

Preface

Water and wastewater management in urbanized areas has been resolved, although sewage sludge created in the course of sewage treatment causes problems. Against this background rural areas, particularly in areas characterized by dispersed distribution of households suffer from the lack of wastewater treatment systems. The problem is aggravated by the increasing use of water due to rising civilization standards. The problem has grown to a scale that no doubt must be resolved in the near future. The most serious faults caused by untreated wastewater being discharged into the environment is pollution of surface and groundwater, and eutrophication of water bodies even in the touristically attractive regions.

In Europe, a substantial proportion of households in rural areas have the so-called dispersed infrastructure (in Poland 26 % of households are separated from each other by 100 m or more). Construction of a sewerage system in such areas is economically ineffective. Moreover, when constructed the sewerage systems suffer from high operation costs.

Also, collecting sewage in septic tanks is unpractical due to odors, costs, and danger, as on puncturing the surrounding soil is polluted. These are the reasons why on-site systems are gaining in interest. One such method that has been developing in the last four decades is a method based on adapting the natural conditions and treatment processes taking place in marsh ecosystems. Treatment wetlands are engineering facilities that tend to follow these natural conditions but in a more controlled way. Wastewater is treated when flowing through the matrix that consists of soil-like substrate and roots and rhizomes as well as microorganisms. The main treatment processes including adsorption, filtration, ion exchange, biodegradation, take place in the gravel filtration medium, however, they are supported by plants that supply oxygen and uptake some minor part of nitrogen. Thanks to the activity of hydrophytes and their ability for gas transfer and release of oxygen to the root zone various types of bacteria can exist and conduct the treatment processes. The method is attractive also because it fits well into the natural type of landscape. Both wastewater and sewage sludge can be utilized in treatment wetland systems (hydrophyte facilities). These facilities are inexpensive to be constructed and

operated. The principles of operation are understandable, in particular to farmers and other inhabitants of rural areas.

Experience gained so far clearly shows that facilities composed of a septic tank and treatment wetland can treat wastewater effectively in the rural areas. However, the development of hydrophyte systems has led to complex facilities enabling efficient removal of not only organic matter and nutrients, but xenobiotics as well. Treatment wetland systems have been applied with success to purposes as distant from the original application as dewatering and stabilization of sewage sludge, treatment of landfill leachate, treatment of reject waters from sewage sludge processing, treatment of surface run-off, treatment of industrial water and wastewater, and others.

In this book, all these applications are described based on the authors' own experience and the literature review. The one subject that is not directly related to treatment is generation of humic-like substances that are produced in the course of treatment of wastewater in treatment wetland systems and traditional plants.

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