

## BOOK REVIEW

ADVANCED WASTEWATER TREATMENT  
(WEITERGEHENDE ABWASSERREINIGUNG)

by

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Advanced wastewater treatment (AWT) is the term relatively new, being first used some 15–20 years ago. AWT should be understood as a system of processes and methods in which residual impurities are removed. Although in the classical treatment process, i.e. in preliminary mechanical and biological treatment about 90% of impurities are removed, but very often this effect is not satisfactory. Pollutants load remaining after this treatment consists of hardly degradable and refractory organic substances, suspension, toxic substances and other pollutants of surface water. Biological wastewater treatment leaves, moreover, excessive amounts of nitrogen and phosphorus which contribute significantly to the total loading of river and lake water. In order to remove these residual pollutants wastewater should be subjected to an advanced treatment realized by various methods. Thus, classical and commonly employed processes are completed with other, specific and not yet entirely known ones.

The book in question gives a review of processes and methods oriented toward the removal of the mentioned above impurities. The content is arranged in the following chapters:

**I. Introduction** to the AWT methods, in which the authors discuss the necessity and advisability of water pollution control (1), eutrophication of the recipient (2), pollution of the rivers and lakes with wastewater (3) and the processes of advanced wastewater treatment (4).

**II. Removal of nitrogen compounds.** This chapter is devoted to the role of nitrogen in surface water (1), and to biological (2) and chemical (3) processes of nitrogen compounds removal, i.e. to nitrification and denitrification processes.

**III. Phosphorus removal from wastewater.** Like in the preceding chapter the authors discuss first the role of phosphorus in the recipient (1) and then biological (2) and physicochemical (3) processes enabling phosphorus removal from wastewater.

**IV. Complete removal of suspended matter.** Characteristics of the kinds of suspensions and their concentrations present in wastewater, given in the introduction (1), is followed by the methods used to improve sedimentation of suspended matter (chemical methods and hydraulic phenomena) (2) and filtration processes (microstrainers, rapid sand filters) (3). The last section (4) is devoted to such methods as flotation, precoat filtration and ultrafiltration.

**V. Removal of dissolved organic substances.** In this chapter the authors characterize first the kinds of organic substances and their concentrations (1) and then the principles of adsorption on activated carbon (2). Next section (3) is devoted to the method by which the adsorption process is conducted. Other treatment methods, such as oxidation of impurities with ozone, desorption of volatile substances and reverse osmosis, are discussed in the last section (4).

**VI. Removal of dissolved inorganic substances (salts).** Characteristics of this group of pollutants (1) followed by ion exchange (2), electrolysis (3), hyperfiltration (4) and other widely applied methods (5).

**VII. Advanced wastewater treatment plants.** First section (1) is devoted to the possible applicability of physicochemical processes. Reconstruction and enlargement of the existing mechanical-and-biological treatment plants to adapt them to multi-stage treatment is discussed in (2). Next sections are concerned with the choice of physicochemical treatment methods (3) and the cost of different treatment systems (4). Some examples of the plants already constructed are given in (5).

Selected literature is enclosed to each paper.

There are numerous publications dealing with AWT methods, but as far as the referee is concerned, this one is one of the first monographs in which almost all actually known AWT methods are discussed. Thus, the book may be considered as much instructive. Its advantage lies in fact that it presents a full review of problems: starting with theoretical principles of the processes, through the results of pilot research (including many results obtained by the authors), up to the known technological solutions.

Since the AWT processes are not so mastered and so "standard" as the classical methods of mechanical and biological treatment, it seems worthy to quote a fragment from the foreword to the book reviewed written by the President of the University of Stuttgart:

*"The users should be warned that the application of the methods presented in the book should be always preceded by basic research. Thoroughly analysed and selected methods are an expensive instrument but attached to a concrete case, all the others, however, are demonstrative objects of thoughtlessly meant up-to-dateness".*

The book should be especially recommended to wastewater technologists and environment protection engineers.

*Edward Kempa*