MINIMIZING LOADS ON WATER BODIES

Koichi Fujie
Department of Ecological Engineering, Toyohashi University of Technology, Japan

Hong-Ying Hu
ESPC, Department of Environmental Science and Engineering, Tsinghua University, China

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Contents

Summary

The concept and mechanisms of self-purification of natural water bodies are described in this article. Approaches for minimizing pollutant loading to natural water bodies are proposed and the usefulness of these approaches is discussed.

1. Self-purification of natural water bodies

It is a well-known fact that the wastes/pollutants discharged into natural water bodies such as rivers; lakes and the seas disappear slowly with time. The removal of pollutants from a water body without any artificial controls is called self-purification, or natural purification. The mechanisms of self-purification of water bodies can be divided into three groups: physical processes, chemical processes and biological processes.

Physical processes contributing to the removal of pollutants from a natural water body include dilution/mixing by inflow of unpolluted water into the water body, diffusion of pollutants in water, and precipitation/filtration of the pollutants to the sediment. The volatilization/vaporization of volatile pollutants from water to the atmosphere will also result in a decrease of pollutants in the water.

Chemical processes related to the removal of pollutants from a water body are oxidation by oxidants such as ultraviolet, ozone and oxygen, reduction by reductants, and neutralization. The biological processes include degradation/transformation of organic pollutants by bacteria under aerobic or anaerobic conditions, and nitrification and denitrification of ammonia and nitrate, respectively. Biological processes play the most

important role among the mechanisms of self-purification in natural water bodies. The biological removal of pollutants from a natural water body is usually called “true self-purification” and the total purification by physical, chemical and biological processes is called “apparent self-purification”. Factors affecting the capacity of self-purification of natural water bodies will be discussed in the next section of this article.

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Biographical Sketches

Koichi Fujie is a professor in the Department of Ecological Engineering at Toyohashi University of Technology, Japan. He completed his PhD in environmental chemistry and engineering at Tokyo Institute of Technology; his PhD thesis was entitled “Oxygen transfer and power economy characteristics of biological wastewater treatments”. Professor Fujie’s research and teaching interests are focused on the sustainability of human society supported by industrial activities. He stresses that minimization of resource and energy consumption, with their environment loading, are essential for sustainability. His major research fields are water and wastewater treatment, development of material recycling technology, bioremediation and design of sound material cycle networks.

Hong-Ying HU is a professor and deputy director of the Department of Environmental Science and Engineering at Tsinghua University. He obtained his master and PhD degrees at Yokohama National University, Japan. His major is environmental microbiology and biological engineering. His research area includes kinetic and ecological study on biodegradation of refractory toxic organic chemicals in natural and manmade ecosystems, bacterial community structure and function in ecosystems, biological and ecological technologies for environmental pollution control, and risk assessment and water quality control for wastewater reclamation and reuse.