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THE EVALUATION OF SMALL PONDS ON THE QUALITY OF WATER IN A RIVER

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ABSTRACT

The quality of water in Jajrood River and the reservoir of Latian Dam is affected by natural factors and the human habitats in its watershed area. Transfer to a large amount of organic matter and nutrients in runoff occurs. In this research, the results of the quality measurements obtained in thewatershed area, which have been done in seven years have been studied and the operation of a small pond which has been made along the the river, has been evaluated as one of the practical methods in controlling the pollution and sediments by performing some experiments.

The results show that in spite of the small reduction in BOD, the degree of water quality indicator (WQI) doesn't change so much. The results of the quality measurements obtained in thewatershed of Latian Dam, which have been done in seven years have been studied and the operation of a small pond which has been made along the the river has been evaluated. The results show that the degree of water quality indicator (WQI) doesn't change so much.

KEYWORDS: Water Quality, Small Pond, Jajrood, WQI

INTRODUCTION

In the recent years, the agents who have been responsible for providing and treatment the drinking water in tehran have been worried about the gradual reduction of the drinking water in this city, specially during the time of drought.The watershed areas of the latiyan dam and the jajrood river which have been the most important for providing the drinking water in tehran, have been affected by the changes in the number of residents and the changes in using the extensive lands around this city.

The studies and investigations show that the chemical quality of water in this river and in the karaj river is better than the under-ground water which is used for providing the lake of drinking water in tehran[1].The watershed area of the latiyan dam with the area equal to 690 kilometers, exists in the area shemiranat province equal to 1100 square-kilometers and between up to degrees of geographic longitude and the geographic latitude between up to [2].

In this research, we have tried to investigation of result of river water quality and it has been triedevaluate the action of a natural small pond in the direction of the basic part of the river in meygoon on the quality of water.This evaluation is important from this point of view that making preimpondmeant and pond in the direction of the river is one of the important stractural methods in reducing the pollution in the watershed area especially for reducing the suspended solids in water.

The quality investigation in the watershed areas have been done in seven years on the basis of chemical, biological and microbial tests, and taking the samples from the pond has also been done in two years.The places of taking the samples have been shown in Fig. 1

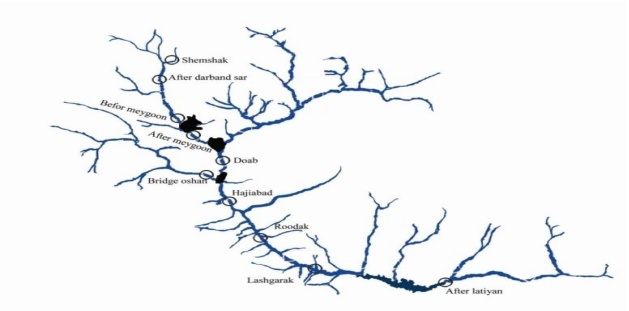

Fig. 1: The Sampling Stations

Checking the Results Related to the River

In the Fig 2,3,4,5,theaverage amounts of the parameters:Fc,Tc, ,BOD,NO3,TDS are shown in the sampling stations during a period of seven years[3].

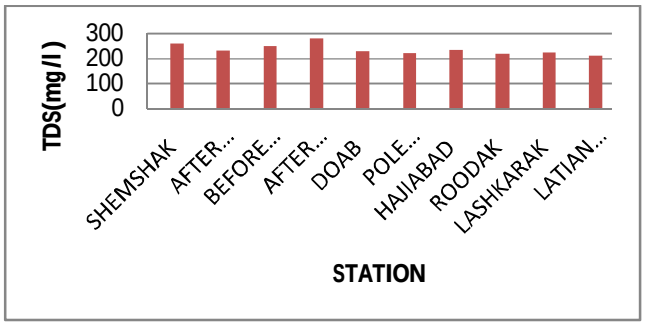

Fig. 2: The Average Amounts of TDS in the Sampling Stations

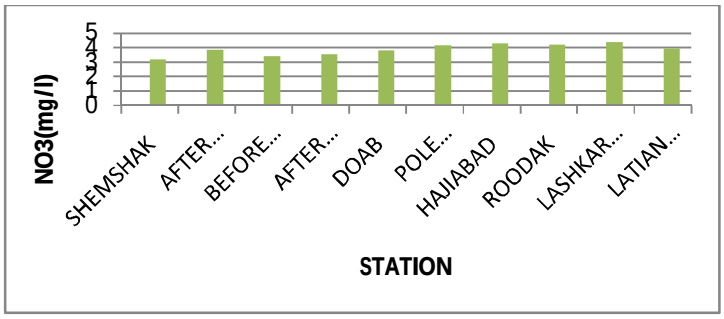

Fig. 3: The Average Amounts of NO3 in the Sampling Stations

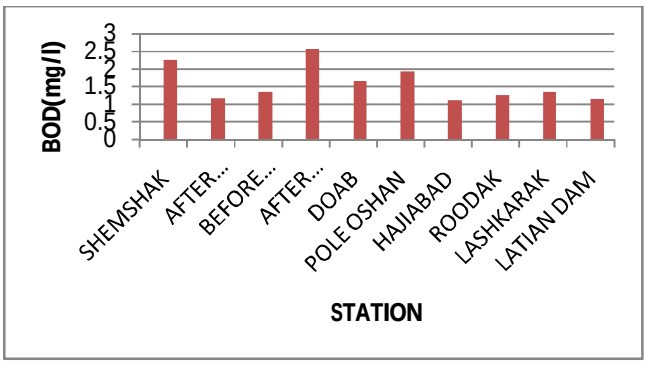

Fig. 4: The Average Amounts of BOD in the Sampling Stations

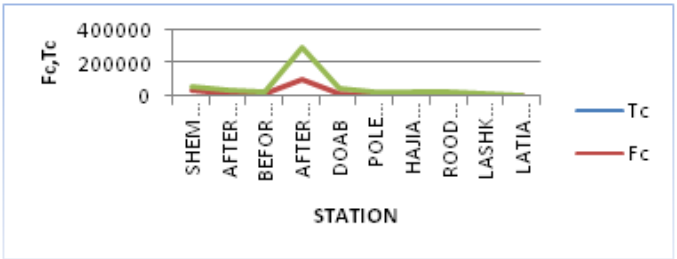

Fig. 5: The Average Amounts of Tc and Fc in the Sampling Stations

Taking the samples has been done monthly in these stations.As it is observed in the curvature of the changes in the amounts of BOD and total coliform, and fecal coliform and nitrate and TDS, in spite of the increase in these parameters in the residential areas such as meygoon, after passing these areas up to the next station, every one of these agents are reduced in a high degree.Using the nutrients by the marine plants and the aljaes and the reduction of BOD by biofilm on the stones at the bottom of the river and the disolved oxygen in a high degree show the Special Condition of the Natural self-purefying of the river. The high degree if Self – Purefying of Water in the river is because of Slope of the Watershed area of Jajrood River. Comparing the bacterial Water quality Coming out of the dam with the Water of Jajrood river shows the high power of the Latiyan Dam reservior in redusing or removing the biological pollution of the water .Although the water in the deep dams are the danger of quality devastation, and this prosess during the time of not having enough water and also twice in a year during the time of mixing the heating layers of water makes a lot of problems.

The resuts shows that in spite of the Fact that the amounts of chemical Parameters Solved in the Water have not reached to unsuitable degree for using it as drinking water, the micobic parameters and the suspended solid Particle in the water along the Jajrood river are high.

The Soil in this area Considaring the Substances (equal to %20) are normally Considered as the rich kind of soil[4]. the results of the tests show that Consideration amount of unsolved Phosphate together with Sediments and Floods current and melting the snow in Spring time are transfered to the Store of the dam

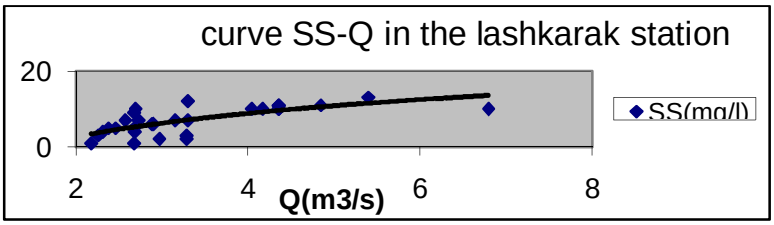

Fig. 6: The Curve of ss Changes with Q in the Station of Lashkagak Entrance Dam

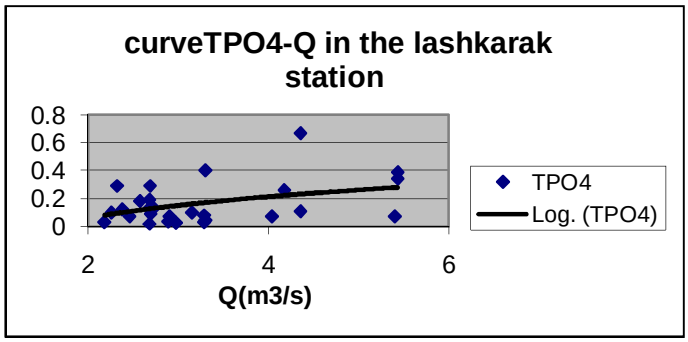

Fig. 7: The Curve of Tpo4 Changes with Q in the Station of Lashkagak Entrance Dam

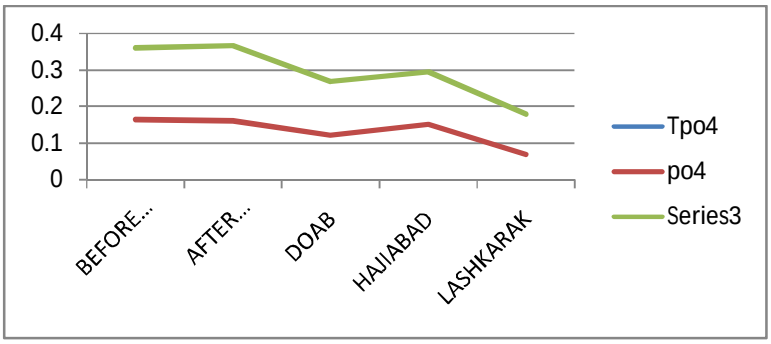

Fig. 8: The Average Comparison of T.PO4 and PO4 in Sampling Stations

These results show that the unsolved phosphate together with these sediment are more at the beginning part of the river. Fig.8. The biological treatment of water in hot season especially near the residential areas such as meygoon has been done and has been ended to the growth of thread-like algae and biofilm over the pieces of stone and sometimes in areas where the speed of flowing water is low.The deposits which are made in the river keep aconsiderable amount of suspeded particles and microbe in the water, therefore in the curve of the change of the fecal coliform from the upper part station up to lashkarak station(The entrance of the latiyan dam lake) a considerable reduction can be seen. Fig. 5

The Method of Evaluating the Pond Operation

In the places where a small basin or pond has been produced naturally along a river and the preservation time has been produced for water,the natural conditions of treatment the water are made.After the survey of the river, the people in charge of this project, tried to choose a place from the along of the river where the pond has been made, and then to do the necessary experiments.

Therefore around the town of meygoon, a place where a pond of 2 meters height has been made was chose.(Fig.9)

Fig. 9: The picture of the Pond

The chemical and biochemical and bacterial experiments were done in summer, autumn and winter in two years. These experiments including the measuring of field and laboratory parameters were done according to a standard method[5]. The obtained results of the measuring the water entering the pond and going out of it were compared by method of water quality indicator NSFWQI.

Introduction the Quality Indicator

In order to analyse and interpret the parameters of the quality of water, there are different mathematic methods which one of them called water quality index is one of easiest methods with a lot of applications. In this method, the information obtained from the quality measurements of water is changed into a single and dimensionless number which

this number in a graded scale has the meaning and the explained qualitative interpration in general, the qualitative indicators are classified into five groups:The general indicators, the special usages indicators and the designing indicators, the statistical indicators, and the biological indicators[6].

Among the general quality indicators of water, the NSFWQI indicator has less difficulties and has been used more than the other indicators. The benefits of this method are its simplicity and availabity of usable quality parameters. parameters in this method are: Fecal coliform, Turbidity, ΔT, PH, TS, PO_4^{3-}, NO_3^-, BOD_5 and DO.

In this method, in order to calculate the final indicator, the following formulae are used in which, I_i is the indicator of every parameters and W_i is the weight indicator of the parameters and n is the number of under indicators. $I=\prod_{i=1}^{n} I_i^{W_i}$ and $\sum_{i=1} w_i = 1$. The indicator degree is a number calculated between zero and 100 and the quality of water is classified. The boundary between 90 to 100 is excellent, 71-90 is good, 51-70 is average, 26-50 is weak and 0-25 is very bad.

The NSFWQI is a reduction indicator or measure, it means that with the increase of water pollution the indicator is decreased[7].

THE RESULTS AND DISCUSSIONS

The amounts of the measured Parameters in the entrance and out let of the small pond in the summer, fall and winter have been shown in the table below.

Table 1: The Measured Quality Parameters

station/	Entrance pond	Outlet pond	Entrance pond	Outlet pond	Entrance pond	Outlet pond	
parameter	Summer of the first year	Summer of the first year	winter of the first year	winter of the first year	fall of the second year	fall of the the second year	W F
Tw	17	18	8.4	8.4	10	10	0.1
Fc	1000	1100	35	20	2400	2400	0.16
PH	8.11	8.11	8.9	8.9	7.76	7.79	0.11
Turbidity	44	44	5.6	10	14	9.5	0.08
Tss	4	2	21.5	21	10	19	0.07
no3	2.21	1.77	5.2	7.1	2	2.2	0.1
TPO4	0.18	0.22	0.46	0.26	0.68	0.69	0.1
BOD5	4.34	3.75	0.9	0.9	3.1	3	0.11
DO	8.7	8.71	7.9	7.7	6.38	6.3	0.17
TDS	327	324	199	200	195	196.2	
NH4	0.0364	0.0486	0.18	0.06			

The flow of the current of water during the time of taking the sample in summer was 0.156 cubic-meter in one second and the time of water remaining in the small pond was 35 minutes.

Checking the changes of the measured parameters in summer shows that the amount of BOD_5 and nitrate has been reduced to some degree in the outlet station in comparison with the inlet of pond and the obtained result of pond operation in the BOD_5 reduction of the river is obtained as ٪135. The amount of phosphate shows a little increas Considering all parameters, the obtained quality indicator does not show a considerable change.

The degree of parameters in winter and autumn have not been changed so much in the entrance and outlet of the river because of the water staying in the pond in shorter time, and the degree of the indicator has hearly been remained unchanged.

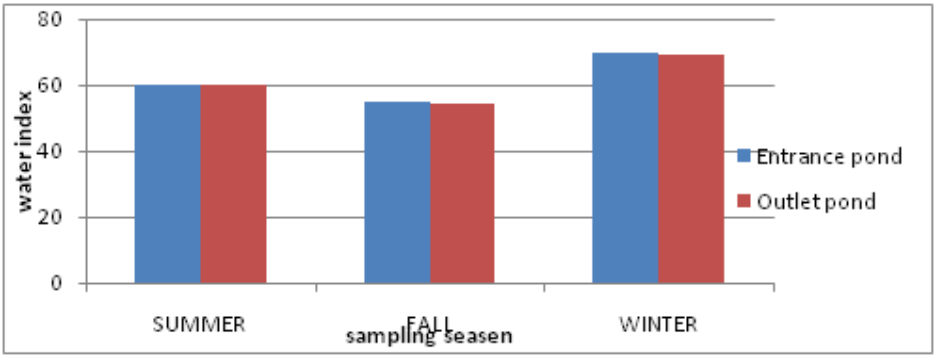

Fig. 10: The Curve of the Changes in the Quality Indicator of Water

CONCLUSIONS

In Fig. 10 in comparison of obtained for quality indicators with quality classification of water is divided in the average condition.

The results show that in these ponds, in summer, because of the activity of the aquatic in water, some of the organic matters which are solved in water are reduced and the a lot of alga grow in water.If some birds living near water or some fish which eat alga and seaweed such as (kapur) are added to water, the organic matters containing nutrients can be omitted from the water and present them from entering the lake behind the dam. the effects of these ponds are too little for reducing the suspended solid in water especially during the raing seasons,and for reducing the solid substances in water, we can get the benefit of the method of ponds with suitable sizes or preimpondments at the entrances of the reservoir for depositingthe sediments

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