EFFECTS OF HUMAN ACTIVITIES ON WATER QUALITY

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Contents

Summary

The effect of human activities on natural water quality is discussed by looking back at the history of water pollution in Japan. The countermeasures for water pollution control such as enactment of ordinances and laws, establishment of chemical management and control system are briefly introduced. In addition, a new concept of emission minimization system is proposed.

1. Modern history of water pollution

It is well known that natural aquatic systems have a capacity to detoxify a certain quantity of pollutants discharged into them. This phenomenon is called self-purification. A water body will be polluted when the pollutants discharged into it excede their capacity of self-purification. The source of pollutants in a natural water body can be divided into two groups: those from natural sources (such as soils, forests, etc.) and artificial sources, namely human activity. By looking back on the history of water pollution, it is easy to understand that the expansion of human activity is the main reason for water pollution.

Water pollution problems occurred even before the industrial revolution. One of the early records of river water pollution in Japan was the outflow of pit water from Ashio Copper Mines into the Watarase River during the late nineteenth century. The outflow of pit water damaged the river water and paddyfields on the riverside. With the growth of industrial activities, the volume of wastewater flowing into rivers increased, bringing serious water pollution problems in various areas of Japan. During the period of

industrial reconstruction after World War II, fisheries had been greatly damaged by the discharge of industrial wastewaters. In the 1960s, during the period of rapid economic growth, water pollution became more widespread and serious in Japan.

For example, until around 1945 the Sumida River had clear water with good populations of fishes, and it provided a place for recreation for local people and also a source of income for local fishermen. However, fish could not survive in the river after about 1955 and offensive odors were produced by the dirty river. A survey of Shizuoka Prefecture (Japan) in 1961 reported that an area of 14 km^2 in and around the Tagonoura Bay was polluted by black sludge, indicating a serious pollution situation. In those days, water pollution was aggravated mainly by the wastewater discharged from factories and business establishments. In 1958, a paper mill discharged its semi-chemical pulp wastewater to the Edogawa River without any treatment, and this caused extensive damage to the shellfish cultures downstream. Many angry fishermen rushed to this paper mill and accused the manager of the plant of discharging wastewater to the river.

The pollution of the rivers flowing through large cities and industrial areas such as the Yodogawa River was further aggravated after about 1960. In 1962, an electroplating plant located at the area of the Tama River discharged huge amount of cyanide compounds to the river. The bodies of many fish such as ayu (sweet fish) were subsequently found to be floating in the river.

The water pollution also began to affect human health. The Minamata disease incident is one of the most famous examples in the world of damage to people's health as a result of water pollution. The Chisso Corporation had established a factory in Minamata City in 1908. From that time the wastewater from this factory was discharged to Minamata Bay and the water of the bay area was seriously polluted by the wastewater. By 1955, bodies of fish were found to be floating on the water surface of the bay and even cats and pigs in the bay area began to die of an unknown and strange disease. In 1956, a patient with brain damage of unknown origin was reported to the local public health center, and the so-called Minamata disease was officially identified. Quite a long time after the first report of Minamata disease, it was determined that the disease was caused by the ingestion of fish and shellfish polluted by wastewater from the factory. Organo-mercury accumulated in the fish and shellfish was taken into human body and this damage the nervous system.

Itai-itai disease is anther well-known example of the affect of water pollution on people's health. The water of the Zinzu River (Japan), which was polluted by metals such as cadmium, lead and zinc, had been used to irrigate paddy fields since the Taisho era (1912 to 1925) and this caused serious damage to local agriculture and human health. Patients appeared with a strange disease in this area. They were suffering terrible pains and they frequently cried "itai-itai" ("ouch-ouch"; *itai* means "sore" in Japanese), so the disease was named "itai-itai disease". The Itai-itai disease was reported to the medical academy in 1955, and after intensive research it was officially announced in 1968 that the origin of the disease was cadmium contained in the wastewater from a mineral mining company located upstream on the Zinzu River.

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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.

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