

# ASSESSMENT OF OCCUPATIONAL LEVEL OF AWARENESS FOR HEALTH AND SAFETY IN SIDI KERIR PETROCHEMICAL COMPANY

By

Elssayed MY<sup>1</sup>, Hassan HM<sup>1</sup>, Hosny G<sup>2</sup>

*1) Department of Occupational Health, Safety, and Environment,  
Sidi kerir Petrochemical Industrial Company (Sidpec).*

*2) Professor of Public Health & Occupational Medicine, Division of Environmental Health,  
Department of Environmental Studies, Institute of Graduate Studies and Research, University of Alexandria.*

## **Abstract:**

**Introduction:** Humans are daily exposed to different kinds of dangerous exposures. Occupationally, workers are at higher risk to different hazards depending on the type of industry. Workers in petroleum and petrochemical industries are exposed to many occupational hazards like noise, different types of chemicals, ionizing radiation and infra-red radiation etc. High level of awareness for health and safety is very important issue for workers in petrochemical industries. **Aim of work:** to assess the occupational exposures and level of awareness for health and safety in Sidi Kerir Petrochemicals Company. **Materials and Methods :** Site survey and analysis for the target company and review of the production process were performed to assess the occupational exposures and level of awareness for health and safety among workers. The study was performed utilizing a questionnaire sheet for awareness assessment. The results revealed that workers are at high risk for exposure to noise and chemicals but at low risk for exposure to ionizing radiation and infra-red radiation. However, the level of awareness for health and safety among workers was shown to be at high level. **Conclusion:** The current results raised recommendations and needs to improve communication between safety management committee and workers and to emphasize the role of training courses to ensure better safety communication and involvement of all workers in top safety management of the company.

**Key words:** Occupational health & safety, Safety awareness, Sedi Kirir Company, Petrochemical industry, Training courses.

## **Introduction**

Undoubtedly, industry is one of the main sources affecting environmental quality. Concern for a clean working environment for the industrial workers is based on the fact that improved air quality lead to high productivity and human welfare of workers. This means that the efforts to improve the working environment have positive impacts on workers, concerned companies and the economy as a whole (Jackson et al, 1989).

The petrochemicals sector plays an important role in the industrial strategies of developed countries. The petrochemicals industry as the name implies is based upon the production of chemicals from petroleum such as natural gas. The occupational health and safety (OH&S) plays central role in industry. It protects all workers from health and safety related issues in their working environments. Protecting workers from injuries is important on a social level, but there is also a positive economic impact in reducing safety hazards. Safety is without doubt, the most crucial investment we can make. And the question is not what it costs us, but what it saves (Hughes and Ferret, 2007).

Nowadays, safety management is less concerned with reacting to accidents when they happen; rather than accident

prevention. Prevention requires knowledge about how and where employees are exposed to hazardous situations, and in which ways the workers could be affected by these situations (Larsson and Field, 2002).

Occupational accidents can be reduced through effective preventative measures by investing on safety equipments, training, and educating the employees, process design, and machinery. In order to develop a good safety culture, attitude of the workers needs to be reoriented by applying best practices, good housekeeping, change in work culture, and work practices (Beriha et al, 2012).

## **Aim of Work**

The present study was conducted in Sidi Krir Petrochemical Company aiming to assess the occupational exposures and the level of awareness for health and safety among workers.

## **Materials and Methods**

The underlying study was conducted to analyze level of occupational awareness of the employees in Sidi Krir Petrochemical Company (SIDPEC) for health and safety. The study was performed utilizing a questionnaire sheet for awareness assessment.

**1. The site of the study.** SIDPEC is a petrochemical complex that includes three main production plants; utility plant, ethylene plant, polyethylene plant and some other assistant departments. The main product of the company is Ethylene gas (300,000 metric tons/year) that is used mainly in the production of polyethylene polymer (220,000 metric ton/year), the remaining ethylene is exported to the Egyptian petrochemicals company to produce polyvinyl chloride (PVC). The utility plant is responsible for production of utilities (instrument, plant, breathing air and de-mineralized, utility, fire and cooling water, also production of steam). SIDPEC was certified with ISO 1400 and OHSAS 18001 over the year 2012. Its total number of workers is approximately one thousand, of which 550 are occupationally exposed workers.

**2. Study population.** The study population was consisted of all regular employees who worked at SIDPEC until December 2012. The sample was selected to be representative to all of the workers in the company.

Local ethical approval from authorized personnel in the company was obtained to conduct the study.

A pilot study was surveyed randomly for workers who were interviewed to answer the final questionnaire used in the underlying study.

Workers involved in the study were interviewed using the finally designed questionnaire. Numbers of workers accept to participate in the questionnaire study was 202.

**3. The questionnaire.** It included the demographic information for the participating workers, which are name, date of birth, sex, date of the start of working at the target company, job title, and pay status. It was designed to include three groups of questions (ten questions per each) that include the following:

**Group 1 questions:** This group of questions aimed at evaluating the performance of the company in the field of training of workers on various health and safety activities.

**Group 2 questions:** This group of questions aimed at evaluating the awareness of workers in the field of health and safety.

**Group 3 questions:** This group of questions aimed at evaluating the situation of the company in the field of performance of health and safety activities.

## Results

Through the processing of the plant, the workers are facing many occupational exposures that may affect their health

.In the present study different kinds of occupational exposures were assessed in order to evaluate the underlying management system for health and safety.

**Table (1). Levels of different exposures in different compartments of SIDPEC.**

Exposure Type	Ethylene plant	Polyethylene plant	Utility plant	Turbines
Noise in dB(A)	LL 92 - UL105 <sup>A</sup>	LL 90 - UL101	LL 90 - UL102	LL 88 - UL104
Ionizing radiation <sup>B</sup>	LL 50 - UL100	LL 30 - UL150	LL 30 - UL100	-----
Chemicals <sup>C</sup>	Methanol - Ethylene and Ethane gases - DMDS (Di -Methyl – Di-Sulphid, liquid)	N-Hexane (liquid) - Hexavalent chromium (silica loaded powder) - Butene -1 - Titanium tetrachloride, Triethyle aluminum, Tri- N- octyle aluminum, Iodine, magnesium, Phosphoric acid, Formaldehyde, Activated carbon, isobutanol, butyl chloride, urea, sodium hypochloride	Chlorine gas- Caustic soda, Hydrochloric acid, Sulphuric acid	Different gases air contaminants

<sup>A</sup> LL is the lower measured level and UL is the upper measured level.

<sup>B</sup> ALL sources are Cesium 137 (Cs137) half life time is 30 years and expressed in millicurie.

<sup>C</sup> Few occupational exposure minor and major accidents were reported to happen variably each year.

Workers were asked about their level of awareness for health and safety and occupational exposures. Table (1) shows the different exposures in the different compartments of the company. The data indicated that employees are exposed to various occupational hazards in such levels that protective and safety measures should be implicated.

**Table (2): The demographic information of the selected sample (n=202).**

<b>Criteria</b>	<b>No. of workers</b>	<b>Percentage (%)</b>
<b>Age groups</b>		
<b>20-30-</b>	28	13.9
<b>31-40-</b>	150	74.2
<b>&gt; 40</b>	24	11.9
<b>Average working years</b>		
<b>1 – 5-</b>	26	12.9
<b>6 – 10-</b>	15	7.4
<b>11 – 15-</b>	146	72.3
<b>&gt; 15</b>	15	7.4
<b>Level of graduations</b>		
<b>High</b>	100	49.5
<b>Inter mediate</b>	102	50.5
<b>Not graduated</b>	0	0

Table (2) shows the demographic data of the selected sample. The total number of examined workers was 202. The data shows that 74% of workers are in the age group of 30 to 40 years old, 72% of them have average working years of 11 to 15 years, and 50.5 of them have intermediate graduation.

**Table (3): Analysis of results for answers of group (1) questions.**

Question No.*	Yes		No		Do not know	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
1	155	76.8	14	6.9	33	16.3
2	147	72.8	25	12.4	30	14.8
3	129	63.8	32	15.9	41	20.3
4	167	82.7	29	14.4	6	2.9
5	102	50.5	84	41.6	16	7.9
6	83	41.1	43	21.3	76	37.6
7	137	67.8	52	25.8	13	6.4
8	115	56.9	27	13.4	60	29.7
9	55	27.2	84	41.6	63	31.2
10	98	48.5	86	42.6	18	8.9

**\*Group 1 Questions (1-10):**

- 1-Does the company have training plan for health and safety for all workers?
- 2-Are there training program for different kinds of exposures?
- 3-Is there a training course on chemical handling?
- 4-Are there some awareness programs for health & safety?
- 5-Is training available for workers on health and safety aspects?
- 6-Did the training plan renewed after accidents and incidents?
- 7-Is training done for emergency cases?
- 8-Are HSE training courses evaluated for their benefits?
- 9-Are training courses on safety aspects conducted in training centers outside the company?
- 10-Did you have the opportunity to share in improvement of safety aspects?

**Table (4): Analysis of results for answers of group (2) questions.**

Question No.*	Yes		No		Do not know	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
1	200	99	2	1	0	0
2	187	92.6	15	7.4	0	0
3	201	99.5	1	0.5	0	0
4	154	76.2	48	23.8	0	0
5	202	100	0	0	0	0
6	184	91.1	14	6.9	4	2
7	44	21.8	158	78.2	0	0
8	145	71.8	55	27.2	2	1
9	75	37.1	127	62.9	0	0
10	140	69.3	62	30.7	0	0

**\*Group (2) Questions (1-10):**

1-Are your safety and your colleague's safety your responsibility?

2-Do you know how to report near misses?

3-Do you care to wear my PPE?

4-Do you know your role in emergency cases?

5- If you find someone makes unsafe acts, do you instruct him?

6- Does your knowledge of safety increases with time?

7- Do you know the safety committee members?

8- Do you always care of awareness of MSDS of chemicals I suppose to be exposed?

9- Do you know the TLV-TWA of chemicals, you suppose to be exposed?

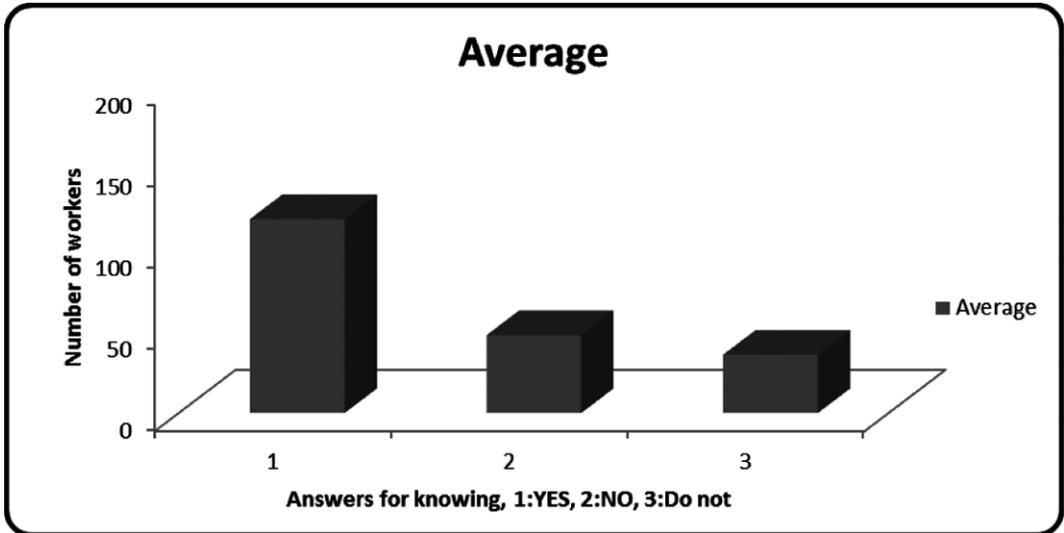
10-Are you trained well on the basics of the first aid?

**Table (5): Analysis of results of answers for group (3) questions.**

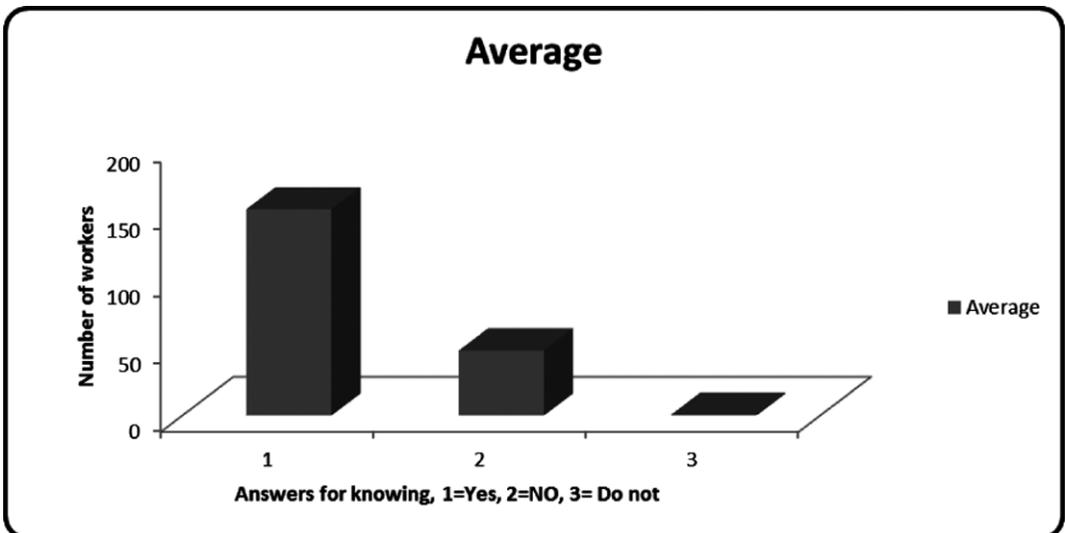
Question No*	Yes		No		Do not know	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
1	124	61.4	64	31.7	14	6.9
2	177	87.6	5	2.5	20	9.9
3	183	90.6	15	7.4	4	2
4	122	60.4	33	16.3	47	23.3
5	116	57.4	42	20.8	44	21.8
6	139	68.8	13	6.4	50	24.8
7	137	67.8	61	30.2	4	2
8	133	65.8	9	4.5	60	29.7
9	138	68.3	10	5	54	26.7
10	141	69.8	19	9.4	42	20.8

**\*Group (3) questions (1-10):**

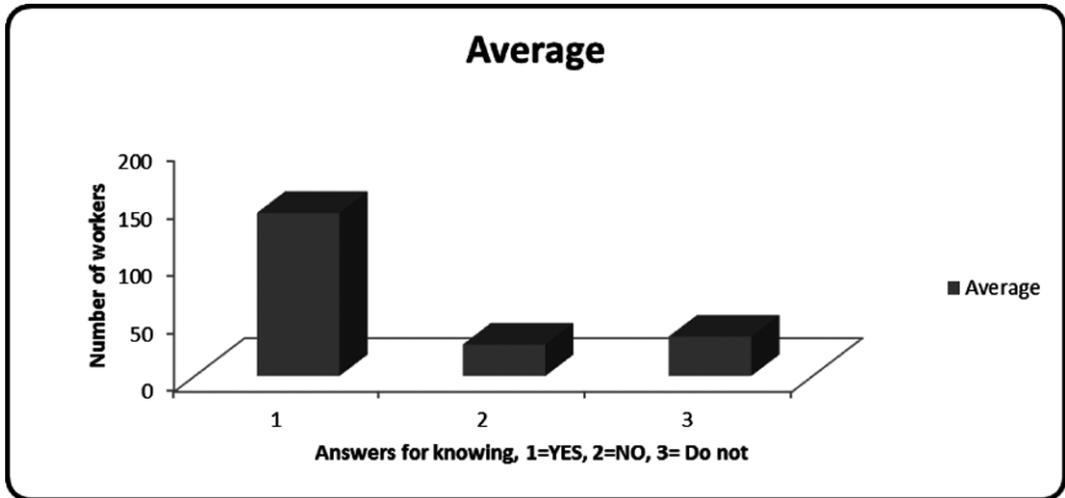
- 1- Are supervisors always concerned with H&S and they always tell you the latest versions of H&S instructions?
- 2- Is periodic inspection for work environment regularly conducted?
- 3- Are health and safety instructions clear and announced for all workers?
- 4- Are the periodical medical examinations conducted?
- 5- Are work instructions periodically updated?
- 6- Is there a procedure for accident reporting system?
- 7- Are personal protective equipments available all time?
- 8- Does the company apply all local and international laws in the field of OHS?
- 9- Are safe acts followed in waste disposal?
- 10- Are there periodical protective measures for internal environmental aspects like noise, radiation and gases?



**Figure (1):** Analysis of the average number of answers of group (1) questions.



**Figure (2):** Analysis of the average number of answers for group (2) questions.



**Figure (3):** Analysis of the average number for answers of group (3) questions.

Analyses of the three groups of questions to examine safety awareness among the selected sample are shown in Tables (3-5) and Figures (1-3). The data illustrate a high level of awareness among workers for topics of health and safety, but there is a slightly miscommunication between workers and managers, as indicated from analysis of group (2) question number 7. Also, training for safety among workers needs to be further improved, as indicated from analysis of group (1) questions and group (2) question number 9.

### **Discussion.**

Health and Safety Authority, HSA, 2012, reported that it is very important to have a guide about number, type and factors that cause accidents in the same company or all over the country to make periodical improvements, to decrease the accidents and to ensure safety. The reason for these statistics is the ease of access and interpretation of data of statistical

summary on an annual basis. This report states that industry is the highest cause of accident rate among economic activities (HSA, 2012). Also, it was reported that the number of fatal occupational accidents has increased recently at the global level due to incompetent safety implementation (Hamalainen et al, 2009; Nenonen, 2012). For good safety performance and to maintain perfect occupational safety, the hazard profile for any company should

be identified. The term “hazard profile” is used to indicate the particular blend of characteristics or exposures within a given work environment that have the potential to cause harm or loss to those whom a duty of care is owed (Makin and Winder, 2008). In the current study, occupational exposures were assessed (Table 1) in order to evaluate the different types of hazards which workers are currently exposed to. The assessment revealed that workers are exposed to different types of chemicals and physical hazards. Thus, the underlying predesigned questionnaire was targeting the safety awareness for the assessed hazards and the plans to avoid incidents and accidents. The safety culture, awareness and performance among workers were shown to be totally correlated to the company’s safety commitment.

Human behavior is a major contributor to occupational safety. Safety issue cannot be tackle effectively without interference of employers with a particular pattern of behaviors as important criteria needed to change employee’s behaviors (Zin, 2012). It was stated that employers and employees with good safety behavior are particularly play a significant role in achievement of safety compliance to occupational, safety and health improvement in industry. Safety behavior depends directly on the

communication that exists in the firm and indirectly on management’s commitment (Fernandez, 2011).

Hurst, 1996, stated that beliefs and attitudes contribute to safety and the performance of process safety management systems. Safety culture is a part of the overall organizational culture and generally is decomposed into different cultures representing different groups within the organization.

The present study was undertaken to examine the level of awareness for health and safety among workers after evaluation of different occupational exposures within the company (Table 1). Analysis of the answers of the predesigned questionnaire indicated that workers have high level for safety awareness (Tables 3 to 5). However, question 7 of group (2) which stated “did you know the safety committee members?” “The answers showed that 78% of workers say no, indicating miscommunication with the committee. Also, analysis of group (1) questions and question 9 of group (2) indicated that training for safety needs to be further improved. Measures of management commitment evaluated in many studies. Geldar, 2010, conducted a study to evaluate actions taken by managements to improve OHS, including formal activities and procedures (e.g., auditing, safety awards)

and informal actions (e.g., spontaneous recognition of worker behaviors). He found that low-injury sites were more likely than medium or high-injury workplaces to give safety awards/prizes to employee. Also low-injury sites defined OHS responsibilities in the job description of every manager somewhat more than did medium or high injury sites. Workplaces having Joint Health and Safety Committees (JHSCs) with greater worker involvement, both in numbers and executive capacity had lower injury rates (Geldar, 2010).

Analysis for answers of group (1) questions, as shown in Table 3, indicated that high percentage of workers agree that the performance of the company in the field of training of workers on various health and safety activities is good. Our results are in coordination with Duijm, 2008. He reviewed the issues related to the management of health, safety and environment (HSE) in process industry, with particular focus on how the management of these three issues is integrated. Management actions related to HSE should be adequate and be prioritized to improve HSE-quality efficiently. Risk analysis remains an important tool in safety management for prioritizing actions and plans (Duijm, 2008).

Analysis of answers of group (3) questions to evaluate the performance

of health and safety activities within the company, illustrated that high percentage of answers agree with the good performance, indicating high level of awareness and good culture for health and safety. A study was performed to define the factors that affect the safety culture and performance in organizations and it was reported that a positive safety culture can lead to better safety performance with a decrease in organizational injury and disaster statistics as well as the costs associated from those injuries (Frazier, 2011).

### **Conclusion and Recommendations:**

From the underlying study, it can be concluded that high level of awareness for health and safety was found among workers at SIDPEC. However, the current results raised recommendations and needs to improve communication between safety management committee and workers to confirm better information transfer. In order to commit top safety management, training courses need to be further emphasized and improved to ensure better safety culture, performance and involvement of all workers in top safety management of the company.

### **References**

1. Beriha GS, Patnaik B, Mahapatra SS and Padhee S. (2012) : Assessment of safety performance in Indian industries using fuzzy approach. Elsevier Ltd. 39: 3311–3323.

2. Duijm NJ. (2008) : Management of health, safety and environment in process industry, *Safety Science* 46: 908–920.
3. Fernandez B. (2011) : Safety climate in OHSAS 18001-certified organizations: Antecedents and consequences of safety behavior. *Accident Analysis and Prevention* 45: 745– 758.
4. Frazier CB. (2011) : A hierarchical factor analysis of a safety culture survey. Appalachian State University Belk Library, Publication Manual of the American Psychological Association, 6th Edition.
5. Geldar S. (2010): Organizational practices and workplace health and safety : A cross-sectional study in manufacturing companies, *Safety Science* 48: 562–569.
6. Hamalainen P, Saarela KL and Takala J. (2009): Global trend according to estimated number of occupational accidents and fatal work-related diseases at region and country level. *Journal of safety research*, Elsevier Science, 40: 125–139.
7. Health and Safety Authority (HSA). (2012) : Summary of workplace injury, illness and fatality statistics 2010-2011, Dublin, Ireland.
8. Hughes P and Ferret E. (2007): Introduction to Health and Safety at Work: The Handbook for the NEBOSH(National Examination Board in Occupational Safety and Health) National General Certificate, An imprint of Elsevier Science, ISBN 978-0-7506-8503-8510.
9. Hurst NW. (1996) : Measures of safety management performance and attitudes to safety at major hazard sites. *Loss Pro. Process Ind. (Elsevier.,SO950-4230(96)000)* 9(2):161-172.
10. Jackson MH, Morris GP and Crawford JF. (1989) : Environmental health reference book .London: Ash gate publishing limited; Pp.7-26.
11. Larsson TJ and Field B. (2002) : The distribution of occupational injury risk in the victorian construction industry. *Safety Science* 40(5): 439–456.
12. Makin AM and Winder C. (2008) : A new conceptual framework to improve the application of occupational health and safety management systems. *Safety Science* 46: 935–948.
13. Nenonen N. (2012) : Analyzing factors related to slipping, stumbling, and falling accidents at work: Application of data mining methods to Finnish occupational accidents and diseases statistics database. *Elsevier* 44(2): 215-224.
14. Zin SM. (2012): Employers' Behavioral Safety Compliance Factors toward Occupational Safety and Health Improvement in the Construction Industry, *Procedia. Social and Behavioral Sciences* 36: 742 – 751.