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DEVELOPMENT OF THE EXPERT SYSTEM MODEL BASED ON FUZZY LOGIC FOR ASSESSMENT OF METHANE AND DUST EXPLOSIONS RISK IN COAL MINES

The paper is devoted to the creation of methane and dust explosion risk assessment method for coal mines for implementation of the risk-oriented approach at the organization of supervisory activities. And also for solving the information support problems at managerial decisions making procedures, which aimed to reducing the probability of methane and dust explosions in underground workings of coal mines. The premises for transition to the dynamic model of the risk-oriented approach are indicated. The information about dynamics of fatal injuries coefficient for underground coal mining for the last 10 years is provided. The of expert system model, based on fuzzy logic, is proposed. The model is designed for risk assessment in condition of information uncertainty in case of incompleteness or lack of reliable information about the impact of risk factors on the mine safety level. On the basis of the investigation of accidents materials in Russia in 2006-2016, the structural scheme of the expert system was created. Input parameters of model are described. The Mamdani's fuzzy logic inference knowledge base was created with using of a MATLAB Fuzzy Logic Toolbox computing environment for taking into account the influence of a complex of geological, technical and subjective factors on the risk of methane and dust explosions. The developed model allows to rank the coal mine sites according to the explosions risk levels, which was proved by processing of the initial data sample. The developed model can be integrated into multifunctional safety systems to assess the risk of various types accidents in real time.

Keywords: coal mine, accident, underground explosions, risk assessment, risk-oriented approach, expert system, fuzzy logical inference model.