

Evaluation Research for Practical Application of A Energy-Saving Sewerage System Using Wind Energy

Whole term

1998.9 - 2003.3

(Purpose)

Energy-saving sewerage system using wind energy that attempts to save energy by generating electric power by wind force which is clean and un-exhaustible natural energy source which can be used as power source. Therefore, the prevention of global warming and reduction of maintenance and operation cost are expected by this system.

This research was performed by the Unoke Nanatsuka City Plan Sewerage Facility Association and the Japan Institute of Wastewater Engineering Technology from 1998 to 2002. In 1998, the implementation of wind power generation to sewage treatment plants was discussed, and it was revealed that it contributed to reduction effect of maintenance and operation cost and prevention effect of global warming. In response to the result, in 1999, the basic specification of the system was established. Moreover, in 2000, the measures for winter lightning which is a special phenomenon in Hokuriku District were discussed.

(Results)

In evaluation research performed in 2000 fiscal year, the influence of lightning strike, in case the aero generator was constructed in the Unoke Nanatsuka wastewater treatment plant, was surveyed and the proposed measures were indicated. The procedure was indicated as follows.

- (1) From the previous information of thunderstorm in winter in Hokuriku District, as a pattern of intended lightning strike in this study, the peak value was set at 100kA, length of wave crest was set at 10 μ s and length of wave tail was set at 1000 μ s.
- (2) Lightning measures had a close connection with the earthing of equipments because earthing resistively value was needed to analyze. Furthermore, measurement in the field was performed at four places and the demonstration value which used in analysis was set.
- (3) Lightning surge energy inflicted to equipment associated with electric facilities in this wastewater treatment plant was estimated when the aero generator was struck by direct lightning with the pattern (1). The intensity of lightning catchers established for protection of equipments was found by EMTP analysis. From the result of analysis, the following results were obtained.
 - ①The adoption of connecting earth method of lightning catchers from aero generator to overhead earth-wire of distribution lines is appropriate.
 - ②In regard to lightning catchers which should be implemented, in order to enhance the anti-invasion measures of surge, electric power drawing-in part should have nominal electric discharge characteristic at 10kA. However, in regard to other lightning arresters, electric power drawing-in part shall have nominal electric discharge characteristic at 5kA by setting earthing resistance value at 10kA.
 - ③As the earthing system of the aero generator, mesh earthing near earth's surface and boring earthing should be used at the same time and combined resistance value shall secure under 5 Ω .

(Future plan)

In the future, actual facilities are going to be designed and constructed. Thus, the performance evaluation is going to be promoted by data acquisition from the operation of actual facilities, wind status survey, etc.

Collaborators: Unoke Nanatsuka City Plan Sewerage Facility Association, Japan Institute of Wastewater Engineering Technology

Person in charge of study: Takashi Eto, Masato Fujino, Takayoshi Kawasaki

Key words

Energy-saving sewerage system, Wind power generation, Cost reduction, Prevention of global warming