STUDY OF THE EFFICIENCY OF UNDERGROUND WATER TREATMENT PROCESSES AT URSENI, TIMIS COUNTY

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Abstract. *Drinking water has become an extremely valuable resource in our century. Corporations have long tried to privatize this vital resource of life and freedom. Slowly new legislative proposals are being made at EU level through representatives of some countries. Underground water should be seen not only as a water tank but must be protected for its environmental value. groundwaters are hidden resources that are much more important than surface waters and for which pollution prevention, monitoring and rehabilitation are much more difficult than surface waters because of their inaccessibility. This hidden nature makes it difficult both to locate and adequately characterize pollution and to understand the impacts of pollution, often resulting in a lack of awareness and / or evidence of the extent of risks and pressures. The main objective of this paper is to determine the quality of groundwater and to present the results of the evolution of the main indicators of the quality of the underground water from the Urseni water treatment station in the period 2016-2017.*

Key words: *underground water, treatment processes, manganese, iron*

INTRODUCTION

Groundwater reserves present a particular economic importance. Through their position within the earth's crust, by filtering many impurities with the infiltration and through a protective shaft that their geographic situation ensures, groundwater has been since ancient times the main source of drinking water and household water (MARTONOS 2017).

According to the National Ground Water Association, the underground springs are the second largest source of freshwater of the Planet, after the water that comes from the melting of the glaciers. According to experts, groundwater is collected from precipitation, which infiltrates underground in aquifers and reservoirs from the earth, according to Live Science (FOSTER 2002).

According to the United States Environmental Protection Agency (EPA), underground springs are important for energy and food security, human health and the preservation of healthy ecosystems, but are also a resource that is at risk of overloading and pollution from human factors (CRISTA, 2013, 2014).

Researchers found that out from the 23 million cubic meters of water from continental bark, only 540,000 cubic kilometers represents a young and fresh reserve, and this is a worrying situation (HAMEED, 2010).

From a qualitative point of view, groundwater is clean and complies with drinking requirements or for industrial requirements less demanding (ZHU, 2011, RADULOV, 2016).

Underground waters may also contain elements whose concentration exceeds the permissible standards for drinking or industrial use. These depend on the composition of the land and usually refer to iron, manganese, calcium, magnesium, hydrogen sulfide, fluoride, carbonate, bicarbonate, ammonium, nitrite, nitrate, etc. In this case it is necessary to approach treatment systems, especially if the water is destined for human consumption.

MATHERIAL AND METHODS

The Timisoara city is documentary attested since the 13th century. The first documentary attestation of Timisoara is controversial, being placed by specialists in 1212 or 1266. In 1342, Timisoara is mentioned under the title "civitas" - city. Archaeological discoveries indicate the existence of a Roman settlement, possibly a town, on the city's hearth from today.

On 1 June 1914 was put in function the first water treatment station in Timisoara, called Uzina no. 1, located in the south-east of the city. The treatment station handled groundwater pumped from a group of 6 drillings from depths of 40-60 m. The technology included a spraying aeration step, a prefiltration stage and a filtration stage, through which were eliminated the iron and manganese salts from the water. The distribution network was 87 km long and provided water to the 46,000 inhabitants of the city. At the same time, the water-canal enterprise of Timisoara, ACOT, was set up. It was the first organization of public services in the country of its kind and was led by Stan Vidrighin. At that time water quality in Timisoara was considered among the best from Southeastern Europe.

The development of the treatment station continued with the execution of another 40 drillings, achieving a total flow of 600 l/s and putting into operation of a new treatment station in 1992.

At present, Urseni water treatment station is upgraded and automated in the proportion of 80%. This provides about 30% of Timisoara's water supply.

The monitoring of water quality for domestic consumption is done at the Urseni Water Treatment Station situated in the southern part of Timisoara (Figure 1).

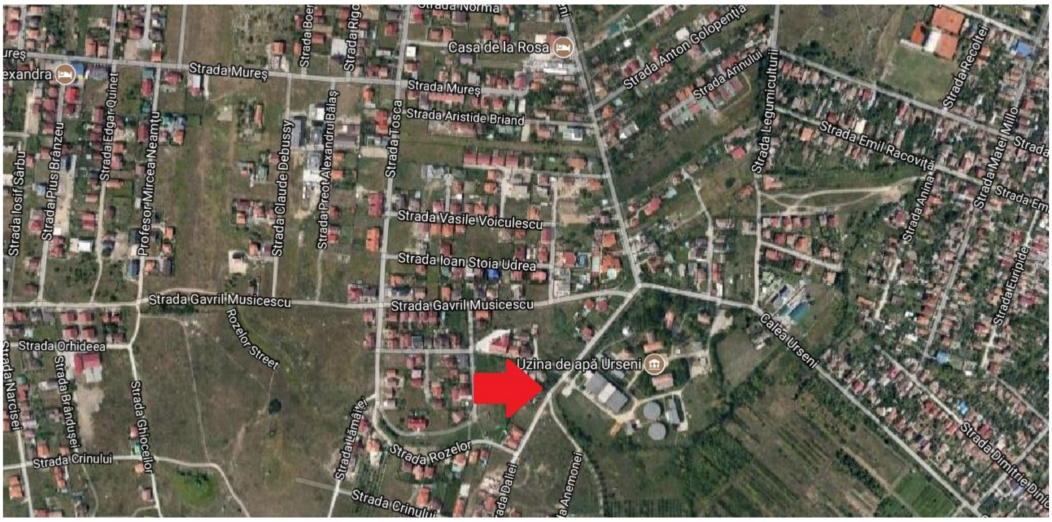

Figure 1 Localization of Urseni Water Treatment Station

The results obtained were analyzed and compared with the main parameters of the physico-chemical quality indicators and their values (listed in table 4.1 and 4.2.), from Law 458 of 2002, regarding drinking water quality supplemented by the Law no. 311 of 28/06/2004.

Studies were made for two years in 2016 and 2017.

RESULTS AND DISCUSSIONS

Following the water analysis at the Urseni water treatment station **in 2016**, it was observed that in the month of January in terms of Fe content, the quantity was 4340 µg/l in raw water, decreasing after the first deferring stage to 76 µg/l, after stage II demanganization at 72 µg/l, resulting a drinking water at the exit from the TREATMENT STATION of only 20 µg/l.

Regarding the Mn content in January, the amount was 650 µg/l of raw water, decreasing after the first deferring step at 33 µg/l, after the demanganization stage II at 3 µg/l, resulting a drinking water at exit from the WATER TREATMENT STATION of only 3 µg/l.

In April the Fe content was 3190 µg/ l of raw water, decreasing after the first deferment step to 52 µg/l, and after the second demanganization step to 46 µg/l, resulting a drinking water at the exit from the STATION TREATMENT of only 23 µg/l.

In the same month of April, Mn content was 530 µg/l, raw water, decreasing after the first deferring step to 22 µg/l, after the 2nd demanganization step at 4 µg/l, resulting a drinking water at the exit from the Water treatment station of only 4 µg/l.

In July, the Fe content was 2400 µg/l of raw water, and after the first deferral step it fell to 23 µg/l, and after the demanganization stage II it dropped to 22 µg/l, resulting a drinking water at the exit from the Treatment Station of only 22 µg / l.

Mn content in July, the quantity was 560 µg/l in crude water, after the first deferation step decreased to 18 µg/l after the 2nd demanganization stage at 4 µg/l, resulting in drinking water at the outlet of the Station treatment of 3 µg/l.

In October, the Fe content was 3900 µg/l in raw water, decreasing after the first deferment step to 54 µg/l, and after Phase II demanganization at 20 µg/l, resulting a drinking water at the exit from the Treatment station of only 20 µg/l.

Also in October, we observe that Mn was 640 µg/l of raw water and after the first deferral step it dropped to 26 µg/l after the second stage of demanganization at 2 µg/l, resulting a drinking water at the exit from the Station treatment of only 2 µg/l.

In conclusion regarding the Fe content, it does not exceed 25 µg/l (MARCH 2016) at the exit from WATER TREATMENT STATION, and in terms of Mn content does not exceed 6 µg/l (MAY, AUGUST 2016) at the exit from the WATER TREATMENT STATION.

Following the water analysis at the Urseni water treatment station **in 2017** it was observed that in January the Fe content was 2520 µg/l raw water, decreasing after the first stage of deferring to 66 µg/l after stage II of demanganization at 34 µg/l, resulting a drinking water at the exit from the Treatment Station of only 23 µg/l.

Regarding the Mn content in the same month of July, the quantity was 570 µg/l crude water, decreasing after the first deferring step to 22 µg/l, after the 2nd demanganization stage at 2 µg/l, resulting a drinking water at the exit from the Treatment Station of only 2 µg/l.

In the same table it is observed that in October regarding the Fe content, the amount was 3610 µg/l crude water, this decreasing after the first stage of deferment to 138 µg/l and after the demanganizing stage II to 22 µg/l, resulting a drinking water at the exit from the Treatment Station of only 20 µg/l.

Regarding the Mn content in October, the quantity was 470 µg/l of raw water, decreasing after the first deferment step to 24 µg/ l, and after the 2nd demanganization step to 2 µg/l, resulting a drinking water at the exit from the Treatment Station of only 2 µg/l.

In conclusion, in this water analysis, in terms of iron content, it does not exceed 23 µg/l (JANUARY 2017) at the exit from URSENI WATER TREATMENT STATION, and with respect to the Mn content, it does not exceed 4 µg/l (FEBRUARY 2017) at the exit from URSENI WATER TREATMENT PLANT.

WATER COMPARATIVE ANALYSIS AT THE URSENI WATER TREATMENT STATION IN 2016 - 2017

From the comparative analysis of the two years studied, it is noted that the highest quantities of iron are recorded in August, being 4160 in 2016 and respectively 4410 in 2017.

The smallest quantities are registered in June 2016, being of 2400 and respectively 2520 in January 2017 (Figure 2).

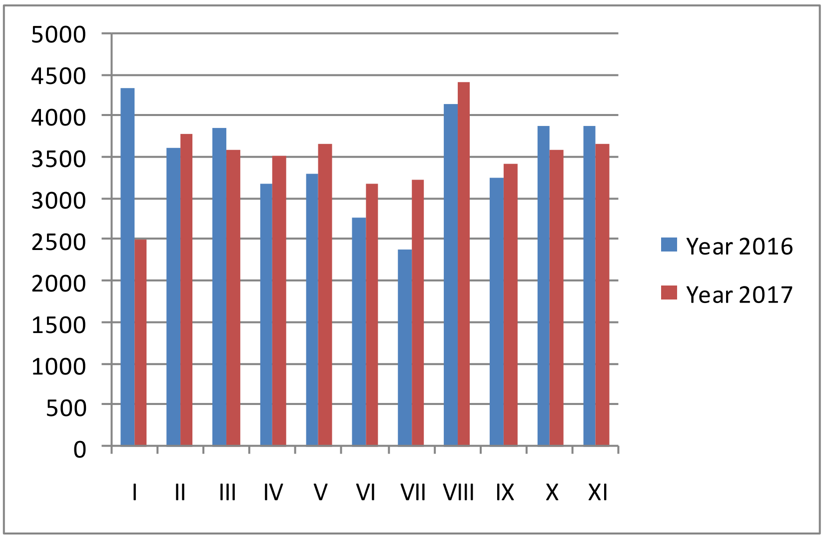

Figure 2. The Iron content in raw water

From this comparative analysis of the two years we can see that the largest quantities of iron are registered in March 2016 being 25 and 23 in January 2017 (Figure 3).

And the smallest quantities are registered in January, September, October and November in 2016 being 20 and in 2017 in November being 19.

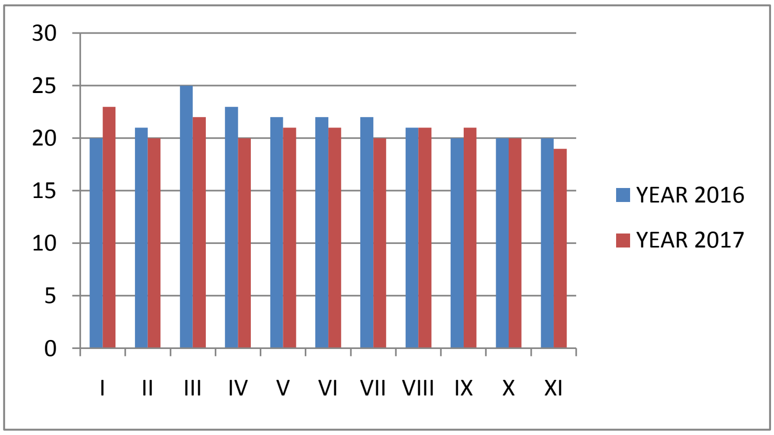

Figure 3. The Iron content after treatment

From the comparative analysis of the two years taken under study, we can see that the largest quantities of manganese are recorded in January and September, being 650 in 2016 and 620 in May 2017.

The smallest quantities are recorded in May 2016, being 480 and respectively 440 in September 2017 (Figure 4).

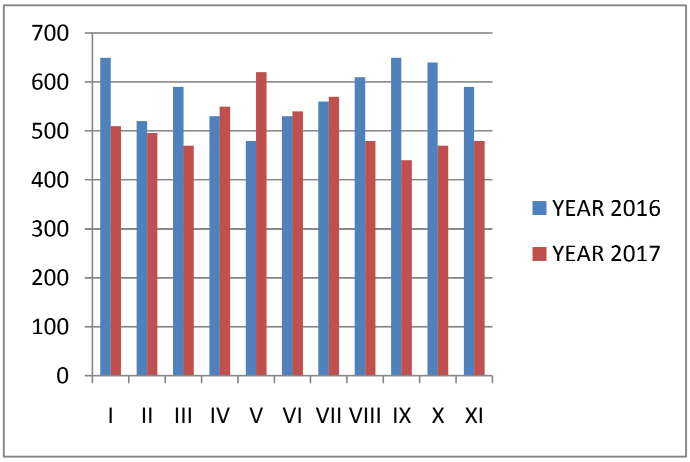

Figure 4. The Manganese content in raw water

From the comparative analysis of the two years taken under study, it is noted that the largest quantities of manganese are recorded in August, being 6 in 2016 and respectively 4 in February 2017.

The smallest quantities are recorded in October 2016, being 2 and 2 in March, April, May, June, July, August, October and November in 2017 (Figure 5)

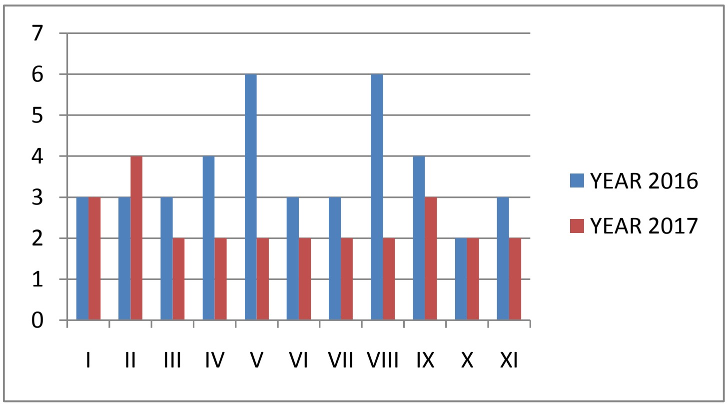

Figure 5. The Manganese content after treatment

CONCLUSIONS

1. Monitoring water quality for household consumption was carried out at the Urseni water treatment plant in the south of Timisoara;
2. The obtained results were analyzed and compared with the main parameters of physical-chemical quality indicators and their values from the Law 458 of 2002 regarding the quality of drinking water supplemented by Law no. 311 of 28/06/2004;
3. From the comparative analysis of the two years studied, it is noted that **the highest quantities of iron entering** in the treatment station are recorded in August, being 4160 in 2016 and respectively 4410 in 2017. The smallest quantities are registered in June 2016, being 2400 and respectively 2520in January 2017.
4. From this comparative analysis of the two years it is observed that **the highest quantities of iron at the exit from** the treatment station are recorded in March 2016 being 25 and respectively 23 in January 2017. And the smallest quantities are recorded in January, September, October and November in 2016 being 20 and in 2017 in November being 19.
5. The largest **quantities of manganese at the entrance** in the treatment station are recorded in August, being 6 in 2016 and 4 in February 2017. The smallest quantities are recorded in October 2016, being 2, respectively 2 in March, April, May, June, July, August, October and November 2017.
6. From the comparative analysis of the two years studied, it is noted that the highest **quantities of manganese at the exit** from treatment station are recorded in August, being 6 in 2016 and respectively 4 in February 2017. Smallest quantities are registered in October 2016, being 2 and respectively 2 in March, April, May, June, July, August, October and November 2017.

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