Improvement for Naula Water Treatment Plant and Distribution

L.A.D.M Athukorala
Uva Wellassa University, Badulla, Sri Lanka

and

S.K.Weragoda, S. Kodhithuwakku, M. Makehelwala
National Water Supply and Drainage Board, Kandy, Sri Lanka

Introduction

Naula Reservoir has been selected as a source of Naula Water Supply Scheme. The reservoir is recharged through the Naula oya Water Treatment Plant is carryout their service continuously 08 or 12 hrs /day.

There is an agricultural land around the reservoir. Therefore, it leads to increase the nutrient content such as nitrate and phosphate of the reservoir (Horne and Goldman, 1994). Increase of the nutrient content caused the algae growth in reservoir leads to the Eutrophication. During the high temperature season in the year, the growth of the phytoplankton and the algae is increase because lake has good conditions for their growth (Horne and Goldman, 1994).

During the dry season, blackish color sludge is formed and foul smelling occurs within water distribution system. The main Objective of this research is Propose the feasible and economical solution for appropriate to the Sri Lanka, problem involve Naula Water treatment Plant.

Materials and methodology

Samples collection was done in the reservoir, treatment plant, and the distribution system. Summarized sample collection method was shows in the figure 1.

DO variation of the reservoir was measured onsite using the portable DO meter. 2m, 4m, 6m, 8m depth from the surface level of the reservoir was measured.

All the collected samples were undergone with the chemical and physical parameter analysis. S^{2-} content, NO_3^- content as N, NH_3 content as N , PO_4^{3-} content were measured as chemical parameters by the DR 5000 spectrophotometer and pH, color, Turbidity, Conductivity were measured.

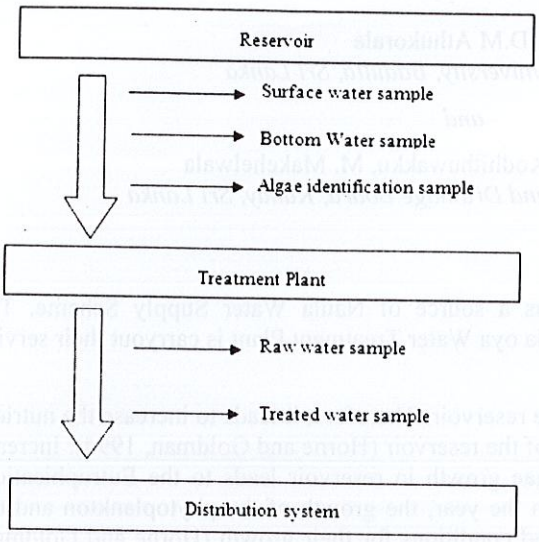

Figure 1: Summary of the Sample collection method

Results and Discussion

Figure 2 shows the DO variation and the Temperature variation with the depth. Both parameters were change as same manner. Highest DO level and temperature is in the surface level. Lowest DO level and the temperature show the bottom of the lake.

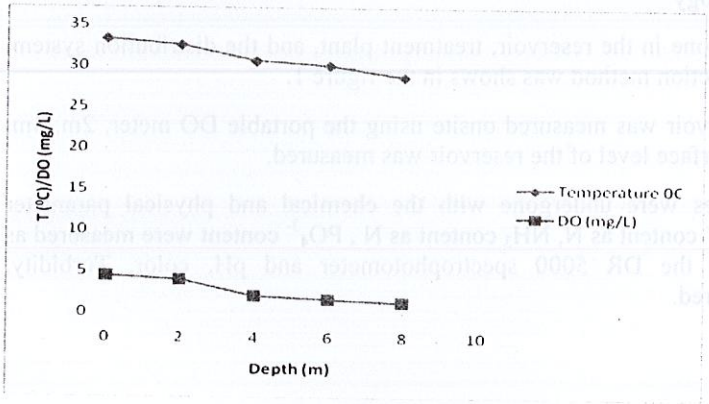

Figure 4: Temperature and the DO variation with Depth

All the collected samples were re-registered as follows. Analysis was done.88 -Surface Water of the Lake, 89 -Bottom Water of the Lake, 90 -Distribution Water, 91 -Treated Water, 92 -Raw Water.

Figure 3 shows the chemical variation in the collected water samples. Highest sulfide content in the bottom of the lake and lowest shows the treated and distributed water. Highest ammonia concentration reported in the bottom water sample. A lower pH value

indicates higher acidity. Highest pH value shows in the surface water sample. But the acidic condition shows in the bottom of the lake.

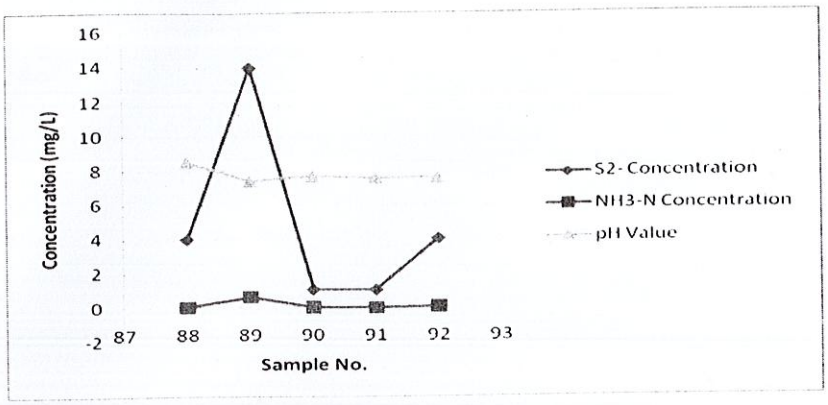

Figure 5: Sulfide, Ammonia and pH variation of the water

Conclusion

This study clearly shows the Naula reservoir has thermal stratification (Horne and Goldman, 1994). In addition, the anaerobic condition in the hypolimnium of the reservoir. pH level of the anoxic hypolimnium is low and it creates acidic condition in the reservoir bottom. Sulfide content was also high in the hypolimnium of the reservoir. These two results are strong evidence for the Sulfur reducing bacteria (SRB) habitant (Wargin et.al, 2007).

The intake of the Naula water treatment plant was situated in the bottom of the reservoir. High organic content and the microorganism content also released to the water treatment plant. Sulfide content high in the bottom and it may form the hydrogen sulfide gas. It will form the foul smell (rotten egg smell). That will cause for the foul smelling in the distribution and Sulfides are precipitates in the pipelines as black precipitates.

For the problem in the Naula treatment plant, the feasible solution is the aeration. In Naula reservoir water is stagnated and does not mixing air well. Therefore, aeration creates good contact with air and oxygen and creates current in the reservoir. Another option is floating intake. In floating intake, intake level will change with water level of the reservoir. It will not affect the bottom condition of the reservoir. Other option is Granular Activated Carbon (GAC) column filtration for raw water. It will remove the organic matters and the microorganism in the raw water.

References

Horne A.J. and Goldman C.R. , 1994. Lake Ecology Overview, Chapter 1, Limnology, 2nd Ed., McGraw-Hill Co.; New York, USA

Wargin, A., Olańczuk-Neyman, K. and Skucha, M. , 2007. Sulphate-Reducing Bacteria, Their Properties and Methods of Elimination from Groundwater; Polish J. of Environ. Stud., 16(4), 639-644