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DEPENDABILITY, SAFETY AND IMPACT OF HUMAN FACTOR

Abstract:
Effective management of task dependability and safety is the necessity of a successful operation of any manufacturing system. No one wants faults to happen, but these events sometimes happen. It is one of the reasons, why engineering work on manufacturing system goes beyond ordinary maintenance and constitutes modification. Such modification involves a change in the plant or process and can introduce a wasting of wherewithal or can cause risks.
At the moment, a lot of problematic areas are encountered during risk evaluation. In this contribution attention is paid to identification and selection of risk and analysis of human factor.

Keywords:
safety management, risk, system or process modification, human factor, hazards

INTRODUCTION

The economic growth of the industry is dependent on the technological advances. The today industry means more complex processes and with very complex and complicated bonds. Because of the system complexity there are a lot of opportunities for faults and mistakes, which are caused by technical errors and by slips of human factors. The human factor is usually the most critical aspect of any manufacturing system with influence of human. For every industrial activity the producer should prevent such faults and to limit their consequences.
At the moment, a lot of problematic areas are encountered during faults reduction. In this contribution attention is paid to identification and selection of the most important risks (the most significant tasks) and analysis of influence of human factor.

HOW THE FAULTS ARISING

Faults do not happen in isolation. Rather, they are the result of a chain of events often culminating with the unsafe acts of operators. The most of faults causations has been at least partially caused by human error.
Howbeit the company management brings about organizational influences, which often lead to instances of unsafe supervision which in turn lead to preconditions for unsafe acts and ultimately the unsafe acts of operators. The order of analysis of unsafe acts of operators is focused at the bottom.

RISK ANALYSIS OF MANUFACTURING SYSTEM

The purpose of the human error analysis is to evaluate the relevant consequences to the system of the human errors identified. To get

error probabilities of the human actions, we must take two steps in judging human reliability: in the first step, there is a collection the qualitative data about the situation to be judged. In the second step, there should be quantitatively evaluated the situation with the help of an HRA. A large number of techniques exist to quantify the probability of human failures. However, a small number of these techniques have actually been applied in practical human error analysis.

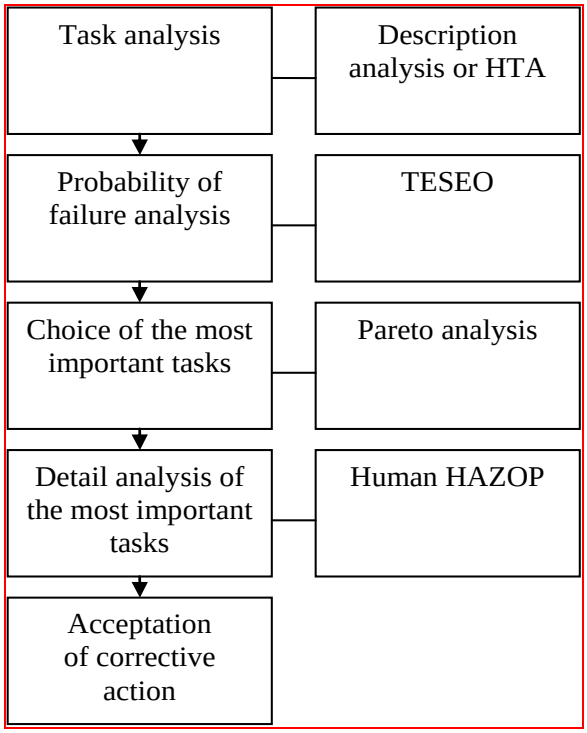

Fig. 1 Sequence of risk analysis of manufacturing system

A detailed analysis of whole manufacturing system with influence of Human factor is not possible (is very time-consuming and benefits doesn't fit the efforts). It is thus necessary to deal only with such risk sources (tasks) the consequences of which are most important. The results of the selection of tasks thus have to be transparent and have to provide an overview on the safety of all the system. From that reason the next step after task analysis and Probability of failure analysis is choice of the most important tasks.
For risk analysis of the most important tasks can be used very good method, which is used in the process industry, Human Factor Method.

TASK ANALYSIS

First of all, it is necessary to build up a description model. It must be generally valid and it must be applicable to all observable tasks. Furthermore, the model must be able to collect all information items on human errors from the events in such a form as is necessary for an analysis because the purpose of a task analysis is to collect information on an operator activity in such a way that this information can be used in a human reliability analysis. A detailed task analysis is required for most of the human error identification techniques and human reliability analysis techniques.
Task analysis describes the demands made on the operator in the tasks he or she has to perform, and examines the resources required and available to enable the operator to meet those demands. A demand is a requirement for the operator to meet some goal which is a partial requirement for achieving a higher goal.
The most significant benefit is that model can provide knowledge of the tasks that the user wishes to perform. Thus, it is a reference against which the value of the system functions and features can be tested. Description Model Method or Hierarchical Task Analysis is the most used analysis.

PROBABILITY OF FAILURE ANALYSIS

Initially, it may be necessary to use expert judgments as a source of the probability estimates. For this purpose can be used TESEO analysis (Tecnica Empirica Stima Errori Operatori), which is a technique used in the field of human reliability assessment, for the purposes of evaluating the probability of a human error occurring throughout the completion of a specific task.
Conclusions from such analyse can then be used to choice of the most important tasks (with using for example Pareto analysis 80/20).
The technique of TESEO is typically quick and straightforward, it is useful in identifying the effects improvements in human factors will have on the overall human reliability of a task.

DETAIL ANALYSIS OF THE MOST IMPORTANT TASKS

When we want to reduce the likelihood of errors occurring within a system improve the overall levels
of dependability, we have to come up with detail analysis of the most important tasks (from the previous paragraph). Ideal for this objective is method Human HAZOP
The method is similar to the well proven HAZOP study for assessing new process design, but focussing on the sequence of actions carried out during a critical tasks.
The key steps in the activity are identified with an experienced operator followed by a team based study to identify potential human failures at each step, using appropriate guidewords.
The key benefits of Human HAZOP are comprehensiveness, systematicness and effectiveness. Human HAZOP ensures that potential deviations from intended task procedure are identified and corrected, process hazards are revealed and actions for necessary process or instrumentation improvements can be planned.

CORRECTIVE ACTION

After Human HAZOP analysis, which gives us the list of arrangements, we have to implement change to cope a weakness identified in a management system. Candidates for preventive action can result also from suggestion of TESEO analysis.
We should try to improve rather than a simple react to identified problems, the preventive action might involve analysis of data, including trend and risk analyses and proficiency-testing results.

CONCLUSION

The prevention of faults is the only possible and rational approach for managed manufacturing system.
Edification for management is needed (especially for medium enterprises). Each employee must have appropriate training, must be well informed about process must be prepare to right and quick reaction. For all that the faults still happen.
The functional dependability and safety management system requires that risk responsibility and accountability will be reduced. The human factor is usually the most critical aspect of any manufacturing system with influence of human factor.
The sequence of risk analysis of manufacturing system contained on the fig. 1 was checked up practically. It demonstrates that the risks associated with failures of critical procedures can be systematically reduced. The method could be applied retrospectively to existing operations or be used during the design stage of new systems.

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