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ABSTRACTS

THE TECHNIQUE FOR REGISTRATION OF INDUSTRIAL AND ECOLOGICAL SAFETY WITH TECHNICAL-ECONOMIC SUBSTANTIATION OF HIGHLY-RISKY OBJECTS OF TECHNOSPHERE

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Enterprises of raw material and fuel-energy industry branches (oil and gas processing, chemistry, railway and pipeline transportation of gas and carbon dioxides, storage of dangerous explosive, flammable and toxic products, etc) are categorized as potentially dangerous, and their operation is related with social-ecological and economic risk.

Operation experience of such enterprises shows exceptional importance of questions of technical-economic substantiation of design and technological solutions, with consideration of objective criteria of enterprises' safety. In order to obtain the criterion of solution's comparison and optimization, a method of comparison is proposed. It is based on comparison of several variants, differing in capital costs, variable expenses and insurance payments in case of accidents and emergency situations. The technique has been developed for finding optimal solutions, which provide acceptable safety level, based on extraction of two components: declared expenses, essential for achievement of required solution, and summarized payments in case of accidents and emergency situations (integrated risk). The value of second component (integrated risk in value numeration) is researched in detail. The model of integrated risk of potentially dangerous enterprises of technosphere is examined (as a superposition of risks of social, material and ecological damages, possessing random nature and dependent on potential risk). For determination of social risk of lethal outcomes the human life is assessed in value expression. Life saving cost (LSC) is used in place of this value. Probability characteristics of potential risk of toxic, demolition and heat affection are studied in detail. Results of real affections are approximated by standard functions of random values distribution in Weybull laws. Considerable amount of attention is paid to questions of risk mapping. Mapped risk allows

to see well enough the character of potential risk distribution and zones of increased danger on the map. This basis can be used for making effective engineering and managerial decisions for minimization of banning influence by way of comparing economic efficiency of reviewed variants. Stated approaches were tested in real conditions of functioning of large potentially dangerous industrial enterprise, producing organic synthesis products. They allowed to conduct technical-economic substantiation and optimization of engineering solutions in placement of propylene and ammonia storehouses.

METHODOLOGICAL PECULIARITIES OF INTEGRATED RISK EVALUATION IN PIPELINE TRANSPORTATION ACCIDENTS

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Methods of analysis and quantitative evaluation of integrated risk of Togliatti-Odessa Transcontinental ammonia pipeline, situated in 5 regions of RF, are considered. Analysis and quantitative evaluation of integrated risk are carried out in connection with industrial safety declaration of OAO «Transammiak». The main risk factor of ammonia pipeline operation is the existence of certain probability of accident with emission of ammonia into the environment and possibility of toxic contamination of the objectђs personnel and population of towns and cities, situated along the main pipeline.

The index of ammonia pipeline safety level is integrated risk of full damage R(D), inflicted on population and environment from the whole complex of possible accidents on a section of main ammonia pipeline. Considering the peculiarities of ammonia action, two components of integrated risk are extracted: social risk and ecological risk. The quantitative evaluation of integrated risk consists of three stages.

First stage. With a help of analysis of the sequence of events, which transform danger into an emergency situation, and using the database on known accidents at the investigated object and those analogous to it, possible reasons for origination and development of a certain class of accidents are discovered.

Second stage. Quantitative evaluation of risk of accidents and emergency situations on the adjacent territory is performed. The frequency of danger realization is determined using methods of engineering approach to risk evaluation. The probability of formation of certain levels of fields of affecting factors is calculated along with the probability of the fact that the above mentioned field levels will cause certain damage: death of people, breaking equilibrium conditions of ecosystems. Non-projected accidents, caused by external destructive influences and leading to guillotine rupture of pipeline with considerable ammonia leaking form the main class of accidents on the reviewed ammonia pipeline.

Third stage. Safety provision and risk reduction measures for population and adjacent territory are analyzed.