

Effect of Noise from Thermal Power Plant on its Workers

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Abstract:

The aims of this work was to study the effect of noise, generated from the thermal power station of south Baghdad on its workers' health. This study also included measuring the noise levels at different places inside the station including turbines pumping stations. A specific sample of workers from different places, ages and different work periods was sent to the clinic for clinical tests to examine the impact of the noise on their hearing ability and health. Through the analysis of the data and clinical examination 12% of workers had a hearing problems and thus we our recommendations were given; the recommendations emphasized that the workers have to apply occupational safety instructions, conduct periodic inspections, in addition to the removal of those workers affected by noise from their workplaces.

Key Word: Noise, pollution, Effect, power station, Work

المستخلص :

تضمنت الدراسة تقديم تأثير الضوضاء الناتجة من محطة كهرباء جنوب بغداد الحرارية على صحة العاملين فيها . وشملت الدراسة على قياس مستوى الضوضاء في أماكن مختلفة داخل المحطة ومن أهمها التوربين والمناطق المحيطة به، ومضخات الدورة الأولى والثانية.وتضمنت أيضا ارسال عينات منهم من مختلف مواقع العمل للفحص الطبي. وجد بان ١٢% من العاملين قد تآثر سمعهم نتيجة الضوضاء لذا أعطيت التوصيات بضرورة تطبيق تعليمات السلامة المهنية, واجراء الفحوصات الدورية، وابعاد المتضررين عن أماكن عملهم.

1. Introduction:

The word Noise is derived from the Greek word "nausea", which means (sea sickness) [1]. Noise is the sound of high level which causes undesirable disorders and troubles harming the human health. Noise is an annoying neighbor which is present day and night and it is an unavoidable road companion which imposes itself and disturbs the environment in which it exists [2]. It is produced by man through his/her daily and industrial activities which develop accompanying disadvantages

which is unavoidable [3]. Its **scarcity** is harmful, its accumulation is also harmful and its abundance is annoying. We cannot live without noise. It has increased due to the technological developments [٤]. As being high level generated noise, that harms the hearing sense. as well as psychological annoyance and disorders with accompanying quick heart pulse as well [5]. The sound pressure level depend on the amplitude at the acoustic vibration and it is defined as the noise intensity. The loudness of sound increases with the sound intensity level at a constant frequency [6].

The accumulation of noise in a continuous way results in psychological and organic diseases [7]. There are no accurate and detailed studies that measure the percentages caused by noise in any disease as well as other causes of heart disease [8], headache, psychological anxiety, annoyance, stress, dizziness, fatigue, nausea, sleeping disorders and blood pressure. Yet, there are many studies that show the extent of noise effect on the hearing sense [9]. The sources of noise are plenty, such as traffic movement (planes wheels), human activities, such as industrial, social, and natural phenomena [10].

The current study deals with the noise that affect the health of workers at the thermal power station of South Baghdad; the study involved the measuring the noise in various locations inside the station, conducting a questionnaire to identify the cases and disorders suffered by the workers throughout their work, in addition to studying the station's information bank, its safety instructions.

2. Theory of Sound and Noise

The sensation of sound is a result of vibrations in the air caused by pressure fluctuations, which can be measured with a sound level meter. Vibrations are more commonly associated with mechanical systems, but air also has mass and stiffness, and as sound travels in the air it is locally compressed and expanded. The simplest type of vibration is a pure tone, which is a one-dimensional sinusoidal vibration with only one frequency

component. The measuring unit for sound is Decibel dB, and is a logarithmic unit used to express power or intensity [11].

There is general agreement that exposure to sound levels less than 70 dB does not produce hearing damage, regardless of the duration of exposure. There is also general agreement that exposure for more than 8 hours to sound levels in excess of 85 dB is potentially hazardous; to place this in context, 85 dB is roughly equivalent to the noise of heavy truck traffic on a busy road. With sound levels above 85 dB, damage is related to sound pressure (measured in dB) and to time of exposure. The major cause of hearing loss is occupational exposure, although other sources of noise, The human ear can hear from 0dB to 120dB, the last being the threshold of pain. A level of 120dB or higher can be dangerous for the ear, and in worst cases [12].

In psychology noise is any unwanted sound that is physiologically arousing and harmful, subjectively annoying, or disruptive of performance [13] . Noise is often psychologically linked to irritability, tension, nervousness, and anxiety; rest and relaxation are interrupted; and efficiency at work is decreased. In addition to hearing loss, continued exposure to loud noise affects a person's nervous system, producing harmful effects on blood flow and pressure.

3.Test Procedure

The procedure used for measurement and analysis of the data is depicted in figure (1).

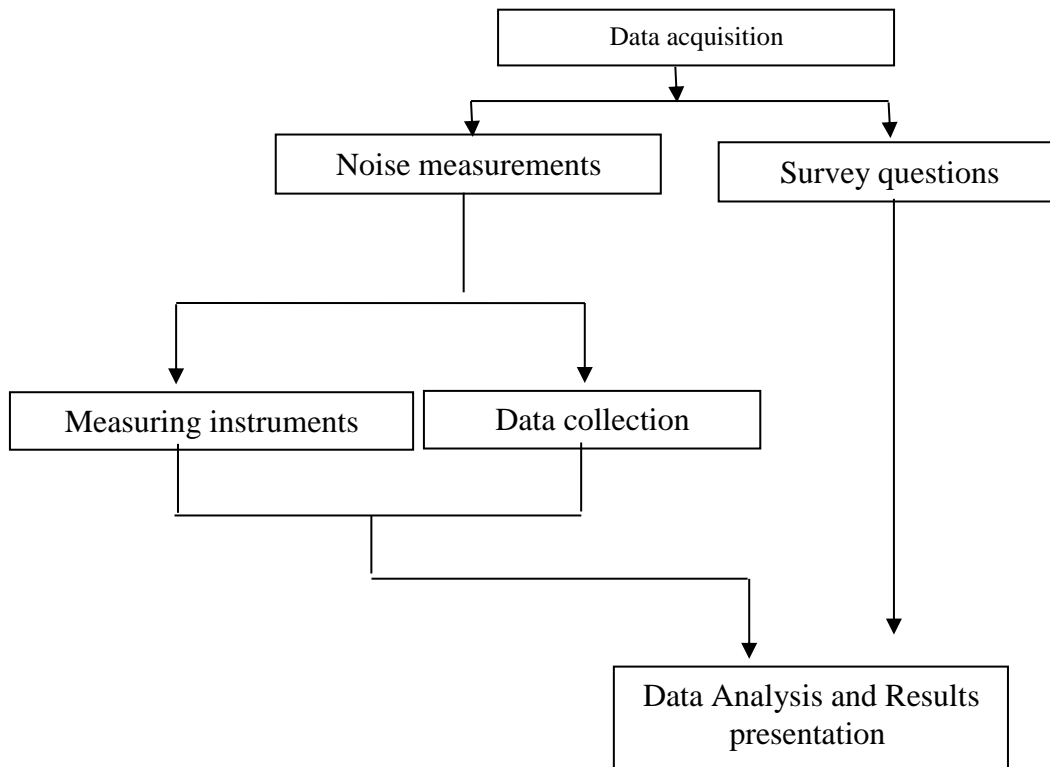


Figure (1) Procedure used for testing Measurement and Testing:

The following tests and measurements wear carried out;

The first test was a noise level measurements for a twelve different locations inside the power station, including work shop pumps stations, , control rooms , and steam turbines. Using a calibrated sound level meter. These measurement were taken through the period from the year 2011 till the year 2017. The results of these measurements are shown in table (1),and figures (1, 2,3,and 4) .

The second test was a data survey, this survey was done as a questions addressed to the workers in the plant, and distributed over different locations and positions. These questions were presented to different workers in order to specify the effect of the noise on the worker's health, and considered age, gender, time of work, work period, as well the health severity effects like, hearing, headache, fatigue, blood pressure...etc. The collected survey data is shown in table (2) and the summary of questions is represented in table (3), and fig. (5).

Clinical tests: A sample of forty three workers from different locations, having difference ages, and work periods was sent to the hospital for medical tests,

to study the effect of noise on their hearing ability and their health. The results of hearing tests are represented in table (4) and figure (6) .

3. Discussion the Results

The results of noise measurements are shown in table (1), and figures (1,2,3, and 4) for a period of seven years (i.e. from 2011 until the end of yea 2017). The noise level for turbine 1, is fluctuated between 90dB and 84 dB, while for turbine 2 from (86 dB to 81 dB).Control rooms around 75 dB, primary, and secondary pumping stations around 88.5,dB .The fluctuation in results is due to experimental error.

From these figures its appear that, there is no improvement or reduction in noise level in the station through these years. From the summary of questionnaire, **i. e.** table (3), 10% of the workers are clamming from hearing troubles and other problems. Those workers were sent to the hospital for hearing examination, Table (4), and Fig. (5), shows that 5 workers out of 43 are affected, the affection workers are concentrated in operation field, i. e. working as operators. The affected workers represent 12% of the total number of the clamming workers. It seemed that the hearing affection depend on period of working rather age of worker see fig. (6). If a sound reaches 85 dB or stronger, it can cause permanent damage to the hair cells in the inner ear, leading to hearing loss [12]. There is a clear evidence of negative health effectives on workers exposed to noise in power station of south Baghdad station. This situation is not acceptable, as it, in long run, will developed into permanent hearing loss with others health effects.

4. Consolation

To avoid the effect of noise in different locations in power station in south Baghdad its necessary to have a sound prove facilities such as earmuff or ear plug for the workers, also changes theirs working area periodically to minimize their exposure. Medical examination is necessary for all workers yearly and using a sound prove screens or materials to isolate the high noisy places from other working area.

Table (1) The noise measurements from 2011 till 2017

No.	Work Location	Noise Percentage (dB):						
		Year 2011	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017
1	Turbine Room/Front	91.5	90.5	91	89.4	86.2	79.6	82.2
	Turbine Room/middle	92	91	89	94	90.6	89.4	90.1
	Turbine Room/rear	92	91	88.5	92	90.1	86.3	84.2
2	Control room 1/turbines control	79	79	72	70.1	64.9	68.3	66.2
	Control room 2/turbines control	77.2	74	75.2	71.6	70.2	78.3	74.6
3	Turbines in Unit 5/ outside control room	96	72	64	70	69	71	69.2
	Passage/ in front of Turbine in Unit 5	100	89	92	91	89	89.2	89.2
4	Control room 2/ Turbines 3 and 4	74	71	70	68.9	67.1	63.2	68
	Passage to Turbines 3 and 4	87.8	80.1	79.6	78.2	72.9	75.4	83.1
5	Turbine 2	85	82.1	80.9	82.6	86.1	83	82
6	Turbine 1	90	83.6	88.4	90	86.9	87.6	89
7	Control room 1/ Ground floor gauges	86.4	70.3	65.9	69.4	71.2	80.2	79
8	Ground floor control room gauges / facing main gate	90.2	78.4	79.6	82	81	86	72
9	Front of station Gate/ 7m distant	77	59.2	60	60.4	38.6	33.2	6.4
10	Water pump / primary circuit	88.9	88	88.7	89	88.8	87.8	89
11	Water pump / secondary circuit	85	84.9	84.8	85	85.3	84.2	83
12	Workshop	86.7	87	86	85.9	87	86.4	85

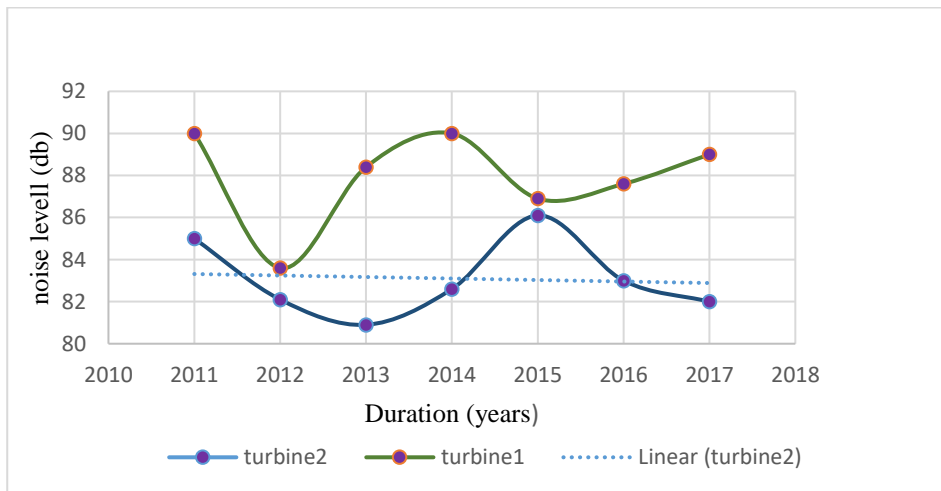


Figure (1) Noise level in Turbines Rooms

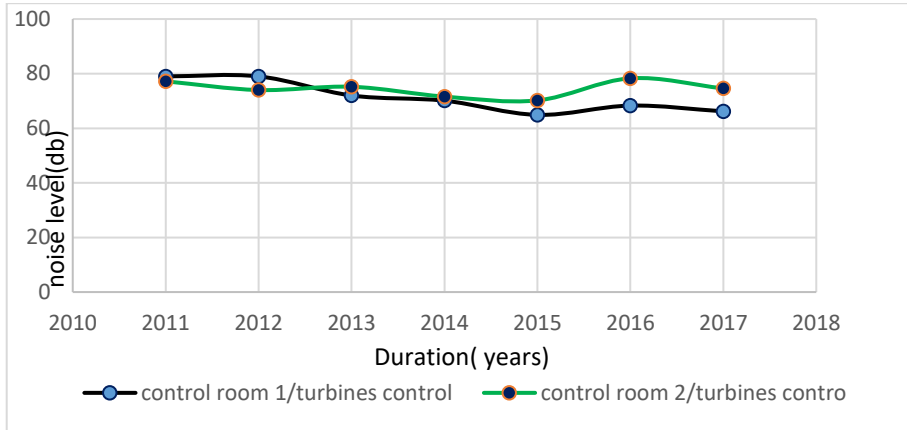


Figure (2) Noise level in Turbines control rooms

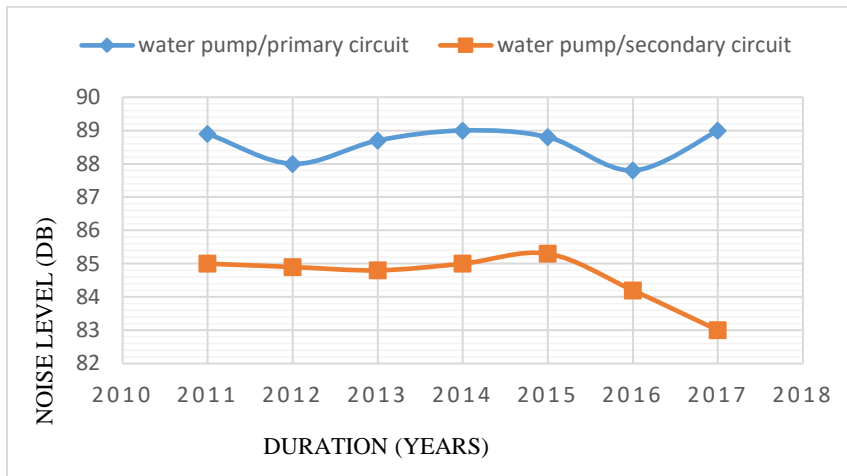


Figure (3) Noise level in Pumping Stations

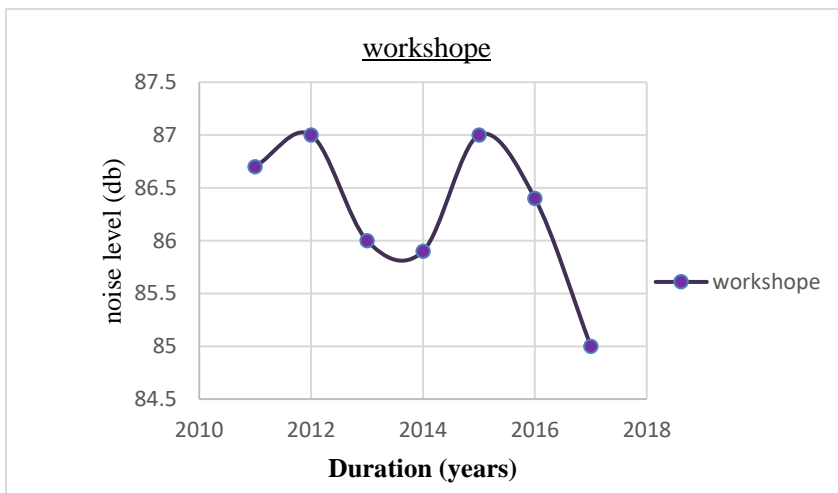


Figure (4) Noise level in Workshop

Table (2) Survey Questionnaire

case no.	Age	Period of work(Years)	Type of Work	Time of Work(hr)	Area Of work	He	St	Ann	Ve	Fa	Anx	Sd	Bp	Hr
1	27	5	Chimistris	8	Lab	1	1	1	0	1	0	1	0	1
2	28	7	Operator	8	Maintenance	0	0	1	0	1	0	0	1	1
3	28	5	Chimistris	7	Lab	1	1	1	1	1	1	0	1	0
4	32	10	Operator	8	Plant	0	0	0	0	0	0	0	0	0
5	33	8	Chimistris	6	Lab	1	1	1	1	1	0	1	0	1
6	36	8	Operator	7	Maintenance	1	1	0	0	1	0	1	1	0
7	37	13	Quality	8	Office	1	1	1	1	1	0	0	0	0
8	38	18	Operator	9	Plant	0	1	1	1	1	1	1	1	1
9	39	13	Operator	7	Boiler	1	1	1	1	1	1	1	1	0
10	40	11	Quality	8	Office	1	1	1	1	1	1	1	1	1
11	40	12	Safety	8	Office	1	1	1	0	1	1	0	1	1
12	40	8	Operator	8	Plant	1	1	1	1	1	1	1	1	1
13	41	21	Operator	9	Plant	1	1	1	1	1	1	0	1	1
14	42	10	Operator	8	Office	0	0	0	0	0	0	0	0	1
15	43	20	Operator	8	Maintenance	1	1	1	1	1	1	1	1	1
16	44	13	Operator	6	Maintenance	1	1	1	1	1	0	0	0	0
17	45	18	Operator	9	Plant	1	1	1	1	1	1	1	1	0
18	45	24	Quality	8	Office	1	1	1	0	1	1	1	1	1
19	46	21	Operator	7	Boiler	1	1	1	0	1	0	1	0	0
20	46	12	Safety	8	Office	1	1	1	1	1	0	1	1	1
21	47	18	Operator	7	Boiler	1	1	1	1	1	1	0	1	0
22	48	27	Operator	8	Office	0	1	0	1	0	0	0	0	0
23	48	10	Operator	10	Maintenance	0	0	0	0	0	0	0	0	0
24	48	20	Operator	8	Maintenance	0	0	0	0	0	0	0	0	0
25	49	28	Operator	9	Maintenance	1	1	1	1	1	1	1	1	1
26	49	15	Operator	6	Maintenance	0	1	0	0	0	0	0	0	0
27	50	20	Safety	8	Office	0	1	0	0	1	0	0	1	0
28	50	20	Operator	8	Maintenance	1	0	0	0	1	0	0	1	1
29	50	30	Operator	9	Maintenance	1	1	1	1	1	1	0	1	1
30	51	20	Operator	7	Boiler	1	1	1	0	1	0	0	0	0
31	52	11	Operator	8	Maintenance	0	0	0	0	1	0	0	0	1
32	52	21	Operator	9	Maintenance	0	1	1	1	1	0	0	0	1
33	52	11	Operator	7	Boiler	1	1	1	1	1	0	1	1	0
34	54	25	Quality	8	Office	1	1	1	0	1	1	1	1	1
35	54	20	Safety	8	Office	1	1	0	0	1	1	1	1	1
36	54	33	Operator	8	Maintenance	1	1	1	0	1	0	1	1	0
37 P	55	22	Chimistris	8	Lab	1	1	0	1	1	0	0	1	0
38	56	25	Operator	6	Maintenance	1	0	1	1	1	1	1	1	1
39	58	18	Operator	8	Maintenance	1	1	1	0	1	0	0	0	1
40	59	33	Operator	8	Maintenance	1	1	0	0	1	0	1	0	0
41	60	25	Operator	8	Maintenance	1	1	0	1	1	1	0	0	1
42	62	25	Safety	8	Plant	0	0	0	0	0	0	0	0	1
43	55	30	Operator	8	Maintenance	0	0	0	0	0	0	0	0	0

Table (3)Summary of Questionnaire

No.	Diseases	No. Of Cases	Cases percentage
1	Hearing (Hr.)	23	10.0%
2	Stress (St.)	33	14.4%
3	Annoyances (Ann.)	27	11.8%
4	Vertigo (Ve.)	21	9.2%
5	Fatigues (Fa.)	35	15.3%
6	Anxiety (Anx)	17	7.4%
7	Sleep diatribes (Sd)	19	8.3%
8	Blood Pressure (Bp)	24	10.5%
9	Headaches (He.)	30	13.1%

Table (4) Clinical test results

case no.	Hearing test	Case no.	Hearing test
1	Normal	24	Normal
2	Normal	25	Normal
3	Normal	26	Normal
4	Normal	27	Normal
5	Normal	28	Normal
6	Normal	29	Normal
7	Normal	30	Normal
8	Affected	31	Affected
9	Normal	32	Affected
10	Normal	33	Normal
11	Normal	34	Normal
12	Normal	35	Normal
13	Normal	36	Affected
14	Normal	37	Normal
15	Normal	38	Normal
16	Normal	39	Normal
17	Normal	40	Normal
18	Normal	41	Affected
19	Normal	42	Normal
20	Normal	43	Normal
21	Normal		
22	Normal		
23	Normal		

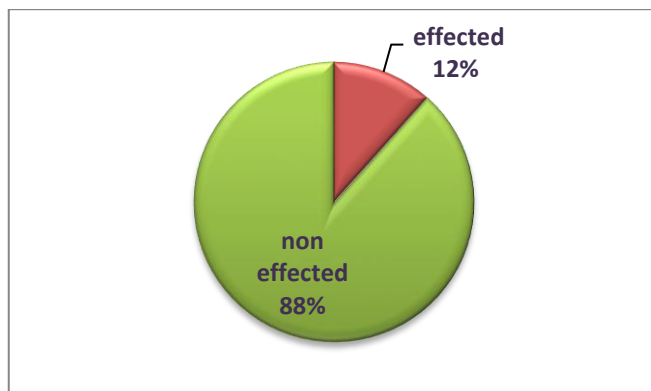


Figure (5) Clinical hearing test results

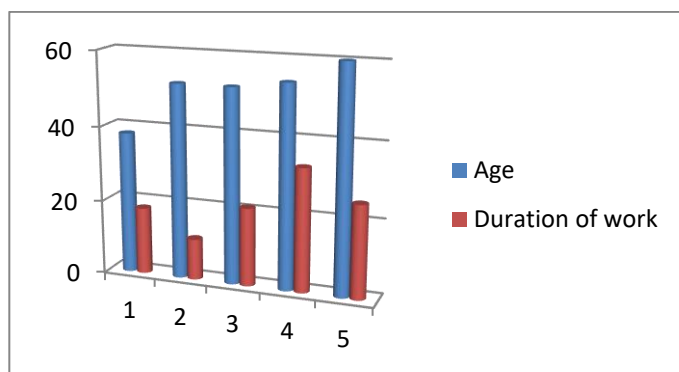


Figure (6) Clinical hearing test results

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