

## TO THE ISSUE OF RISK MANAGEMENT IN COAL PRODUCTION

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## ДО ПИТАННЯ КЕРУВАННЯ РИЗИКАМИ ВУГІЛЬНОГО ВИРОБНИЦТВА

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## К ВОПРОСУ УПРАВЛЕНИЯ РИСКАМИ УГОЛЬНОГО ПРОИЗВОДСТВА

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**Annotation.** In the last quarter of the twentieth century, a new technical term appeared in world practice - risk, with its various manifestations: technical and industrial, emergency, aerological, environmental, individual, collective, complex, etc. New forms of safety assessment preceded the public's understanding of the need to improve approaches to its assessment in such a way, which led to great differences in the interpretation of risk-oriented technology for safety management of dangerous production objects (DPO). In the article, the peculiarities of coal production in modern Ukraine are considered in terms of labor protection with its drawbacks, and a conclusion is made that the way out for the coal industry from the situation is to reduce risks of various types, which increases the safety of coal workers. It is noted that the terms «risk» and «danger» are not synonyms. Safety does not mean absence of unacceptable risk. A term «risk management» requires additional discussion and elucidations. Based on the terminological foundations of management theory, management is a process which includes development of alternative control influences, making of decisions by choosing the most effective ones and the implementation of control influences to achieve the desired results of the controlled object. The Risk, as (a) measure of danger of an object, is not an object, and therefore cannot be an object of control. Risk cannot function, and it has no results of functioning. Therefore, it is impossible to manage risk as such. The term "risk management" is a market phrase it is a mistake to consider risk in the form of an independent entity (because risk is only a rate of danger). It is necessary to manage work the safety of the site as a whole, and not its features and parameters, one of which is the risk. Unfortunately, in practice, we have to observe how "risk is managed" by unscrupulous authors of industrial safety declarations, as well as by hasty interpreters in their one-sided and biased reports in some media. The risk of a man working in DPO needs further and more thorough researches.

**Keywords:** acceptable risk, risk management, increase of safety, quantitative estimation of risk, cost of human life

Recently, the state of occupational safety at dangerous production objects (DPO), which fully include the enterprises of the coal industry of Ukraine, remains difficult. The situation is complicated by the fact that the transition to market forms of management requires the creation of new, different from the Soviet planned economy, approaches to regulatory and legal support of production. The question arises: how, given the recent changes in the country's economy, to achieve significant changes in the current situation and increase the efficiency of work to ensure safe working conditions?

In the last quarter of the twentieth century in world practice, a new technical term - risk, in addition in various manifestations: technical and production, emergency, aerological, ecological, individual, collective, complex, etc., was appear.

New forms of safety assessment preceded the public understanding of the need to improve approaches to its assessment in such a way that caused great differences in

the interpretation of risk-oriented technology for managing the safety of DPO.

Here the emphasis is on safety, not on risk. Let's try to find out the difference.

Features of coal production of modern Ukraine are as follows:

a) all dangerous production objects (DPO) which can cause accidents and injuries to workers are known today;

b) most accidents and damages occur as a result of or under the significant influence of the "human factor";

c) available tools and ways to reduce the probability of harmful effects of all known DPO are improved;

d) the threat of harmful effects of any DPO varies both over time and in space - during the operation of existing mine workings and during the development of mining operations;

e) usually, company has in advance sufficiently complete information about the potential danger for any given moment of time;

f) the company sets clear responsibilities of its workers for ensuring safety of their work (they are familiar with accident prevention and response plans, rules of conduct in emergencies, etc.);

g) the necessary standards and procedures to ensure the safe operation of equipment and materials are available;

i) training of employees of the enterprise on safe methods of work and safety rules is carried out;

k) the coal industry has transited from sectoral management to functional, which is expressed in the decentralization of production management;

l) the form of ownership of enterprises has changed;

m) restructuring and closure of particularly unprofitable mines is carried out;

n) a number of coal enterprises are moving to more productive equipment and technology; there are difficulties in the transition period, including those related to the safety of work.

At the same time:

a) there is a forced reluctance of enterprises to take safety measures (although there is an understanding of this), because it affects the cost of production and productivity. However, safety measures are in some cases ineffective, which in turn increase reluctance to use them;

b) there are no effective economic incentives to improve the safety of enterprises;

c) uniform requirements and measures aimed at solving certain safety issues may not be equally effective in different mining and geological, mining and technical and organizational and economic conditions of work. Therefore, the use of strict uniform safety regulations by supervisors can hardly be effective. This is evidenced by both domestic experience and the experience of most developed coal-mining countries:

d) specialists have extensive information on potential hazards in coal production. At each enterprise, such information should be accumulated, summarized, analyzed in a timely manner and used in production management. Information on potential hazards should come not only from various technical sources, but also be the result of observations of employees and supervision;

e) during mining operations, the transition from normal to unsafe conditions in most cases requires the management of enterprises to make voluntary decisions to ensure safety. Such decisions are often not made or are made, but are not implemented due to existing contradictions between the desire to maintain or increase production efficiency and the need to "slow down" when taking safety measures;

f) analysis of accidents at work shows that the necessary technologies and equipment to reduce risk in enterprises are available, but are not used effectively enough;

g) given the complexity of mining and the variety of potential hazards, safety can only be effectively addressed with an appropriate occupational health and safety management system.

The way out of the situation that has arisen in the coal industry is to reduce the risks of various types, which achieves increased safety of workers in the coal industry.

As experience has shown, the most successful is to determine *the risk of an accident* as a measure of danger, which characterizes the possibility of an accident at the DPO and the corresponding severity of the consequences. In our case - the probability of injury to the worker or an accident due to the influence of some dangerous factor, such as the risk of methane explosion, the risk of injury due to rock collapse, etc. [1]. The risk cannot be zero - all coal companies to some extent belong to the DPO. *Acceptable accident risk* - the values of accident risk, established by normative documents, the excess of which creates a risk of accident at the DPO.

At the same time, the *danger of an accident* is the possibility of causing harm to people, property and/or the environment as a result of an accident at an DPO. It is due to the presence of hazardous substances in the DPO, energy and mass transfer properties of technological processes, errors in design, construction and exploitation, failures of technical devices and their systems, as well as uncalculated (beyond) external natural, man-made and anthropogenic impacts on DPO. *Accident threat* is an actualized danger of an accident that directly characterizes the pre-emergency state of the DPO. It occurs under conditions of unjustified deviations from the requirements of industrial safety, as well as in cases of approach of external man-made, anthropogenic and natural influences to the maximum design loads.

The terms "risk" and "danger" are not synonymous. Safety - there is no lack of unacceptable risk.

Another example of poor wording is "complex risk" [2]. Some researchers consider it a joint manifestation of natural, social and man-made emergencies. But such a definition not only contains an explicit tautology (risk is a manifestation of risk), but also unsuitable in accordance with the requirements of ISO 704: 2000: in general, danger is usually understood as the possibility of causing some harm to potential victims by a source of danger, and risk - a measure of danger. No risk, including a complex one, as a measure of danger, cannot be "manifested" (the measure is only selected, established, compared, determined, etc.). In this context, the danger may manifest itself in the form of some damage, i.e. such a change in the structure or other characteristics of the object, which makes it worse. It would be

more correct to write down the definition in the form: "complex risk - a measure of the joint manifestation of the dangers of emergencies of natural, man-made and social nature."

However, even in such a "smoothed" form, the sign of risk - "complex" - is artificially contrived and redundant. After all, real dangers always exist together and without the additional condition of "complexity". From a scientific and practical point of view, it is difficult to imagine a "non-complex" risk.

The term "risk management" needs further discussion and clarification. Based on the terminological foundations of control theory, management is a process that includes the development of alternative control effects, decision-making on choosing the most effective and the implementation of control effects to achieve the desired results of the controlled object. The object is considered to be selected by some rules part of the world, which is the subject of knowledge and practice. The value that characterizes the property of the object, the value of which is determined by a qualitative or quantitative scale, is called, respectively, the feature or parameter of the object.

Risk, as a measure of the danger of an object, is not an object, and therefore cannot be an object-volume of management. Risk cannot function, and it has no results of functioning. Therefore, it is impossible to manage risk as such. The phrase "risk management" is opportunistic, it is a mistake to look for risk in the form of an independent entity (after all, risk is only a measure of danger).

It is necessary to manage the safety of work on the site, not its features and parameters, one of which is the risk. Management of safety of works at the enterprise should include:

- a) generalization and analysis of all available information on the existing hazardous factors in the production and the degree of their danger;
- b) timely adoption of effective measures to reduce risk, based on its assessment;
- c) control over the measures taken to ensure the safety of the enterprise and reduce the risk of its operation;
- d) constant updating of risk assessment depending on changes in the conditions of work;
- e) adjustment of measures taken to reduce risk in order to increase their effectiveness;
- f) ensuring the planning of risk reduction in the workplace.

There is no place for risk management in this list. Control involves varying, increasing or decreasing the value of a parameter; the risk must only decrease, no economic benefits can justify its increase. However, this mistake is made by a number of researchers. In [3] there is even a diagram of the safety management system at the enterprise, the central block of which is the "Risk Management Plan", which is developed and controlled by Derzhgirtechnaglyad! But we have already found out that "risk" and "danger" - the concepts are not identical: the first - quantitative, the second - qualitative. However, the same author notes below that risk reduction measures are still being taken on the basis of this plan. And then it's about safety management. Measures in this regard look more convincing:

- a) regulatory and methodological support at the enterprise, which determines the scope of such management;
- b) assessment of the efficiency and planning of enterprises to ensure safe working conditions, "external" control of the degree of risk (*you can control the risk - Authors*) of the enterprise;
- c) the use of appropriate measures to influence the case of work with a degree of risk that exceeds the normative values;
- d) definition of strategic directions of improvement of safety of works in the coal industry.

Accordingly, in terms of various forms of ownership and independent management of enterprises, the system of occupational safety and health management (here the terminology is already used correctly, such systems existed in the USSR in a planned economy and exist today) should:

- a) correspond to the risk of injury to the worker or the occurrence of an accident that changes both in space and time;
- b) allow the effective use of all available capabilities of various technologies, methods and techniques for safety, as well as the use of new technologies when necessary and possible;
- c) comply with the methods of detection and forecasting of hazards used, taking into account changes in the reliability of the assessment in different mining and geological and mining conditions;
- d) ensure the collection and analysis of information on existing and emerging industrial hazards from various sources;
- e) guarantee control of the process of hazard identification and risk assessment, the fact of conducting mining operations in hazardous conditions, as well as the collection and analysis of information;
- f) ensure the possibility of control for the purpose of quality implementation of all planned safety processes, as well as risk mitigation measures;
- g) guarantee compliance with relevant procedures and standards for the use of equipment and materials;
- i) provide training for workers in safe work practices and safety rules at work;
- k) guarantee the ability to make decisions on disciplinary issues, which in turn must be objective and flexible from a safety standpoint.

That is, it can be considered definite: acceptable risk cannot be managed. But some reduction needs to be achieved, and this needs to be quantified so that it is perceived by the community and understood. An approach based on "number magic" is currently used for this purpose [4]. The average citizen, seeing the entry "Acceptable may be the risk of a dangerous situation  $1 \cdot 10^{-x}$ ", calms down: because  $x$  in this expression with a sign "-" means millionths or billions of fractions. Risk  $10^{-6}$  could mean the death of one person in a hazardous environment per million. That is, it may not apply to me. And risk management, which is reduced to shifting the degree of risk from  $10^{-6}$  to  $10^{-7}$ , significantly increases the level of industrial safety.

But is everything so simple?

Carrying out "risk management" by varying the values of " $1 \cdot 10^{-x}$ ", experts calm down in their virtual calculations of risks to justify safety; thereby calming the public. There is an agreement to accept the danger by the risk takers, which is usually wrongly called "acceptable risk". It is alleged that a person feels safe in a condition of " $10^{-6}$ ". With such a legitimization scheme, the state of the source of danger is not important at all. It is important to reassure the risk taker by legalizing him through "authority": the Western standard (which, due to the same "human factor" of compilers is hardly an authority), the influential figure of risk manager (see previous comment), state supervisory services and domestic laws. and standards (not always perfect and tested by experience). As a rule, the approving instance is not clear enough about where the acceptable standard " $10^{-6}$ " came from in Ukraine; it is enough that he is "contemptuously small." To the first serious accident, which breaks these ideas. But even then there is a "loophole": the risk can be replaced by " $10^{-5}$ ", it is also negligible. Perhaps this is acceptable for production efficiency. But for occupational safety? Replace the acceptable death of one person with the death of ten ?! Risk " $10^{-6}$ " is suitable for suggestion, not for explanation.

Some experts suggest the introduction of a financial measure of human life [5]. A large number of sociologists and scientists do not agree with this: human life is sacred and financial transactions are unacceptable. However, in practice, there is inevitably a need for such an assessment precisely for the safety of people, if the question is: "How much money must be spent to save lives?". And this question is rather philosophical. For example, in the United States of America, human life is estimated at 650 thousand to 7 million dollars. But can the family of the deceased miner receive such money? And on the other hand, will she agree to exchange for these money the life of a father or a groom ?!

In practice, unfortunately, we have to observe how the risk is "managed" by unscrupulous developers of industrial safety declarations, as well as hasty interpreters in the biased reports of some mass media. The risk of a person working for an DPO needs further and most thorough research.

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**Анотація.** В останній чверті ХХ століття у світовій практиці з'явився новий технічний термін – ризик, до того ж у різних проявах: технічний і виробничий, аварійний, аерологічний, екологічний, індивідуальний, колективний, комплексний тощо. Нові форми оцінки безпеки випередили розуміння суспільством необхідності вдосконалення підходів до оцінки її таким чином, що і спричинило великі розбіжності у трактуванні ризик-орієнтованої технології керування безпекою небезпечних виробничих об'єктів (НВО). У статті розглянуто особливості вугільного виробництва сучасної України стосовно охорони праці, існуючі недоліки і зроблено висновок, що вихід з ситуації, яка створилась у вугільній промисловості, полягає у зниженні ризиків різних типів, чим і досягається підвищення безпеки працівників вугільної промисловості. Наголошено, що терміни «ризик» і «небезпека» не є синонімами. Безпека – не є відсутність неприпустимого ризику. Термін «керування ризиком» потребує додаткового обговорення і роз'яснень. Якщо виходити з термінологічних основ теорії керування, то керування – це процес, що включає вироблення альтернативних керуючих впливів, прийняття рішень щодо вибору з них найбільш ефективних і реалізацію керуючих впливів з метою досягнення бажаних результатів функціонування керованого об'єкту. Ризик, як міра небезпеки об'єкту, не є об'єктом, і тому не може бути об'єктом керування. Ризик не може функціонувати, і у нього немає результатів функціонування. Тому керувати ризиком як таким неможливо. Словосполучення «керування ризиком» - кон'юнктурне, помилково шукати ризик у вигляді самостійної сутності (адже ризик – лише міра небезпеки). Керувати необхідно безпекою робіт на самому об'єкті, а не його признаками і параметрами, одним із яких і є ризик. На практиці, на жаль, доводиться спостерігати, як «керують ризиком» недоброчесні розробники декларацій промислової безпеки, а також поспішні інтерпретатори у попереджених і тенденційних повідомленнях деяких засобів масової інформації. Ризик людини, що працює на НВО, потребує подальших і найретельніших досліджень.

**Ключові слова:** прийнятний ризик, керування ризиком, підвищення безпеки, кількісна оцінка ризику, вартість людського життя

**Аннотация.** В последней четверти ХХ века в мировой практике появился новый технический термин – риск, к тому же в разных проявлениях: технический и производственный, аварийный, аэрологический, экологический, индивидуальный, коллективный, комплексный и т.п. Новые формы оценки безопасности опередили понимание обществом необходимости совершенствования подходов к оценке ее таким образом, что и повлекло большие разногласия в трактовке риск-ориентированной технологии управления безопасностью опасных производственных объектов (ОПО). В статье рассмотрены особенности угольного производства современной Украины относительно охраны труда, существующие недостатки и сделан вывод, что выход из создавшейся ситуации заключается в снижении рисков различных типов, чем и достигается повышение безопасности работников угольной промышленности. Отмечено, что термины «риск» и «опасность» не являются синонимами. Безопасность – не есть отсутствие недопустимого риска. Термин «управление риском» требует дополнительного обсуждения и разъяснений. Если исходить из терминологических основ теории управления, то управление – это процесс, включающий выработку альтернативных управляющих воздействий, принятие решений относительно выбора из них наиболее эффективных и реализацию управляющих воздействий с целью достижения желаемых результатов функционирования управляемого объекта. Риск, как мера опасности объекта, не является объектом, и поэтому не может быть объектом управления. Риск не может функционировать, и у него нет результатов функционирования. Поэтому руководить риском как таковым невозможно. Словосочетание «управление риском» - конъюнктурно, ошибочно искать риск в виде самостоятельной сущности (ведь риск –

лишь мера опасности). Управлять необходимо безопасностью работ на самом объекте, а не его признаками и параметрами, одним из которых и является риск. На практике, к сожалению, приходится наблюдать, как «руководят риском» недобросовестные разработчики деклараций промышленной безопасности, а также поспешные интерпретаторы в предвзятых и тенденциозных сообщениях некоторых средств массовой информации. Риск человека, работающего на НПО, нуждается в дальнейших и самых тщательных исследованиях.

**Ключевые слова:** приемлемый риск, управление риском, повышение безопасности, количественная оценка риска, стоимость человеческой жизни

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