

Relationship between Water Quality and Nutrient Loads - Time Series Analysis in Osaka Bay, Japan -

Nakatsuji, Keiji¹, Yamane, Nobuyuki²

1. Department of Civil Engineering, Osaka University, Suita, Japan, 2. CTI-Engineering Co.Ltd, Osaka Branch

During the period of industrial reconstruction after the World War II, the coastal zone of Seto Inland Sea had experienced the construction of many heavy industrial factories and the explosive increases in population. As a result, a large amount of untreated waste water caused great damages to ecosystem and fisheries. The problem also began to affect to residents, with disasters such as Minamata disease due to mercury contaminants. During the rapid economic growth started from around 1960, the problem of water pollution became more widespread and severe year by year. Red tide has occurred with high frequency as a result of the eutrophication of the seawater, and some kinds of red tide result in destruction of marine creatures including cultured yellowtail.

The Japanese Government established the Environmental Agency in 1971 on the basis of public opinion. Against successively serious water pollution, the Environmental Agency enacted the Law Concerning Special Measures for Conservation of the Environment of the Seto Inland Sea (called Seto Inland Law for short) in 1973. Comprehensive measures have been taken under the law; for example, the decrease of the COD load from the coast of the Seto Inland Sea to half of the 1973 load and the law prohibition of land reclamation larger than 0.5 km² in the Seto Inland Sea. Furthermore, in order to solve remaining problems relating to organic pollution, legislation was introduced to limit an area-wide total pollutant load control in effluent in 1978. In addition to the conventional restrictions on concentration levels in waste water were set. That is to say, sea areas are classified according to waste usage, and the environmental quality standard values are established for each class.

The present study is to evaluate the yearly change of water quality in Osaka Bay based on data measured during the period from 1928 to 1992 and to estimate the nutrient loads flowing from land to sea using the ratio method based on collected data related to social and economic activities. According to such analyses, it becomes possible to consider how we have contaminated Osaka Bay, and what kinds of countermeasures should be focused for the improvement of water quality. The socio-economic aspect is an important factor as well as physical, chemical, biological and ecological aspects.

Major results are as follows;

- (1) Water quality in the bay head of Osaka Bay had been polluted before this survey, namely 1928.
- (2) Time change of water quality has influenced by the socio-economical activities in the bay hinterland.
- (3) Water quality changes in cooperation with a change of nutrient loads discharged from land to sea with delay of about four or five years.
- (4) An area-wide total pollutant control is expected to have dramatic results in order to promote conservation for water quality in enclosed coastal waters.