Investigation on the executive planning of the project to improve the Hayama stream-region		
Whole term	1995. 10 ~ 1998. 3	

(Purpose)

This investigation aimed at the application of the process of flocculation, one of the water treatment processes, in a stream flowing into Lake Biwa. The process of flocculation is used in every field of wastewater treatment for removal of fine SS, phosphorus and etc.

This research performed experiments for 3 years on the flocculation-precipitation process, flocculation-precipitation-filtration process and flocculation-filtration process.

From 1995 to 1996, the experiments on the first two processes were performed, and then the relationship between the flocculant injection rate and the effect on the treatment, the experiments for reusing the sludge generated from the treatment process as returned sludge and the durability of its effect were clearly confirmed. In 1997, the optimal loading rate of the water surface area, the optimal injection rate of flocculant and the effect on treatment were investigated through experiments on the flocculation-filtration process.

Also, the characteristics of the treated water and operational problems of the experiments were summarized.

(Results)

1. Flocculation-precipitation process and flocculation-precipitation-filtration process

① For the case without the return sludge, the removal efficiency increased with lager PAC injection rate, and if the PAC injection rate had been 60 mL/m^3, the treated water quality of 0.05 mg/L could have been reached without the sand filtration.

② The removal effect with PAC injection rate of 20 mL/m^3 and return sludge rate of 1% was similar to that with PAC injection rate of 60 mL/m^3.

③ The durability and stability of the effective treated water quality by return sludge was confirmed through consecutive plant operations.

④ In the flocculation- precipitation process, the case with turbidity to serve as a core of floc showed better results.

⑤ The flocculation-precipitation-filtration process was applicable to a wide range of inflow water quality concentrations.

2. Flocculation-filtration process

① The flocculation-filtration process was found to be suitable for an inflow of relatively low turbidity. In this method, the generated floc was filtered, which means it did not need to be formed into a radius large enough for floc to precipitate, and smaller amount of chemical injection was needed than that for the flocculation-precipitation method.

② If the inflow and PAC injection rate was changed to 15~100 m^3/day and 10~40 mL/m^3, respectively, approximately 90% of the removal efficiency of TP and SS would be observed for every case.

③ The factors which decided the optimal operational condition of the flocculation-filtration method were the duration of filtration, the net rate of operation and the net amount of the treated discharge. The duration of filtration was longer for small inflows with PAC injection rate being 10 mL/m^3 at any inflow water quality. On the contrary, if PAC injection rate was high as 40 mL/m^3 the filtering duration time would get shorter.

④ With respect to the net rate of operation of the experimental plant and the labor reduction per day, PAC injection rate of 10 mL/m^3 with a long duration of filtration and an inflow rate of 60~100 m^3/day were proved to be more efficient. Also, the inflow of 100 m^3/day showed the maximum labor reduction rate per day.

⑤ The minimum amount of sludge generated from the flocculants occurred in the

flocculation-filtration method. The flocculation-precipitation and flocculation-precipitation-filtration processes produced the maximum amount of sludge, which, however, could have been reduced to 1/3 if the sludge had been returned.

Keywords	Phosphorous removal, Flocculation-precipitation-filtration process, Flocculation-filtration process, Recycle ratio of sludge, Injection rate of coagulant