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Oil Pollution in east part of Izmit Gulf

İzmit Körfezi Doğu Bölümünde Petrol Kirliliği

Hülya Günday, Selma Ünlü and Kasım C. Güven

Istanbul University, Institute of Marine Sciences and Management, Müşküle Sok. 1. Vefa, Istanbul

Abstract

The oil pollution was carried out at 8 stations in eastern part of the İzmit Gulf. Oil contamination was determined by using the Iranian crude oil, imported mostly by TÜPRAŞ, İzmit Refinery, as the reference material.
Oil levels found in this area varied in 2002 as 4.81-144.37 (µg/L), in 2003 1.52-9011.3(µg/L). When these findings are compared with the earlier results of 1994-1995 periods, and after the Gölcük – İzmit earthquake of 17 August 1999, the conclusion so reached has indicated that the rate of pollution decreased during the years. Outcomes for the Naval Zone Gölcük has been more promising and revealed that the rate of pollution sharply decreased as compared with the 1994-1995 results.

Keywords: Sea water, oil pollution, İzmit Gulf.

Introduction

The investigation area is located at the eastern edge of the İzmit Gulf, having 49 km length, 2-10 km width and the area of 310 square kilometres. It is separated into three distinct regions as western, central and eastern parts, and the depth at these regions are 200 m, 180 m and 35 m respectively.

It has two distinct water layers; the upper layer and the lower layer. The upper layer is of the Black Sea water, whereas the lower one being the Mediterranean Sea water.

There exist large population and industries almost all along the Gulf. The TÜPRAŞ refinery is located in the examined region and imports oil by 10 milions t/a. A moment of approx. 3600 tanker/a occur for oil transportation. The oil imported by TÜPRAŞ is mostly Iranian origin with a ratio of 30% in 2002–2003.

The oil pollution was investigated in the same area at 1994-1995 (Güven *et al.,* 1997), after the Gölcük – İzmit earthquake of 17 August 1999 (Güven and Ünlü, 2000) and after TPAO tanker accident in west part of İzmit Gulf (Ünlü *et al.*, 2000).

The shipping activity and also tankers play a key role in the oil pollution occurrence of this area.

In this work the oil pollution was measured in different 8 stations of eastern part of the İzmit Gulf during 2002-2003

Material and Methods

The sampling stations and dates are shown in Fig. 1 and in Table 1.

For the extraction of oil in samples the UNESCO method IOC, 1984 using the dichloromethane (DCM), instead of n-hexane was adopted. Sea water samples were collected from the surface in 2.8 L amber glass bottles which had previously been washed with DCM and 15 mL of DCM was added for preservation of the sample.

The samples were extracted three times with 50 mL DCM. The extracts were combined and then dried over anhydrous sodium sulphate, filtered and distilled at 35ºC. Oil pollution in the samples was measured by UVF (Fluorospectrophotometer, Shimadzu RF-150l). The oil pollution was calculated from the Iranian crude oil. The concentrations of oil used for plotting of calibration curves were 0.25,

0.50, 1.00, 1.50 µg/mL in hexane. The absorption was measured at 310/360 nm (ex/em). The sample of crude oil reference was taken from the İzmit Refinery.

Fig. 1. Sampling stations

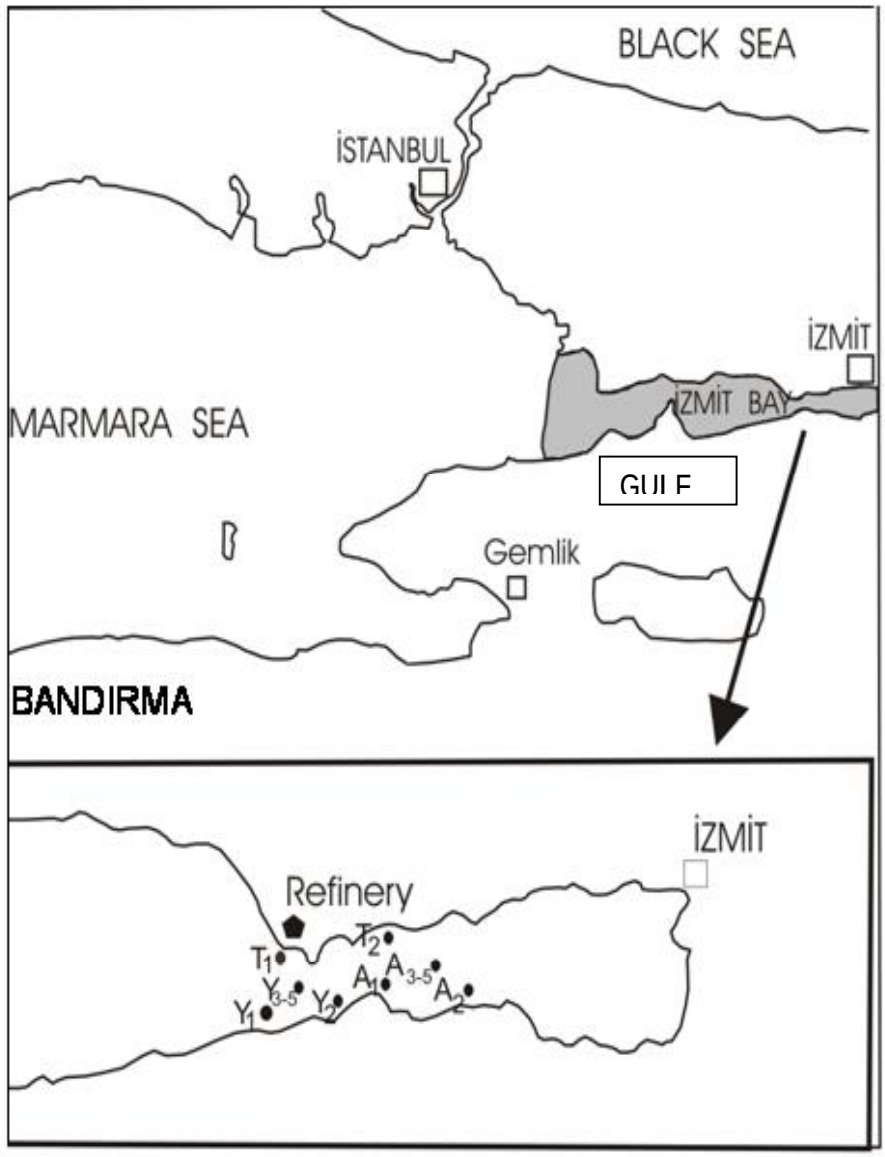


Table 1. Sampling station

Stations	
T1	TÜPRAŞ refinery 115
T2	Derince 60 evler (Derince,"60 Houses" district)
A1	Naval coast
A2	Poyraz İskelesi (Poyraz Naval jetty.)
$A3_a$	Naval Zone,Gölcük, surface water
$A3_b$	Naval Zone, 10 m depth
$A3_c$	Naval Zone, 20 m depth
Y1	Kuruçeşme (Kuruçeşme District,Değirmendere)
Y2	Yüzbaşılar 1
$Y3_a$	Surface water off 8-9 Roads, (Yüzbaşılar).
$Y3_b$	Water at 10 m depth, off 8-9 Roads, (Yüzbaşılar).
$Y3_c$	Water at 20 m depth, off 8-9 Roads, (Yüzbaşılar).

Results and Discussion

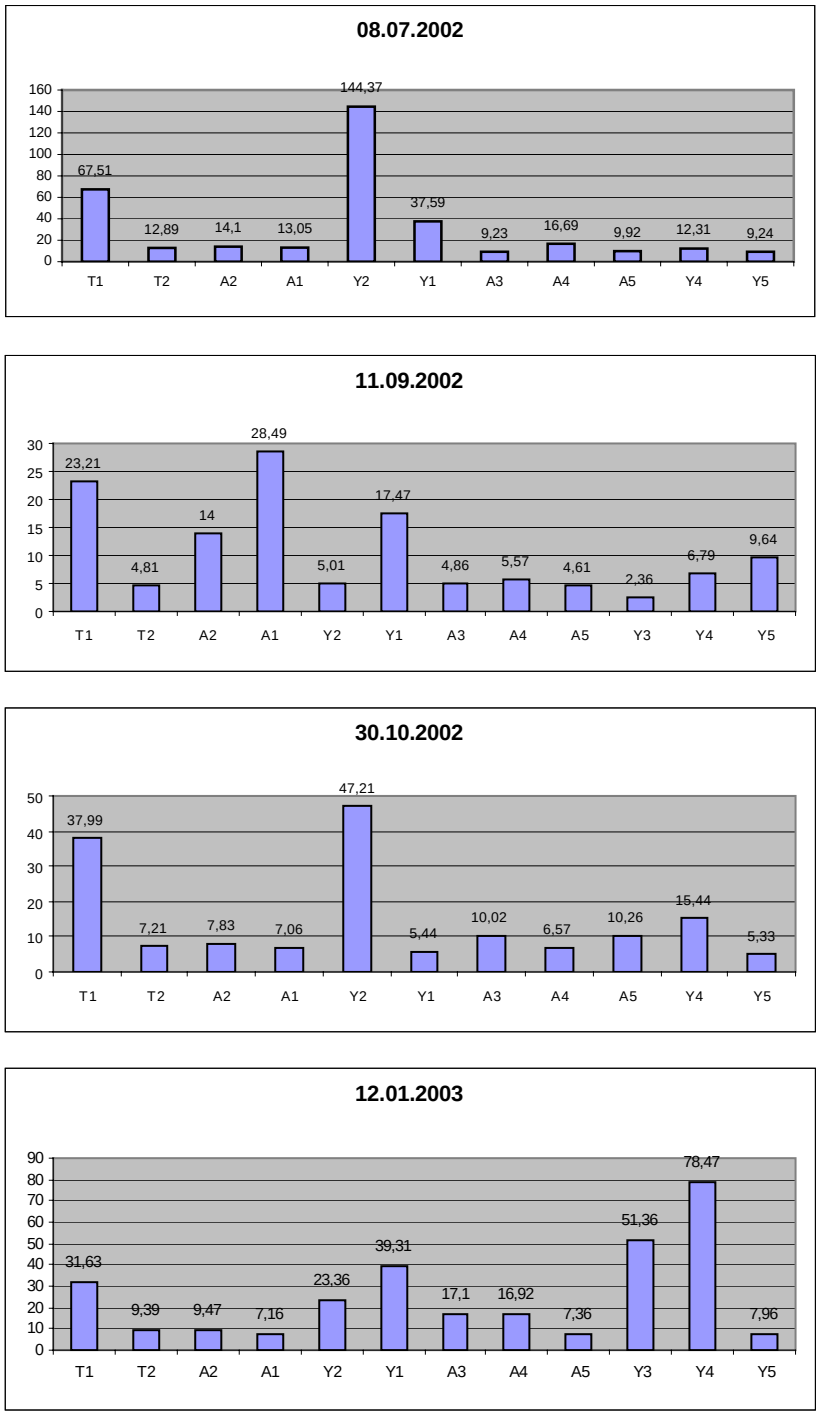
Further to the earlier study (Güven *et al.*, 1997) oil pollution was determined at 5 new stations in this area as T2, A1-A3, Y2, Y3.

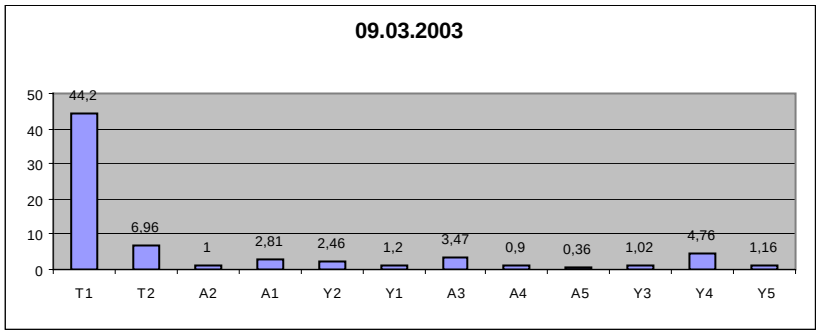
The equation used for the quantitative determination of oil pollution through Iranian oil is:

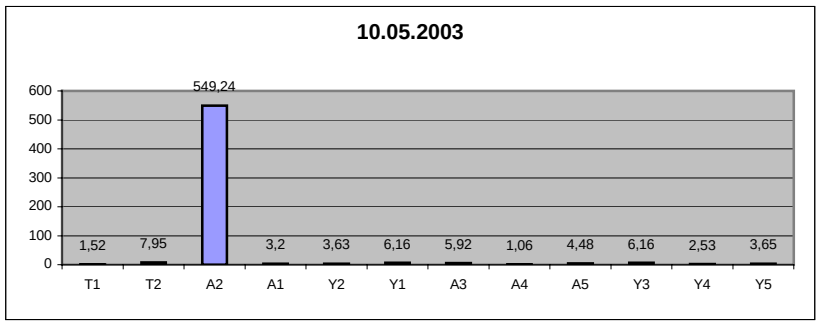
$F_1 = 309.65\ c + 78.619,\ r^2 = 0.99$

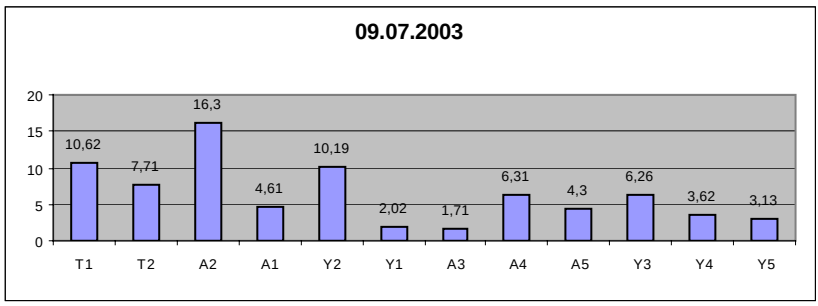
The maximum oil pollution results at station of T1, T2, A1, A2, $A3_{a-c}$ and Y1, Y2, $Y3_{a-c}$ are shown in Figure 2.

Figure 2. Max. oil level in the stations and sampling dates.









It was found that the oil amount in 1994-1995 at examined station of T1 in 1994 varied as 12.74- 237.24 µg/L, in 1995 as 68.20- 383.44 µg/L, in 2002 as 23.21-67.51 µg/L, in 2003 as 1.52-31.63 µg/L, in A1 86.63- 856.70 µg/L in 1994, in Y3 32.01-986.53 µg/L in 1995 and 7.06- 28.49 µg/L in 2002, 3.2-7.16 µg/L in 2003.

Oil level was also determined in sea water column at stations A3(a,b,c), Y3(a,b,c) .

The highest pollution rates are found in ongoing years is as follows (μg/L):

	2002	2003
T1	67.51	44.20
T2	12.89	9.39
A1	28.49	7.16
A2	14.10	549.24
A3		
a) Surface	10.02	17.10
b) 10 m	16.69	9011.30
c) 20 m	10.26	8.03
Y1	37.59	39.31
Y2	144.37	23.36
Y3		
a) Surface	2.36	51.36
b) 10 m	15.44	78.47
c) 20 m	9.64	7.96

Having compared the oil levels at the stations in 2002-2003 the highest pollution was found in 2003 at station A2 as 549.24 μg/L and A3 at 10 m depth as 9011.30 μg/L (9.0 mg/L). According to these results the pollution at A3 in 10 m depth was the highest polluted area. When compared the results of 1994-1995 with 2002-2003 the pollution amount was decreased from 1994 towards 2003.

Results for the Naval Base marine zone, Gölcük, however give out a better outcome. Improvements have been very promising and current rates revealed that the rate of pollution sharply decreased as compared with that of 1994-1995 results.

The pollution after eartquake (17 Aug. 1999) was not discussed in this paper while the pollution was very high at that time.

Gulf of İzmit is indispensably an important area for Turkey while most of the industries and refinery are located in this area.

Conclusion: This area must be surveyed continuously.

Özet

Bu çalışmada İzmit Körfezi Doğu Bölümü'nde 8 istasyonda petrol kirliliği araştırması yapılmıştır. Bunun için referans olarak Tüpraş Rafinerisi'nin büyük miktarda ithal ettiği İran petrolü kullanılmıştır. Bu bölgede petrol kirliliği miktarı 2002'de 4.81-144.37 (µg/L), 2003'te 1.52-9011.3(µg/L) arasında değişmiştir. Bu sonuçların 1994-1995 sonuçları ile karşılaştırılmasında kirlilik miktarında düşme olduğu saptanmıştır.

References

Anon. (2006). Tüpraş, Türkiye Petrol Rafinerileri Anonim Şirketi http://www.tupras.com.tr

Guven, K.C., Günday, H., Okuş, E., Ünlü, S., Doğan, E., Gezgin, T., Burak, S. (1997). Oil pollution of Izmit Bay. *Turkish J. Mar. Sci.* 3:1-10

Guven, K.C. and Ünlü, S. (2000) Oil pollution in sea water of Izmit Bay following the eartquake (17 Aug 1999). *Turkish J. Mar. Sci.* 6:215-226

IOC (1984). Manuals and Guides, No:13. Procedure for the petroleum component of the IOC Marine Pollution Monitoring System (Mar polmon- P) UNESCO, Paris, 35 pp.

Ünlü,S., Güven, K.C, Doğan, E. and Okuş, E. (2000) Oil pollution in Tuzla Bay after TPAO tanker accident. *Turkish J. Mar. Sci.* 6:135-150

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