U. Wiesmann. Fundamentals of Biological Wastewater Treatment, S. Choi, E.-M. Dombrowski (Eds.). Wiley–VCH Verlag GmbH & Co. KgaA, Weinheim, Germany (2007). 390 pp., US$ 165.00, ISBN: 978-3-527-31219-1

This book is a straightforward, well-written and technically sound discussion of wastewater treatment. It was authored by three chemical engineers who are in a Berlin, Germany academic institutions. Given the backgrounds of the authors, it is not surprising that the fundamental methods underlying the various waste treatment processes are well developed.

The authors focus on the future of water treatment and this is "reuse". In the Preface, they note:

> "The reuse of treated water is still a topic of controversial discussions. However, the authors of this book are convinced both that we must learn to develop and continue to promote water recycling systems and also that biological wastewater treatment processes play a highly important role."

Later in the Preface, they reinforce this statement with the following (written from the perspective of chemical engineering faculty members):

> "A better understanding is needed of the biological, physical, ecological, social and economical interactions surrounding water and wastewater. We cannot consider all these aspects, but this book provides important information about the fundamentals and engineering aspects of biological wastewater treatment. The methods used to describe and solve the problems presented are those used by biochemical engineers developing models based on mass balances which are valid for specific systems. The authors made every effort to present mathematical derivations so comprehensively that at least graduate students can follow. The target group also includes all engineers, biologists and chemists working in the field of wastewater treatment who are interested in learning more about its fundamentals.
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> After a survey of the historical development of microbiology and wastewater treatment, we give a brief introduction to wastewater characteristics and relevant legislation as well as microbial metabolism and stoichiometry, which is of fundamental importance for mass balances with biological reactions. Gas/liquid oxygen transfer is discussed in detail because of its high importance for all aerobic processes in wastewater treatment. Anaerobic substrate degradation is discussed afterwards as a very interesting alternative for the treatment of high-load effluents. Persistent, industrially produced compounds are not easily treated in biological processes. Therefore, the results of several recent studies are summarized and discussed here. The great significance of nitrogen and phosphorus removal has led us to report about their stoichiometric and kinetic backgrounds individually. In the past two decades, discussions about modelling of the activated sludge process have increased. To gain a better understanding of activated sludge model number 1(ASM 1) and its description of nitrogen removal, we give detailed explanations. We have dealt with the use of membranes in place of secondary clarifiers to emphasize that new possibilities exist for reusing and recycling water in the future."

The authors have published their material in 13 chapters titled below: (1) historical development of wastewater collection and treatment, (2) wastewater characterization and regulations, (3) microbial metabolism, (4) determination of stoichiometric equations for catabolism and anabolism, (5) gas/liquid oxygen transfer and stripping, (6) anaerobic wastewater treatment in activated sludge systems, (7) aerobic treatment with biofilm systems, (8) anaerobic degradation of organics, (9) biodegradation of special organic compounds, (10) biological nutrient removal, (11) modelling of the activated sludge process, (12) membrane technology in biological wastewater treatment, and (13) production integrated water management and decentralized effluent treatment.

To say the least, I enjoyed reading the first chapter which traced the development of water and wastewater collection systems. Having studied microbiology in graduate school, I was delighted to see the discussion and pictures of A. Van Leeuwenhoek's microscope and his observations of "animalicules".

The authors continue the development of the fundamental basis of microbial processes in Chapter 3 in which they discuss the biochemical and microbial processes underlying the growth and reproduction of bacteria. Discussed were enzymology, nucleic acids, RNA, DNA, catabolism, citric acid cycle, glycolysis, etc.

I appreciated reading the chapter on oxygen transfer, that area being of long interest to me (having been the topic of my PhD thesis). It was pleasant to review the development of K_LA, the oxygen mass transfer coefficient. While that topic is old, the new "hot" topic of membrane technology is discussed later. Much of that discussion revolved around Zenon Corporation's hollow fiber technology. The final chapter is devoted to "... the development of new production processes with reduced consumption levels of water and raw materials and with reduced production of wastewater".

One feature of the book I liked was the inclusion of worked example problems (1–3 problems per chapter). But, unfortunately, no problems for student assignment were given.

The authors are to be commended for securing the translation services of a colleague to assist in editing their work. That translator did an excellent job.

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