Journal of Scientific Perspectives

Volume **3,** Issue **3,** Year **2019**, pp. **201-206**
E - ISSN: **2587-3008**
URL: http://ratingacademy.com.tr/ojs/index.php/jsp
DOİ: https://doi.org/10.26900/jsp.3.020
Research Article

DETERMINATION OF CR (VI) IN CREEKS DISCHARGE TO İZMIT GULF (KOCAELI, TURKEY)

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Received: 28 June 2018; Accepted: 9 July 2019

ABSTRACT

With increasing industrialization, environmental pollution has become a threat to human health. The heavy metal pollution, especially from industrial waste water, is the best example of this. Chromium holds a special position among living organisms because on its species it can be either essential or toxic. Cr (VI) even at very low concentrations is harmful and carcinogenic, while Cr(III) is a necessary microelement for cellular metabolism. Therefore, it is very important to determine the chromium metal found in the wastewater of leather, paint and iron - steel industries. Four main creeks discharges located in the important industrial area in Kocaeli Province are made to the Gulf of İzmit.

In this study, Cr (VI) was measured by the spectrophotometer S.M.3500-Cr B. Calorimetric Method sampled from four main streams Saz, Dil, Narca (Bağ) and Ambar (Ulupınar) Creeks samples and the results were found to be <0.02 mg / L. With these values it is observed that there is a visible improvement in the pollution of the creeks.

Keywords: *Creek, Water pollution, Heavy metal, Chromium (VI)*

1. INTRODUCTION

Kocaeli has been dealing with environment as the most important problem as a province which has realized its rapid industrialization and has been the problem of migration, social problems and zoning for years. Kocaeli Province; It has always been a center of attraction with its land, sea, railway transportation networks and being in the middle of metropolitan cities such as Istanbul, Bursa and Sakarya. The industrialization move that began in the 1960s brought a huge population growth in the 1970s and 1980s with it, as well as reactions from environmental problems. The 1990s and 2000s were the years when environmental technologies were implemented to meet environmental problems [1]. İzmit Bay has struggled with pollution originated from water pollution, which is one of the environmental problems, for years. Water pollutants can affect ecological life in both surface waters and ground waters.

The territory of Kocaeli Province is entirely within the Marmara basin. There is not a significant stream in the basin and the Kocaeli peninsula is divided by many brooks and streams. These waters, which are generally short and flooding, played an important role in the formation of the earth's forms in the province. Some of the streams are poured into Black Sea and others into İzmit Bay or Marmara [2].

Dilovası, an official district since 2008, is a region with industrial, agricultural and residential areas. For this reason, it is estimated that people, animals, plants and other living species living in this region with a population of 47663 are exposed to industrial pollutants. Industrial wastewater also contains heavy metals such as lead, copper, nickel, mercury, arsenic, chromium and cadmium, which are very toxic and dangerous for aquatic organisms. Many branches of industry (mining industry, energy and fuel production, fertilizer and pesticide industry, metallurgy and iron and steel industry, leather processing, photographic industry) has heavy metals containing heavy metal waste which are given directly or indirectly to the nature [3-5][6-9].

Most of the heavy metals are toxic and carcinogenic. It poses a great threat to human beings and other living things. Chromium; Two oxidation which are stated in nature are Cr (VI) and Cr (III). Cr (III) is a mineral that is useful to the human body. Cr (VI) is harmful and carcinogenic even at very small concentrations. Chromium which has a very common areas of usage like armored vehicle, blast furnace bricks, leather, paint, metallurgy, steel industry, has been accumulating in the environment and spreading to the human and aquatic ecosystem and finally creates permanent damages [10-14].

In this study, the four main creeks selected along the İzmit Bay in Kocaeli Province, Saz Creek, Dil Creek, Narca (Bağ) Creek and Ambar (Ulupınar) Creek Cr (VI) were measured. In particular, the measures taken for the Dilovası region of the İzmit Bay and the impact of the applied environmental technologies on the rivers were evaluated.

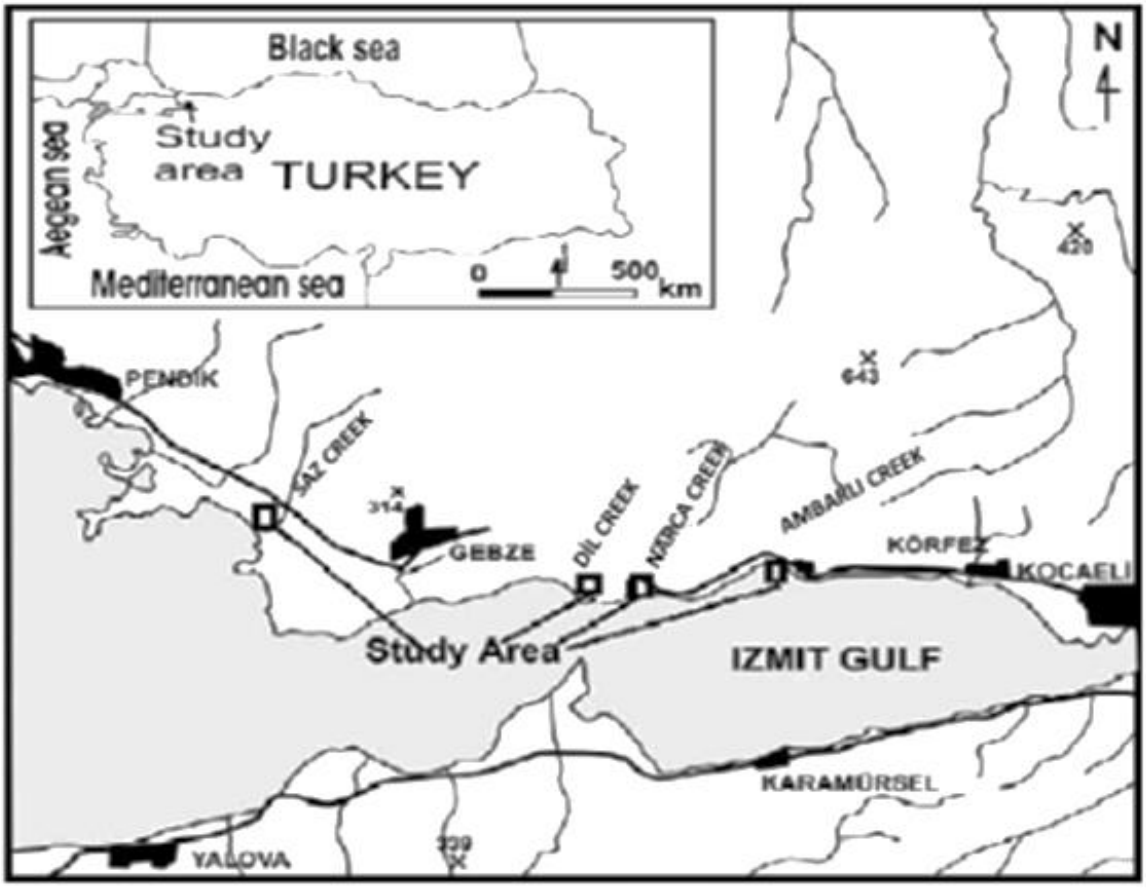
2. MATERIALS AND METODS

The study area is surrounded by the Bay of İzmit, the Marmara Sea and Istanbul, and the Black Sea in the north. The total length of the Saz Creek to the west of Dilovası is 9.75 km. Dil Creek is one of the most important rivers pouring from the north of the Bay to the Sea of Marmara and has a total length of 17 km. Narca (Bağ) Creek. It is 12 km long stream starting from Samanlı Mountains and pouring into İzmit bay. Ambar (Ulupınar) Creek is a 2,25 km long stream that flows into the Gulf of İzmit from the town of Hereke [2], (Fig. 1) .

Samples of 2L-plastic containers from each of these streams were collected according to the principles of Sampling using SM 3500 Cr (VI) B method; Cr (VI) was determined by colorimetric method using spectrophotometric (Merck Pharo 300 UV/VIS) reaction with

reaction of diphenylcarbazide in acid solution [15]. All chemicals were purchased from Merck (Germany) and they were all in analytical grade.

Fig. 1. Saz, Dil Narca, Ambarlı Creeks pouring into İzmit Bay [4].



3. RESULTS AND DISCUSSION

The sample is brought to room temperature. 100 mL of sample is taken. If the amount of suspended solids in the sample is high, it is filtered. 0.25 mL of ortho-phosphoric acid are added. With 0.2 N Sulfuric acid, pH is adjusted to 2. It is mixed well. Add 2 mL diphenylcarbazide solution. Wait for 5 -10 minutes. Read on spectrophotometer at 540 nm wavelength.

If the measured value is higher than the absorbance value in the calibration curve, the test is repeated by applying dilution. It is read on spectrophometer by remarking how many times diluted with pure water. As seen in Table 1, Cr (VI) value measured in four streams was less than 0.02 mg / L. Tests were performed in 3 replicates and averaged.

Table 1. Cr (VI) measurement results in streams

Creeks	**Parameter**	**Analysis Result**	**Unit**	**Analysis Method**
Saz Creek	Cr(VI)	<0,02	mg/L	SM 3500 Cr(VI) B
Dil Creek	Cr(VI)	<0,02	mg/L	SM 3500 Cr(VI) B
Narca Creek	Cr(VI)	<0,02	mg/L	SM 3500 Cr(VI) B
Ambarlı Creek	Cr(VI)	<0,02	mg/L	SM 3500 Cr(VI) B

In the study, which is carried out in the Dil Stream by Oktor et al [4], Cr (VI) results were found to be 0.0592 ± 0.0010 mg / L as IV. Quality Water.

Marka [6] compared all heavy metals in Dil Creek and other creeks with the Quality Criteria According to the Classes of Inland Water Resources Table for Water Pollution Control by the Regulation on Water Pollution Control in Environmental Concept Report in Kocaeli with Rehabilitation and Industrial Nuances. It is stated that the pollution given for the class is even higher than that of the pollution and even about 9 times the value of Chromium.

4. CONCLUSION

In recent years, environmental technologies have been put into use with the improvement works for İzmit Bay and Dilovasi Region. In this context, industrial facilities in Dilovası district have been assigned as DOSB Dilovası Organized Industrial Zone and all of the 200 facilities are connected to sewerage line and then the domestic wastewater of settlements is also connected to this sewerage line. In 2011, the Industrial and Domestic Wastewater Treatment Plant was established by DOSB Directorate and the wastewater that could not be connected to the treatment was brought to the facility by transportation and then discharged after the treatment [6].

The World Health Organization (WHO), the US Environmental Protection Agency (EPA) and the Turkish Standards Institute (TSE) have issued a limit value of 0.05 mg/ L for Cr (VI). In this study, the Cr (VI) value below 0.02 mg / L as II Quality Water in the samples taken from the four creeks shows that the water quality of the streams increased and the improvement studies made since 2010 are considerable development. In order to increase the water quality in both creeks and Bay Waters in Kocaeli province, new environmental technologies should be implemented and sustainability should be continued.

Acknowledgments

The author would like to thank Büşra EMİR and Hilal ŞEN for their contribution as a graduation work. The author thanks Rabia ŞAHİN for assistance in this study.

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