

The Impacts of Industrial Processing of Oil on the Fountain Water Quality

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Surface groundwater, with its manifestation in the form of fountains, constitutes an important segment of environmental contaminant easily contaminated with oil processing specific activity noxious. This paper will study the impact of oil processing activity of a society, on the quality of the fountains water.

Keywords: groundwater, oil processing, fountains water

To reveal any structural anthropic or polluting changes, determined general chemical nature of the water fountain in the monitored area.

For this purpose it used the Piper diagram who designed the data obtained from chemical analyzes by selecting it not only those values for which the balance ion is balanced, but also those with an error of less than 5% (fig. 1) [1].

The obtained data reveals the following:

- groundwater in the studied area are calcium - magnesium bicarbonate type;
- chloride ion contents are variable and can exceed 50 % of the total anions;
- general chemical nature of the water can change because the to water infiltration from rainfall mixed with water coming from the pipes and sewage losses etc. having an accumulation of Na^+ , SO_4^- and Cl^- ions and decreased Ca_2^+ , Mg_2^+ and HCO_3^- ion concentration ;
- Piper diagram can give indications regarding the demarcation of the influence area of the industrial processing of oil activity by SC XXX in Constanta County.

Experimental part

Quality indicators of water fountain, detailed on the sequence (physical, biochemical, chemical and bacteriological) were determined in May - September 2003 - 2007 in 5-point -station namely: NAVODARI, OVIDIU, LUMINA, SACELE and CORBU.

Comparing water fountain quality indicators, was achieved not only with the values from STAS 1342/2002 for drinking water, but also with the water of a fountain

outside the area of the influence of the plant, namely in the town CASTELU.

In general, the fountains from the studied area, are located near vegetable gardens, agricultural land cultivated, by stores and platforms litter of household waste, stables, etc.

In this context, the quality of groundwater is dependent on many factors, where the pollution has a certain contribution, the intake of each segment to results can not be explained [2, 3]

Fountain water analysis was done monthly during intense growth and fruiting of plants, from May to September, during 2011-2015.

NAVODARI

Fountain of this locality has the following characteristics (table 1).

The chemical composition of the water fountain analyzed from NAVODARI in May - September 2003 - 2007, is:

- a diameter of 80 cm, a depth of 14 m, the water level is 5 cm, high flow rate;
- located near the cultivated land ;
- a series of quality indicators water fountain, including nitrates, phosphates, exceeding LMA (the maximum admissible level) during the monitoring period;
- absence of the specific contaminated for industrial processing oil activity;
- the presence of organic matter, chemically stable in quantities exceeding the LMA for CCO-Cr;
- slightly higher content of calcium ions from the water treatment with lime to sanitize;
- ammonium content exceeding the upper limit LMA of variation for the test period reaching $0.717 \text{ mg} / \text{dm}^3$, more than 7 times LMA ;
- relatively high amounts of nitrates and nitrites, commonly exceeding LMA, generally except June;
- upper limit of variation of phosphorous ions is almost triple the LMA;
- in terms of bacteriological, water was uneven contaminated with coli, being present in large quantity, plentiful rains only; [5]
- compared with the fountain water from CASTELU, it is not inferior from the point of view of quality;

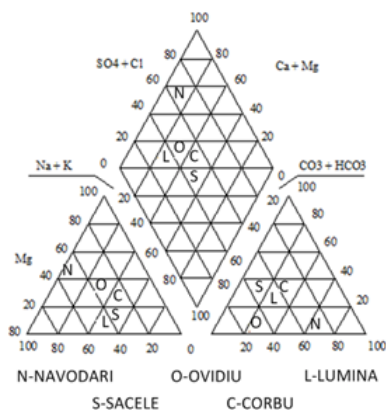


Fig. 1 Piper Diagram for the chemical structure of water fountain located in the influence area of S.C. XXX (me / l) from Constanta County

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Table 1
CHEMICAL COMPOSITION OF THE NAVODARI WATER FOUNTAIN

Indicators	Units	STAS 1342-91	Sample collection period				
			MAY	JUNE	JULY	AUG.	SEPT.
pH	-	6.5-8,5	6.36-7.90	6.70-8.20	6.8-7.6	6.61-7.80	6.35-7.76
Conductivity	$\mu\text{S}/\text{cm}$	1000	320-2150	510-2025	606-1900	-	627-1309
CCO-Mn	mg/dm^3	2.5	1.25-3.95	1.32-3.62	1.1-5.2	1.28-4.20	0.9-4.4
CCO-Cr	mg/dm^3	3	15.7-76.8	6.0-57.5	3-101	11.4-63.0	18-45
Fixed residue	mg/dm^3	100-800	160-1080	260-1316	303-692	-	313-780
Chlorides, Cl^-	mg/dm^3	250	73.67-386.8	65.4-295.9	66.3-306.4	102.2-294.4	56.13-253.76
Sulphates, SO_4^{2-}	mg/dm^3	200	3.6-321.8	8.64-119.1	3.6-172.4	3.2-158.1	2.3-32.2
Calcium, Ca^{2+}	mg/dm^3	100	105.0-115.3	31.3-142.5	42.65-150.1	25.5-110.5	7.7-148.7
Sodium, Na^+	mg/dm^3	-	22.1-131.0	21.7-115.5	20.95-63.2	20.6-115.4	0.72-139.1
Potassium, K^+	mg/dm^3	-	1.1-7.98	1.1-2.9	1.9-19.6	1.0-5.9	0.9-7.8
Ammonium, NH_4^+	mg/dm^3	0	0.003-0.67	0.001-0.17	0-0.717	0-0.47	0-0.355
Nitrogen, NO_2^-	mg/dm^3	0	0.007-0.11	0-0.048	0-0.072	0-0.073	0-0.026
Nitrate, NO_3^-	mg/dm^3	45	2.09-60.8	0.98-133.15	10.3-38.38	1.1-83.2	1.1-128.3
Phosphate, PO_4^{3-}	mg/dm^3	0.1	0.002-0.25	0.001-0.182	0.001-0.08	0.001-0.094	0.004-0.124
Bact. Colif. all.	Nr/cm^3	<10	9-220	70-330	17-170	-	<20-240
Bact. Colif. fec.	Nr/cm^3	<2	2-70	20-50	2-20	-	13-70
Strept. faecalis	nr/cm^3	<2	<2-20	<20	<2-20	-	<2-20
Heterotic bacteria	Nr/ml	<300	19-200	21-120	79-175	-	18-100

OVIDIU

In this village, fountain and water has the following characteristics (table 2).

The chemical composition of the OVIDIU water fountain analyzed in May - September 2011 - 2015:

- diameter of 30 cm, a depth of 17 m, the water level is 1.5 m, low flow, dries up in drought;
- the presence of stable organic matter with a high degree of complexity given by overcoming nearly 20 times the LMA for CCO-Cr;
- located near the house and cropland;
- a series of water quality indicators exceed the LMA during the monitoring period;
- the absence of main contaminants specific for industrial processing oil activity;

- the conductivity maximum permissible limit was sporadic exceeded due to cleaning treatments applied;
- the fountain is contaminated with organic matter, the presence of ammonia and nitrite ions are indicating this;
- nitrite ions existing in negligible amounts, indicate that the evolution of nitrous ions to stable form, as a result as a weakly basic medium [6];
- ground water is often contaminated with nitrogen and phosphorus nutrients;
- colimetria indicates a bacteriological contamination, depending on rainfall;
- compared with CASTELU fountain, this water can be easier polluted, probably because the groundwater is closer to the surface.

			MAY	JUNE	JULY	AUG.	SEPT.
pH	-	6.5-8.5	6.8-7.97	7.06-8.60	7.27-7.97	7.1-8.1	6.7-7.96
Conductivity	$\mu\text{S}/\text{cm}$	1000	272-1468	891-1611	1020-1380	-	1014-1351
CCO-Mn	mg/dm^3	2.5	0.77-1.50	0.8-2.44	0.5-3.2	0.63-4.2	1.0-2.3
CCO-Cr	mg/dm^3	3	18.9-57.6	3-48	9-70	19-54	10.2-58.0
Fixed residue	mg/dm^3	100-800	260-954	450-1047	509-897	-	577-837
Chlorides, Cl^-	mg/dm^3	250	69.6-147.76	63.5-173.95	73.2-206.3	49-141.7	84.4-217.6
Sulphates, SO_4^{2-}	mg/dm^3	200	2.40-135.9	3.54-161.85	2.2-170.7	2.5-138	2.58-54.0
Calcium, Ca^{2+}	mg/dm^3	100	51.2-142.4	37.8-189.6	18.4-139.1	18.61-160.5	9.7-183.2
Sodium, Na^+	mg/dm^3	-	55-131	10.0-107.6	36.8-405	36.1-99.7	0.55-280.0
Potassium, K^+	mg/dm^3	-	0.77-4.70	0.9-6.1	1.7-6.8	1.55-6.10	0.9-5.8
Ammonium, NH_4^+	mg/dm^3	0	0.001-0.205	0.0001-0.13	0.002-1.21	0-0.117	0-0.22
Nitrogen, NO_2^-	mg/dm^3	0	0.006-0.34	0.002-0.178	0.009-0.014	0.07-0.40	0.002-0.078
Nitrate, NO_3^-	mg/dm^3	45	3.9-79.93	4.41-136.05	3.5-43	5.1-83.2	1.1-105.3
Phosphate, PO_4^{3-}	mg/dm^3	0.1	0.02-0.17	0.002-0.235	0.001-0.915	0.002-0.079	0.005-0.52
Bact. Colif. all.	Nr/cm^3	<10	5-2400	80-340	7-230	-	2-220
Bact. Colif. fec.	Nr/cm^3	<2	2-2400	14-90	2-130	-	<2-<20
Strept. faecalis	nr/cm^3	<2	<2-<20	<2-40	<2-<20	-	<2-<20
Heterotic bacteria	Nr/ml	<300	10-290	62->300	35-178	-	28-84

Table 2
CHEMICAL
COMPOSITION
OF THE OVIDIU
WATER
FOUNTAIN

Table 3
CHEMICAL COMPOSITION OF THE LUMINA WATER FOUNTAIN

Indicators	Units	Stas 1342-91	Sample collection period				
			MAY	JUNE	JULY	AUG.	SEPT.
pH	-	6.5-8.5	6.7-8.19	7.06-8.39	5.9-8.13	6.90-7.90	6.90-8.17
Conductivity	µS/cm	1000	760-1193	780-1430	820-1380	-	707-849
CCO-Mn	mg/dm ³	2.5	0.44-1.60	0.87-3.59	0.2-1.6	0.48-3.70	0.79-3.40
CCO-Cr	mg/dm ³	3	6.9-65.9	7.0-28.8	10-64	10.0-64.1	8.0-66.0
Fixed residue	mg/dm ³	100-800	340-5801	427-728	410-607	-	384-500
Chlorides, Cl ⁻	mg/dm ³	250	48.9-65.7	48.6-153.3	42.83-79.10	22.75-58.1	26.06-55.70
Sulphates, SO ₄ ²⁻	mg/dm ³	200	0.48-72.0	3.06-45.3	0.84-18.2	0.6-18.9	0-17.4
Calcium, Ca ²⁺	mg/dm ³	100	51.3-131.1	60.8-121.0	15.0-78.75	-	8.9-153.6
Sodium, Na ⁺	mg/dm ³	-	50-101.1	25.4-53.5	19.3-251.0	2.4-104.5	0.91-99.7
Potassium, K ⁺	mg/dm ³	-	0.9-9.0	0.85-6.90	0.65-7.1	1.0-5.2	0.7-4.8
Ammonium, NH ₄ ⁺	mg/dm ³	0	0.001-0.18	0-0.89	0-1.55	0-0.124	0-0.41
Nitrogen, NO ₂ ⁻	mg/dm ³	0	0.006-0.105	0.02-0.05	0.004-0.053	0-0.009	0.0002-0.035
Nitrate, NO ₃ ⁻	mg/dm ³	45	9.40-117.61	5.87-128.52	3.1-94.56	0.6-39.5	1.8-47.65
Phosphate, PO ₄ ³⁻	mg/dm ³	0.1	0.01-0.13	0-0.18	0.005-0.100	0.001-0.077	0.0001-0.97
Bact. Colif. all.	nr/cm ³	<10	2-790	4-90	2-230	-	2-240
Bact. Colif. fec.	nr/cm ³	<2	2-200	4-20	2-230	-	2-34
Strept. faecalis	nr/cm ³	<2	2-20	2-20	2-20	-	2-20
Heterotic bacteria	nr/ml	<300	17-215	70-168	30-200	-	13-96

LUMINA

The fountain from this point has the following characteristics (table 3).

The chemical composition of the LUMINA water fountain analyzed in May - September 2011 - 2015:

- diameter of 80 cm, a depth of 30 m, the water level is 5 m, high flow with submersible pump for extraction;
- located near the house and cropland;
- a series of of water quality indicators exceed well beyond LMA during the monitoring period;
- the absence of specific contaminants specific for industrial processing oil activity;

- the maximum permissible limit for water conductivity was exceeded in June due to sanitation;

- the presence of stable organic matter, with a high degree of complexity given by exceeding the upper limit of variation LMA throughout the period of more than 30 times for the CCO-Cr;

- the fountain is contaminated with organic matter containing ammonium and nitrite ions, which are produced by its decomposition, were recorded sporadically throughout the monitoring period;

- groundwater was frequently contaminated with nitrogen and phosphorus nutrients;

Table 4
CHEMICAL COMPOSITION OF THE SACELE WATER FOUNTAIN

Indicators	Units	Stas 1342-91	Sample collection period				
			MAY	MAY	MAY	MAY	MAY
pH	-	6.5-8.5	6.60-8.12	6.58-7.50	6.74-7.51	6.90-7.80	6.4-7.8
Conductivity	µS/cm	1000	700-2790	275-2610	415-2170	-	1161-2790
CCO-Mn	mg/dm ³	2.5	1.18-2.75	1.40-3.99	1.26-3.8	2.0-3.6	1.4-7.5
CCO-Cr	mg/dm ³	3	19.2-48.0	15-60	19.2-60.0	5.6-40	9-72
Fixed residue	mg/dm ³	100-800	89.6-1677	187-1658	792-1511	-	754-1590
Chlorides, Cl ⁻	mg/dm ³	250	86.42-350.7	31.1-298.9	153.1-313.9	102.9-293.3	72.33-335.0
Sulphates, SO ₄ ²⁻	mg/dm ³	200	6.6-269.9	8.04-362.8	6.30-171.35	6.9-170.2	2.7-64.4
Calcium, Ca ²⁺	mg/dm ³	100	95.0-446.5	38.0-357.9	12.1-297.45	27.1-245.5	13.40-409.35
Sodium, Na ⁺	mg/dm ³	-	55.5-123.2	72.0-115.4	2.50-540	25.5-124.8	0.98-220.0
Potassium, K ⁺	mg/dm ³	-	0.85-10.9	1.2-11.4	0.65-10.5	0.7-11.7	1.3-10.1
Ammonium, NH ₄ ⁺	mg/dm ³	0	0-0.92	0.05-5.53	0-1.25	0-0.343	0-0.345
Nitrogen, NO ₂ ⁻	mg/dm ³	0	0.013-0.143	0.008-0.203	0-0.062	0-0.09	0.01-0.473
Nitrate, NO ₃ ⁻	mg/dm ³	45	9.9-88.55	4.5-155.8	0.05-128.38	3.1-128.4	0.7-85.9
Phosphate, PO ₄ ³⁻	mg/dm ³	0.1	0.05-0.50	0.001-0.129	0.002-0.30	0.005-0.146	0.005-0.45
Bact. Colif. all.	nr/cm ³	<10	34-2400	34-2400	22-240	-	50-2400
Bact. Colif. fec.	nr/cm ³	<2	4-790	14-1300	2-130	-	14-110
Strept. faecalis	nr/cm ³	<2	2-230	2-50	2-20	-	2-20
Heterotic bacteria	nr/ml	<300	33-200	30-260	36-195	-	75-197

Table 5
CHEMICAL COMPOSITION OF THE CORBU WATER FOUNTAIN

Indicators	Units	Stas 1342-91	Sample collection period				
			MAY	MAY	MAY	MAY	MAY
pH	-	6.5-8.5	6.75-7.83	6.87-7.84	7.06-7.79	7.20-7.80	6.5-7.85
Conductivity	µS/cm	1000	760-1506	637-2309	990-2325	-	757-1100
CCO-Mn	mg/dm ³	2.5	0.9-1.69	0.67-3.74	0.08-2.8	1.6-3.1	0.94-2.4
CCO-Cr	mg/dm ³	3	8.9-36.1	18.8-67.2	6.5-40.4	18-61	20-42
Fixed residue	mg/dm ³	100-800	380-979	71-1547	510-898	-	492-650
Chlorides, Cl ⁻	mg/dm ³	250	41.40-61.25	47.87-69.03	45.1-56.5	29.4-61.25	44.38-54.8
Sulphates, SO ₄ ²⁻	mg/dm ³	200	1.62-25.70	1.60-84.2	2.5-35.3	2.43-55.6	2.4-35.2
Calcium, Ca ²⁺	mg/dm ³	100	47.6-150.2	18.0-155.2	19.8-130.15	14.7-134.1	12.1-160.9
Sodium, Na ⁺	mg/dm ³	-	22.8-83.8	14.6-68.4	13.58-46.1	16.1-49.0	0.55-52.02
Potassium, K ⁺	mg/dm ³	-	2.5-4.93	2.4-6.3	1.1-8.4	1.7-5.7	1.2-6.6
Ammonium, NH ₄ ⁺	mg/dm ³	0	0.01-0.37	0.002-1.55	0-0.63	0-0.221	0-0.25
Nitrogen, NO ₂ ⁻	mg/dm ³	0	0-0.045	0-0.029	0.007-0.052	0-0.62	0.007-0.091
Nitrate, NO ₃ ⁻	mg/dm ³	45	5.0-88.97	4.67-142.49	0.05-43.20	1.76-36.5	0.7-38.5
Phosphate, PO ₄ ³⁻	mg/dm ³	0.1	0.002-0.159	0-0.346	0.001-0.08	0.001-0.073	0.001-0.52
Bact. Colif. all.	Nr/cm ³	<10	2-340	2-2400	40-330	-	2-2400
Bact. Colif. fec.	Nr/cm ³	<2	2-340	2-1300	2-130	-	2-2400
Strept. faecalis	nr/cm ³	<2	2-20	2-50	2-20	-	2-20
Heterotic bacteria	Nr/ml	<300	14-210	14-210	60-196	-	16->200

- colimetrica indicates a bacteriological contamination dependent on rainfall;
 - compared with CASTELU fountain, water may be easier polluted, probably because the existence of the cracks in the earth's crust that allow various wastewater leakage.

SACELE

Fountain - under study has the following characteristics (table 4).

The chemical composition of the SACELE water fountain analyzed in May- September 2003 - 2007:

- diameter of 30 cm, a depth of 12.5 m, the water level is 3.5 m, high flow, located in the home garden and near land cultivated;

- a series of four indicators of water quality for the entire period exceed well beyond LMA;

- the range of variation of the water conductivity for the entire test period, was exceeded in September, due to sanitize the fountain;

- the presence of stable organic matter with a high degree of complexity;

- the fountain is contaminated with organic material, the content of ammonium and nitrite ions, which are produced by its decomposition, were recorded during the first four months of monitoring;

- groundwater was contaminated with nitrogen and phosphorus nutrients;

Table 6
CHEMICAL COMPOSITION OF THE CASTELU WATER FOUNTAIN

Indicators	Units	Stas 1342-91	Sample collection period				
			MAY	MAY	MAY	MAY	MAY
pH	-	6.5-8.5	7.40-8.61	7.11-7.97	7.68-7.94	7.20-8.00	6.85-8.30
Conductivity	µS/cm	1000	270-577	230-948	242-1210	-	242-343
CCO-Mn	mg/dm ³	2.5	3.80-5.00	1.1-4.80	4.26-5.4	1.24-12.2	3.3-4.3
CCO-Cr	mg/dm ³	3	16.8-50.0	33.7-82	12.0-56.6	18.5-91.3	17.0-56.9
Fixed residue	mg/dm ³	100-800	140-375	146-635	126-270	-	121-223
Chlorides, Cl ⁻	mg/dm ³	250	10.6-20.0	11.46-35.8	13.3-29.0	11.3-45.5	11.7-73.3
Sulphates, SO ₄ ²⁻	mg/dm ³	200	0.12-59.1	0.01-78.3	0.18-13.8	0.34-17.5	0.92-18.12
Calcium, Ca ²⁺	mg/dm ³	100	38.45-189.6	53.2-118.4	11.85-82.2	33.0-68.8	37.0-58.4
Sodium, Na ⁺	mg/dm ³	-	9.0-68.1	50.75-57.0	4.13-50.0	2-47	22.45-48.0
Potassium, K ⁺	mg/dm ³	-	0.77-5.2	1.9-6.5	0.5-4.6	0.04-4.1	1.3-4.0
Ammonium, NH ₄ ⁺	mg/dm ³	0	1.01-1.67	0.002-1.56	0.22-2.41	0.04-0.258	0.01-1.18
Nitrogen, NO ₂ ⁻	mg/dm ³	0	0.002-0.159	0.018-1.12	0.01-0.08	0-0.121	0.014-0.807
Nitrate, NO ₃ ⁻	mg/dm ³	45	2.35-7.16	3.16-20.22	0.25-8.30	0-36.5	1.63-51.03
Phosphate, PO ₄ ³⁻	mg/dm ³	0.1	0.002-1.4	0.002-1.23	0.03-0.87	0.029-0.58	0.06-0.42
Bact. Colif. all.	nr/cm ³	<10	2-130	2-2400	2-790	-	2-2400
Bact. Colif. fec.	nr/cm ³	<2	2-80	2-200	2-20	-	2-2400
Strept. faecalis	nr/cm ³	<2	2-20	2-1300	2-20	-	2-20
Heterotic bacteria	nr/ml	<300	46-108	16-234	16-215	-	7-56

- colimetria indicates a bacteriological contamination quite frequent, mainly determined by accumulation of household waste and manure near the fountain;
 - compared with CASTELU fountain, this water can be easily polluted, probably because of the existence of some cracks in the earth's crust that allow various wastewater leakage.

CORBU

The monitored fountain at this point had the following characteristics (table 5).

The chemical composition of the CORBU water fountain analyzed in May - September 2011 - 2015 :

- diameter of 80 cm, a 9 m deep, the water level is 2 meters, high flow, which in normal dry conditions vary;
 - it is located close to cultivated land;
 - a series of 11 quality indicators of fountain water often exceed LMA;
 - the absence of the main contaminants specific for industrial processing oil activity;
 - water reaction is weakly basic, with a rather narrow range of variation in the summer months, only about 0.5 pH units;
 - upper limit of the water conductivity range variation for the tested period, exceeded LMA during all the months;
 - the presence of stable organic matter with a high degree of complexity given by overcoming for CCO-Cr;

Table 7

SUMMARY OF THE CHEMICAL ANALYTICAL DATA OF THE FOUNTAIN WATER QUALITY IN ANALYZED POINTS FROM CONSTANTA

Current number	Quality indicators	Units	STAS 1342-91	Observations
1.	pH	-	6.5-8.5	There have been exceedings in: May – Castelu June – Ovidiu
2.	Conductivity	µS/cm	1000	There have been exceedings in: May – Navodari, Ovidiu, Lumina, Sacele, Corbu; June – Navodari, Ovidiu, Lumina, Sacele, Corbu; July – toate localitățile; September – Navodari, Ovidiu, Sacele, Corbu;
3.	CCO-Mn	mg/dm ³	2.5	There have been exceedings in: May – Navodari, Castelu; June – Navodari, Lumina, Sacele, Corbu și Castelu; July – Navodari, Ovidiu, Sacele, Corbu și Castelu; August – all the localities; September – Navodari, Lumina, Sacele și Castelu;
4.	CCO-Cr	mg/dm ³	3	There have been exceedings in: May – all the localities; June – all the localities; July – Navodari, Ovidiu, Lumina, Sacele, Corbu; August – all the localities; September – all the localities;
5.	Fixed residue	mg/dm ³	100-800	There have been exceedings in: May – Navodari, Ovidiu, Lumina, Sacele, Corbu; June – Navodari, Ovidiu, Sacele, Corbu; July – Ovidiu, Sacele, Corbu; September – Ovidiu, Sacele, Corbu;
6.	C Chlorides, Cl ⁻	mg/dm ³	250	There have been exceedings in: May – Navodari, Sacele; June – Navodari, Sacele; July – Navodari, Călinești; August – Navodari, Sacele, Corbu; September – Navodari, Sacele;
7.	Sulphates, SO ₄ ²⁻	mg/dm ³	200	There have been exceedings in: May – Sacele; June – Sacele;
8.	Calcium, Ca ²⁺	mg/dm ³	100	There have been exceedings in: May – all the localities; June – all the localities; July – Navodari, Ovidiu, Sacele, Corbu; August – Ovidiu, Sacele, Corbu; September – Navodari, Ovidiu, Lumina, Sacele, Corbu;
9.	Sodium, Na ⁺	mg/dm ³	-	non-standardized values
10.	Potasiu, K ⁺	mg/dm ³	-	non-standardized values
11.	Ammonium, NH ₄ ⁺	mg/dm ³	0	There have been exceedings in: May – all the localities; June – all the localities; July – all the localities; August – all the localities; September – all the localities;
12.	Nitrogen, NO ₂ ⁻	mg/dm ³	0	There have been exceedings in: May – all the localities; June – all the localities; July – all the localities; August – all the localities; September – all the localities;
13.	Nitrate, NO ₃ ⁻	mg/dm ³	45	There have been exceedings in: May – Navodari, Ovidiu, Lumina, Sacele, Corbu; June – Navodari, Ovidiu, Lumina, Sacele, Corbu; July – Navodari, Ovidiu, Lumina, Sacele; August – Navodari, Ovidiu, Sacele, Corbu; September – Navodari, Ovidiu, Oarja, Sacele și Castelu;

continued

14.	Cyanide, CN ⁻	mg/dm ³	0.01	There have not been exceedings
15.	Phenols	mg/dm ³	0.001	There have not been exceedings
16.	Oil residue	mg/dm ³	0	There have not been exceedings
17.	Triazines	mg/dm ³	0	There have not been exceedings
18.	Phosphate, PO ₄ ³⁻	mg/dm ³	0.1	There have been exceedings in: May – all the localities; June – all the localities; July – Ovidiu, Sacele și Castelu; September – all the localities;
19.	Total Bact. Colif.	nr/cm ²	<10	There have been exceedings in: May – all the localities; June – all the localities; July – all the localities; September – all the localities;
20.	Fecal Bact. Colif.	nr/cm ²	<2	There have been exceedings in: May – all the localities; June – all the localities; July – all the localities; September – all the localities;
21.	Strept. Faecalis	nr/cm ²	<2	There have been exceedings in: May – all the localities; June – all the localities; July – all the localities; September – all the localities;
22.	Heterotic bacteria	Nr/ml	<300	There have not been exceedings

- the fountain is contaminated to very low levels of organic matter, the content of ammonium and nitrite ions, which are produced by its decomposition, there were only sporadically ;

- colimetria indicates a fairly wide spread bacteriological contamination, dependent on rainfall;

- groundwater can be contaminated harder, as demonstrated the seasonal variation in water quality indicators;

- compared with CASTELU fountain , this water can be polluted more difficult, although it is near the farmland.

CASTELU

The fountain characteristics from this station are described in (table 6).

The chemical composition of the CASTELU water fountain analyzed in May - September 2011 - 2015:

- has a diameter of 80 cm;
- a series of indicators of fountain water quality exceed sporadic well beyond LMA;

- the absence of main contaminants specific of the industrial processing oil activity;

- the reaction of water exceeded the maximum permissible limit, in May 2011;

- the water fountain is contaminated with organic material, the content of ammonium and nitrite ions, which are produced by decomposition of this, there have been

recorded in all months of monitoring, with the exception of nitrites in September;

- groundwater was contaminated with important amounts of nutrients;

- the presence of stable organic matter, with a high degree of complexity, but in smaller quantities which led overcoming CCO-Cr;

- colimetria indicates a bacteriological contamination, fairly widespread, virtually the same periods as for the fountains from the studied area.

Conclusions

Summarizing all chemical- analytical data related to fountain and water quality are presented in table 7.

From the changes in the fountain water quality indicators from the influenced area of SC XXX from Constanta, in May - September 2011 - 2015, the following issues results:

- the water from the fountains located in the plant influenced area is not contaminated with specific oil industry activity substances , namely: phenols, oils, cyanide and triazines;

- the water quality recorded an uneven variation, at some indicators the seasonal variation is relatively small (PO₄, CCO-Cr, NO₂), and at others very wide (NO₃, pH, SO₄);

- nutrients (mineral nitrogen without nitrites, phosphates) had a fairly uneven variation but shows a tendency to eutrophication of the groundwater;

Table 8
THE NUMBER OF FOUNTAIN WATER QUALITY INDICATORS EXCEEDED IN THE INFLUENCED AREA OF S.C. XXX-CONSTANTA, BETWEEN MAY-SEPTEMBER 2011-2015

Month	Localities											
	Navodari		Ovidiu		Lumina		Sacele		Corbu		Castelu	
	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015	2011	2015
May	11 (31)	8* (31)	11 (31)	3 (31)	8 (31)	3 (31)	12 (31)	6 (31)	10 (31)	2 (31)	8 (31)	5 (31)
June	9 (31)	5 (28)	9 (31)**	8 (31)	8 (31)	5 (31)	10 (31)	5 (31)	10 (31)	7 (31)	8 (31)	7 (31)
July	7 (31)	2 (28)	10 (31)	3 (25)	7 (31)	3 (31)	10 (31)	6 (31)	9 (31)	5 (31)	9 (31)	4 (31)
August	3 (11)	2 (11)	4 (11)	2 (11)	3 (11)	2 (11)	4 (11)	1 (11)	6 (11)	2 (11)	3 (11)	2 (11)
September	6 (31)	5 (31)	10 (31)	6 (31)	6 (31)	4 (31)	11 (31)	8 (31)	8 (31)	7 (31)	8 (31)	5 (31)

- systematic overcoming for oxygen consumption expressed by CCO-Cr, regardless of the month or point-station investigated;

- in terms of quality, the water from the CASTELU fountain is no different from the fountain water located in the area of influence of the oil processing activity;

- tend to improve the water quality fountain from the monitored area by reducing the content of some chemical indicators, due to sanitize the households fountains;

- interpreting the evolution of ammonium ion content through the limitations imposed by the European Community (0.05-0.5), the number of exceedances would drastically reduce because the exceedances recorded values are at quite low levels;

- reducing the content of phosphates and nutrients - the causes are multiple.

From the data in table 8, it is clear fountain water quality improvement, the number of quality indicators exceed reduced to different levels. This is due to the fact that the owners have been notified about water lack of potability to some indicators, which caused repeated sanitization by using lime and kitchen salt.

From the above data it is clear that the industrial processing of oil activity by SC XXX in May - September 2011 - 2015, has not led to the contamination of groundwater in the affected area.

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