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APPLICATION METHODS FOR ANALYSIS CAR ACCIDENT IN INDUSTRY ON THE EXAMPLE OF POWER

4.1 INTRODUCTION

The problem of failure is widely present in modern quality management. One of the methods, which in practice are often used to analyze the failure, is the method RCA (Root Cause Analysis). The use of the method allows to determine the cause of the failure and to determine methods to prevent common problems. The aim of the publication is to present the analysis of methods used to analyze the problem of failure and the presentation of the practical implications of its use.

4.2 RCA MTHOOD – ROOT CAUSE ANALYSIS – THEORETICAL BACKGROUND

RCA Method (Root Cause Analysis) is an analysis of root causes, it is an independent and comprehensive method of risk analysis used to study, identify and classify the root causes of incidents in the work. This method is a set of tools, approaches and processes to carry out the analysis of various types of failure and that the result necessary to find the root causes of their formation [7].

RCA is a problem-solving methodology aimed at identifying the sources of problems or important events. The efficiency of this methodology results from the elimination of the actual causes of the problems, in contrast to eliminate only symptoms. By directing corrective measures and adequate resources in the right places, you can expect that the likelihood of a recurrence of the problem will be minimized. It is recognized that complete prevention of recurrence of the cause of the single intervention is not always possible. Thus, RCA is often taken into account, as the iterative process and is often seen as a tool for continuous improvement [1].

RCA analysis assumes that all events are interrelated, action in one area have effects in other areas. By tracking action back, you can find out where the problem occurred. This method can be applied to almost any situation when is a need to analyze in detail the causes of errors [5].

In the method of RCA we could use different methods and tools of quality management. The most commonly used methods and tools in the RCA method include: a FMEA method, 5-Whys, Ishikawa diagram, etc. [3, 4, 6, 8, 9, 10, 11, 12].

4.3 DESCRIPTION AND COURSE OF ACCIDENT

There was a turn off traffic of main pump PG-22 due to tripping of protection from the pressure drop on the suction side of the pump. After finding a lack of feed water flow the staff has taken immediate action seeking to block the withdrawal. Then immediately quenched block using "off the fuel." When the minimum water level was in the drum, the boiler was turn off in emergency. After finding flooding feed pumps on the block 1 through the gaping pipelines block No. 2, the staff started to discontinuation of the block 1. After the completion of activities associated with the discontinuation of the blocks, they proceeded to the vision of the local area of failure.

4.4 ANALYSIS USING 5-WHY METHOD

Using the method of "5 Why" we asked questions, starting with the question "When a failure occurred" sought to the objective pursued, which was to answer the question whether the stop had to exist, what happened, what your problem has consequences for the company, what was the scale of the problem and by asking the question "why?" they sought to situations in which one could find the original cause of the problem. In the analysis we 9 times asked the question "why?" In this way we could to state the source of the problem, which was excessive deformation caused by improper manufacturing process piping prefabrication and knees. In a further analysis, we briefly describe the problem and then ask “why’s” and with answers.

- When there has been a failure?

The failure occurred on the afternoon shift at: 15:38

- What happened?

The feed pump fell out of traffic, then heard a big bang and there was a puff of steam hich indicated a burst pipe water supply.

- What is the scale of the problem?

The problem depends on the emergency unit which will underestimate the power of a national database available capacity.

- What problem it creates a for the company?

Emergency stop of the block for creating workplace downtime 2 power blocks of 125 MW which resulted in repair costs and the need to restore items to the utility. This failure caused the stop of two blocks for a period of 16 days.

Using the question "why?" Awe attempted to get to the root of the problem.

- Why the block fell

Because main pump falled out

- Why main pomp falled out

Because it worked securing system in the pressure drop on the suction side of the pump

- Why worked securing system the pressure drop on the suction side of the pump?

Because it bursted pipe water supply

- Why it bursted pipe water supply?

Since the cracking occurred in the pipeline of a large delamination of the material on

the inner.

- Why cracks occurred?

Because the pipeline had deformation and defects in shape

- Why pipeline had defects in shape?

Since the failure occurred on the section of the pipeline in the area of small change its shape – knee open with a small angle of bending.

- Why the pipeline has such a shape?

Since the place of building it indicates there attached inadequate fastening system.

- Why were installed such a system of mounting?

Since the sixties of the last century is not yet in force provisions limiting the permissible shape pipelines 8%.

- Why, then, the pipeline was damaged?

Because there was excessive deformation, which was caused by improper manufacturing process piping prefabrication and knees.

4.5 ISHIKAWA DIAGRAM

Then they analyzed the failure using the simplified version of the Ishikawa diagram (Fig. 4.1). This allowed to conclude that the factor which most often initiates the crash is a bug in a human-work, determined adverse conditions found in the workplace. As part of the preventive measures taken as a result of the evaluation, particular attention should be paid to recognize the nature of the existing threats and the effectiveness of actions taken, to reduce the effects of existing threats.

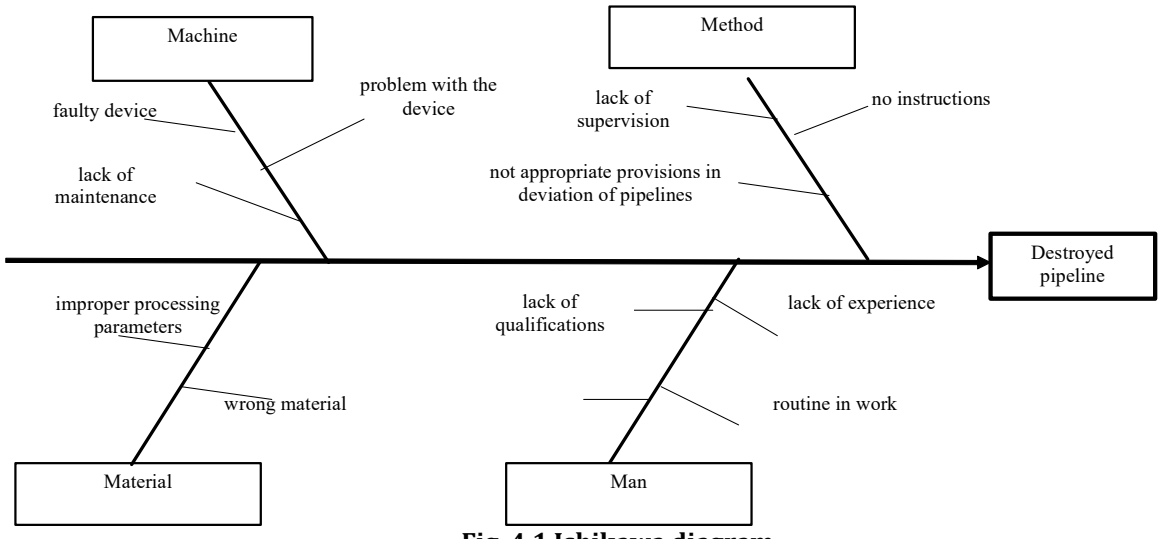

Fig. 4.1 Ishikawa diagram

Source: [2]

4.6 THE USING OF FMEA METHOD

Studying fault by FMEA method assumes that potential drawback was inadequate mechanical properties of the material. The consequences of failure could be a danger to workers in the area of failure as well as the possibility of exposure of

the outside, which could lead to a tragedy. After identifying potential defects should have been applied preventive measures affecting the elimination of defects in the future, including through more frequent and thorough process control and placing additional warning signs on pipelines.

Thanks to the efforts to improve the detection of defects rate risk level cap has been lowered to secure the border, there has been a successful improvement of what benefits the future bring. As part of the simplified version of FMEA analysis we determined the way to mark faults by estimating a point in the three criteria "S", "P", "D", where: Severity „S" It means the consequences for the client, which carries the occurrence of defects; Occurence „P" of defects; Detection „D" is the probability of detection of a defect in the enterprise. With these three criteria determines the ratio of the level of risk **RPN=S x P x D.** Tables (4.1, 4.2), for selection of individual priority numbers were accepted as literature of the subject, in particular [10].

Table 4.1 FMEA Analysis

The potential defect	The potential impact of defects	Potential causes of defects	Preventive measures	S	P	D	RPN
Inadequate strength properties of the material (damaged pipeline)	- danger to the faculty Traffic blocks in case of hidden defects - the need to make amendments - the possibility of exposure of the outside	- improperly conducted technological process	- more frequent and more detailed process control	8	9	1	**81**
		- improper processing parameters	- control processing tools, the correct set of automation tools cutting	8	9	4	**288**
		- lack of product identification	- provide additional information on each pipe	8	9	1	**72**

Source: [2]

Measures taken under the simplified FMEA analysis will allow for improved (reduced) RPN values.

Table 4.2 Preventive measures

Measures to improve the detection of defects				PN
- analysis of the whole process taking into account phenomena occurring during the new process				
- verification vendors along with conducting an audit to check the quality of supplied materials and tools				**6**
- application of new methods of labeling pipelines nameplates				**4**

Source: [2]

4.7 CONCLUSION

Using the tools were carried out the analysis, the result of which could be used to identify the root causes of failure. We determined the source of the problem and used a number of adjustments that prevent the problem in the future. As a result of the method of "5 Why" we answered a series of questions on why the failure

occurred, were reached to the power failure, followed by Ishikawa diagram examined the failure.

Ishikawa diagram was used to help answer the question, which influenced the formation of failure. We found that to a large extent is the man responsible for the creation of the problem, it is often due to a lack of competence of the employee, lack of experience and the stress caused by an unusual situation.

In the last step, using the FMEA method, we analyzed each failure. Knowing the possible causes we could determine preventive measures, which are designed to minimize the occurrence of problem in the future. Calculated cap rate for each described crashes, then determined efforts to improve the detection of defects, in order to be able to identify the problem much earlier and stop the negative effects of failure. As a result of the earlier identified failure through the use of appropriate tools the problem can be reduced in the future.

The results have direct practical implications. The use of the proposed preventive measures such as the analysis of the whole process, taking into account the phenomena occurring during the new process, the verification of suppliers along with conducting an audit to check the quality of supplied materials and tools and the use of new methods of labeling pipelines nameplates will limit the consequences of a failure which in turn will lead to reduce the costs associated with a damaged pipeline.

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APPLICATION METHODS FOR ANALYSIS CAR ACCIDENT IN INDUSTRY ON THE EXAMPLE OF POWER

Abstract: *The paper presents the concept of using the RCA method to failure analysis on the example of power plant. Nowadays, where the speed plays a big role in business, it's not easy to get to the root causes of failure. RCA Method (Root Cause Analysis) is an analysis of root causes, it is an independent and comprehensive method of risk analysis used to study, identify and classify the root causes of incidents establishment in the work. The aim of the publication is to examine the benefits of using the analysis of RCA as a reactive method of identifying the causes, discovering problems and solving them in the company.*

Key words: *RCA analysis, FMEA analysis, Ishikawa diagram, 5-Why method*

ZASTOSOWANIE METODY RCA DO ANALIZY AWARII W PRZEMYŚLE NA PRZYKŁADZIE ELEKTROWNI

Streszczenie: *W publikacji przedstawiono koncepcję wykorzystania metody RCA do analizy awarii na przykładzie elektrowni. W dzisiejszych czasach gdzie pośpiech gra wielką rolę mało kto próbuje dotrzeć do przyczyn źródłowych awarii. Metoda RCA (Root Cause Analysis) jest analizą przyczyn źródłowych, jest ona niezależną i kompletną metodą analizy ryzyka, służącą do badania, identyfikacji oraz sklasyfikowania przyczyń źródłowych zdarzeń zagrażających zakładowi pracy. Celem publikacji jest zbadanie korzyści płynących z zastosowania analizy RCA jako reaktywnej metody identyfikowania przyczyn, odkrywania problemów i ich rozwiązywania w firmie.*

Słowa kluczowe: *analiza RCA, analiza awaryjności, metoda FMEA, diagram Ishikawy, metoda 5-Why*