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## **Managing Security Risks in an Industrial Investment – Analysis Directions**

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**Abstract:** This paper achieved an analysis of some important management strategies for an investment, in correlation with index of global pollution. Environmental security assessment shall be determined taking into account the workplace security and effects on health, safety of workers in an industry investment. It is necessary to observe and collect a larger number of data generated by the development of an industrial process, so as to make a deep analysis on global pollution index and how it is affected industrial investment environment. This research shows how can the substances that infest the environment to produce much damage and influence the environmental factors (air, water, soil, landscape, fauna and flora). When we know the risks that characterize the plant equipment, we can protect the life and we can protect the environment for a sustainable development in the future.

**Keywords:** strategies; environmental security assessment; index of global pollution.

### **1. Introduction**

In relation to the risks presented by the pollutants products, its assessment is often difficult, because of the richness of products and the preparations used.

The leader of businesses will have to implement a policy of prevention which favors replacing dangerous products with less dangerous products.

For the purpose which is faced with this problem it has been developed a simplified methodology for the assessment of the risks to health, safety and the environment.

The method has been applied in a few companies from different sectors, and the results were analyzed with an expert implement in practices.

In order to reduce the risks to employees, it is necessary to research and assessment of occupational risks and put in practice a prevention politics, based on technical or organizational measures.

The risks evaluation principles are referred by the framework of the European Council Directive on 12 June 2001.

This system of evaluation requires application of a methodology, which identify hazards, the conditions of use, which are likely to give rise to a risk.

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The basic principles of this approach have been the subject, in 2006, of a guide book published by the European Commission. They have published several decrees containing tools for the risk evaluation.

Given the wide variety of uses, there is no single prioritization system appropriate to all applications. Some ranking systems focus on: the relative condition of assets that might fail the relative potencies of different chemical hazards relative availability of exposure pathways to receptors or the likelihood of harm should exposure occur (Ricci, 2010).

## **2. Strategy Guide for Avoiding Polluted Risk**

To help entrepreneurial system in this approach has created a guide that represents an instrument of awareness, which allows before all, an enumeration of dangers.

This guide is limited when the number of chemicals listed is great, and when it becomes necessary to a ranking of risks.

To assist enterprises to manage their chemical risk in your day-to-day business, it has developed a simplified methodology for the assessment of the risks to health, safety and the environment when used chemicals.

A system for chemical polluted evaluation, necessity a plan with a lot of preventive action that must cover all aspects of chemical risk.

To meet the demands different partners (business, physicians in occupational medicine, territorial officers of labor protection), are faced with the chemical risk assessment, the specialists in domain from Europe, have achieved methodologies and procedures that were the object of verification for validity.

They were making risk evaluations in some cases studies and expert opinions were confronted with the results of the method. In the institutions which have been the subject of an assessment, the number of chemicals was very variable: from a few tens to hundreds.

In some cases, the systematic nature of the assessment procedure, allowed demonstration for risks situations, which had not been identified by the experts.

It has been found a good correlation between expert opinions and proposed method. Even if the assessment method simplified exhibits occasionally tend to overestimate risk. Also, the method has been tested by the services for the Prevention of Regional Houses of the Health Insurance.

## **3. Inventory of Pollutants**

It is the most important step, because determine the quality of general procedure for the risk evaluation. To ensure the success of this stage, it is desirable that the working group, supported by the enterprise leader, designate a responsible for this operation. Group will have to be ensured in the first place that this responsible shall have access to the various sources of information available in the enterprise and that it is receiving assistance from the management and staff.

This stage represents a load of their important, which may be facilitated by using the activity plan of the undertaking, the documents of the procurement service, organization chart of enterprise.

At the end of that stage will be drawn up complete the list of products and materials used in the enterprise.

At the time of the inventory, the products which expired or are unused for a certain period of time will be removed.

Data collected during this phase are the following:

- indications for product or the name(s) of the product;
- quantity used (per year/month or up to the time when considered);
- frequency of use;
- the working area where product is being used;
- information on hazards provided by labels (icons, risk phases etc.);
- information provided by the safety data sheet (hazards, physic-chemical, etc.).

In view of the large number of products and raw materials used in an enterprise, it is necessary to prioritize risks through the establishment of priorities, for example by identifying first the most dangerous products (Rojanski & Bran, 2004). Prioritize products identified during inventory shall be carried out in accordance with existing method which shall take into account hazards, potential exposure(health), potential for ignition (fire-explosion) and an impact on the environment.

It must calculate the potential risk score for a chemical, the effects on human health, risk of fire - exploded and environmental impact.

Combining the value classes of each parameter we can calculate a score of potential risk. It sets the priorities for the risks assessment for a plant sector, a workshop, a job, etc. So, in relation to the practical application of the method provides objective elements decision to establish situations that requiring with priority, an assessment of the risk.

It is strongly recommended to classify priorities for assessment by a Group of Homogeneous Exposure (GHE), to organize the next phase named “assessment of the risks”.

A GHE corresponds to an assembly of persons, places of work or tasks, for which it is estimated that exposure is of the same nature and similar intensity.

Creation of a GHE can be carried out on the basis of three approaches concerning:

- chemical agent, which shall consist of the risk evaluation to all GHE from an enterprise that uses chemical agents with potential risk increased, regardless of location;
- workstations, which shall consist of the evaluation of the risk to all GHE of the work area which is characterized by a significantly potential global risk (geographical notion);
- the procedure, which consists in the risk assessment for all GHE business, regardless of location (notion of production line).

### **3.1. About Siris Method**

It is a scoring system highly appropriate for the estimation of environmental risk. This method, based on four exposure criteria and four effect criteria, was highly efficient for risk assessment and made it possible to display various groups of chemicals and to classify them. (Friar, Pryde, Beaumont, Morris, & Tickner, 1999)

Another new methodology to be used in Romania at the level of year 2015 regarding the ecological impact/risk assessment, based on Dempster (Dempster-Shafer theory is an approach to combining

Evidence developed and degrees of belief derived from independent items of evidence) from theory Dempster-Shafer and the algorithm of rational approach from the theory Evidential Reasoning.

This methodology is able to face uncertainty that is proper for systems involving subjective assessments. It is able to offer quantification and a mathematical model for the uncertainty. It also respond to the present law requirements regarding large democratic and transparent participation of all stakeholders in the decision making process concerning environmental impact/risk assessment.

The proposed methodology consists of a set of principles, rules and methods able to offer a mathematical model of uncertainty and to consider all opinions during the assessment process even when they are very different in nature.

The chosen research method was a case study based, that has the advantage of directly applying the theory in practice investigating the research objects in the real context they occur. This, it is also a method that includes evidences from multiple sources and uses oriented samples in case studies selection.

In the ecological impact/risk assessments, this selection type is a plus because, generally speaking, the usual or average cases are not the richest in information.

In case studies selection, we considered, on one side, the uniqueness of each case study.

I considered, on one side, the uniqueness of each case, taking into account the specific pollution, and on the other side the fact that each of them might be a representative case for the prospective sustainable development of Romanian industry. I have also considered that is the most appropriate research method to exemplify the implementation of an ecological impact/risk assessment knowledge based method. The instruments of data collection were technical documentation and public surveys. We collected two categories of data for research accomplishment: quantitative data – measurements, and qualitative data from evaluators' value-judgments, obtained from conducted public surveys. The entry data, about work place was pollution situations of this area. We ensured that they are used adequately concepts define like “significant pollution” and “ecological risk”), and the method used in the evaluation process was based on the applicable current environmental legislation. To assure the internal validity, we used data (physical-chemical and biological) from multiple sources. By involving a number of 30 persons in the public surveys (grouped in six interest groups, based on their specific field of activity), the method assured the external validity. Each group consisted of five members having background and experience in academic, research, hydromechanics engineering, quality management, environment, health and work safety fields, acting as environmental concerned public.

#### **4. Research on Global Pollution Index in an Investment**

Investigations that are being made to determine the environment risk, must be able to answer to the following aspects:

-if the existing data are sufficient;

- If there is no limit or standard values generally accepted criteria, to differentiate the significant impact levels;

-if there are methodologies quantitative/statistical, suitable for description impact levels, or make a subjective assessment;

-if there is no previous evaluation which might have led to similar actions.

Ideal conditions to assess the environment impact, shall consist in the existence of specific data both for the unit to be analyzed as well as for the area is located.

Existing tested models tested of the environment impact, so the subjective analysis has to be reduced to a minimum.

For these reasons, the valuation methods can be divided into two groups (Bedford & Cooke, 2001):

- Empirical methods by which to generate the provision of technical environment conditions in the future;
- Methods, which uses measurements relative to underprivileged provision environment in the future.

Assessment of the environmental impact is the main method to determine the degree of deterioration in the environment as a result of industrial activities.

Systematic list shall submit a summary of proposed actions. It shall provide elements which characterize nature and phases of work for the environment risk determination.

Matrix method is the most used instrument of environmental risk assessment.

The matrix is a table, where is co-positioned activities that can produce an environmental impact. Matrix lines represent the criteria which will mark the risk of one activity. In each cell of the matrix may be marked a digit by showing so far as the business is likely to have a negative or positive effect to the given criterion.

Matrix columns represent activities which may cause an impact on the environment taking into account the components and characteristics of the environment.

Activities which may affect the environment are: conversion of land, the extraction of resources, and renewal of resources, storage and treatment of wastes, chemical treatment, and accidents to the environment.

The environmental characteristics to be aimed at in an impact analysis are:

- physic-chemical characteristics of the soil, water, air;
- biological conditions: flora, fauna;
- factors of cultural activities: lands use, recreation, cultural interest, facilities and man-made activities;
- ecological relationships: salt in water resources, water polluted, insect's transmitters of diseases, etc.

It will be appropriate to identify all anthropogenic activities which may environmental affect (columns);

At the top of the toolbox shall be placed a number, which indicates the magnitude of impact (the number 10 represent the most high magnitude, and number 1, the most low magnitude); before each number shall be noted type of impact, if it is positive with “+” and negative to the sign “-”);

In the upper left hand corner of each box shall be placed a number that indicating important of environmental impact (regional, local).

In the case of environmental balance, with this method may be appreciating the time, the environmental influence of human activities. In this way, it can make an assessment of the effectiveness of the emission control activity.

## 5. Calculus of Global Pollution Index

Aim of assessing the impact of human activities on the environment, as well as to follow the development of the pollution phenomenon, there is a need for an assessment of health, or of pollution of the environment, to a moment. Assessment of the pollution degree for the environment is represented by the global index of pollution. The analysis of soil types also show if it is possible to develop the investment in the status of soil quality like in the figure No.1.

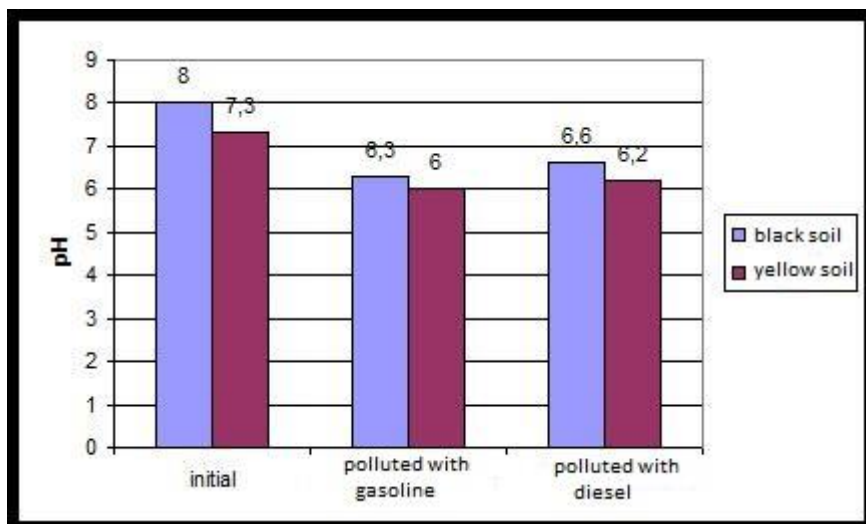


Fig.1. pH for two types of soils.

It is considered that it is possible to assess quality of the environment at a given moment, by the quality indicators on the environment (air, water, soil quality, Climacteric comfort, thermal regime, wind regime, radiation regime, O<sub>2</sub> quantity, dissolved in the water) state of health and the deficit of plants and animals species.

### 5.1. Indicators of pollution source-case study

These indicators were adopted by the European Union and aims:

1. Emissions of CO<sub>2</sub>, SO<sub>2</sub>, Nox; 2. Emissions of greenhouse gas; 3. Changing the category of land use; 4. Using chemical fertilizer; 5. Use of water resources; 6. Use forest resources; 7. Wood trade; 8. Fishing; 9. Waste from production activities; 10. Municipal waste; 11. Industrial accidents; 12. Increased of economic activity; 13. Structure of production; 14. Consumption of energy; 15. Industrial production; 16. Transport; 16. Household consumption; 17. Demographic trends.

According to the entry in the predetermined limits, shall be granted notes worthiness, obtained for each environmental factor analyzed, and also serve to achieve graphics of a strip, as a simulation of the effect of product of pollutants.

Figure resulting can be an equilateral triangle, a square or a pentagon regularly, depending on the number of environmental analyze factors.

The index of global pollution (I.G.P) status of an ecosystem, (allowed.”), is the ratio between the area representing ideal status (Si) and representing of actual (real)status (Sr):

$$gp = Si/Sr$$

When there is no change in the quality of environmental factors, when there is no pollution, this index is equal to 1.

Conventional has established a scale of 1 to 6 for the index of global pollution, as follows:

$IGP=1$  –environment unaffected of human activity.

$1 < IGP < 2$  - environment is affected of human activity, status permissible in the case of forms of life.

$2 < IGP < 3$  – environment is affected of human activity, discomfort of the life forms.

$3 < IGP < 4$  – - environment is affected, as a result of human activity, disturbed for forms of life

$4 < IGP < 6$  –environment seriously affected by the activity, danger in the case of forms of life

$IGP > 6$  - The environment has deteriorated, unfit for forms of life.

Index calculation global pollution in the case of 4 environmental factors analyzed for an industrial investment.

Note worthiness for the analyzed factors are: air- 8; for water- 9; for soil- 7; noise level-9.

The ideal status is represented by a regularly quadrilateral to the area  $S_1$ .

Actual Status (real) is represented by an unregulated quadrilateral with area  $S_2$ , entered in the regular quadrangle with area  $S_1$ .

The index of global pollution allowed is representing by the rapport  $S_1/S_2$ .

General formula for calculating the Quadrilateral area:

$n$  = the number of polygonal sides.

In the case regular quadrilateral,  $l = NB = 10$ ;

for regular quadrangle is achieved by means of calculations to general formula:

For the initially regularly quadrilateral all area  $S_i = 200$

For the unregulated quadrilateral:  $S_r = S_I + S_{II} + S_{III} + S_{IV} = 130$  (like example)

$S_i/S_r = 200/130 = 1,54$ .

In our calculus example of IGP we can say: environment is affected of human activity, status permissible in the case of forms of life because IGP is between 1 and 2.

An assessment plan may also describe more sophisticated assessment techniques that could be conducted depending on the results of initial work (Freeman, 2009). Effective planning can help to answer hypotheses at an early stage in the assessment. The environmental information collected is adequate and indicates that there is not toxicity for flora and fauna and we can built an investment in this case.

## **6. Conclusions and Discussions**

Advantages of this method shall consist of:

- provides an overall picture of the environment health status at any given time;
- allow a comparison between the different areas, with condition that, these area can be analyzed by same basis indicators;

- allows comparing the state of an area at different times, offering traceability both quality various environmental factors as well as the quality of the overall environment in the area in question;
- provides the ability to establish a direct relationship between the environment and population;
- ensure active use of large quantities of data on the environment state, obtained from the functioning of the monitoring system at the national level.

The disadvantage of this method consists of:

- limits for the indicators that characterize environment at a given time and the proportion thereof in the determination of the environment quality.
- assessment of global status in the environment quality;
- Prioritize refurbishment of areas which have been damaged by anthropogenic activities;
- orientation of some funds necessary for environmental rehabilitation.

It is very important that the managerial strategy used when it must to made an industrial investment to be developed in correlation with an complexes analyze of environmental factor affected and all of these in the context of sustainable developing of the society.

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