Assessment of risks factors in accordance with OHSAS 18001 standard

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***Abstract*—**In this paper are detailed the theoretically and applicative aspects regarding the risks assessment methodology in order to evaluate the accidents at the work place and occupational health in accordance with ISO 18001. In this respect, in this paper are applied the processes of identification, evaluation, avoidance and control of risk of injury and illness associated to professional activities of the organization. The case study describes the identification and assessment of risk factors specific to the workplace. Also, it is determined the global risk level for analyzed process, and the risks distribution for executant, work task, manufacturing equipment and work environment and it was proposed measures of improvement for the factors to which the risk exceeds the limits of acceptability for the analyzed workplace.

***Keywords*—** Occupational health and safety; Risk factors; Risks assessment; Risk matrix

I. Introduction

ASSESSING the level of security is a systematic examination of all aspects of work undertaken in order to determine the sources that could cause bodily harm, and this forms the basis for substantiation of measures to prevent and control risk. Risk assessment process should be initiated by the management of employment legal person, an individual, in consultation with all concerned at work.

OHSAS 18001:2007 standard is not the solution to all problems of security and health at work of an organization, but offers a practical way to achieve a healthier work and more secure, and continuously improve performance through a comprehensive management [1].

Summary of main changes:

The assessment should be structured to cover all relevant hazards and risks. When risk is identified, the assessment begins by researching primarily the possibility of eliminating it at source.

Assessing the level of security is a systematic examination of all aspects of work undertaken to determine the sources that may cause bodily harm, constituting the basis for substantiation of preventive measures and control risks. The risk assessment work to be initiated by the legal name of the person, in consultation with all those involved in the work.

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II. Evaluation Methodology of Risks

• Full identification of risk factors is a form that includes the main categories of risk factors for injury and occupational disease, grouped by Foreground Criterion of the work system (executing task employment, means of production and working environment).

• List of possible consequences of the action of risk factors on the human body is a tool helpful in applying the rating scale of severity of consequences. It includes categories of injury and harm the integrity and health of the body, possible location of consequences in relation with body structure and minimum gravity - maximum generic of consequence.

• Rating scale of severity and likelihood of consequences of action of risk factors on the human body is a grading scale of severity of consequences classes and class probability of their occurrence.

In terms of probability classes, following trials finally chosen the method for adapting standard EU risk assessment on the machine so that it specified intervals instead have considered the following:

- Class 1 of probability: the frequency of the event over 10 years;
- Class 2: frequency of production - every 5÷10 years;
- Class 3: every 2÷5 years;
- Class 4: every 1÷2 years;
- Class 5: once at 1 year ÷ 1 month;
- Class 6: less than once a month.

Rating scale of severity and likelihood of consequences of action of risk factors on human body is presented in table 1.

• Key risk assessment is a table, of which class or classes of severity, and columns - Classes of probability.

With the grid is made effective expression of existing risk analysis system, as the couple gravity - frequency of occurrence.

• Scale of classification of levels of risk / security work, built on the scale of risk assessment is a tool used in assessing the expected risk, respectively the level of security.

In the central area of the form are given explicitly all couples gravity-probability associated risk levels.

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• The summary assessment of the workplace is the document summary of all operations by identifying and assessing risks of injury and / or occupational disease.

• proposed measures sheet is a form to centralize the necessary preventive measures implemented, results of job evaluation in terms of risk of injury and occupational disease exist.

There are several variations on this matrix that can be found in the literature [1]–[9]. According to ISO 18001, the scale of risk assessment (risk matrix) presents a combination of severity of consequences and probability of occurrence (table 1). The following risk matrix is used in risk assessment process for analyzed case study, (Table 1).

Table 1. Rating scale of severity and likelihood of consequences

SEVERITY LEVEL		**SEVERITY**
CONSEQUENCES		
1	NEGLIJABLE	– minor consequences reversible disability likely to 3 days calendar (healing without treatment)
2	LOW	– a reversible consequences foreseeable disability 3 - 45 days requiring medical treatment
3	MEDIUM	– consequences reversible disability likely a 45 - 180 days requiring medical treatment and hospitalization
4	HIGH	– irreversible consequences of a reduction of work capacity of up to 50% (Grade III disability)
5	CRITICAL	– irreversible consequences with loss of 50 - 100% of work capacity, but with the possibility of self (disability grade II)
6	CATASTROPHIC	– irreversible consequences with total loss of capacity and capacity for self-employment (disability grade I)
7	HAZARD	– death
LIKELIHOOD LEVEL		**PROBABILITY**
EVENT		
1	EXTREMELY RARE	Probability of producing extremely rare impact **$P < 10^{-1}$/year**
2	IMPROBABLE	Probability of producing very small impact **$10^{-1} < P < 5^{-1}$/ year**
3	RARELY	Probability of producing small impact **$5^{-1} < P < 2^{-1}$/ year**
4	OCCASIONAL	Probability of producing medium impact **$2^{-1} < P < 1^{-1}$/ year**
5	PROBABLE	Probability of producing major impact **1^{-1}/an $< P < 1^{-1}$/ year**
6	FREQUENT	Probability of producing very large impact **$P > 1^{-1}$/ year**

The methodology for evaluation the risks of occupational health and safety consist of following steps:

1. Risk assessment planning;
2. Risks identification;
3. Identification of exposed persons;
4. Identifying types of exposure;
7. Risk assessment (the likelihood and the consequences);
8. Monitoring and control of risks;
9. Setting priorities for action and adoption of security measures;
10. Implementation and application of security measures;
11. Registration of the assessment process;
12. Measurement (assessment) effectiveness;
13. Control (regular or in case of changes in the system):

- Evaluation results retain validity (not required any further action);
- Revision is necessary.

14. Tracking plan for risk assessment.

the unacceptable risks must be treated. The objective of this stage of the risk assessment process is to develop cost effective options for treating the risks.

The options of risk treatment are:

− Avoiding the risk,
− Reducing (mitigating) the risk,
− Transferring (sharing) the risk, and
− Retaining (accepting) the risk.

Avoiding the risk - not undertaking the activity that is likely to trigger the risk.

Reducing the risk: controlling the likelihood of the risk occurring or controlling the impact of the consequences if the risk occurs.

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III. IDENTIFICATION OF RISKS FACTORS

A. Risk factors own means of production

• Driver risk factors:

- Tapping the excavator arm during the cutting work;
- The fall of the drum on legs or upper
- Impactor by means of automobiles on during the work in the work area or move to car transport;
- Benches pit work area during the work (vibration, car access, tram, etc.)
- Drop objects, materials, the vehicles moving near the work area or disposed of apartment tenants;
- Project management or particles:
- Stone wheels driven by motor vehicles;
- Particles in the detached concrete or asphalt;
- Recoil caused by the use of drilling tools;
- Jet Oil on accidental breakage of the plant hydraulic excavator - inadequate pressure hoses;
- Direct contact of skin with dangerous areas - cutting, stinging - heads cable, broken glass, sharp objects embedded in the soil;

• Heat risk factors:

- Direct contact of skin with cold metal surfaces to work in winter;
- Working with open flame (lamp and accessories) or development of flame caused by neighboring networks, under pressure - burning heat;

• Electrical risk factors:

- Electrocution by direct touch:
- The absolution cables;
- Achieve accidental remaining blood elements;
- Accidental breaks existing LEA conductors on the same route;
- To maneuver the station and posts TRAFO wrong;
- Electricity:
- Electric indirect touch: the accidental damage to electrical insulation surrounding routes;
- Emergence voltage step: to put down accidental electrical paths in the vicinity of the intervention;

• Chemical risk factors:

- Working with toxic substances (some adhesives sets of sleeves, some grease in sets of sleeves) - chronic intoxication;
- Working with flammable substances: insulation, fuels, lubricants.

B. Risk Factors own working environment

• Physical risk factors:

- High temperature air in warm season - work outdoors or in covered pit tent;
- Lowered the air temperature in the cold season - the work may take place until a temperature of -10 ° C;
- Drafts, especially cold season;
- Low level lighting at intervention and high contrast light - dark to work in sunny days;
- Natural disasters - surprise lightning, blizzard, the collapse of trees;
- Dust - dust particles driven by air currents;

• Chemical risk factors:

- Gases, fumes, toxic aerosols in the atmosphere of working environment:
- Gas accessories resulting 3 M and / or RAY CHEM;
- Vapor degreasing of organic solvents;
- Gas density greater than air emissions from transport.

C. Risk factors own the job:

• Content:

- Use of existing installation accessories intervention works on the same cable due to advanced state of wear of the plant (there are economic restrictions for the use of new materials);

• Overloading Physical:

- Dynamic Effort:
- Works manual cutting, clearance;
- Manual handling of cables;
- Forced and vicious postures within pits;

• Overloading psychological:

- Rhythm great work and repetitive short cycle operations.

D. Risk Factors own contractor:

• Wrongful:

- Removing FUSE MPR on circuits and their connection without the use of devices intended for that purpose;
- Failure distance of 500 mm between the edge of the pit and land result in the cutting;
- Enforcement of connections in memory;
- Use of inappropriate tools (with cutting edge unsharpened);
- There are not indicated and enclose the work areas as required by law in force;
- Travel, stopping in hazardous areas:
- On car access routes;
- Under high load means;
- The way FF and tram;
- Drop the imbalance at the same level, slips, trips - Uneven surfaces covered with ice;
- Falls from height:
- The scale of aluminum;
- The platform telescopic arm;
- The graves of more than 2 m;
- Communications between performer and higher hierarchical steps or between the band members;

• Failure:

- Failure means of protection of equipment (personal protective equipment).

IV. RISKS ASSESSMENT OF OCCUPATIONAL HEALTH AND SAFETY

The process of work which is intended to be examined is the performance of maintenance and repair underground power lines LES 0.4 kV - subscribers, public lighting and L.E.S. medium voltage (6 kV, 20 kV) and operational work of operation (reception facilities in November, check the field construction, putting into service).

The result is specified by “Assessment sheet”, which is

observed that the total of 35 risk factors identified (figure 1), only 6 above, as part of the risk, the value of 3, one falling into the category of factors maximum likelihood, one falling into the category of high risk factors and 4 others falling into the category of medium risk factors.

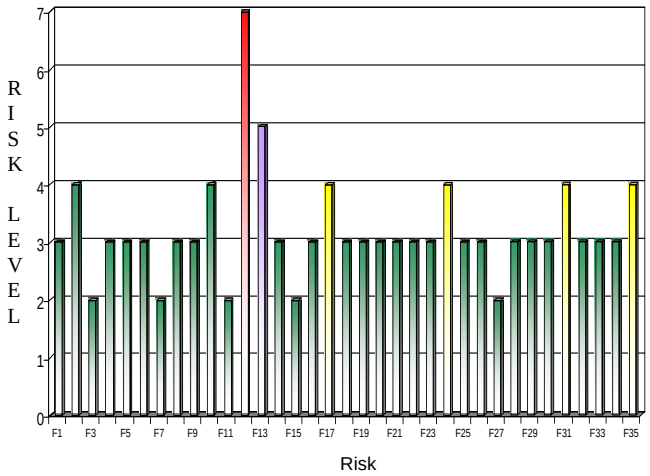

Figure 1. Partial risk levels vs. risk factors

V. Conclusions

The 6 risk factors that are unacceptable are:

• F12 (the partial risk - level 7) by the direct shock: the unlinking cables; achieve accidental elements remaining under tension, the accidental breaking of conductors LEA on the same route, to maneuver the station and wrong positions;

• F13 (partial risk - level 5) electric current:: the electric shock by indirect; emergence voltage step;

• F17 (the partial risk - level 4) lowered the air temperature in cold season;

• F24 (the partial risk - level 4) dynamic effort: work manual digging, clearing, handling and manual cable positions and forced to work in the vicious landfill;

• F31 (the partial risk - level 4) travel, stops in dangerous areas: the ways of auto access; the task of lifting;

• F35 (partial risk - level 4) of non-protective equipment (personal protective equipment).

The percentage of identified risk factors for the work system elements is illustrated in figure 2.

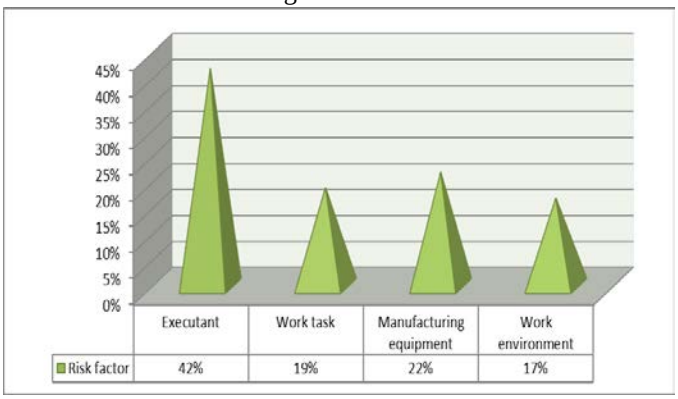

Figure 2. The percentage of identified risk factors

To reduce or eliminate the 6 risk factors (which are unacceptable in the field), are necessary measures presented in the generic "sheet of proposed measures" to workplace. As regards the distribution of risk factors generating sources, the situation is as follows (see figure 3):

- 42.86% of their factors of production;
- 20.00%, environmental factors of own workplace;
- 8.57% load factors own workplace;
- 28.57% own worker factors.

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