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THE RISK ASSESSMENT AT THE WORKPLACE OF ASSEMBLY OPERATION

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Abstract

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Risk Assessment Process by FMEA method involve hazard identification, risk assessment and risk control processes and their input is fundamental to a successful EH&S system. This Risk assessment tool follows the general process and requirements of the Health and Safety Risk Assessment Procedure.

Keywords: risk assessment, safety, FMEA, manufacturing process

INTRODUCTION

The Failure Mode and Efect Analysis were design as tool for improving safety in many processes of the automotive industry. A formal FMEA process should be a part of a comprehensive quality system. The FMEA can be effectively used alone in the organization. The result may be that FMEA team focuses on the safety failure modes, missing significant opportunities to improve safety measures in the company that are the biggest problems. Appropriate use of this one can have a positive effect on an EH&S system in organization. The department of safety within the production organization is managing by safety manager, which has responsibility and competence. (Bujna *et al.*, 2011; Földešiová *et al.*, 2013; Kredatusová *et al.*, 2010; Lestyánszka, 2012)

MATERIALS AND METHODS

The quality of safety processes, activities or level of OSH (Occupational safety and health) is directly associated with the occurrence of the risk situations (employees create a dangerous activities, etc.). For these reason, carried out activities, which belong to section of the risk management and are part of FMEA method. This process, includes these points:

- determination of connection in the processes,
- identification of dangers,
- risk assessment,
- the elimination of the risk,
- the acquaint employees with residual risk and inform employees about danger,
- the inspection of corrective measures,
- the lasting mapping of danger and the feedback (Bujna *et al.*, 2013; Hrubec *et al.*, 2009; Matedeis *et al.*, 2006).

The safety FMEA analyzes the risks at the working machines for all workplace carried out by their work content on given processing equipment. The FMEA method describes the actual level of safety in the organization (Tab. I) and simultaneously describes the effectiveness of the proposed measures, together with the residual risks (Tab. II). The first part FMEA method involve the place of employment in organization, describe the process or clear identification of plant, specify the name of working position, a brief description of the process or working equipment, entry of date risk assessment.

I: *The first part of FME, which describes the actual level of safety*

#	Op or Machine Number	Op Description	Hazard Category	Hazard Description	Detection: 1 = Operator Will Detect & Understand 2 = Set Up or Team Leader Will Detect 3 = Safety Walk or Corrective Main. Will Detect 4 = Annual PM or Safety Review Will Detect 5 = Not Detectable	Occurrence	Will event require medical treatment?	Expected LTC Duration (of Months)	Is Event expected to cause: Death or Permanent Disability?	Activity Type: 1 = Poka-yoke 2 = Routine with Documentation 3 =Standard Procedure Written 4 =Non-Standard Task 5 =Routine without Documentation	Risk Priority Number (RPN)	Risk Factor
1.												
2.												
n												

II: *The second part of FMEA, which involves corrective actions and residual risks*

#	Mitigation	Detection: 1 = Operator Will Detect & Understand 2 = Set Up or Team Leader Will Detect 3 = Safety Walk or Corrective Main. Will Detect 4 = Annual PM or Safety Review Will Detect 5 = Not Detectable	Occurrence	Will event require medical treatment?	Expected LTC Duration (of Months)	Is Event expected to cause: Death or Permanent Disability?	Activity Type: 1 = Poka-yoke 2 = Routine with Documentation 3 = Standard Procedure Written 4 = Non-Standard Task 5 = Routine without Documentation	New Risk Priority Number	New Risk Factor
1.									
2.									
n									

III: *Calculation of Risk Factor Matrix*

Probability of occurrence	Non Disabling Injury/ Illness – No Medical Treatment required	First Aid with required medical treatment	Injury with days lost (< 3 month), total recovery	Major injury (lost days > 3 months) and permanent impairment	Death or Total Disability
1 event within 10 years	1	2	3	4	5
1 event within next year	2	4	6	8	10
1 event within next quarter	3	6	9	12	15
1 event within next month	4	8	12	16	20
several times per week	5	10	15	20	25
L = Low Risk	May be tolerated, but should be reduced if possible with minimum investment.				
M = Medium Risk	Should be modified unless unfeasible				
H = High Risk	Not tolerable. Correction is mandatory.				

The risk analysis using this method is based on two steps:

- section initial brainstorming, which contains a description of work tasks and the occurrence of the risk,
- the analysis of risks, which involves corrective actions to reduce risks (mitigation of damages in the form injury, financial damage, …).

The section initial brainstorming determines the risks, which arises at workplace in the following forms:

- mechanical risk,
- electrical risk,
- hazardous materials risk,
- biological risk,
- fire and explosion risk,
- thermal risk,
- ergonomic risk,
- physical strain/stress risk,
- other risk.

The initial brainstorming includes input data from documentation of safety walk, corrective maintenance, standard operating process and the technical documentation of manufacturing equipment.

The second step is risk assessment the above points in the second step:

- detection of risk (who and how detection of the risk),
- occurrence of risk (day, month, quarter, year, decade),
- event requires medical treatment,
- expected LTC Duration (of month),
- is event expected to cause: Death or permanent disability?
- determine the risk priority number,
- determine the level of risk (risk factor),
- it will propose corrective measures to reduce risk.

The risk factor FMEA determinates the level of risk by the following risk matrix (Tab. III).

RESULT

Project Classification

Update of the previous risk analysis in workplace (assembly operation can you see Fig. 1).

Problem Statement, Scope, and Goal

The risk assessment for a new project „Kaluga" is in selected organization. The risk analysis is the part of documentation of pilot run. Elimination risks and proposes corrective measures at the assembly operation in the organization.

CONCLUTION

The FMEA method is best important tool in competitive environment is quality management of production and the risk management, which is important part of quality management system. In the field of assembly we evaluated the high risk factor by the FMEA method, arising from the using handling tools (knife, electrical screwdriver) and sharp objects at the workplace of assembly position. To eliminate these risks, we need to realize next protective measure: The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. We must carry out the control of observance the standard operating procedure. The employees must to use safety gloves, safety shoes. The organization should carry out control of the 5S system at workplace.

1: *The workplace of assembly operation in the organization*

IV: *The partial example the risks analysis by FMEA (The first part of FMEA with the actual risk)*

#	Op or Machine Number	Op Description	Hazard Category	Hazard Description	Detection: 1 = Operator Will Detect & Understand 2 = Set Up or Team Leader Will Detect 3 = Safety Walk or Corrective Main. Will Detect 4 = Annual PM or Safety Review Will Detect 5 = Not Detectable	Occurrence	Will event require medical treatment?	Expected LTC Duration (of Months)	Is Event expected to cause: Death or Permanent Disability?	Activity Type: 1 = Poka-yoke 2 = Routine with Documentation 3 = Standard Procedure Written 4 = Non-Standard Task 5 = Routine without Documentation	Risk Priority Number (RPN)	Risk Factor
1.	Kaluga / Operator 12	The assembling the switch cover	Other Risk	The Employee is not trained persons (the risk from damage component)	2	year	yes	0	no	1	8	M
2.	Kaluga / Operator 12	The assembling the switch power windows	Other Risk	The Employee is not trained persons (the risk from damage component)	2	year	yes	0	no	1	8	M
3.	Kaluga / Operator 12	The assembling next components (in accord type the door panel)	Other Risk	The Employee is not trained persons (the risk from damage component)	2	year	yes	0	no	1	8	M
4.	Kaluga / Operator 12	The assembling of the grand handle	Other Risk	The Employee is not trained persons (the risk from damage component)	2	year	yes	0	no	1	8	M
5.	Kaluga / Operator 12	The assembling the switch cover	Mechanical Risk	The risk from sharp object (The employee use screwdriver at fastening cover)	1	year	yes	0	no	2	8	M
6.	Kaluga / Operator 12	The assembling of the grand handle	Mechanical Risk	The risk from sharp object (The employee use screwdriver at fastening cover)	1	year	yes	1	no	1	6	M
7.	Kaluga / Operator 12	The assembling of the grand handle	Ergonomics Risk	The risk from manual handling / hand tools (the employee is using the electric wrench)	1	year	yes	0	no	1	2	L

V: *The partial example the risks analysis by FMEA (The second part of FMEA with the residual risks)*

#	Mitigation	Detection: 1 = Operator Will Detect & Understand 2 = Set Up or Team Leader Will Detect 3 = Safety Walk or Corrective Main. Will Detect 4 = Annual PM or Safety Review Will Detect 5 = Not Detectable	Occurrence	Will event require medical treatment?	Expected LTC Duration (of Months)	Is Event expected to cause: Death or Permanent Disability?	Activity Type: 1 = Poka-yoke 2 = Routine with Documentation 3 = Standard Procedure Written 4 = Non-Standard Task 5 = Routine without Documentation	New Risk Priority Number	New Risk Factor
1.	The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. The employees use safety gloves, safety shoes.	2	decade	no	0	no	1	2	L
2.	The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. The employees use safety gloves, safety shoes.	2	decade	no	0	no	1	2	L
3.	The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. The employees use safety gloves, safety shoes.	2	decade	no	0	no	1	2	L
4.	The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. The employees use safety gloves, safety shoes.	2	decade	no	0	no	1	2	L
5.	The employee must to use safety gloves he must to adhere general safety instruction in company	1	decade	no	0	no	2	2	L
6.	The employees must working according to standard operating procedure and employees are training about it. The employees must to safety instruction and to use protective measure. The employees use safety gloves, safety shoes.	1	decade	no	0	no	1	1	L

SUMMARY

The risk assessment was being done at the new project in organization of automotive industry in Nitra. In the article we used the FMEA method, which is most important tool in competitive environment in the quality management of production and the risk management like the important part in all components of the system. In the field of assembly we evaluated the high risk factors by the FMEA method, which arising from the using handling tools (knife, electrical screwdriver) and sharp objects at the workplace of assembly position. If we want to eliminate risks, we need to used recommended protective measure.

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