ALEXANDRIAUNIVERSITY
High Institute of Public Health
Occupational Healthand
AirPollutionResearchCenter

قسمالصحة المهنية وتلوث الهواء
المعهد العالي للصحة العامة
وحدة بحوث ودراسات الصحة المهنية وتلوث الهواء

Study of Air Pollutants Levels Resulted from Stacks and Production Operation in Indoor and Outdoor Environment EGYPT LECICO COMPANY (KHORSHED)

October2014

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RESULTS & DISCUSSION

1. Work Environment evaluation

1.1. Noise levels using Sound Level Meter calibrated at 114 dB and Wet Bulb at different departments of sanitary production

a) Noise levels at preparation, pouring, gypsum, glaze, spraying, sorting and models

Department	Sound Intensity Level (dB)	TLV according to Egyptian Environmental Law No. 4 for 1994 In case of 8 continuous working hours
Preparing	82.5-89.5	90 dB
Pouring	76.0-80.1	
Gypsum	85.3	
Glaze	88.0-90.0	
Spraying	86.0-89.0	
Sorting	77.3-88.3	
Models	67.0-84.0	

b) Noise levels at spraying department

Department		Sound Intensity Level (dB)	Nature of Exposure	TLV according to Egyptian Environmental Law No. 4 for 1994 amended by Law No. 9-2009
Control rooms in spraying departments	Spraying 1(15rooms) without air spraying	91.3	Work only 30 seconds every 5 minutes (totally 50 minutes in the shift period of 8 hours). Moreover, all workers use ear muffs	*99.0dB*
	Spraying 1(15rooms) with air spraying	97.6		
	Spraying 2(9rooms) without air spraying	91.5		
	Spraying 2(9rooms) with air spraying	99.0		

It is clear from the two tables that the measured noise levels were lower than the threshold limit values- time weighted average, hence they are safe..

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c) **Heat stress index at production departments in sanitary plant**

Department	Heat Stress (WBGT °C)		
	Heat stress	Nature of Work	Threshold Limit Value According to Law No.4, 1994 amended by Law No 9-2009
Preparing	24.1	Average work with 50% work and 50% breaks	29.4°C
Pouring	28.1		
Gypsum	27.2		
Glaze	25.8		
Spraying	29.2		
Sorting	26.5		
Models	25.6		

It is obvious from the table that the measured levels of wet bulb globe temperature were lower than that of the threshold limit values-time weighted average.

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d) **Lighting at production departments in sanitary plant**

Department	Light Intensity Levels (Lux)		
	Lighting Level**	Required Accuracy	TLV according to decision No 211-2003
Preparing	1215.0	Tasks require average accuracy in details	323 Lux
Pouring	325.0		
Gypsum	325.0		
Glaze	2085.0		
Spraying	688.0-731.0		
Sorting	1245.0	Tasks require high accuracy in details	1076
Models	925-1140	Tasks require accuracy in details	538

* *The levels of light intensity must not be less than the maximum permissible limit

As clear in the tablethe measured levels of lighting were compatible with the threshold limit values of the decision of Minister of Man Power & Immigration No. 211-2003.So, the levels are safe and no health effects are expected.

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1.2. Sound intensity level using Sound Level Meter calibrated at 114 dB at different departments of tile production.

a) Sound intensity level using Sound Level Meter calibrated at 114 dB

Location	*Sound Intensity Level (dB)*			
	T2	T4	Duration of Exposure	*TLV according to Environmental Law No.4-1994*
1. Preparation	86.1	90.0	Continuous exposure for 8hours/day	*90*
2. Glaze	91.7	90.0		
3. Décor	81.3	88.6		
4. Sorting	84.4	80.4		
5. Ovens	80.5	86.2		
6. Pistons	84.0-87.0	90.0		

It is clear from the table that the measured levels of noise were lower than the threshold limit values-time weighted average. So, The noise levels are safe and no health effects are expected.

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b) **Heat stress index using WBGT index at production Sectors**

Location	Heat stress index (WBGT) °C			
	T2	T4	Nature of Work	Threshold Limit Value According to Law No.4, 1994 amended by Law No 9-2009
1. Preparation	26.7	27.4	Average work with 75% work and 25% breaks	28°C
2. Glaze	25.1	26.0		
3. Décor	27.8	27.2		
4. Sorting	27.4	27.6		
5. Ovens	27.5	27.6		
6. Pistons	27.3	26.1		

It is obvious from the table that the wet bulb globe temperature is lower than the threshold limit values-time weighted average. So, the levels are safe and no health effects are expected.

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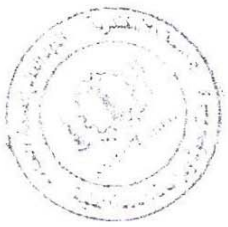
c) Lighting levels at production Sectors using Lux meter

Location	*Light Intensity Level (Lux)*			
	T4	T2	Required Accuracy	TLV according to decision No 211-2003
1. Preparation	390.0	510.0	Tasks require average accuracy	323
2. Glaze	266.0	840.0		
3. Décor	325.0	325.0		
4. Sorting	1430.0	760.0	Tasks require high accuracy in details	753
5. Ovens	450.0	620	Accuracy in details	538
6. Pistons	325.0	491	Tasks require average accuracy	323

**The levels of light intensity must not be less than the maximum permissible limit

As clear in the tablethe lighting levels were compatible with the threshold limit values of the decision of Minister of Man Power & Immigration No. 211-2003.



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1.3. Total and Respirable airborne particulates at indoor work environment of different production departments

Departments of Sanitary Factory		Concentration of Total and Respirable Particulates (mg/m^3)	
		TSP	RSP
Sanitary	Preparation	1.67	0.66
	Pouring	3.12	0.81
	Gypsum	3.95	0.69
	Glaze	2.00	0.68
	Spraying	2.58	0.47
	Sorting	3.36	0.83
	Models	2.58	0.87
Tile	PreparationT2 T4	2.46 2.21	0.67 0.34
	Décor T2 T4	3.48 2.15	0.39 0.61
	Glaze T2 T4	2.00 3.41	0.93 0.46
	PressingT2 T4	4.29 3.92	0.75 0.59
	Sorting T2 T4	2.10	0.55
	Kilns T2 T4	1.91 1.87	0.59 0.67
	3rd Fire	2.01	0.63
Maximum Permissible Level According to Law No.4, 1994 amended by Law No. 9-2009		10.00	3.00

According to the Egyptian Environmental Law No. 4 for 1994 amended by Law No. 9-2009 and the Annex 8 of its executive rule No 1095-2011, all levels of total and respirable particulate matter were below the Threshold Limit Values (TLVs) and do not cause any occupational adverse health effects for the exposed workers.

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1.4. Total airborne particulates, Sound Intensity level, Wet Bulb Globe Temperature and Light Intensity Level at indoor work environment of Fret Plant

a) Concentration of Total Suspended and Respirable Particulates in Fret Plant

Locations in Fret Factory	Concentration of Total Suspended Particulates (mg/m^3)	Concentration of Respirable Particulates (mg/m^3)
1. Supervisor's Cabinet	6.59	1.74
2. Preparation	6.78	1.75
3. Control Room	3.20	1.16
Maximum Permissible Level According to Law No.4, 1994 amended by Law No. 9-2009 and decision No. 211-2003	10.0	3.0

It is clear from the table that the measured levels were lower than the threshold limit values time weighted average. These levels are safe and no health effects are expected

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b) Sound Level at Fret Plant

Locations in Fret Factory	Noise Level (dB)	Duration of Exposure	TLV according to Environmental Law No.4-1994 amended by Law No. 9-2009
1. Supervisor's Cabinet	83.2	Not more than 4 Hours per shift	93 dB
2. Preparation	86.8		
3. Control Room	81.6		

The table indicates that the measured levels were lower than the threshold limit values time weighted values. So, the exposures are safe, and no health effects are expected

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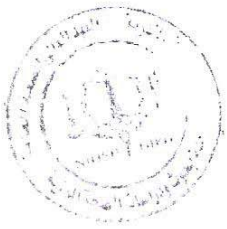
c) Heat stress index in Fret Plant

Locations in Fret Factory	Heat Stress (WBGT °C)		
	Heat Stress (WBGT °C)	Nature of Work	TLV according to Environmental Law No.4-1994
1. Supervisor's Cabinet	25.8	Average work with 75% work and 25% breaks	28°C
2. Preparation	25.7		
3. Control Room	23.7		

The table shows that the measured levels were lower than the threshold limit values time weighted average. So, the levels are safe and no health effects are expected.



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d) Lighting in Fret Plant

Locations in Fret Factory	*Light Intensity (Lux)*		
	Lighting (Lux)	Required Accuracy	TLV according to decision No 211-2003*
1. Supervisor's Cabinet	539.0	Tasks Require Accuracy in details	538
2. Preparation	540.0		
3. Control Room	780.0		

* Threshold limit values according to table 6 of the Decision of the Minister of Man Power and Immigration No 211-2003, and it must be lower than the measured levels.

The table shows that the measured levels were higher than the threshold limit values. Therefore, the exposures are safe and no health effects are expected.

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2. Stack Particulate Emission Evaluation

2.1. Concentrations of particulate in the exhaust emission from stacks

Stack Location	Particulates (mg/m^3)
Furnace (Automizer)	23.1
Preparation 1	32.7
Preparation 2	32.9
Preparation 3	16.8
Preparation 4	21.2
Fret	12.8
Permissible Emission Levels According to Law No. 4, 1994 amended by the Law No 9-2009	200.0

As shown in the table, all concentrations of particulates were much lower than the recommended emission levels in the Egyptian Environmental law No 4 - 1994amended by law No. 9-2009 and the executive law of the Prime Minister decisions No. 1095-2011 & 710-2012. Therefore, the emission levels are safe and no public or environmental effects are expected.

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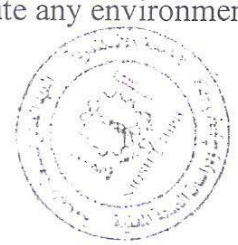
2.2. Concentrations of Pollutants in the exhaust emission from stacks of the Sanitary plant in mg/m3 of the Exhaust

Stack Location	*Pollutant Concentration (mg/m^3)*				CO_2 %	*Combustion Efficiency (%)*
	Smoke	CO	SO_2	NO_2		
Stack of oven (1)	4.83	70.0	--	38.1	7.0	98.9
Stack of oven (2)	4.89	70.0	--	25.4	7.0	98.9
Stack of oven (3)	4.77	130.0	--	17.6	7.0	97.4
Stack of oven (4)	14.90	119.0	--	18.6	7.0	95.7
Stack of oven (5)	13.2	103.0	--	24.8	7.0	98.5
Stack of oven (6)	18.3	95	--	25.9	7.0	99.3
Stack of oven (8)	15.1	86.0	--	19.5	7.0	95.0
Permissible Emission Levels According to Egyptian Environmental Law No. 4, 1994	50.0	150.0	400.0	600.0	-	-

As shown in table, all concentration of pollutants were much lower than the recommended emission limits in the Egyptian law No 4-1994 amended by law No. 9-2009 and the executive law of the Prime Minister decision No. 710-2012. Hence, they do not constitute any environmental danger.



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2.3. Concentrations of Pollutants in the exhaust emission from stacks of the Tile and Fret plants in mg/m3 of the Exhaust

Stack Location		Pollutant Concentration (mg/m^3)				CO_2 (%)	Combustion Efficiency (%)
		Smoke	CO	SO_2	NO_2		
T2	Stack of oven (1)	17.5	28.1	---	56.7	7.0	95.7
	Stack of oven (2)	18.9	29.3	---	51.4	7.0	95.6
	Stack of oven (3)	14.3	32.9	---	58.7	7.0	99.1
	Stack of oven (4)	27.8	37.4	---	46.8	7.0	88.7
	Stack of oven (5)	17.4	34.2	---	49.7	7.0	95.9
	Stack of oven (6)	20.6	30.5	---	51.1	7.0	95.0
T4	Stack of oven (1)	18.7	24.1	---	61.3	7.0	97.1
	Stack of oven (2)	15.1	25.6	---	48.8	7.0	96.7
	Stack of oven (3)	16.6	24.3	---	43.4	7.0	95.2
	Stack of oven (4)	19.1	24.5	---	52.9	7.0	96.2
	Stack of oven (5)	20.4	24.4	---	40.0	7.0	96.2
	Stack of oven (6)	15.2	20.1	---	30.4	7.0	98.5
	Stack of oven (7)	Not working					
	Stack of oven (8)						
	Stack of oven (9)						
Fret	Stack of oven (1)	27.6	22.7	---	39.3	7.0	82.8
	Stack of oven (2)	24.3	22.5	---	33.2	7.0	69.4
	Stack of oven (3)	27.9	22.6	---	34.8	7.0	62.4
	Stack of oven (4)	26.4	21.8	---	30.1	7.0	77.8
	Stack of oven (5)	26.8	22.9	---	31.8	7.0	85.0
	Permissible Emission Levels According to Egyptian Environmental Law No. 4, 1994	**50.0**	**150.0**	**400.0**	**600.0**	-	-

As shown in the table, all concentration of the emitted pollutants were much lower than the recommended emission limits in the Egyptian law No 4-1994amended by law No. 9-2009 and the executive law of the Prime Minister decision No. 710-2012 and do not constitute any environmental danger. This may be due to use of natural gas that is cleaner than other types of fuel. CO_2 percentages are within normal range of natural gas combustion. It is worthy noting that there is no limit of CO_2 emissions in Egyptian environmental low.

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3. AMBIENT AIR POLLUTION

Four sampling stations were selected representing the four main directions around the LisicoMisr Company for assessment effect of the company on the surrounding atmosphere. The levels of TSP in $\mu g/m^3$ and noise level in decibel (db) are also illustrated in the same table.

3.1. Concentrations of TSP in the ambient air around LisicoMisr Company

Station No.	Location	*Average TSP ($\mu g/m^3$)*	
		1/10/2014	*2/10/2014*
1	**In front of the sanitary department next to EzbetZaaghloul (South)**	**215.4**	**158.3**
2	**In front of Crusher and tile production and Fret plant next to EzbetKhorshed (East)**	**213.8**	**144.1**
3	**Behind Sanitary plant next to EzbetRahma (West)**	**184.4**	**157.1**
4	**In front of industrial waste treatment plant next to EzbetKhorshed (North)**	**162.3**	**158.6**
Recommended Outdoor Daily Concentration to law No.4, 1994amended by Law No 9-2009		*230 ($\mu g/m^3$ daily average)*	

By comparing the results of total suspended particulates in ambient air with the maximum allowable limits according to annex No. 5 form the executive rule of the Prime Minister decision No. 1095-2011 of Environment low No. 4 – 1994 amended by Law No. 9-2009 (average daily concentration 230 $\mu g/m^3$).it was found that all the concentrations were less than these limit.

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3.2. A-weighted Equivalent Noise levels in the ambient air around LisicoMisr Company

Station No	Station Location	Equivalent ambient noise level (dB)
1	El-Rahma Street "West"	61.1
2	El-Rahmafarm"North"	57.3
3	Zagloul Farm "South"	57.4
4	Khorshed Farm "East"	58.0
Recommended Outdoor Daily Concentration to law No.9-2009		65.0

According to the Annex No 5 of the executive law of the Prime Minister's decisions No. 1095-2011& 710-2012 of the Egyptian Environmental Law No 4 - 1994 amended by Law No 9-2009, the A-weighted equivalent noise levels in ambient air were not exceeded.

Unit Manager

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