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STUDIES AND RESEARCH ON DESIGN OF EFFICIENCY TECHNOLOGICAL PROCESSES BY ESTIMATING THE RISKS

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Rezumat. *În scopul identificării surselor de risc, managerul de proiect va trebui să definească tipul de proiect ce face obiectul analizei care poate să-i ofere variante și mai ales surse de analiză a factorilor specifici de risc. Pentru proiecte, pentru obiective industriale, sisteme tehnice/tehnologice analiza de identificare a surselor de risc, evaluarea și monitorizarea în vederea reducerii și/sau neutralizarea riscurilor, se vor avea în vedere cel puțin următoarele: factorii de risc intrinseci sistemelor tehnice/tehnologice, factori de risc externi și/sau de natura conjuncturală, factori de risc asociați erorilor umane, organigrama conținutului minimal al analizei de risc în fazele de proiectare, execuție, montaj și funcționare a sistemelor tehnice/tehnologice.*

Abstract. *In order to identify sources of risk, the project manager will have to define the type of project which is the subject analysis which can offer options and especially sources of analysis of the specific risk factors. A For the projects, for the industrial objectives, technical/technological systems, analysis of identify the sources of risk, assessment and monitoring in order to reduce and/or neutralize risks, will be taken in regard for the following: risk factors within technical/technological systems, external risk factors and/or the conjuctural nature, risk factors associated to human errors, organizational chart of minimal content of risk analysis to the stages of design, execution, assembly and operation of technical/technological systems.*

Keywords: Efficiency, Risk, Technological, Analysis, Process.

1. Introduction

In the speciality literature, currently, there are multitudes of specific risk managements. The structuring of these methods have made the object of many studies in national and international level. In this case study I have analysed the

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efficiency of the specific methods of risk management in the purpose of establishing the risks related to the process of repairing and reconditioning on motors.

2. Contribution for the identification of risk with the help of specific methods

In general, the identification step of risks stands in the research of the initial likely causes that may affect the projects objectives. In this step there can be used more several techniques of data collection like interviewing the experts, databases that contain knowledge from acquired from last projects.

The success of this step stands in imagination stimulation and the use of the gained experience of the persons involved in the project.

The risk identification is the most difficult and at the same time the most important step of the process. If all the risks are not identified, the resulted consequences can be fatal to the project.

The risk identification must be realized in a systematic and continuous mode. The process can be structured by the identification of the consequences origins (risk generating situations), or the other way (determination of the consequences).

At present in the specialty literature there are many risk identifying methods, most used are: Brainstorming, predefined questionnaires, interviews, databases of identified risks in previous projects.

The Brainstorming is a technique of group creativity, meant to generate a number of ideas, for the settlement of a problem and plays an important role in risks identification.

It's recommended that, in the Brainstorming session to be used the Structure of Risk Discomposing cause the necessary time will be reduced, and the risk identification is going to be realized in a structured manner.

At this step is necessary the enforcing of two evaluating types:

-quality risk evaluation - has on the basses the election of a distribution from a predefined scale of the studied variable and its parameters;

-quantity risk evaluation - is based in general on the using of the Monte Carlo method and it requires, most of the times, a specific informatics instrument for the reduction of calculating time.

With the help of these evaluations we can accomplish the ranking of the risks and the measures that have to be taken.

The ranking of risks requires establish the of acceptability limits, this notion varying according to the parameters taking into account. [1,2]

2.1 Evaluation and analysis of risks

The evaluation of risk probability establishes the possibility of occurrence for every risk in part. The evaluation of risk impact allows the study of potential effects, negative and positive, over the project objectives (time, costs, and performances).

For every risk in part there will be established:

1. occurrence probability;
2. impact of occurrence upon the project's objectives;
3. criticism of risk as a product between: impact occurrence and probability of occurrence. [1].

In this case study, for the qualitative evaluation and analysis of risks related to the projection step of a technologic process for reconditioning and repairing motors, a ranking, there are going to be used qualitative units for both, occurrence probability and impact.

For establishing a ranking of the analyzed risks, depending on the occurrence probability and the impact over the whole project, the use of sliding scale is required.

In this case I defined for occurrence probability, 3 sliding scales (table 1). The "low" value assigned to the probability means that the risk has low chances of occurrence, and the "high" value means that the risk will occur in close proportions or equal to 100%. [1,2]

Table 1. Stairs value for probability of risk

	Occurrence probability		
Qualitative unit	Low	Average	High
Value	0.1	0.4	0.7

The impact represents the result of risk occurrence. The impact study is limited to choosing and using in execution and assembly of materials, choosing, acquisition, assembly and component services, equipment and machines related to technological systems, projection, execution, assembly and functioning of technological systems, functioning conditions and territorial location, in other words, the objectives of the project namely: performances, costs and deadlines.

The impact can have values between low, representing 15% of negative effects and high, representing 85% of negative effects. (Table 2)

Table 2. Stairs value for the impact of risk occurrence

	Impact		
Qualitative unit	Low	Average	High
Value	0.1	0.4	0.7

The criticism will be calculated with the next formula:

$$C=PA*I \tag{1}$$

PA – represents the probability of risk occurrence;
I – represents the impact of risk occurrence.

The matrix of probabilities and of impacts can be applied for each objective in part. In addition, both, opportunities and threats can be grouped in the same matrix (Table 3). The results obtained from calculating the values associated to the probability and the values associated to the impact helps adopting answers for the risk generating situations.

The risks that have a negative occurrence (0.49) upon the project objectives are prioritary and require aggressive strategies of response (the red square).The risks of low nature do not require emergency measures, just being monitored (the blue square). In case of opportunities take similar actions.

Table 3. Matrix of probabilities

Probability/impact	**0.1**	**0.4**	**0.7**	**0.1**	**0.4**	**0.7**
0.1	0.01	0.04	0.07	0.01	0.04	0.07
0.4	0.04	0.16	0.28	0.04	0.16	0.28
0.7	0.07	0.28	0.49	0.07	0.28	0.49
	THREATS			**OPORTUNITIES**		

In figure 1 and figure 2, have been established criteria by ranking of risks and opportunities resulted, based on the criticism calculation.[1,2]

For the values of criticism between 0,07 and 0,16, the risks are moderate in terms of influence on the project's objectives, opportunities are within the same sphere value.

For the values of criticism between 0,28 and 0,49, the risks are high in terms of influencing the project's objectives, opportunities are within the same sphere value.

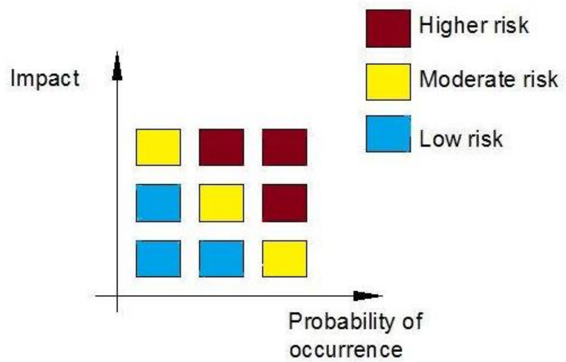

Fig. 1. Ranking of risks according to probability and impact.

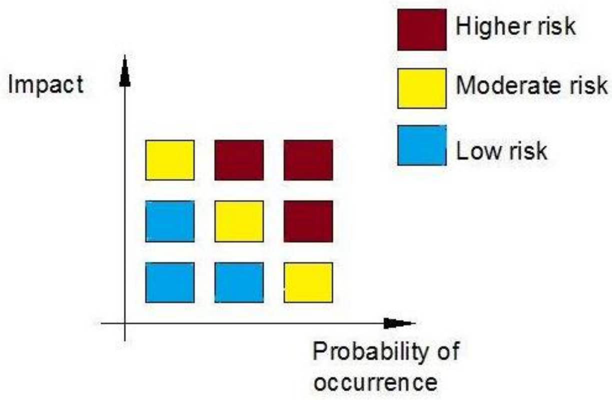

Fig. 2. Ranking of risks according to probability and impact.

Based on the value scales above, was conducted a qualitative analysis of the specific risks in the process of reconditioning/repair motors. (table 4)

In this qualitative analysis on the two objectives of the project (quality and costs), the probability values have not remained constant, varying on each objectiv. Based on this analysis, the major risks that can have a high influence on the process can be identified, on each objective in part, what will lead to splitting them on categories and to the discovery of the trigger sources. As we know, the associated risks and values, (occurrence probability and impact) vary from process to process and from what team has participated in the process of projecting because, inevitably, subjectivism can appear. The carried out analysis, only offers us guidelines and has the role of validating the defined value scales. This will alow us to act on those elements of the project that require increased attention, thereby improving the efficiency of the corrective measures wich we will apply. In addition we can differentiate the risks that require an immediate response (applied corrective actions) from the risks that may be dealt with later.

Table 4.

Nr. crt.	Identified risks	Possible effects of risk factors	Quality			Costs		
			P	I	C	P	I	C
Factors intrinsic risk potential, due to the election and use in manufacturing and assembly materials								
1.	Quality class does not conform to the technical conditions of exploitation	Sensitivity of weakening, cracking; Conformities which converts residual risks	0.1	0.7	0.07	0.4	0.7	0.28
2.	Chemical and structural homogeneity compliant	Concentrators random local efforts, corrosion, erosion	0.4	0.7	0.28	0.4	0.4	0.16

3.	Mechanical, physical, electrical inadequate	Lower lifetime corrosion and abrasion as a result of accelerated	0.1	0.4	0.04	0.4	0.7	0.28
4.	Behavior lean against corrosive and abrasive agents operating	Structural and chemical inhomogeneity leading to uncontrolled technological and technical defects	0.1	0.7	0.01	0.4	0.7	0.28
5.	Capacity reduced conservation; roperties mechanical, physical and electrical at high	Metallographic structure which affects strength inappropriate to wear	0.4	0.7	0.28	0.4	0.7	0.28
6.	Improper Behavior (brittle, cracking) at negative temperatures	Danger of breaking / destruction by creep and / or thermal or thermomechanical fatigue	0.4	0.7	0.28	0.4	0.7	0.28
7.	Non-compliant behavior to thermo-mechanical, thermal, dynamic, electrical and fatigue	Tenacity resilient low-inappropriate	0.1	0.4	0.04	0.4	0.4	0.16
8.	Composite materials with features and bandwidth usage in terms of trade vessels	Elastic behavior inconsistent or inappropriate	0.4	0.7	0.28	0.4	0.4	0.16
9.	Coverage incomplete or very high tolerances of the provisions of the regulations, standards or additional evidence required	Tenacity resilient low-inappropriate behavior	0.1	0.7	0.07	0.4	0.7	0.28
Potential risk factors, intrinsic, associates choice, acquisition, installation and component services, technical equipment and related systems / technology								
10.	Quality class components compliant with the quality of the technical system	Uncontrollable random failures	0.4	0.7	0.28	0.4	0.7	0.28
11.	Technical and functional characteristics unrelated to the technical system	Assembly-conformities resolved residual risks	0.1	0.7	0.07	0.1	0.7	0.07
12.	Operating connections / life unrelated to the system	Additional measures to ensure the reliability and maintenance	0.1	0.4	0.04	0.4	0.7	0.28
13.	Operating capacity / lifespan correlated with system	Designed for functional parameters in the system	0.1	0.4	0.04	0.1	0.7	0.07
14.	Terms of execution, installation, operation inconsistent with those provided for system	Connections input / output with errors, residual risks	0.1	0.7	0.07	0.4	0.7	0.28

15.	Safety, complying with the required protection system	Events accidental operation	0.4	0.7	0.28	0.7	0.7	0.49
16.	Deviations assembly operation generating unwanted exenimente	Maintenance costs and additional maintenance	0.4	0.7	0.28	0.1	0.7	0.07
17.	Neglecting operating conditions, ergonomic and accurate scale-control actuation means	Effects on the yield and attention the human factor	0.1	0.7	0.07	0.1	0.4	0.04
Potential risk factor intrinsic to the design, execution, installation and operation of technical systems								
18.	Operating modes and functional parameters evaluated inappropriately	Functional parameters change	0.4	0.7	0.28	0.1	0.7	0.07
19.	Calculations of strength, deformation, stability based on incomplete or wrong based situations	Dangerous operation and total or partial disposals	0.1	0.7	0.07	0.1	0.7	0.07
20.	Geometric and structural configuration that can generate loads / additional requirements	Failure of the parties or of the entire system	0.1	0.4	0.04	0.1	0.7	0.07
21.	Design negligence in managing functional deflections and vibrations schemes	Exceeding noise, vibration dangerous	0.4	0.7	0.28	0.1	0.4	0.04
22.	Identification and management of the concentrator surface of the concentrator building and residual tensions	Local failure of accident	0.4	0.7	0.28	0.1	0.7	0.07
23.	Residual mechanical stress after the manufacturing and assembly processes	High costs of repair and monitoring of residual factors	0.4	0.4	0.16	0.4	0.7	0.28
24.	Poor quality of welded joints and methods of their control inadequate	Leaks, spills of hazardous fluids	0.1	0.4	0.04	0.1	0.7	0.07
25.	Infractions outside tolerances for site	Interruptions in operation for fixes Works systematic security systems and break functionality	0.4	0.7	0.28	0.4	0.4	0.16
26.	Regimes running outside parameters	They circuits, fires, explosions, destruction or total potential components	0.4	0.7	0.28	0.4	0.4	0.16

27.	Variations uncontrolled technological parameters agents	Electromagnetic fields with harmful effects to human and functional parameters	0.1	0.7	0.07	0.1	0.7	0.07
Risk factors associated with human error								
28.	Inadequate organization and management of technical products	Wrong or incorrect maneuvers	0.4	0.7	0.28	0.1	0.4	0.04
29.	Preparation, selection, training of operating personnel inappropriate	Communication faulty, faulty transmission of sound information	0.4	0.7	0.28	0.4	0.7	0.28
30.	The absence of clear operating instructions, procedures and prescriptions adequate and fair	Misinterpretation of information received	0.1	0.7	0.07	0.1	0.4	0.04
31.	Operating conditions generate stress, fatigue, aging	Errors perception wrong side-effect Stress, fatigue, illness	0.4	0.7	0.28	0.4	0.7	0.28
32.	Social factors (professional relationships difficult, unfavorable junctions, etc.)	Lack of concentration controlled	0.1	0.7	0.07	0.1	0.7	0.07
33.	Economic factors, work motivation	Fluctuation of workers	0.1	0.7	0.07	0.4	0.4	0.16
34.	Failure maintenance program	Uncontrolled behavior of residual factors	0.1	0.4	0.04	0.1	0.7	0.04
35.	Faulty monitoring, periodic unavailability of risk	The appearance of dysfunction in operation, damage	0.1	0.4	0.04	0.4	0.7	0.28
36.	Residual hazards are not covered in preventive maintenance	Failure to comply with the repairs scheduled cycles The decrease in the lifetime	0.1	0.4	0.04	0.1	0.7	0.07
37.	lack of measures to limit the effects of accidents	The emergence of new residual risks	0.1	0.7	0.07	0.1	0.7	0.07
38.	Absence of programs and the documentation of operation	The decrease in the lifetime	0.1	0.7	0.07	0.1	0.7	0.07
39.	Lack of spare parts for accidents	Long interruption of operation	0.1	0.4	0.04	0.4	0.7	0.28
40.	Incomplete documentation for access, stop-start system, operation	Costly repairs and maintenance	0.1	0.4	0.04	0.4	0.7	0.28

Conclusions

Conclusion (1) Risk management is a mechanism for managing exposure to risk that enables us to recognize the events that may result in unfortunate or damaging consequences in the future, their severity, and how they can be controlled.[3] Through the risk analysis have been identified major risks that may occur in the repair and reconditioning process of motors, for the criticism risk values between 0,28 and 0,49. Within the above steps we studied a methodology for the implementation of a risk assessment method, which allows the knowledge and their management on the entire process.

Conclusion (2) Following the analysis carried out above it was concluded that in order to be able to analyze potential sources of risk, is necessary the listing of all activities that will be carried out (planning at all activities) realization of a Brainstorming session based on the list for the clear identification of all the risk generating events and the identification of all potential risk sources, to be evaluated at a later stage and carrying out a program of preventive measures and tracking its observance.

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