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IMPROVING THE ENVIRONMENTAL PROTECTION SYSTEM OF MINING AND ENERGY COMPLEX BASED ON PREPARATION FOR EMERGENCY RESPONSE

Abstract: *Response in case of emergencies is one of the very responsible work activities in mining and energy complex. The guidelines of ISO 14001 related to preparedness for emergency responses are the basis for the functioning of environmental management system. Management representatives in mining and energy complex have an obligation to establish, implement and maintain procedures to identify potential emergency situations and ways of reacting, as prescribed by the ISO 14001 standard. The main goal of applying planned actions is to reduce the consequences for the quality of the environment and to preserve human health and safety.*

Key words: environmental, mining and energy complex.

INTRODUCTION

Preparation of documents related to the preparedness of emergency response at the open pit mines and thermal power plants starts with the phase of development of existing procedures related to preserving the quality of working and living environment and health and safety of the employees. Drafting of preparedness procedures for emergency response should include procedures for identification of the elements for early detection of incidents, proposed protective measures in case of emergency and corrective actions.

Procedure proposal should be the result of a team work of experts in fields of mining, energy, mechanical engineering, environmental protection, occupational safety and fire protection. Common defining of procedures for emergency response provides an opportunity for a comprehensive preparation for the cases of landslides, spontaneous combustion of coal, burning of explosives, fire in the storage of liquid fuel, explosions, emissions of pollutants, bursting of ash dams, pyralene spills of oil or natural disasters. Defined response procedures should be fully understood by performers of work activities, with a detailed plan of work tasks and the evacuation plan. Employees, based on studied procedures, should be able to report the accident, perform alerting, notification, and internal communication. Leader in the department for emergency response situations should alert the workers responsible for implementation of the monitoring system on the possible need for continuous monitoring of the environmental quality parameters. The aim is to prepare and adopt procedures for preparedness of emergency responses.

PROCEDURE FOR EMERGENCY RESPONSE

Drafting of procedures for preparedness of emergency responses implies a clear idea of reaction and sequence of activities, which are the responsibility of all employees. It is based on methods for identifying potential emergencies and accidents [1], emergency procedures defining the necessary protective measures and actions of procedure analysis and acting in real situations. Table T. 1 presents display of guidelines of ISO 14001, which can be applied in an integrated management system of mining and energy complex. Applying the realization approach within the process of environmental management system, developed on the basis of ISO 14001 guidelines, is presented in table T.2 and T.3. Management representative for environmental protection and head of environmental protection have a task to: consider the significant environmental aspects, legal requirements and other regulations, analyze previous incidents, respond to the incident situations and effects on the environment [2,3]. The sequence of planned work activities, within the framework of preparedness for emergency response is presented in Figure 1. Management representative for environmental protection prepares and periodically checks the plan of emergency response [4], based on the identification of elements [5] for early detection of the incident, the proposal of preventive measures and defined reaction procedures, which are showed in Figure 1.

Table T.1 *Guidelines of ISO 14001 standards in the system of environmental management and energy transformations in mining and energy complex*

Policy
-Environmental Protection Policy
Planning of mining and energy management system
-The exercise of work activities -Identification of environmental aspects -Identification of mining and energy complex impacts
General and specific objectives of environmental protection and mining and energy complex programs
-Environmental management system programs -Internal audits of application of prescribed measures for environmental protection -Training of workers for environmental protection
Mining and energy complex documentation in the area of systems management
-Control of environmental protection systems -Procedures for emergency situations response -Documents related to the application of protective measures in mining and energy complexes -Document management
Reviewing management system improvements
-Reviewing of environmental management system in mining and energy complex -Identifying areas for improving the functioning of the management system -Taking measures to improve the environmental management system

Table T.2 *Requirements for the environmental management system in the mining and energy complex, general requirements, environmental policy and planning phases in accordance with the requirements of ISO 14001*

ISO 14001: 2004	Designation
Requirements for the environmental management system in the mining and energy complex	**4**
General requirements	4.1
Environmental policy in the mining and energy complex	4.2
Planning	4.3
Implementation and operation	4.4
Checking	4.5
Review	4.6

Table T.3 *Realization - the second phase of planning and ISO 14001 requirements*

ISO 14001: 2004	**Designation**
D (Do) - Realization - Implementation and operation Application of adopted communication procedures, documenting, document management, operational control and emergency response by the workers and representatives of the environmental protection department in the mining and energy complex	**4.4**
Resources, roles, responsibility and authority of the representatives of environmental protection department in the mining and energy complex	4.4.1
Competence, training and awareness of workers in the environmental protection department of the mining and energy complex	4.4.2
Communication of environmental protection department representatives with the management and employees of mining and energy complex	4.4.3
Documentation relating to the application of protective measures in mining and energy complexes	4.4.4
Control of documents	4.4.5
Control of operations (Operational control) for implementation of environmental protection measures in mining and energy complexes	4.4.6
Emergency preparedness and response	4.4.7

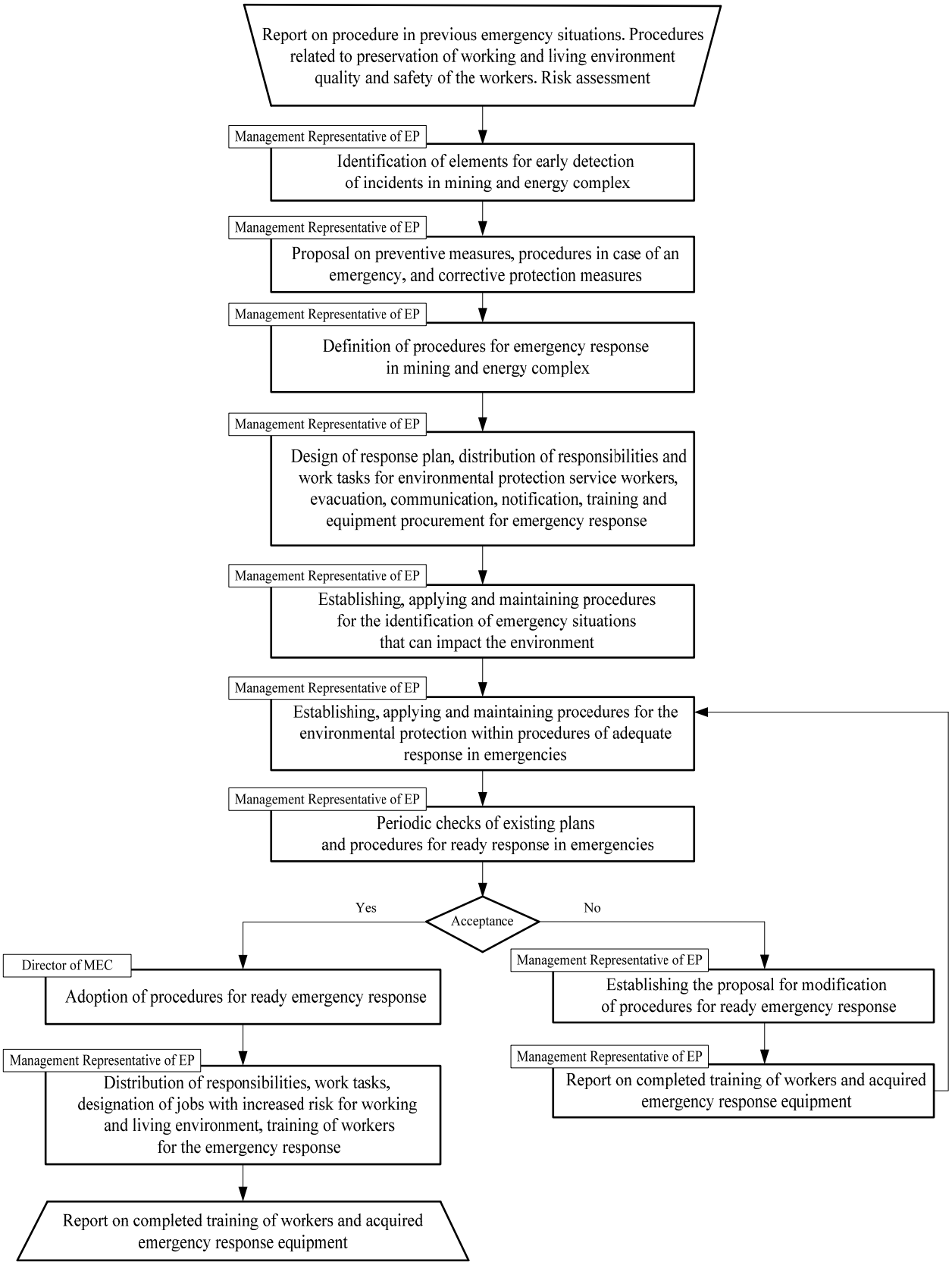

Figure 1 *Flowchart of drafting and implementing the program of preparedness for emergency response*

The director of mining and energy complex adopts the procedure for preparedness of emergency response. Identification of procedures to react and defining the necessary documentation, from the report on responding to the response plan, is presented in Figure2.

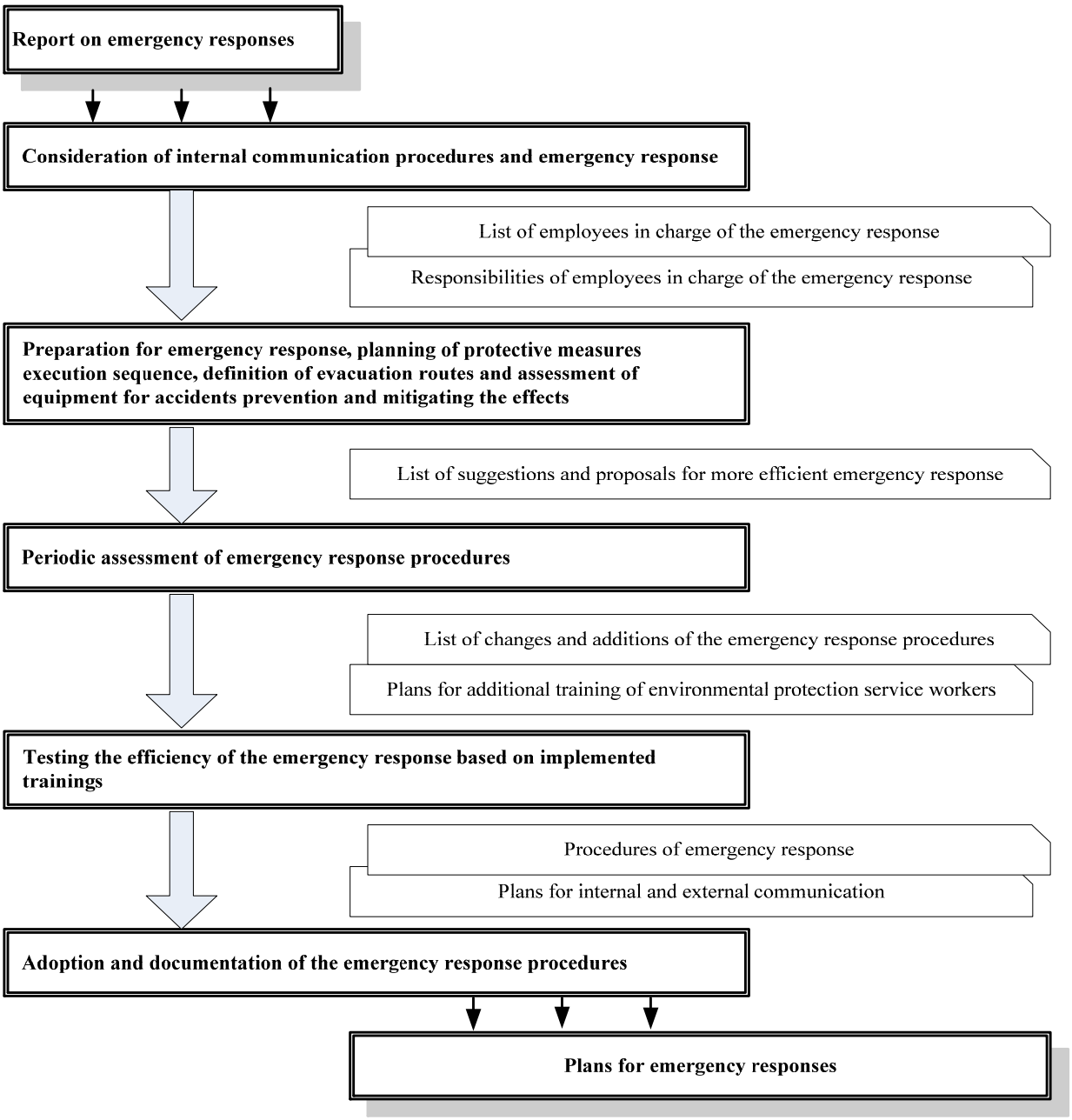

Figure 2 *Diagram of environmental management system requirements for identifying and documenting procedures for preparedness of emergency response, in accordance with ISO14001*

Figure 2 represents the requirements of the ISO14001 relating to the identification and documentation of procedures for the preparedness of emergency response. The result of considering work activities carried out in the previous period and method of implementation of internal communication is reflected in the amended lists of employees in charge of emergency response and employees' responsibilities. The list of suggestions and proposals for a more effective response in case of emergency situations should be established on the basis of considerations of equipment availability, the order of execution of work activities and evacuation routes.

Periodical review of the adopted procedures and efficiency of the response enables amendments and changes to the list of response procedures and plans for additional training for workers, plans of internal and external communication and emergency response plans.

Communication of workers responsible and trained for emergency situations with the head of the environmental protection service, management representative for environmental protection and management representative for the functioning of environmental management system, police service, fire services, emergency medical services and services for emergency situations should be planned and organized in detail. External services and organizations react in case of emergencies or participate in rehabilitation of the consequences of emergency situations.

In the analysis of the procedures applied during the pilot exercises, one should pay attention to: the availability and accuracy of equipment for emergency response, accuracy of the information and alert system.

Checking of preparedness procedures for the emergency response can be performed on the basis of the proposed checklist in table T.3.

Table T.3 *Verification checklist for procedures of preparedness and emergency response in mining and energy complex within the environmental management system*

Questions related to auditing procedures of preparedness and emergency response in mining and energy complex within the environmental management system	**Reply**	
Did the management of the mining and energy complex establish procedures for the identification of possible emergencies that may threaten the quality of the environment?	Yes	No
Did the management of mining and energy complex consider the link of emergency response to the adopted general and specific environmental goals?	Yes	No
Did leadership of mining and energy complex implement and maintain procedures for the identification of possible emergencies that may have an impact on the environment?	Yes	No
Is there any documentation on notifying workers of mining and energy complex on the responsibilities, duties and procedures that should apply in case of emergencies?	Yes	No
Have workers in mining and energy complex successfully mastered the training on response in case of emergencies?	Yes	No
Are workers responsible for the emergency response in mining and energy complex competent enough for the application of urgent protective measures?	Yes	No
Do workers in the emergency response service have the necessary equipment to respond when needed?	Yes	No
Are the conclusions drawn after completion of the exercise discussed and adopted in the new proposal of procedures for emergency response?	Yes	No

Efficiency evaluation of plans and procedures should be performed through periodical test exercises and by simulating emergency situations, and test results should be used for the improvement and periodic changes to procedures and plans.

CONCLUSION

A key issue relates to the existence of cooperation between representatives of management in mining and energy complex and manager of the department of environmental protection with the operators, because the exchange of useful information can play a significant role in the prevention of unimaginable consequences.

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BIOGRAPHY

Jelena Malenović was born in Knjaževac, Serbia, in 1974.
She received the Diploma in Environmental Engineering and the Master of Technical Sciences Degree in same field from the University of Nis, Faculty of Occupational Safety in Niš.
Her main areas of research include environmental protection, environmental management, air quality, environmental safety, etc.
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UNAPREĐENJE SISTEMA ZAŠTITE ŽIVOTNE SREDINE RUDARSKO-ENE-RGETSKOG KOMPLEKSA BAZIRANO NA PRIPREMI ZA REAGOVANJE U VANREDNIM SITUACIJAMA

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Apstrakt: *Reagovanje u slučaju vanrednih situacija spada u veoma odgovorne radne aktivnosti rudarsko-energetskog kompleksa. Smernice standarda ISO 14001 vezane za pripravnost reagovanja u vanrednim situacijama predstavljaju osnovu za funkcionisanje sistema upravljanja zaštitom životne sredine. Predstavnici rukovodstva rudarsko-energetskih kompleksa imaju obavezu da uspostave, primenjuju i održavaju postupke za identifikaciju mogućih vanrednih situacija i načina reagovanja, kao što je i propisano standsardom ISO 14001. Cilj primene planiranih postupaka je da se smanje posledice po kvalitet životne sredine i očuva zdravlje i bezbednost ljudi.*

Ključne reči: životna sredina, rudarsko-energetski kompleks.