

THE ENVIRONMENT IMPACT OF PHONIC POLLUTION IN AN AREA WITH HYDROCARBS EXPLOITATION ACTIVITIES

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ABSTRACT

The paper presents the obtained results and the conclusions following the measurements regarding the noise pollution, from the analysed area of Galati. Monitoring has been made for as many factors as possible, possible causes of noise pollution, with the purpose of covering the entire area of development and the activity of oil exploitation. The determinations were made at different time intervals, for several working days, and in the end, they were compared with the regulations required by law regarding the exposure limit value for a normal day of 8 hours. Because the activity of exploration and exploitation of hydrocarbons requires the use of many heavy machinery, which pollute, their noise they can have a significant impact on the environment. For the analysis, several work points were monitored with the purpose of providing an overview, regarding the noise pollution, in the Independence oil exploitation area.

KEYWORDS: noise pollution, environment, hydrocarbs exploitation

1. Introduction

The analysed area is located on the territory of Galați County, about 22 km away, to the NW, in the vicinity of the localities of Schela and Slobozia Conachi. The acoustic measurements which were made aimed to determine the noise level from the Independența oil area, where a multitude of factors pollute the environment. Noise samples for our analysis were taken from several work points, in order to have a clearer view regarding the noise pollution in the respective area.

The acoustic measurements were made in the Independence oil exploitation area, to determine the noise level in the area. For the analysis, several work points were monitored [1, 3].

The sources of noise pollution monitored are:

- probes with repair and intervention activities;
- wells in production activities;
- reservoir parks;
- combustion plants (boilers);
- traffic;
- deposit (treatment area).

The recorded results were obtained, with the multifunctional digital sound measuring instrument, the PCE - 222 Multiparameter (Fig. 1).



Fig. 1. PCE-222 sound level meter

2. Experimental research

2.1. Noise determinations at wells with repair and intervention activities

The probes where intervention or repair activities were carried out are noise generators. The tests were conducted over two working days, divided as follows:

- M 1, day 1 - morning, repair probe; in the afternoon, the intervention probe;

- M 2, day 2 - in the morning, the intervention probe; afternoon, repair probe.

Although the engines of the work facilities are homologated, it was found that, at times, they exceeded the permissible noise level of 87 dB, admitted by the laws in force. The other equipment set at the location did not exceed the noise level, but when their engines were at full speed, they reached the limit of noise pollution [2, 4] provided by law (see Table 1).

The noise level, resulting from the activity of the two probes, in some cases exceed the threshold imposed by law, but considering that the activity is not carried out near the engines of the installations, the workers are not exposed to the risk of noise pollution.

Table 1. Noise determination at repair and intervention probes

Probe	The place where measurements are made	Noise dB- average value	
		M 1	M 2
Capital Repair	The mouth of the probe	65 / 85	63 / 83
	Installation AM 12-40	70 / 90	69 / 88
	Motor pump	63 / 85	61 / 80
	Drive unit	62 / 86	60 / 85
	Outside the square	55 / 65	55 / 64
Intervention	The mouth of the probe	65 / 85	64 / 83
	Installation IC 5-T	70 / 88	70 / 86
	Drive unit	63 / 85	63 / 84
	Outside the square	56 / 68	55 / 67
Exposure limit value (according to GD 493/2006) for a normal working day of 8 hours		87	

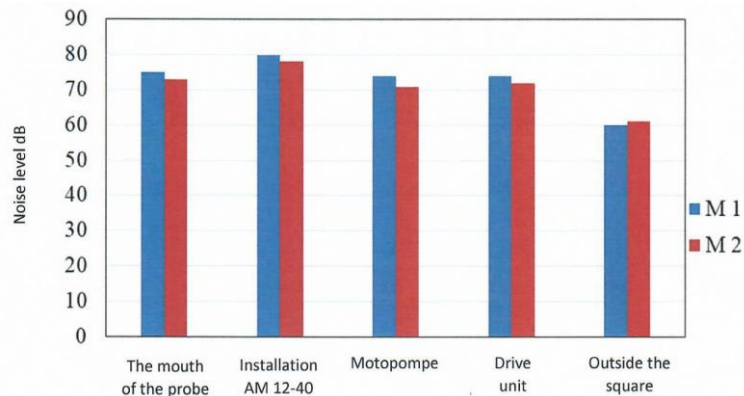


Fig. 2. Average noise level, produced by machine engines - capital repair probe

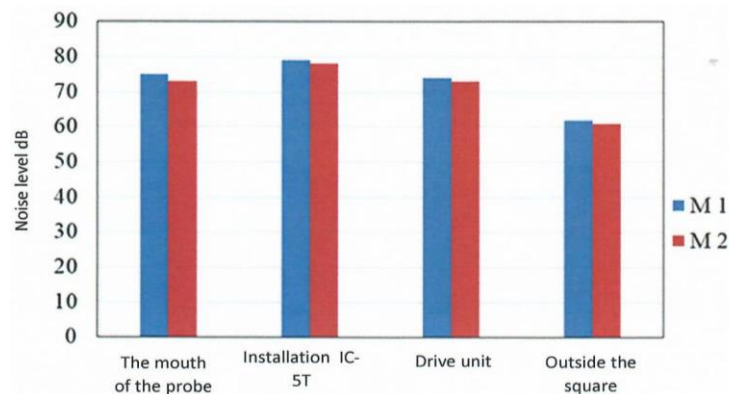


Fig. 3. The average of the noise level produced by the engines of the machines - the intervention probe

We find that there is no exceedance of the threshold of attention, and therefore, the risk of exposure of workers is not a high one.

2.2. Noise determination at production wells

In the exploitation phase of the probes, the potential source of noise is the electric motor. This actuates the rotor, which enters the helical pump, in order to lift the fluids to the surface. Ventilation of the probe (if it contains gases) can be a source of noise. Depending on how they are removed, they can cause noise pollution [5].

The measurements were made near the probe, and on the ring road, near the houses. The monitoring duration was about 30 minutes, for each probe, between 12:00 and 13:00 and the results noted in Table 2 are an average of the noise produced by the drive units at the mouth of the probes.

In order to identify the risk degree of the workers and residents in the vicinity of the monitored objectives, the results were compared with the norms in force regarding the minimum safety and health requirements, regarding the exposure of the workers, the risks generated by the noise, and the permissible limits of noise level, outside the lens and near buildings.

Table 2. Noise determination at production wells

Object	Noise level - dB		
	Near the engine	At the edge of the square	Near the houses
Sample 1	85	60	33
Sample 2	80	57	31
GD 493/2006, a nominal day of 8 hours	87		
Stas 10009-88, outside of the objective		65	50/40
Stas 10009 - 88, near buildings (day / night)			

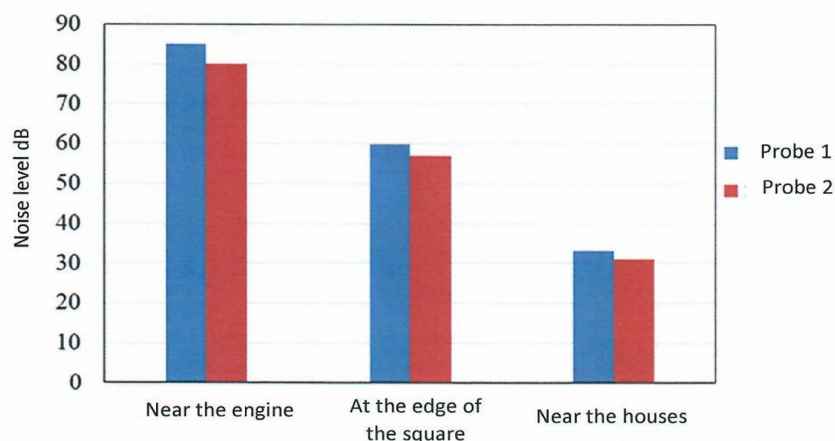


Fig. 4. Average of sound pressure, at the wells in production

Following the measurements made, it was found that the analysed objectives do not exceed, on any of the three points, the noise level required by law. Most of the wells in the vicinity of the dwellings are

equipped with sound-absorbing cabins, which have the role of optimizing the noise produced by electric motors.



Fig. 5. Illustrative view, at the probes, at the outskirts of the town of Schela, which have sound-absorbing cabs, against the noises

2.3. Research on noise pollution, in reservoir parks

Although modernized for their most part, the reservoir parks are still noise generators, through the thermal power plant, the injection pump, the air compressor, the gas manifold, etc.

Two parks, which require personnel, were chosen, in order to track how they were exposed to noise pollution. Some parks are fully automated, and no longer require permanent staff. The operators and maintenance teams go through them periodically, and check the proper functioning of the equipment.

Table 3. Noise level determination, in Park no. 3, Independence

The place where measurements are made		Noise - dB	
		M 1	M 2
Park nr. 3	The manifold of the gas	55	65
	The boiler	79	80
	Injection pump	80	80
	Air compressor	84	85
	Access alleys	60	62
Exposure limit value (according to GD 493/2006) for a normal working day of 8 hours		87	

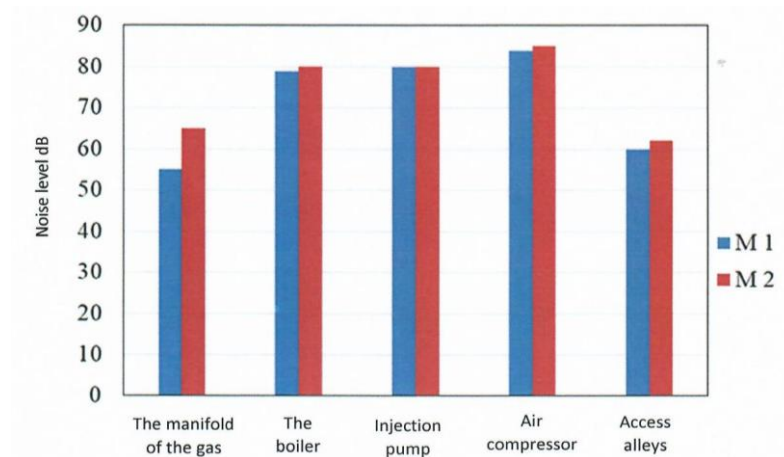


Fig. 6. Results of sound pressure, recorded in Independence Park 3

The research regarding the noise level in Park No. 3, Independența highlights the fact that although modern, the equipment produces enough noise. The periodic monitoring of the noise pollution is necessary.

The measurements showed that the noise produced by the equipment is generally the same, in both situations; a difference exists only in the case of the gas manifold, which has the role of directing the gases to the waste basket in order to be eliminated.

Table 4. Noise level determination, in Park no. 11, Independența

The place where measurements are made		Noise - dB	
		M 1	M 2
Park nr.11	The manifold of the gas	70	58
	The boiler	75	75
	Injection pump	73	74
	Air compressor	84	84
	Access alleys	60	59
Exposure limit value (according to GD 493/2006) for a normal working day of 8 hours		87	

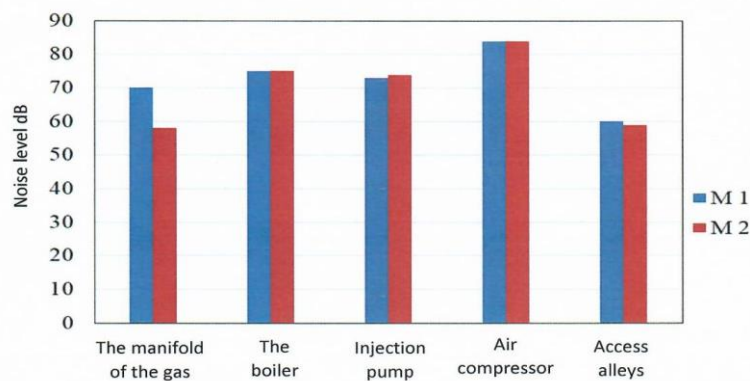


Fig. 7. Noise level determination, in Park no. 11, Independence

2.4. Noise analysis in the battery with boilers

The battery with boilers plays an important role in the treatment process, as it provides the hot water necessary for the fluidization of the oil. The two functional boilers produce sufficient noise, which

determines a permanent supervision, by the employer, regarding the degree of noise pollution.

The result recorded after the monitoring, showed that the noise level was quite high, sometimes exceeding the alert threshold of 87 dB, provided by the regulations regarding the exposure limit for a nominal day of 8 hours.

Table 5. Noise analysis in the battery with boilers

The place where measurements are made	Noise - dB	
	M 1	M 2
Boiler no. 2	86	87
Boiler no. 3	84	84
Exposure limit value (according to GD 493/2006) for a normal working day of 8 hours	87	

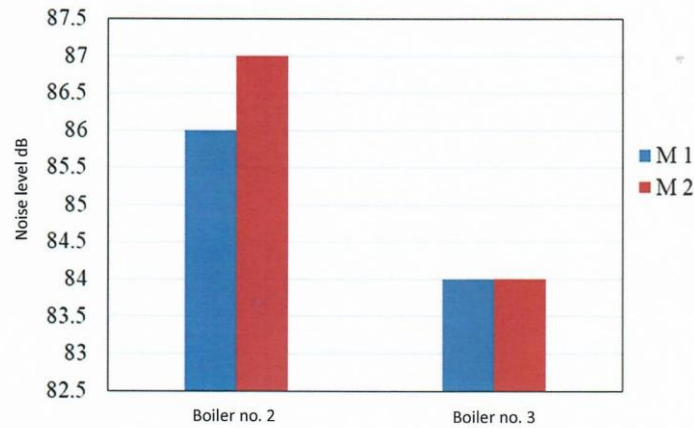


Fig. 8. Noise analysis in the battery with boilers

2.5. The measurement of noise due to traffic on the area

The traffic on the ring road was chosen, off the town of Schela was a paved road between two exploitation parks, and a paved road between the wells. The measurements were made over a period of

two days, for each day, approximately 30 minutes for each road. During the 30 minutes, as long as the monitoring lasted, an average of the recorded results was made, both during the traffic and in its absence. For comparison, we scored M 1 with the average of the noise level during the traffic and M 2 with the average of its lack.

Table 6. The measurement of noise due to traffic on the area

The place where measurements are made	Noise - dB	
	M 1	M 2
The ring road of Schela commune	72	33
Gravel road, between wells	75	35
Paved road between parks	73	36
Stas 10009 - 88, Acoustics in construction; Urban acoustics – limits allowable at the noise level	65	

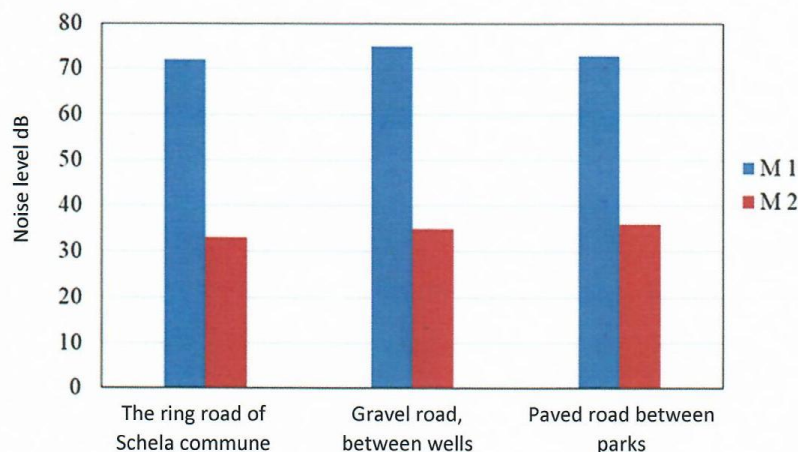


Fig. 9. The measurement of noise due to traffic on the area

As can be seen, the noise level produced by the road traffic exceeds the allowable limit value of 65

dB, outside the objective, provided by the law on construction acoustics and urban acoustics.

2.6. Determinations of noise at the central warehouse (treatment area)

All the fluids extracted from the wells (crude oil and reservoir water) arrive through the parks, which pump the fluids through the pipes in the central warehouse (treatment area). Here, the fluids are first

collected in the tanks, where the decanting process takes place, then, after the water has been removed, the remaining oil is subjected to the treatment process. For all these processes (treatment, directing of oil and reservoir water), pumps eliminating the fluids must be used.

Table 7. Determinations of noise at the central warehouse (treatment area)

The place where measurements are made		Noise - dB	
		M 1	M 2
Inside deposit	Near decanter	74	73
	At the heaters	73	73
	Between tanks	73	73
	At the skid	74	73
	Access alleys	73	72
Injection pump chamber		91	90
Recirculation pump room		81	81
Oil pump room		83	83
Exposure limit value (according to GD 493/2006) for a nominal day of 8 hour		87	

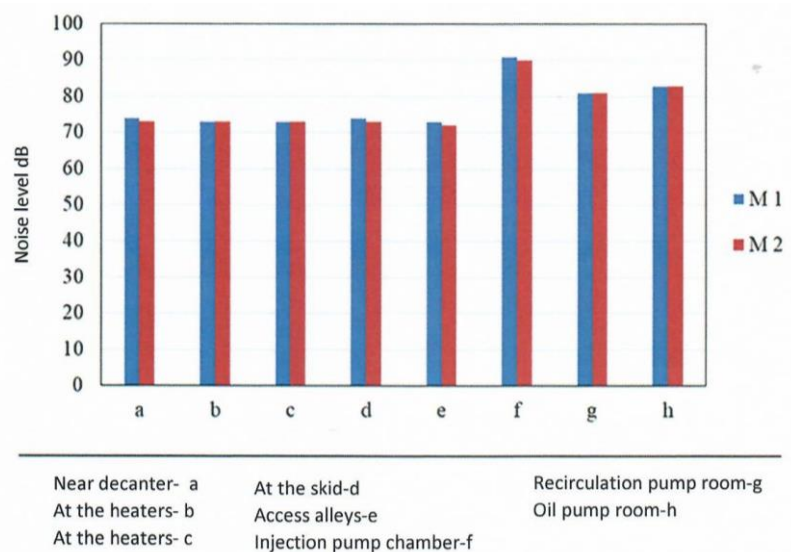


Fig. 10. Determinations of noise at the central warehouse (treatment area)

As a result of the noise monitoring process, the injection pumps, which operated at full capacity were observed to produce a high-level noise of 87 dB, during the 8 working hours, which was above the limit imposed by the regulation. For this reason, the employer provided the workers with noise protection equipment (antiphons).

3. Conclusions

The results obtained following the monitoring of the six objectives were compared with the Laws in

force regarding the noise pollution: Decision no. 493 of 12.04.2006 [6] and the norms of Standard 10009 – 88 [7], respectively.

Based on the data regarding the acoustics of the noises, machines and means of transport, under normal operating conditions, the noise level relative to the nearest receiver (human settlements) is below the permissible noise values of 50 dB, according to the regulations in force.

Although there have been exceedances of the noise level in several analysed objectives, the risk of the workers' exposure is not high, because, the

activity does not require permanent supervision. Hearing protection is used when necessary.

Under these conditions, a series of measures were taken, to limit to the impact caused by the noise pollution. These will decrease the degree of exposure of the workers. The residents are not exposed, because most of the wells, and absolutely all of the parks are located in the outskirts of the town, and the noises produced do not represent any threat to their health.

The level of exposure at workers is 87 dB for a period of 8 hours. If the exposure level exceeds the exposure limit value of 87 dB, the employer will have to ensure:

- individual means of hearing protection;
- technical means for noise reduction;
- the organization of the work so as to reduce the noise by limiting the duration and intensity of the

exposure and to establish sufficient breaks during the work program.

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