Water Quality Monitoring Using Total Dissolved Solids Measurements

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Total Dissolved Solids (TDS) are used, together with other parameters, to classify the river water concerning their quality. The rapid increase of pollution in Dambovita County, due to the industrial processes, thermal power station and domestic sewage, modify the quality of Ialomita river along the county. So, it is necessary to determine the deviation of TDS from standard values. In this paper the results of total dissolved solids (TDS) measurements of water from Ialomita River, Dambovita County are reported. The TDS measurements were performed at the sampling sites by means of Hach CO150 conductometer, three month running. The monthly TDS migratory forms were determined.

Keywords: TDS, conductometry, pollution, water quality

Water plays an intrinsic role in our living environment. Water of suitable quality and quantity is essential to all life forms. It shapes and beautifies the landscape, controls our climate, determines the nature of the surrounding environment and is a vital requirement in agriculture, industry, power generation, recreation and tourism. While water of good quality is needed for drinking, swimming, fishing, farming, and manufacturing, water can also be used for the disposal of industrial waste, sewage, and waste heat. Its quality can deteriorate and limit its future use.

Surface water is an important component of fresh water systems and surface water monitoring is essential to attain a comprehensive understanding of the physical, chemical, and biological characteristics of aquatic systems [1-3].

Total Dissolved Solids (TDS) are solids in water that can pass through a filter. TDS is a measure of the material amount, which is dissolved in water. This material can include bicarbonate (HCO_3^-), chloride (Cl^-), sulphate (SO_4^-), calcium (Ca^{++}), magnesium (Mg^{++}), sodium (Na^+), potassium (K^+), iron (Fe^{++}, Fe^{+++}), nitrate (NO_3^-) and other organic ions. A certain level of these ions in water is necessary for aquatic life.

However, if TDS concentrations are too high or too low, the growth of many aquatic lives can be limited, and death may occur. A high concentration of TDS may also reduce water clarity, contribute to a decrease in photosynthesis, combine with toxic compounds and heavy metals, and lead to an increase in water temperature.

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Experimental part

Determination of TDS by evaporation is tedious and also TDS by the sum of ions required analysis for all the major constituents is expensive. So, a much simple method is to determine the electrical conductivity as a measure of the total dissolved mineral material [4].

Different samples of surface water, from Ialomita River, collected at points with industrial sources of pollution from Dambovita area (table 1) were measured three month running in May, June and July. The measurements were performed on the sampling sites by means of Hach CO150 conductivity meter. The electric conductivity (σ, measured in μS/cm) of water sample was converted into the concentration of TDS (mg / L), through multiplication by a conversion factor with an approximate value of 0.67 (fig. 1). This factor was determined using KCl standard solution.

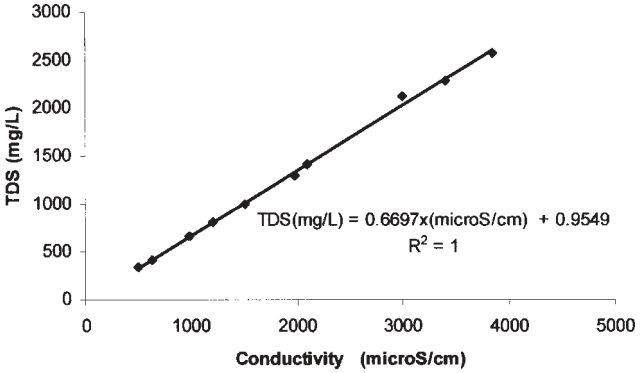

Fig. 1. TDS versus conductivity KCl standard solution

Results and discussions

The experimental results of TDS measurements of surface water samples are presented in table 2. The TDS values present a continuous increases starting from Bucegi Mountains to the plains, excepting Fieni point, where the TDS value decrease.

A striking point is the decrease of TDS value in Fieni. It can be the same reason, which can decrease the temperature of water un this point. This result will be the subject of the next investigation concerning the quality of Ialomita River along the Dambovita County. Another striking point is placed between Targoviste input and output sites, where small difference in the TDS is often detected. It can be results of an efficient system of domestic water purifying.

The applied standards [5, 6], which classifies surface water into three quality classes was taken into consideration for the assessment of the Ialomita River pollution along the Dambovita County. The obtained TDS

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Table 1

SAMPLES FROM IALOMITA RIVER

Sample	Collecting points/ polluting sources
C1	Dobresti – Bucegi mountain area
C2	Moroieni-Mountain zone/Healthy sanatorium
C3	Pietroşiţa-Mountain zone
C4	Fieni – town –30 km north from Targoviste town/cement factory, lighting products factory
C5	Pucioasa- town –20 km north from Targoviste town /textile factory
C6	Doiceşti –village area- 10 km north from Targoviste town/ energetic coal factory
C7	Târgovişte-input town/Steel Special Trust, Romlux – light sources factory, Victoria-chemicals factory, PETROM- oil extraction trust
C8	Târgovişte-output town /Steel Special Trust, Romlux – light sources factory, Victoria-chemicals factory, PETROM- oil extraction trust

Table 2

THE MONTHLY MEAN VALUES OF TDS MEASUREMENTS

Sample	Total dissolved solids					
	May		June		July	
	TDS (mg/l)	SD* %	TDS (mg/l)	SD* %	TDS (mg/l)	SD* %
C1	128	6.9	284	8.5	405	6.3
C2	183	7.1	400	9.1	592	6.5
C3	191	2.5	400	7.5	591	5.1
C4	139	12.2	297	10.5	406	10.6
C5	199	7.6	411	7.7	637	7.5
C6	219	7.1	452	6.8	675	6.9
C7	255	7.5	509	7.2	745	7.2
C8	262	6.7	561	7.3	803	7.2

* standard deviation

values put the segment of Ialomita River from Dambovita County in the first class of quality, water that can became drinkable (TDS standard values < 500 mg / L) on May - first month and June- month 2. On July - month 3 the first class of quality was changed into the second class of quality, water being destined to industry, to fish enterprises and for urban and recreation use (500mg / L < TDS standard values < 1000 mg / L).

Conclusions

The obtained TDS values reveal an evident seasonal dynamic of quality of Ialomita River along the Dambovita County, a normal increase of TDS by the first month to the third month can be explain by temperature increase. The results reveal that TDS values increases between the extreme collecting points, which can be explained by the polluants transport into downstream river. The present study has not been able to assign with accuracy the particular contributions of real sources of degradation to water quality from Ialomita River. A constant monitoring of the water and sediments is required to establish the pollution status of the river.

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