

Environmental and Healthy Assessment for North Refineries Company Baiji - (Iraq)

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(Received: 31 / 10 / 2010 ---- Accepted: 11 / 5 / 2011)

Abstract

Environmental samples such as soil industrial water and air were studied at Baiji refineries site to assess the risk of pollutants on local populations .

The results obtained in this work indicate that the soil , industrial water and air samples in Baiji refineries are not contamination with pollutants studied in present research , i.e. with in national environmental limitation ,therefore no risk on the healthy of population living indoor and outdoor of this establishment. The cause of oil pollution in Tigris River due to leak in pipe line carrying crude oil from north oil company to Baiji refineries ,but there were an increase in pH, NO₃⁻ and TDS values in the liquid waste of the thermal Baiji station above the quantities of the national environmental parameters .

Introduction:

Pollution is the undesirable change in the physical, chemical or biological characteristics of air, water and soil that may or will harmfully affect human life or that of other desirable species [1]. Air pollution is due to of many kinds of gases , droplets and particles that reduce the quality of the air such as CO,CH₄,SO₂,NO₂,NO and lead particles [2].The health effects of these pollutants are short term irritation to eyes , nose and throat[3].While the health effects on long term are chronic respiratory disease , lung cancer heart disease damage to brain , nerves , eyes liver or kidneys [4].The toxic chemical in environment air pollution stimulate immune system to activate leukocytes and macrophages that can damage cells on line human blood vessels block lead to systemic hypertension[5] Carbon monoxide can exacerbate cardiovascular disease in humans [6]. In Iraq the environmental problems from ten , oil refineries, in Baghdad and other governorates are without complete treatment units for the gas emission to air [7]. Pollution soil is any soil which appear to be in such conditions by the effects of pollutants on or under the soil causing significant harm [8]. The human effects of polluted soil are death ,toxic effects, carcinogenicity ,teratogenicity , mutagen city and sensitization [9]. Pollution in water is caused by one or more substances which adversely affect human welfare such as salts , heavy metals, hydrocarbons , pesticides , temperature , biological agents, acidity or alkalinity and radioactivity [10]. Industrial water pollution is the liquid sewage produced from

manufacturing operation and discharging to water sources with or without treatment [11].

Sampling Sites and Analysis :

Baiji refineries are the location of the central north of refineries for ministry of oil, the site is located 200 km north of Baghdad, 3 Km west of Tigris river and 1.5 Km north of the town of Baiji The 25 Km² site contains 4 refineries such as oil refinery, north refinery, Salhaldeen-1 and Salh-aldeen-2 refineries and administration building .The facility was used to refine crude oil over 27 years operation period, the oil were discharged for Kirkuk through pipeline to produce Benzene , liquid propane Gas (LPG) and Gasoline . The soil sample (1gm) was digested with 10 ml of concentrated nitric acid and heated to reduce the volume to 2ml then filtered through 541 filter paper , the volume diluted to 25ml with distilled water , the analysis was done by Varian flame atomic absorption spectrophotometer using are – acetylene flame at environmental laboratory in Baiji refineries , the results obtained are listed in Table (1).

The physical and chemical properties of industrial and drinking water were measured at environmental laboratory in Baiji refineries using different analytical techniques , the results obtained are listed in Table (2) . The gas sample was analyzed for H₂S , CO ,CH₄ and SO₂ using gas detector instrument at environmental laboratory in Baiji refineries , the results obtained are listed in Table (3) . The accuracy and precision of analytical method used in this work are showing in Table (4) , it is reliable , sensitive and highly recovered .

Table -1- Pollutants concentration in Baiji soil sites at April 2010

Items	Location Pollutants	Location for container T.E.L ppm	Location for Oil Refinery ppm	Location for Oil Tank ppm
1	Pb	0.021	0.006	0.006
2	Fe	0.03	NIL	NIL
3	Zn	3.39	NIL	NIL
4	P	0.186	0.8	0.391
5	P ₂ O ₅	0.426	1.84	0.896
6	(PO ₄) ³⁻	0.571	2.46	1.2
7	NO ₃ ⁻	63.3	90	88.2
8	Cr	156	696	1950
9	pH	7.27	7.08	6.76
10	Conductivity	2574 μ s	2150 μ s	3294 μ s
11	Humidity	3 %	2.4 %	3.5 %
12	C.O.D	810	930	4290
13	Total oxygen Dissolved O ₂	-	-	-
14	T . D. S	1287	1075	1650

Table – 2- Environmental parameter concentration in industrial water at Baiji Refineries discharged to Tigris River Abo_joari Location at April 2010 .

Location Test ppm	Industrial water north refinery	Industrial water Sahaldeen	Industrial water oil	Industrial water (out let)	for Limitation industrial water ppm	Drinking water	Limitation for Drink water
pH	8.1	7.8	7.2	8.2	6.5-8.5	7.3	- 8.5
Oil	13	12.2	10.5	10	Less than 10	-----	-----
Temp C ^o	25	25	25	25	Less than 33	25	25
T.D.S	572	486	457	833	Less than 1500	235	500
Cond (. μ s)	1170	971	915	1513	Less than 3000	471	1000
Turb.(FTU)	30	75	45	83	50	4	5 – 10
B.O.D	60	57	65	68	Less than 30	---	-----
C.O.D	108	152	161	129	Less than 150	---	-----
Sal.(NaClO)%	2.2	1.8	1.8	2.7	Less than 4	0.8	1 -0.9
Free Cl ₂	---	---	---	---	-----	0.27	1-0.7
Total Cl ₂	---	---	---	---	-----	0.38	1-0.7
Phenol	---	---	---	1.17	0.05	---	0.001
Chromium (Cr)	---	---	---	0.14	0.05	---	---
Aluminum(Al)	---	---	---	0.27	5	---	---
Iron(Fe)	---	---	---	0.13	2	---	---
Zinc(Zn)	---	---	---	6.2	2	---	---
Lead(Pb)	---	---	---	0.001	0.1	---	---
Nitrate NO ₃ ⁻	---	---	---	1.9	Less than 30	---	Less than 20
Sulfate(SO ₄) ²⁻	---	---	---	210	400	---	Less than 200
Phosphate(PO ₄) ³⁻	---	---	---	0.08	3	---	---
Cyanide CN ⁻	---	---	---	0.194	0.05	---	---

Table – 3- Concentration of Gases in Baiji Refineries at April 2010

Items	Location	Salahdeen Treatment	North Treatment	Oil treatment	Unit	Hydration Salahdeen refinery	Benzene Improvement Salahdeen refinery	Limitation
1	H ₂ S ppm	0	0	0	3	0	0	10
2	CO ppm	2	2	0	75	60	0	35
3	LEL CH ₄ %	0	0	0	0	0	0	10
4	SO ₂ ppm	0	0	0	0	0	0	---

LEL = Low Explosive level

Table (4) Accuracy and Precision of Analytical Method

Concentration of Zn added ($\mu\text{g}/\text{ml}$)	Concentration of Zn found ($\mu\text{g}/\text{ml}$)	Recovery (%)	R.S.D (%)
5.0	4.87	97.4	0.6618
5.0	4.85	97.0	0.5883
5.0	4.95	99.0	0.6870

R.S.D = Relative standard Deviation

Discussion :

The result in Table (1) indicate that the soil of Baiji refineries is not contaminated with pollutants measured in this research and agreed with the results of other workers [12,13] .Tables(2) and (3) illustrate that air and the industrial water produced from Baiji refineries and discharged to Tigris river are not contaminated [14] according to national environmental limitations Table(5).

Table(5) Iraqi Environmental Limitations .

Parameters	Results (ppm)
PH	6 -9.5
BOD	40
(SO ₄) ²⁻	400
Cl ⁻	600
(PO ₄) ³⁻	23
NO ₃ ⁻	25
T.D.S	-
Oil and grease	10
Zn	-
Pb	0.1
Fe	2

There was thermal Baiji station in the same area for producing electricity neighboring to Baiji refineries also discharged the liquid waste to Tigris river. Some of The environmental parameters of the liquid waste

of the station are listed in Table (6) , which show above the quantities of the national environmental parameters .

Table (6) Environmental parameter of liquid waste from thermal Baiji station

Parameters	Concentrations (ppm)
pH	10.4
BOD	12.3
(SO ₄) ²⁻	296
Cl ⁻	120
NO ₃ ⁻	554
(PO ₄) ³⁻	2.14
T.D.S	220

Conclusion:

The sites used in Baiji refineries are considered to represent no risk to the health of population according to national and international environmental limitations while the liquid waste produced from thermal Baiji station is contaminated the Tigris river which leads to affect directly on aquatic life and indirectly to water resources for drinking water of the populations north Baiji .The oil pollution in Tigris river is due to leak in pipeline carrying oil to Baiji refineries and not due to operation of refinery in Baiji company.

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تقييم الخطر البيئي والصحي لشركة مصافي الشمال بيجي - العراق

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(تاريخ الاستلام: ٣١ / ١٠ / ٢٠١٠ ---- تاريخ القبول: ١١ / ٥ / ٢٠١١)

الملخص

قدرت بعض الملوثات في النماذج البيئية في التربة والماء الصناعي المطروح الى مياه دجلة والهواء في بعض المواقع من مصفى بيجي لتقدير مدى خطورة هذه الملوثات على العاملين داخل المصفى والسكان المحليين خارج المصفى .

بينت النتائج التي تم الحصول عليها بان التربة والماء الصناعي والهواء في مصفى بيجي غير ملوثة وانها ضمن الحدود البيئية الوطنية المسموح بها وانها لاتمثل خطر على صحة السكان العاملين في هذه المنشأة والسكان في مدينه بيجي وأن سبب التلوث النفطي في النهر ناتج عن التسرب في الأنابيب الناقلة للنفط الخام الى مصفى بيجي ، لكن لوحظت زيادة في pH , NO_3^- , TDS عن المحددات البيئية الوطنية في العراق في مياه التصريف لمحطة بيجي الحرارية .