

Surveillance study on energy saving measures of existing sewerage facilities(the2)

Whole term

1999.4 ~ 2000.3

(Purpose)

The amount of electric power used for sewerage occupies about 60% of the total amount of power used throughout the country, and since fossil fuels such as fuel oil are used for sludge incineration treatment, etc., and methane and dinitrogen monoxide are generated from a sewage treatment process, a great deal of effort will be required in the future to restrict the generation of greenhouse gases occurring in executing industrial businesses by applying novel technology to sewage services and taking energy saving measures.

Under such circumstances, in the 1998 examination, we collected the possibilities of energy saving measures from the calculation of the amount of power used per the quantity of treatment water involved in the sewage treatment of the sewage treatment plants of the whole nation and the existing documents such as paper presented in a sewage study conference with the aim of helping take energy saving measures for sewage and put them in order. In the 1999 examination, we intended to carry out a survey by questionnaire and an on-site hearing based on the examination results of 1998, collect data on the amount of power used in each unit's process and at a level of main equipment, and grasp the unit requirement of the amount of power to be used and extract examples of energy saving measures to help realize energy saving measures.

(Result)

1. Contents of examination

In this examination we collected data on the amount of power used in each unit's process and at a level of main equipment (operation time, output, number of operating equipment, amount of treatment and others), carried out a survey by questionnaire and an on-site hearing, grasped, analyzed and assessed data on the amount of power used in each unit's process and at a level of main equipment to extract concrete examples of energy saving measures. In the sewage treatment plant in which the examination was carried out, the amount of water treated is 1,000 to 30,000 m³ per day, and the oxidation ditch method and the standard activated sludge method were used therefor.

2. Examination results of each facility

(1) Pump in the facility: Power of 0.05 to 0.15 kWh/m³ is used at the target sewage treatment plant.

(2) Water treatment facility

- Sludge rake: Sludge tends to precipitate in the beginning and at the end in the sewage treatment plants where the amount of water treated is 10,000 m³ or less a day. This is because a final settling reservoir has so small a water-area load that the area of the settling reservoir becomes large, thus causing equipment to require a large amount of power.
- Return sludge pump: When the return ratio becomes high in the OD method and the standard activated sludge method, the unit requirement of power per the quantity of return sludge decreases. In the case of sewage treatment plants where consumption energy during continuous operation is large, it is considered to be rational as an energy saving measure to pay special attention, for example, to increasing the number of low-load operating pumps or preparing a plurality of motors for replacement.
- Aeration equipment: Compared with the swirl flow method, the overall aeration in which air diffusion efficiency is high can reduce power energy in the standard activated sludge method. In the comparison of the traversal axis type and the vertical axis type in the OD method, discrepancies are large in both types, and no remarkable difference is considered to exist between them.

(3) Sludge treatment facility

- Concentrating facility: The unit requirement of power energy is far larger with centrifugal concentration than with gravitational concentration as the whole concentration facility, but this is a matter to be studied from the viewpoint that effects as the whole sludge treatment facility should be assessed in consideration of the sludge treatment method, disposal method, water treatment method, etc.
- Sludge dehydrating facility: When compared by the amount treatment water of the examination target, the power energy used is larger with centrifugal concentration than with belt press concentration.
- Incineration facility: The relationship between a treatment scale and the unit requirement of power energy has little variation, being 0.3 to 0.4 Wh/kg-DS.

(4) Other facilities: In the standard activated sludge method, when the amount of water to be treated a day exceeds 20,000 m³ per day, the unit power energy is less than 0.1 kWh/m³, and the more the quantity of treatment water is, the more the scope of power energy included in other facilities is limited.

3. Matters related to energy saving

We extracted intermittent operation, a method by invert control, etc., a method of changing into energy saving type equipment and examples of the effective use of energy from the reply to the questionnaire and studied the matters to be connected to energy saving.

4. Future tasks

Through the examination and analysis, we have come to know that it is particularly important to study and grasp the specifications of aeration equipment and return sludge pumps and their operating conditions as the energy saving measures of existing sewerage facilities. As a future task, it is necessary to grasp power energy with higher accuracy to analyze the power energy to be used for main equipment and each facility, and it is also

necessary to put in order the way of thinking for a load at each stage such as the planning of an appropriate capacity of facilities and the selection of appropriate facilities and equipment. Furthermore, concerning the power energy of “other facilities” which was excluded from the main examination target, since the power energy used in small-scale facilities is about 30% of the total power energy used in the whole sewage facilities, it is necessary to know the detailed contents and study taking energy saving measures for major items.

Independent research

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Keywords

Existing plants, Energy saving measures