

Study on the technology of instrumentation and automation and control of the advanced wastewater treatment

Whole term

1997. 4 ~ 1993. 3

(Purpose)

Nitrogen, phosphorus and organic matters likely to cause eutrophication are of primary concerns due to eutrophication prevention being mainly aimed by the advanced wastewater treatment. The necessity of a well-established technique of operation was highlighted for an effective functioning of the advanced treatment process. The utilization of the measuring technology and development of the automatic control technology were expected, which would result in an efficient energy-use as well as effective and safe operation.

Therefore, the objective of this research was to investigate the existing technological situation of the instrumentation in the advanced wastewater treatment in order to establish a new goal for utilization of a new measuring technology and enhancement of sensors, and eventually to announce the results of the research with hopes to enable it to contribute to the future technological development.

(Results)

Questionnaires were performed about wastewater treatment plants and producers in 1997, and the existing situation and trends of measurement and automatic control were summarized. The specific goals for the development of sensors and automatic control items were established, and the verification and forecasting the demand were also done for the utilized items.

1. Existing situation of the monitoring sensor and automatic control technology

Although operational problems associated with DO, ORP, and MLSS sensors of wide use were pointed out, many alternatives had been developed with respect to the correction and revision.

Continuous measurements of the sensor type had not been developed for nitrogen and phosphorus concentration meters though they had been in the consideration to be used in the stage of application to the advanced treatment, thus the existing situation of the automatic control technology was summarized.

2. Establishment of the goal for development

The goal for development was set with respect to fine correction, revision and operation for the 3 types of sensors. That for nitrogen and phosphorus concentration meters was established by reinvestigating the role of nitrogen and phosphorus concentration meters in automatic control in the advanced treatment.

3. Suggestion of instrumentation, control and automation (ICA) system

The control flow was suggested to be measured in the case where the ICA technology established as goals for development would be applied to four types of the advanced treatment.

4. Effect of the utilization

The energy efficiency, the stability of treatment and the improvement in maintenance were verified after reviewing the literature on the examples employing the ICA systems.

5. Forecast of the demand

By extrapolating the trend of the advanced treatment, it was estimated that approximately 450 treatment plants would introduce advanced treatment in the targeted year (2010). Moreover, the number of ICA systems was forecasted to be around 22,000 considering the treatment capacity.

According to this study, it is necessary not only to develop the measuring technology using sensors but also to establish control algorithms and control measuring technology corresponding to the treatment mechanisms for effective and stable future operation in the advanced treatment.

Collaborators: Liaison Conference for Sewerage Development

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Keywords

Advanced treatment, Measuring sensor, Automatic controlling, DO meter, ORP meter