guide should be used together for training classes, studying for certification exams, and improving the quality of operations within the facility or firm.

The video can be downloaded from the Internet free of charge (news.wef.org/wef-teaches-about-operation-of-water-resource-recovery-facility-2/). It is a 10-minute, narrated educational video providing an excellent virtual tour of a typical water resource recovery facility about wastewater treatment, water reuse, biosolids generation, land application, energy generation, anaerobic digestion, facility infrastructure, and wastewater treatment operation. The readers should download and view the WEF video first.

The next step for the readers is reading the official training material MOP 11, *Operation of Water Resource Recovery Facilities*, and learning the state-of-the-art development in water resource recovery facility management and operation.

Finally the questions and solutions in this study guide can be used by the readers for a comprehensive review and examination preparation. The video, training manual MOP11, and this study guide all emphasize principles of treatment, facility management, troubleshooting, and preventive maintenance.

Specifically this study guide contains challenging questions and detailed solutions to help readers with continuing education as well as on the job demands. These questions can be used to help develop advanced knowledge and ensure that your water resource recovery facility is fulfilling its mission of environmental protection. The following is this study guide's table of contents: Chapter 1, "Introduction"; Chapter 2, "Permit Compliance and Wastewater Treatment Systems" (20 problems and solutions); Chapter 3, "Fundamentals of Management" (20 problems and solutions); Chapter 4, "Industrial Wastes and Pretreatment" (15 problems and solutions); Chapter 5, "Safety" (22 problems and solutions); Chapter 6, "Management Information Systems—Reports and Records" (13 problems and solutions); Chapter 7, "Process Instrumentation" (19 problems and solutions); Chapter 8, "Pumping of Wastewater and Sludge" (16 problems and solutions); Chapter 9, "Chemical Storage, Handling, and Feeding" (17 problems and solutions); Chapter 10, "Electrical" (12 problems and solutions); Chapter 11, "Utilities" (12 problems and solutions); Chapter 12, "Maintenance" (25 problems and solutions); Chapter 13, "Odor Control" (12 problems and solutions); Chapter 14, "Integrated Process Management" (20 problems and solutions); Chapter 15, "Outsourced Operations Services and Public/Private Partnerships" (13 problems and solutions); Chapter 16, "Training" (16 problems and solutions); Chapter 17, "Wastewater Sampling" (14 problems and solutions); Chapter 18, "Preliminary Treatment" (10 problems and solutions); Chapter 19, "Primary Treatment" (14 problems and solutions); Chapter 20, "Activated Sludge" (24 problems and solutions); Chapter 21, "Trickling Filters, RBC, Combined Processes" (15 problems and solutions); Chapter 22, "Biological Nutrient Removal" (20 problems and solutions); Chapter 23, "Natural Biological Processes" (20 problems and solutions); Chapter 24, "Physical-Chemical Treatment" (16 problems and solutions); Chapter 25, "Process Performance" (12 problems and solutions); Chapter 26, "Effluent Disinfection" (15 problems and solutions); Chapter 27,

“Solids Management” (12 problems and solutions); Chapter 28, “Sludges and Residuals” (12 problems and solutions); Chapter 29, “Thickening” (13 problems and solutions); Chapter 30, “Anaerobic Digestion” (10 problems and solutions); Chapter 31, “Aerobic Digestion” (22 problems and solutions); Chapter 32, “Stabilization Methods” (12 problems and solutions); and Chapter 33, “Dewatering” (14 problems and solutions).

Both the international standard units and the US customary units are adopted in this study guide for international distribution. The study guide’s listing cost of \$85 is reasonable. Many subjects, such as permit compliance, industrial wastewater pretreatment, physical-chemical treatment, UV disinfection, DAF thickening, nutrient removal, energy recovery, instrumentation, safety, etc., are either first time included or further emphasized. The WEF video, training material MOP 11, and this study guide are all excellent self-study references for facility managers, superintendents, wastewater operators, college students, and consulting engineers.

The already excellent WEF training materials set (video, MOP 11, and this study guide) may still be further improved by adding important resource recovery processes and technologies, such as membrane filtration (microfiltration, ultrafiltration, nanofiltration, reverse osmosis), membrane bioreactor, sequencing bioreactor, primary DAF clarification, secondary DAF clarification, powdered activated carbon adsorption, oil-water separation, wet land treatment, living machines, nutrient recovery, heavy metal recovery, carbon dioxide recovery, VOC reduction, activated carbon regeneration, chemical sludge treatment/recovery, etc.

References

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4. The Nutrient Roadmap (2015). Water Environment Federation WEF Press, 601 Wythe Street, Alexandria, VA 22314-1994, USA, 184 pp., softcover, ISBN 978-1-57278-314-0
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