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Exploring and evaluating health, safety and environment conditions of oil industry staff in Southern Pars special economic energy zone as a result of oil, gas, and petrochemical industry development

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Key words: Dispersion of Pollutants, Health, Safety and Environment Effects, Gas and Petrochemical Complexes, Southern Pars.

Abstract

This research was conducted in analytic-cross sectional form in Southern Pars region. Individuals` health and hygiene information was collected through studying 1450 occupational medicine files of staff in Southern Pars Special Economic Energy Zone. Studying occupational accidents and safety of staff revealed that, out of 211 occupational accidents in 2013, falling from height scored the top with 53.1% frequency and entry of objects into body scored the lowest point by 1.42%. Total number of 6 death were reported as a result of industrial accidents and 5 cases led to maim. Average age of the victims was reported 32.6 and most accidents happened in the summer. Condition of environmental pollutants: four pollutants were higher than national standard: Pb=0.153, SO_2= 224.96, NO_2= 38.15, PM_{10}= 77.22. Also, the concentration average was TPH= 107.16 gr/dwt/µ and heavy elements were measured as following: Pb=6.839, Cu=5.506, Fe=7.023, Zn=9.27, and Ni=3.028 in coastal waters which were higher than national standard. According to the results and young population of staff in Southern Pars Special Economic Energy Zone, accurate and comprehensive planning as well as HSE fulfillment need to be concentrated by a modern outlook on staff health factors, safety, and environment in gas and petrochemical industry in order to reduce dissatisfactory effects of industry on environment and protect the most of it, increase the positive effects on society, provide staff health and safety, and decline industrial accidents and damages in accordance with sustainable development based on increased productivity and human resource development.

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Introduction

Oil and gas reserves and resources and increasing development of these industries lead to some challenges concerning individuals` health, their safety, and environment, particu-larly following the processing of this strategic industry. Devastating effects of pollutants from these industries lead to some consequences such as non-biodegradable waste, excessive air pollution, green house and poisonous gases like CH4, CO2, NOX, and SOx, different VOCs compounds, aerosols, the gradual destruction of the ozone layer, the occurrence of severe weather conditions, free water pollution, and destruction of aquatic ecosystems.

For industrial and economic growth of the country's industry projects that are designed for the well-being of human communities, undoubtedly have negative environmental impacts such as pollution of water, soil, air, loss of plant and animal species, the impact on human health and finally unbalancing the ecosystem which in some cases is irreversible.

In the current situation and the preservation of industrial values, the oil industry is of vital importance and therefore it is a concern for every country. Oil is the main source of energy at the international level in a way that 32% of Europe and Asia's energy supplies and 53% of world's energy resources are situated in the Middle East. The annual consumption of 30 billion barrels of oil shows that developed countries are the largest consumer of this natural resource. In 2007, about 25% of the oil produced is consumed by the United States (Dobaradaran, 2013).

For industrial and economic growth of the country's vast oil industry projects that are designed for the well-being of human communities, undoubtedly have negative environmental impacts such as pollution of water, soil, air, loss of plant and animal species, the impact on human health and finally unbalancing the ecosystem which in some cases is irreversible.

The necessity of addressing the issue becomes clearer when you understand the pursuit of sustainable industrial development though it is impossible without considering the importance of environment.

Dumping million liters of crude oil into marine ecosystem due to different accidents, pollution via thousands of liters of waste oil from vehicles traveling on land and sea, air pollution caused by the activity of hundreds of refineries and industries, large quantities of waste water from industry and other factors, these are all warnings as the Global Village is warning thus we have to pay more attention to our environment (Muna-wari, 2011).

The aim of this study is Exploring and evaluating health, safety and environment conditions of oil industry staff in Southern Pars Special Economic Energy Zone as a result of oil, gas, and petrochemical industry development.

Material and methods

Statistical Population

The study method isanalytic-cross and sectional. Populations under study are 1,450 cases of industrial medical files from Special Administrative Region of the South Pars along with cases of work field accidents and safety of employees were collected in 2013. The SPSS software was used for health information employees of statistical analysis. Descriptive statistics (frequency, percentage, mean) and statistical analysis (chi-square test, t test, Pearson's correlation coefficient) were also used.

Meteorological data

To evaluate the environmental pollution data from16 monitoring stations located in the7th zone measure thee missions of air pollutants (Pb, O_3, NO_2, SO_2, CO, PM_{10}, $PM_{2.5}$) shown in Fig. 1. With regard to the establishment of 16 permanent monitoring stations in different location sregional standard and continuous monitoring of weather data, weather and chemical stations, re-sampling and analysis of pollutants is neglected.

Portable laboratory for monitoring air pollution from vehicles equipped with scrubbers and photo chromatography method or the manual method was used.

Water sampling stations data

Data from16 monitoring stations in coastal waters of the Persian Gulf were used to measure pollutants which contains 7 different parameters (Fe, Pb, Cd, Ni, Cr, Zn, Cu) shown in (Table 2). And the results of water pollution monitoring tests with a nova, Variance and paired test were analyzed.

Location

Geographic of area under study:

South Pars Special Economic Energy Zone was established in 1998 to perform activities in the field of oil, gas and petrochemicals. This zone is situated in the area of the Persian Gulf, 300 kilometers East of Bandar Bushehr, and 570 miles West of Bandar Abbas and at the distance of 100 km from South Pars field in the sea.

This area is located at 27 degree latitude, 52 degrees longitude and air temperature is between the ranges of 5 to 50°C (Fig. 1). This zone contains 10 active gas refineries, 10 petrochemical units while 11 gas refineries and 4 petrochemical plants are under construction, undoubtedly make this zone as the economic capital of Energy (Official Website of Special Zone, 2009).

Fig. 2. Map of South Pars gas field in GIS environment.

Table 1. Location of 16 pollution monitoring stations in the South Pars region of Assaluyeh.

Row	Location	**Row**	**Location**
Station 1	Chahe mobark	Station 9	Building Tondgoyan
Station 2	Persian Gulf Airport	Station 10	phase outputs 9 to 10
Station 3	Atisaz of Residential Complex	Station 11	Sulfur Storage Unit
Station 4	Camp 4	Station 12	The Sulfur Storage Unit and flare
Station 5	Bidkhoon	Station 13	Pars Petrochemical
Station 6	Camp 5	Station 14	HSEQ Petrochemical
Station 7	Beach Park Assaluyeh	Station 15	Kavian Petrochemical
Station 8	Beach Park Nakhl Taghi	Station16	Shirino

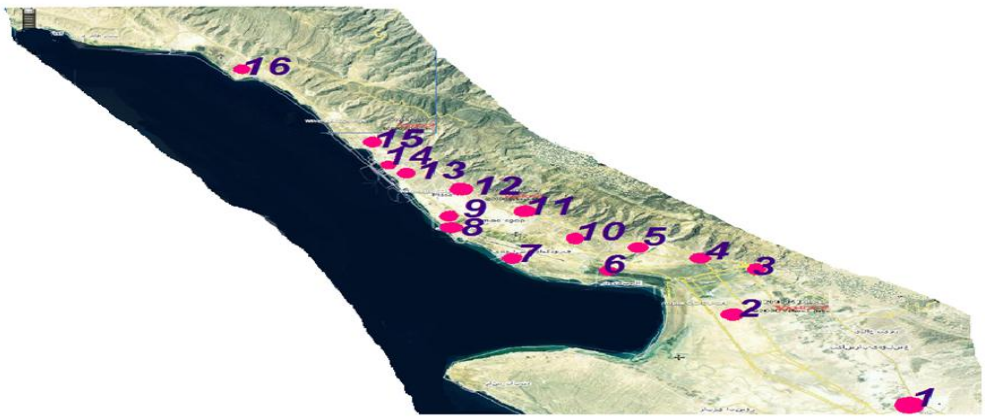

Fig. 1. South Pars region and 16 pollution monitoring stations.

Table 2. Location and geographical coordinates of 16 sampling stations in the Persian Gulf region of Assaluyeh.

Row	Location	Row	Location
Station 1	Halleh	Station 9	Opposite phase outputs 1 to 3
Station 2	Khorbestanian opening	Station 10	Opposite phase outputs 4 to 5
Station 3	Naiband Bay	Station 11	Opposite desalination petrochemical output
Station 4	Control Station	Station 12	Shirino
Station 5	Khorbidkhon (1)	Station 13	Siraf
Station 6	Khorbidkhon (2)	Station 14	Phase 13 Akhtar
Station 7	Nakhl Taghi	Station 15	Phase 14
Station 8	Opposite of Hyundai desalination unit	Station16	Shepherds Pond

Result and discussion

Statistical of health results

1450 medicine Files of industrial zone office workers from 2013 were investigated. Demographic detain, age, education, work experience and employment type. Average employee age was 35.5theiraverage work experience was 7 years. Statisticscharacteristics are shown in Table 3, statistics of chronic diseases in employees such as indices Spiro metric, eudiometry, and mental health are shown in table 4, 5, 6, 7.

Table 3. Demographic characteristics study of population.

Variables	Statistical Indicators	Abundance	Percentage
Sex	Man	1385	95.5%
	Women	65	4.5%
Education	Under diploma	200	13.8%
	Diploma	345	23.8%
	Diploma degree	323	22.3%
	Bachelor، s degree	437	30.1%
	Masters or higher degree	145	10%
Employment type	Official	373	25.7%
	Contract based	1077	74.2%
Work conditions	Satellite	1241	85.5%
	Daily basis	209	14.5%

In order assess disease factors in patients regarding chronic disease normal cholesterol levels less than 200 mg/dl, triglycerides less than 150 mg/dl, LDL[1] less than 150 mg / dl, hypertension with systolic blood pressure ≤140, diastolic pressure ≤ 90 mmhg, diabetes with FBS[2] above 126 mg / dl, overweight with BMI[3] between 25 to 29.9 and obesity with a BMI greater than 30 were considered as standard (Harrisons, 2012).

To identify difference in spirometric in workers via MRI (Medical International Research) Italian model shows indices FVC[4] (vital capacity operation) ≤ 80%, FEV_1[5] (expiratory air volume at first second) ≤ 80%, with respect to FEV_1 / FVC ≤ 75% were calculated (Aghilinejad *et al.,* 2010). Spirometry results indicate that the 14.1% of diseases were Idiopathic and 6.4% were occlusive disease.

Table 4. Chronicle disease risk factors in workers.

Type of disorder	Abundance	Percentage
Hyper Cholesterol	505	34.9 %
Hyper Triglyceride	713	49.1%
Increased LDL	186	12.8%
Hypertension	62	4.3%
Diabetes	66	4.6%
Overweight	662	45.4%
Obesity	193	13.3%

Table 5. Workers spirometric indices.

Type of disorder	Abundance	Percentage
Disorder in FVC	301	20.7%
Disorder in FEC_1	204	14.1%
Disorder with respect to FEV_1/FVC	93	6.4%

In order to assess hearing test pure tone PTA model Amplivox 116 made in Germany was used.

Hearing loss due to noise exposure, type of sensory neural SNHL and those with previous exposure to noise in NIHL at 4000 Hz which had the highest prevalence of hearing loss were considered (Aghilinejad *et al*,, 2010).

Audiometric results indicates a prevalence of 10.5% sensory neural hearing loss of less than 25 db, 7.4% hearing loss above 25db and 4.2% loss due to conductive deafness.

Depression Anxiety Stress Sheet (DASS) questionnaire was used to measure stress, anxiety, depression validity with 85% reliability was used. (Southham, 2001).

Table 6. Special audiometric factors in workers.

Type of disorder	Abundance	Percentage
Normal	1089	75.1%
Sensory neural hearing loss, unilateral or bilateral level less than 25db	153	10.5%
Sensory neural hearing loss of 25db level over a one or two-sided	108	7.4%
Conductive hearing loss	61	4.2%
Unknown	39	2.8%

The results include a 10 percent prevalence of depression, anxiety and stress among the employees.

Table 7. Measuring depression, anxiety and stress using DASS test.

Condition	Depression		Anxiety		Stress	
	Abundance	Percentage	Abundance	Percentage	Abundance	Percentage
Normal	1313	90.7%	1316	90.9%	1295	89.5%
Slightly	64	4.4%	49	3.3%	56	3.8%
Medium	43	2.9%	47	3.2%	54	3.7%
High	14	0.9%	22	1.5%	23	1.5%
Very high	16	1.1%	16	1.1%	22	1.5%
Total	1450	100%	1450	100%	1450	100%

The results of statistical analysis showed that spirometric parameters FVC, FEV1with along with work experience during the test T test shows significant relationship (P> 0/05). Spirometric indices and working conditions (on daily basis) yield no significant results. On the other hand measurements between audiometric and education level using Chi squire indicates positive correlation between them (P> 0/05). But between exposure and working conditions (satellite, day basis) and work experience no significant results were achieved.

Between work experience and triglycerides level LDL with Pearson correlation coefficient statistically significant results were obtained (P> 0/05), (r = 0/5). Between body's mass index (BMI) and work experience no significant results were obtained. Statistical analysis between depression, anxiety, and stress along with work experience history using Pearson correlation coefficient shows no significant results. Between depressions, stress, anxiety, there was no statistical correlation based on education level and working conditions.

Statistical of safety results

Occupational and industrial accidents were studied according to the accident report of patients who referred to the clinic. While studying 211 occupational accidents, the highest frequency was reported for falling from height with 53.1% frequency and the lowest was for entry of objects into body by 1.42%. (Table No. 8). Average age of the victims was 32.6. Total number of death accounted for 6 cases and 5 cases of maim occurred.

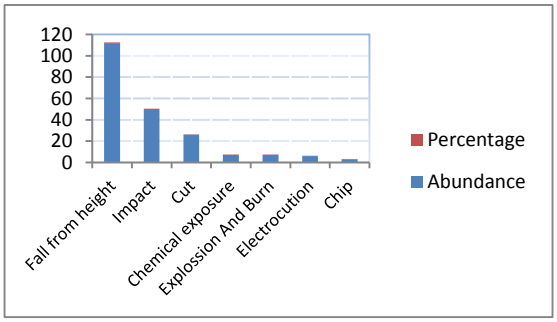

Fig. 3. Type and frequency of the incidents.

According to Fig. 4 most of the affected body parts are hands and feet with a frequency of 43/5%.

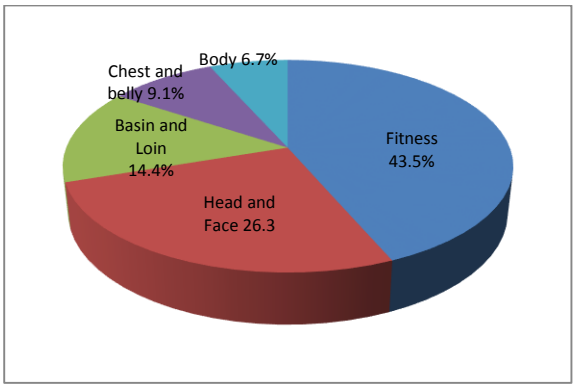

Fig. 4. Body parts injured in accident.

The results showed that most injuries occurred in summer (Table 8). Frequency of occurrence of accident and incidence has no significant relationship between age group and damaged body part.

Investigation of distribution of air pollution

In the assessment of air pollutants, concentrations of seven pollutants like (Pb, O_3, NO_2, SO_2, CO, PM_{10} and $PM_{2.5}$) were studied at 16 sites in 2013.

The average concentration of each of the seven pollutants were identified, where as 4 pollutants (Pb, NO_2, SO_2, PM_{10}) concentrations were much higher from standard levels which are shown in table 10.

Table 8. Occurrence of occupational accidents in each season.

Type of accident	Incident occurrence season				
	Spring	Summer	Fall	Winter	Total
Fall from height	25	30	29	28	112
Impact	9	14	14	13	50
Cut	4	6	9	7	26
Chemical exposure	1	2	3	1	7
Explosion and burnet	1	5	1	0	7
Electrification	1	4	0	1	6
External body	0	1	2	0	3
Total	41	61	58	51	211

The average age facing accidents is between 28 to 37 years (Table 9).

Table 9. The meanage of accidents based on injury type.

Type of accident	Workers age			
	Maximum	Minimum	Average	Standard deviation
Fall from height	65	19	32.39	10.54
Impact	57	21	32.65	9.49
Cut	55	17	30.26	8.93
Chemical exposure	58	25	35.20	13.06
Explosion and burnet	40	22	30.17	6.82
Electrification	55	24	37.0	16.09
External body	31	25	28.0	3.0

Table 10. Emission Measurement Results in 2013.

S. No	Parameter	Measurement unit	Description	Standard	Mean	Percentage difference
1	PM 2.5	(ug/m3)	Particulate less than 2.5 microns in diameter	25	10.6	42.4
2	PM_{10}	(ug/m3)	Particulate lessthan10 micronsin diameter	50	77.22	155
3	CO	(ppb)	Carbon monoxide	9000	5324.5	59.16
4	NO_2	(ppb)	Nitrogen dioxide	21	38.15	182
5	SO_2	(ppb)	Sulphur dioxide	37	224.96	608
6	O3	(ppb)	Ozone	50	30.06	60.12
7	Pb	(ug/m3)	Lead	0.05	0.153	306

Fig. 5 to 8. Shows the mean concentrations of four pollutants (Pb, NO_2, SO_2 and PM_{10}) measured.

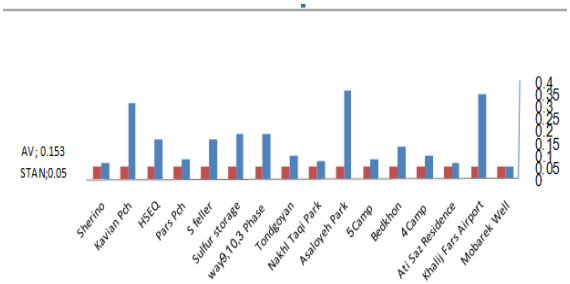

Fig. 5. The average lead concentration Pb (ug/m3).

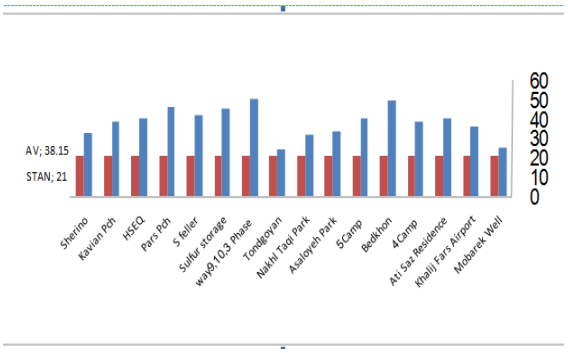

Fig. 6. The average concentration No_2 (ppb).

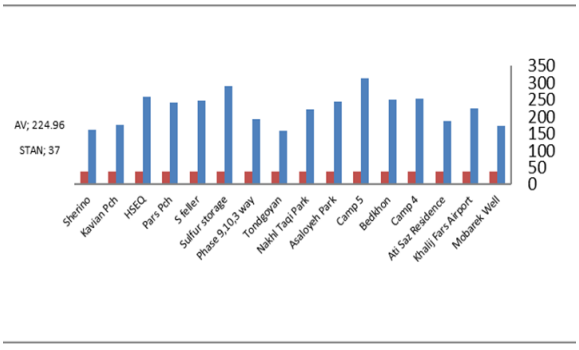

Fig. 7. The average concentration of SO_2 (ppb).

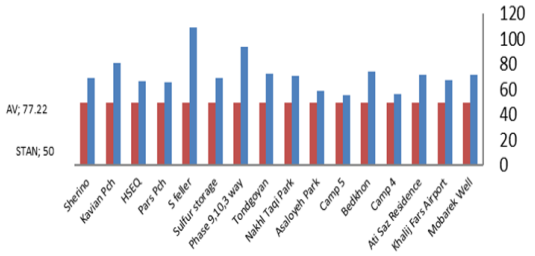

Fig. 8. The mean concentration PM_{10} (µ/m3).

Investigation of distribution of water pollution

In order to determine amount of petroleum hydrocarbons and heavy metals in water and sediment samples, the results of the 16 sampling stations located in coastal waters of Assaluyeh in 2011 were utilized.

Concentrations of heavy metals (Fe, Pb, Cad, Ni, Cr, Zn and Cu) and the concentration of total organic carbon TOC were examined in the results.

The average concentration of heavy metals in water collected from 16 stations of Asalooye indicates Fe=7.023, Zn= 9.27, Pb= 6.839, Cad=0.126, Ni =3.028, Cr=2.75 and Cu= 5.506 were present in water samples.

The concentrations of these substances in water sediments are shown on Tables 11, 12 and Fig. 9 to 16.

Table 11. Heavy metal concentration in coastal waters collected from 16 stations at Asalooye in ppm.

Station	Zinc (ppm)	Cu (ppm)	Lead (ppm)	Cadmium (ppm)	Nickel (ppm)	Chromium (ppm)	Iron (ppm)
1	7.453±0.723	4.948±0.510	4.260±0.668	0.102±0.002	2.058±0.102	2.336±0.234	6.237±0.135
2	7.746±1.531	5.223±0.102	4.873±0.530	0.103±0.001	2.324±0.146	2.382±0.238	6.765±0.101
3	7.883±0.840	5.213±0.470	5.601±0.332	0.103±0.001	2.679±0.111	2.454±0.245	6.768±0.009
4	8.184±1.475	5.251±0.668	6.090±0.122	0.104±0.001	2.817±0.181	2.502±0.250	6.781±0.048
5	9.080±0.865	5.315±0.412	6.550±0.193	0.116±0.002	2.821±0.140	2.544±0.254	6.912±0.074
6	8.961±1.057	5.416±0.349	7.125±0.466	0.121±0.003	2.999±0.029	2.592±0.259	7.018±0.030
7	9.302±1.565	5.475±0.532	7.641±0.079	0.123±0.001	3.059±0.036	2.692±0.269	7.125±0.033
8	9.814±0.434	5.533±0.228	7.907±0.065	0.123±0.002	3.158±0.042	2.766±0.277	7.228±0.015
9	9.702±0.319	5.582±0.268	8.210±0.308	0.133±0.002	3.231±0.053	2.859±0.286	7.310±0.076
10	10.083±1.433	5.617±0.229	8.665±0.059	0.135±0.001	3.267±0.064	2.908±0.291	7.3**57**±0.045
11	9.992±0.466	5.697±0.184	8.551±0.100	0.136±0.002	3.307±0.010	2.974±0.297	7.391±0.096
12	10.303±0.748	5.761±0.182	8.588±0.174	0.137±0.001	3.368±0.017	3.024±0.302	7.441±0.027
13	10.338±0.823	5.793±0.285	7.386±0.241	0.141±0.001	3.407±0.033	3.046±0.305	7.517±0.074
14	10.125±1.249	5.795±0.366	7.540±0.371	0.144±0.002	3.456±0.034	3.096±0.310	7.471±0.101
15	10.132±0.756	5.810±0.216	6.037±0.073	0.147±0.001	3.483±0.010	3.039±0.304	7.593±0.233
16	10.015±1.049	5.864±0.210	5.157±0.290	0.149±0.001	3.510±0.013	3.003±0.300	6.117±0.431
Maximum	7.453±0.723	4.948±0.510	4.260±0.668	0.102±0.002	2.058±0.102	2.336±0.234	6.117±0.431
Minimum	10.338±0.823	5.864±0.210	8.665±0.059	0.149±0.001	3.510±0.013	3.096±0.310	7.593±0.233
Average mean	9.272±0.991	5.506±0.270	6.839±1.414	0.126±0.017	3.028±0.425	2.758±0.263	7.023±0.451

Table 12. Concentration of heavy metals in coastal water sediments of Asalooye obtained from 16 stations.

Station	Zinc (ppm)	Cu (ppm)	Lead (ppm)	Cadmium (ppm)	Nickel (ppm)	Chromium (ppm)	Iron (ppm)
1	49.346±0.324	29.768±0.231	9.231±0.326	0.541±0.004	20.978±0.276	19.346±0.231	67.432±0.245
2	49.483±0.526	29.981±0.245	9.546±0.418	0.554±0.005	20.994±0.195	18.987±0.146	67.781±0.316
3	49.639±0.635	30.423±0.198	9.892±0.271	0.569±0.004	21.245±0.453	19.467±0.372	67.980±0.261
4	49.824±0.642	30.768±0.187	9.467±0.196	0.591±0.005	21.476±0.673	19.591±0.361	68.190±0.426
5	50.138±0.517	31.236±0.223	9.982±0.129	0.598±0.006	21.953±0.628	19.720±0.415	68.567±0.513
6	50.762±0.552	31.873±0.345	10.142±0.287	0.603±0.004	22.116±0.451	20.128±0.517	68.929±0.415
7	50.983±0.546	32.132±0.316	10.267±0.532	0.615±0.005	22.476±0.362	21.364±0.334	68.996±0.304
8	51.839±0.535	32.986±0.246	10.996±0.351	0.619±0.004	22.890±0.473	21.947±0.452	69.765±0.241
9	49.993±0.498	32.452±0.152	10.546±0.328	0.602±0.005	22.321±0.534	21.237±0.463	69.126±0.216
10	49.932±0.567	31.289±0.326	10.017±0.467	0.589±0.004	22.052±0.518	21.118±0.422	69.214±0.327
11	49.423±0.415	30.425±0.271	9.961±0.216	0.554±0.004	20.198±0.620	20.413±0.512	69.012±0.134
Maximum	49.346±0.324	29.768±0.231	9.231±0.326	0.541±0.004	20.198±0.620	18.987±0.146	67.432±0.245
Minimum	51.839±0.535	32.986±0.246	10.996±0.351	0.619±0.004	22.890±0.473	21.947±0.452	69.765±0.241
Average mean	50.196±**0.773**	31.237±**1.049**	10.021±**0.498**	0.584±**0.026**	21.676±**0.794**	20.327±**0.980**	68.630±**0.709**

In terms of microwave heating per gram

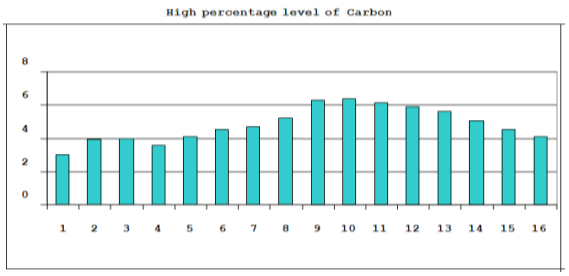

Fig. 9. Concentration levels of organic Crane at 16 of offshore stations of Assaluyeh.

The total organic carbon content of station No. 10 (opposite exit of phases 4 and 5) was 6.3 percent and 2.9 percent as the lowest percentage at station 1 (Halleh) was measured.

Organic carbon values in the area are not significantly different from one another.

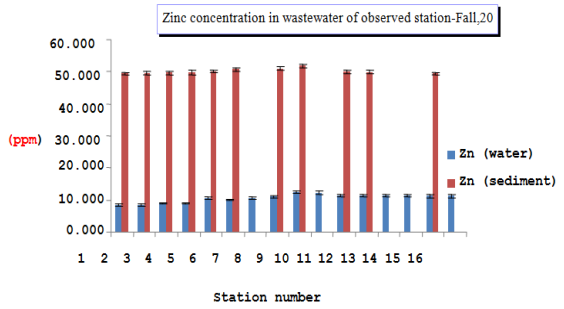

Fig. 10. The amount of zinc in water and sediment surveyed at 16 stations.

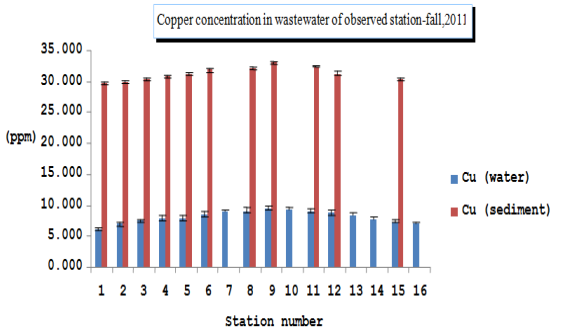

Fig. 11. The amount of copper in water and sediment surveyed at 16 stations.

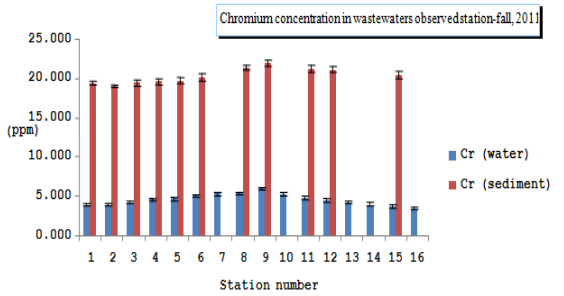

Fig. 12. The amount of chromium in water and sediment at 16 stations surveyed.

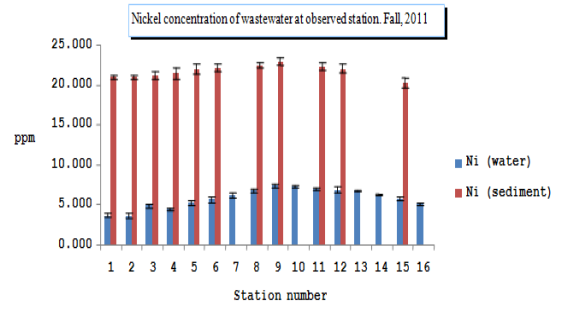

Fig. 13. The amount of nickel in water and sediment at 16 stations surveyed.

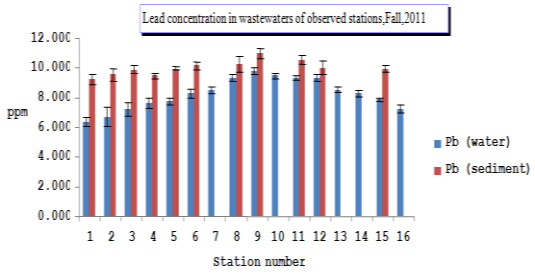

Fig. 14. The amount of lead in the water and sediment at 16 stations surveyed.

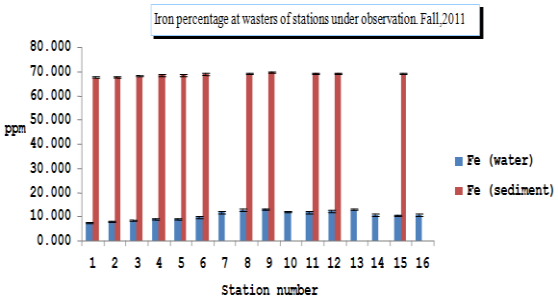

Fig. 15. The amount of Iron in the water and sediment at 16 stations surveyed.

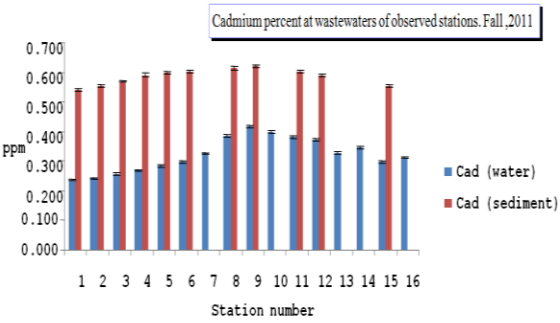

Fig. 16. The amount of cadmium in water and sediment at 16 stations surveyed.

The results showed that the concentrations of heavy metals such as lead had max value of 9.82 at Station 9 and 6.38 at Station 1, Copper concentration was 9.56 at Station 9and 6.19 at Station 1, Chrome's concentration was 5.94 at Station 9 and 3.43 atstations16, Irons concentration 13.04 at Station 9 and 0.211 at Station 1, Cadmium concentration 0.619 at station 9 and 0.541 at Station 1, Nickel concentration 7.37 at station 9 and 3.57 at station 2, Zinc concentration were 12.37 at station 9 and 8.34 at

station 1, in PPM measured in costal had the concentration of elements like lead concentration was 10.99 at station 9 and 9.23 at station 1, Copper concentration were 32.98 at station 9 and 29.76 at station 1, Chromium concentration was 2.94 at station 9 and 18.98 at station 2, iron concentration were 69.76 at station 9 and 67.43 at station 1, Cadmium concentration 0.619 at station 9 and 0.541 at station 1, Nickel concentration 89/22 at station 9 and 19/20 at station 15, Zinc concentration were 83/51 at station 9 and 34/49 at station 1 were measured at micro gram per gram and were higher than the standard level.

The results of statistical indicators of the health of workers in the region, especially in South Pars showed that 34.9 % had with Hyper lipidemia, 3.4% hypertension, 6.6% diabetes, 45.4% were overweight and 13.3% were obese. Between work experience cholesterol levels LDL we found a significant result. Therefore with respect to rise in work experience increases these disorders were observed.
Study conducted by doctor Lotfi and colleagues in 2010 also shows the same results. His study showed that 18.3% worker had high cholesterol, 41.8% had hyper triglyceride, 11.1%, diabetes and 11.5% had hypertension levels.

Spirometric results indicate that the prevalence of Idiopathic diseases were 14.1% obstructive diseases were 4.6%. An audiometric result shows that 10.5% sensory neural hearing loss is less than 25 db, while 7.4% of sensory neural hearing loss was greater than 25db hence conductive deafness was 4.2%. Measurement results of stress, anxiety, depression represents that approximately 10 percent of employees have these symptoms.

Research performed by Farad Taremiyan. *et al* in 2009. on stress levels of South Pars employees shows similar results. The results show the highest frequency of job accidents which involves 53.1% falls from height, strains 23.8%, cuts and exposure to chemicals 3.3%, blast and burn 2.8%, chips 1.4%. While Bigharz in 2010 showed that strains in workers in the years of 2010-11 were impartial with average of 35.7%, cuts 29.64%, falling from a height of 18.94%, burns 3.8%, 3.5% chemical Contact and chips was 1.59%.

The results of measurement of air pollution emission concentration of 4 pollution (Pb=0.153 μ/m^3, NO_2=38.15 ppb, SO2=224.9 ppb, PM_{10} 77.22 μ/m^3) showed that the average concentration was higher than the standard values which compared to the emissions in 2010 of NO_2, SO_2 and BTX monitored at 18 stations were almost equal.

Finally, a study of heavy metal pollution in coastal waters indicates average percentage of Lead to 6.839, Copper 5.506, Iron 7.023, Zinc 9.27 and 09.27 ppm of Nickel was present in coastal waters which were higher than the standard values which have a resemblance with the studies conducted by Gholamreza Fakhrudd in and Sakineh Mahdavi at Assaluyeh petrochemical refinery.

Conclusion

With the advance in technology and industry various methods for utilizing oil energy has been emerged which along with their benefits have negatively affected human health and its environment. With respect to the results obtained from this research based on the HSE philosophy and health safety determined the impact of oil industry on environment and policies which adverse these effects Increase the safety of staff and facilities in the industrial centers, industrial such as decrease accidents and environmental damage to lowest possible level and to increase safety and security through the elimination of non-specified methods. HSE management system must create a comprehensive cultural of health, safety and environment, hazards, incidents and problems interaction in order to evaluate and offer contraceptive methods. Thus, according to the HSE policies, Ministry of Petroleum had tried to eliminate

all accidental and harmful effects on people and the environment via industry and efforts have been done to achieve sustainable development, increase productivity and development of standards.

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