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EVALUATED WORK SYSTEM AND ENVIRONMENTAL RISK FOR A WORKER IN DRILLING FOR METHANE GAS

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ABSTRACT

Improving the safety and health at work is important not only in terms of human view, in order to reduce possibilities of accident to workers, but also as a way to ensure the success and durability work for a worker in drilling for methane gas.

Although considerable effort is undertaken, the number of working accidents and occupational diseases remains high. The cost that these involve for the society, businesses and individuals is high.

Accidents at work can have a major financial impact. Some costs are evident, for example loss of production and revenue, or the number of working days lost by taking medical leave. This loss can be expressed easily in financial terms.

KEYWORDS: worker in drilling for methane gas, safety work

1. Introduction

Enterprises should be aware of not only aspects of the costs involved in accidents at work, but also those relating to benefits on request may bring them a suitable management of safety and health at work.

Studies have made it clear that it was management efficiency of their safety and with employment is closely related to profitability and excellence in business. There is a direct relationship between a good working environment and a good performance of the undertaking. However, a large part of the consequences of occupational accidents on economic grounds are not visible immediately, or cannot be easily quantified.

The worker that drilling for methane gas need a lot of equipment like: drilling equipment, pipes, transport systems sealing systems, dig through drilling and efficiently quality control.

The daily work task for a worker is to drive drill equipment in mining area, to introduce pipes and seal-rings between them, to do not have leakage, to avoid open flames, to watch permanently pressure in the gases.

2. Identified risk factors

The risk factors for a worker in gas drilling are of such a nature as mechanical, physical, heating, electrical, biological like:

2.1. Mechanic risk factors

F1 - Cut, puncture contact with dangerous surfaces.

F2 - Adjusting of equipment parts that must be changed.

2.2. Heat risk factors

F3 - Flames, fire hazard.

F4 - High temperature materials because of frictions between diverse parts.

2.3. Electric risk factors

F5 - Electrocution through indirect touch or high voltage.

F6 - The occurrence of induced voltage.

2.4. Physical factors

F7 - High air temperature in warm weather.

F8 - Low air temperature in cold weather.

F9 - Air currents - especially when is storm.

F10 - Natural disasters: lightning, hail, blizzards, collapsing trees.

2.5. Biological factors

F11 - Airborne microorganisms from mining area.

F12 - Dangerous Animals and insects (rats, dogs, wasps).

2.6. Physical overload

F13 - Dynamic Effort (for introduction of new pipes).

F14 - Quick decisions in a short time, repetitive tasks in a short-cycle, stress caused by the high responsibility given and the intense work places.

2.7. Omissions

F15 - Failure to use protective means.

These risk factors and their magnitude we see in the Figure 1.

From the analysis of the evaluation form is found that 46.15% of identified risk factors can have irreversible consequences on the performer (death or disability).

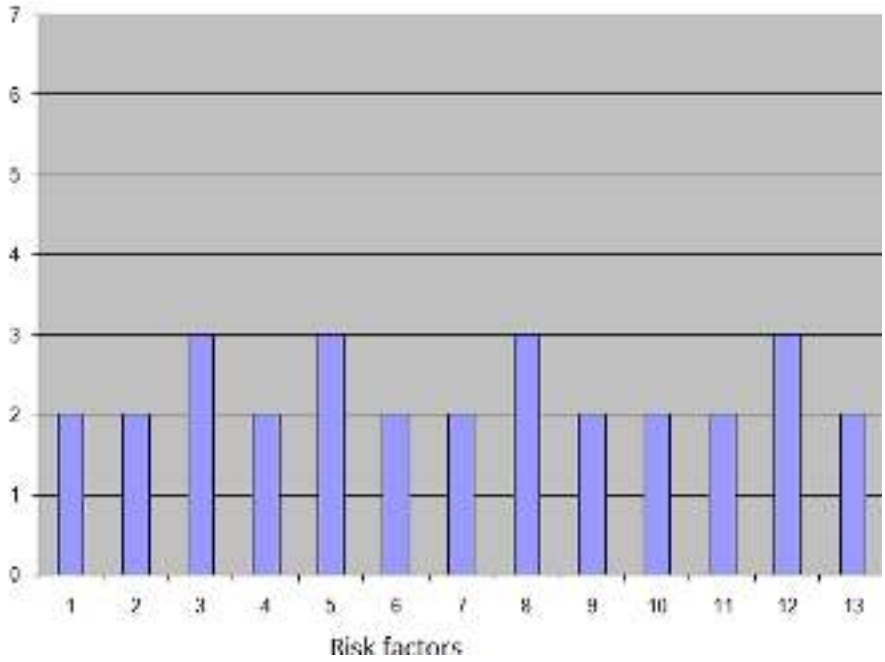

Fig. 1. *The magnitude of risk factors*

3. Calculus of global risk level at the workplace

For calculate the global risk coefficient (N_{rx}) we use the next formulas:

$$N_{rx} = \frac{\sum_{i=1}^{n} ni \times R_i}{\sum_{i=1}^{n} ni} = \frac{4(3 \times 3) + 9(2 \times 2)}{4 \times 3 + 9 \times 2} = \frac{72}{30} = 2.25$$

4. The results interpretation of workplace global risk coefficient

Assessment under beautician work led to a risk level equal to 2.25, a value that it falls into the category of jobs with acceptable risk level, the result is supported by the evaluation form which is observed as the total of 13 factors risk identified in Figure 1, only 4 factors indicate a partial risk of magnitude 3, representing 30.77%. The rest factors falling into the category of very low risk (magnitude 2).

Our research shows that the risk factors are in the range acceptable.

Regarding the distribution of risk factors on the sources generating the situation is as follows:

53.85% - own the means of production;

7.69% - the working environment factors;

23.08% - factors specific performer;

15.38% - factors work task.

Fig. 2. *Elements of the work place named "worker in drilling for methane gas"*

In the next Figure we see the percentage between work task, work environment, means of production and performer. The means of production occupied the first place (56.85%) and work environment (7.69%) is on the last place.

5. Evaluation of environment impact

Assessment of environmental impact shall be carried out using the matrix method (for index of quality) and V. Rojanschi method (calculation of global pollution index).

An assessment of the impact on the environment shall be based on:

- indices of quality on environmental factors (water, air, soil-sub soil, noise, human settlement, biodiversity, landscape) (I_C)
- index of global pollution (I_{PG} quality of an environment factors is falling within the allowed limits of STAS or reglementations Normative.

It is estimated effects „project" on the environment based on „factor size" which are to be analyzed taking into account the level of quality indicators that characterize its effects.

The formulas of environmental quality index is (I_c):

$$I_c = L_{project}/L_{reglementation} = E^{-1}$$

where:

$L_{project}$ – project actions;

$L_{reglementation}$ – reglementations of Normative actions;

E – environmental effects.

Interplay between actions project ($L_{project}$) and environmental effects (E) can be highlight in the tanle no.1. Its size it is estimated by a common system to the whole assembly (with +, - or zero), as follows:

- + positive influence
- 0 influence zero –
- negative influence

Assessment of quality index values

This assessment is based on:

- Quality index values (I_c) for each environmental factors;
- Worthiness note that corresponding of I_C values like in the Table 1.

Table 1.

Worthiness note	I_C value	Environmental effects
10	$I_c = 0$	Environmental is not affected by the developed activity.
9	$I_c = 0.0 \div 0.25$	Environmental is affected in admissible limits. Level 1. Positive effects.
8	$I_c = 0.25 \div 0.50$	Environmental is affected in admissible limits. Level 2. Positive effects.
7	$I_c = 0.50 \div 1.00$	Environmental is affected in admissible limits. Level 3. Positive effects.
6	$I_c = - 1.0$	Environmental is affected over admissible limits. Level 1. Negative effects
5	$I_c = - 1.0 \div - 0.5$	Environmental is affected over admissible limits. Level 2. Negative effects
4	$I_c = - 0.5 \div - 0:25$	Environmental is affected over admissible limits. Level 3. Negative effects
3	$I_c = -0.25 \div - 0.025$	- The medium is degraded, level 1. - The effects are harmful to long periods of exposure.
2	$I_c = - 0.025 \div - 0.0025$	The medium is degraded, level 2. - The effects are harmful to medium periods of exposure.
1	$I_c =$ sub – 0.0025	The medium is degraded, level 3. - The effects are harmful to short periods of exposure

In the Figure 3 is shown how are polluted the environment factor by the worker in drilling for methane gas. It was accorded a worthiness notes for water (7), for air (9), for soil (10) and for noise (9).

There has been created a new quadrangle which overlays ideal rectangle (Fig. 3) Ideal rectangle has worthiness notes to water, air, soil and noises polluted 10.

As an indicator of environment is more polluted has a less worthiness note.

Global index of pollution is defined as the ratio between the surface of ideal rectangle and real quadrangle surface.

Depending on global index value of pollution, shall be determined how polluted is the work environment being studied.

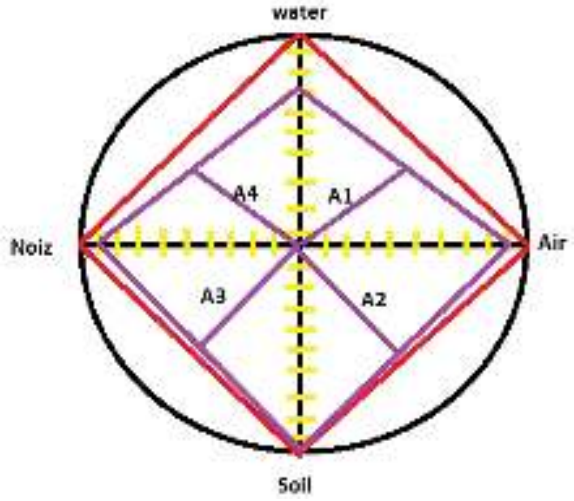

Fig. 3. *Quadrangle real which overlays ideal rectangle*

The worthiness notes according for Water = 7, for Air = 9, for Soil = 10 and for Noise = 9. In the next are calculate the value of surface A1, A2, A3, A4: A1 = 31.5 cm^2; A2 = 45 cm^2; A3 = 45 cm^2; A4 = 31.5 cm^2.

The surface of real quadrangle Sreal: S real = 153 cm^2.

The surface of ideal rectangle S ideal: S ideal = 10 x 10/2 = 50x4 = 200 cm^2.

Global polluted index is: Ic = Si/Sr = 1.3.

This value show that environment pollution is in admissible limits. Between water soil, air and noise we see that underground water is under suspicion to be polluted.

I_c = 1	- Environmental is not affected by human activity.
I_c = 1...2	- Environmental is affected in admissible limits.
I_c = 2...3	- Environmental is affected and existing a discomfort for life forms.
I_c = 3...4	- Environmental is affected and existing troubles for life forms.
I_c = 4...6	- Environmental is severe affected and existing multiple dangers for life forms.
I_c > 6	- The medium is degraded, unsuitable for life forms.

6. Conclusions and safety measures proposed

Risk factors	**Risk level**	**Measures proposed**	**Who is responsible**	**Remedy term**
		Nominating measure		
1	**2**	**3**	**4**	**5**
F1 – Striking of The movement of pedestrian or and/or the movement of traffic accidents with motor vehicles for equipment transport.	3	Organizational measures: - Training the staff on the traffic on access roads inside the company - Will be made the training of the workers with regulations on the Road Code.	Leader workplace	Immediately and permanently

Flames - fire hazard.	3	Organizational measures: - Regularly check fire means within the company (fire extinguishers, hydrants) - OG.712/2005.	Leader workplace	Immediately and permanently
Electrocution touch voltages step indirect or appearance.	3	Organizational measures: - Permanently Check the electrical wiring and announcement in case of damage. - Making PRAM measurements in power switchboards.	Leader workplace	Immediately and permanently
Natural disasters - lightning strikes, hail, blizzards, collapsing trees.	3	Organizational measures: - Training of staff in accordance with Law 481/2004.	Leader workplace	Immediately and permanently
Mishandling of car during field displacement.	3	Organizational measures: - Staff training on traffic on the access roads within the company (access will be made on access roads marked on the right).	Leader workplace	Immediately and permanently
Failure of individual protective equipment (personal protective equipment, electrical means).	3	Technical measures: - Providing workers with personal protective equipment which is in accordance with art. 10, 16 (3) of GD 104/2006.	Leader workplace	Immediately and permanently

References

[1]. ***, *Directive 98/24/EC on the protection of workers from the risks related to exposure to chemical agents at work (fourteenth specific directive within the meaning of Article 16 paragraph 1 of Directive 89/391/EEC).*
[2]. ***, *Directive 91/322/EEC on establishing indicative limit values for the application of Council Directive 80/1107/EEC, against the risks related to exposure to chemical, physical and biological agents at work.*
[3]. ***, *Executive Decision No 1218/2006 on the minimum health and safety requirements to ensure the protection of workers from the risks related to exposure to chemical agents at work.*
[4]. ***, *Executive Decision No 1091/2006 on the minimum safety and health requirements for the worker in drilling for methane gas.*