1. Project Names

1.3.7 The Investigation for the Complex Wastewater Recycling Use 1990 (H2)~1994 (H6)

The investigation for the nitrogen removal and annexation recycle use 1991 (H3)~1994 (H6)

2. Objectives

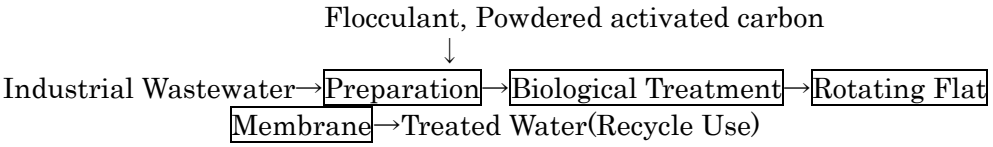
Although technology is witnessing advancement, the residue of nitrogen and the appearance of slimes due to phosphate, causing clogs in manufacturer machinery, and piping are some of the known problems in the way of the promotion of the water recycling system.

Given these problems, the development of a cost and space efficient water recycling technology able to simultaneously eliminate phosphorous, nitrogen, and other unnecessary matter found in manufacturer's wastewater.

3. Contents

【Treatment Procedures】

Below are the procedures of the treatment system



【Summary】

In order to eliminate the organic compounds in the wastewater, the use of the MBR, the potential highly efficient and compact system, and the supplement of Flocculant, and Powdered Activated Carbon is needed as required.

For the simultaneous elimination of nitrogen and phosphorous, it will be required to use the Nitrification-denitrification technology with the biological treatment from the system stated above, as well as the PAC as a Flocculant.

The Powdered Activated Carbon is planned for supplementation in place for the Flocculant in the case when other material is left as residue after the biological treatment.

Treated Amount of Water：50~100L/day

Denitrification Tank：9.5L

Nitrification Tank：9.5L

Rotating Flat Membrane：ϕ 210, Polysulfone series, Molecular Weight limitation 750,000

【Operational Conditions】

An experiment regarding the effects to the membrane and the biological treatment tank was done, setting the HRT at 2 to 9h, and the MLSS at 15,000mg/L. The supplementation of PAC and Powdered Activated Carbon was done as needed.

4. Results

【Results】

The stable and long-term operation was proven to be possible without the clogging by the material that was not able to be decomposed, the decrease in membrane flux, when the HRT is 6~8h.

Supplementing 50mg/L of Powdered Activated Carbon when the color level of the source water is approximately 40 results in a color level of below 5, leading to a satisfying quality of recycled water.

Also, supplementing 4mg/Al/L of PAC into the biological treatment tank when the T-N is 30mg/L and T-P is 4mg/L, the treated water T-N was confirmed to become below 5mg/L, and T-P under 0.5mg/L.

As with the BOD treatment, a stable 99% removal rate was confirmed.

【Economic and Cost Efficiency】

Construction costs in the case of a 1,000 m^3 /day duration has been estimated at about 7,000,000 to 8,000,000 JPY. Because the scale up merits of the rotating flat membrane, an important aspect of the system, was small, the scale merits for the overall system also resulted small.

The operational cost which is 170~185JPY/m^3, will possibly be lower than the recycling costs (approximately 200 JPY/m^3). However, the further decrease in the membrane costs is desirable as approximately half of the operational costs are in the membrane exchanging process.

【Conclusion】

It was proven that this system is safe and high quality water producing.

Because the scale up merits of the rotating flat membrane, an important aspect of the system, was small, the scale merits for the overall system also resulted small. Given this, it is more efficient and beneficial for smaller systems of below 1,000m^3/day to use this than larger systems.

Also, the decrease in cost for the membrane exchanging process is desired, as half of the operational costs represent this process.

5. Reference

Ministry of International Trade and Industry contractors

Cooperative Organizations: Hitachi Plant Engineering & Construction Co., Ltd.