

PAPER • OPEN ACCESS

## Social aspects of industrial safety: current challenges

To cite this article: I V Plyushch *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **483** 012098

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the [collection](#) - download the first chapter of every title for free.

## Social aspects of industrial safety: current challenges

I V Plyushch<sup>1,2</sup>, V I Ruzanov<sup>2</sup>, L M Safiulina<sup>3</sup>, N V Vysotskaya, T N Yudina

<sup>1</sup>Reshetnev Siberian State University of Science and Technology, 31 “Krasnoyarskiy Rabochiy” pr., Krasnoyarsk, 660037, Russian Federation

<sup>2</sup>Federal State Educational Institution of Higher Professional Education Siberian Federal University 660041, 79 Svobodny pr., Krasnoyarsk, 660041, Russian Federation

<sup>3</sup> Russian state social University 4 Wilhelm Pieck St., bld. 1, Moscow, 129226, Russian Federation

reft@inbox.ru, ruvich@yandex.ru, luzia@inbox.ru, vysotskaya25@yandex.ru, ioudinatn@mail.ru

**Аннотация.** The paper discusses the importance of social aspects in industrial safety. Specifics of the Russian society, manifested in culture and set of population’s values cause underestimation of social constituents when breaking labor safety rules. At the same time, industrial infrastructure differs significantly from the environment, so safety in these conditions tends to change its essential characteristics. Governmental measures aimed at the improvement of industrial safety are insufficient. According to the study it is important to consider a technological environment as a field of human activity.

### 1. Introduction

Anthropogenic environment came into being as a protection tool aimed at the improvement of human safety. People started confronting with new hazards because of technological advancements. These days, the issue of human interrelation with the anthropogenic environment is thought to be the major area of human fears. As the society develops, an individual tends to realize deeper the specific character of human interaction with the anthropogenic environment. Here, this interaction can be characterized from an entirely new point of view, furthering, as a result, changes in worldview concepts of the mankind. In the 20<sup>th</sup> century issues of ecology had a breakthrough effect on the worldview, in the early 21<sup>st</sup> century problems of safety and interrelation with the anthropogenic environment are of high importance. Undoubtedly, various kinds of hazards and risks were an integral part of the entire evolution of human civilization. However, understanding of essential characteristics of hazards and identification of system safety characteristics have been center-stage only in recent years.

Safety is supposed to be one of characteristics and criteria of function and development in social, economic, technical, environmental and biological systems. To date, safety and security are key issues for an individual and any spheres of the society – organization, institution, state. Safety arrangements are vital for efficient management.

This problem should be of key importance in the Russian Federation, since security and safety have been permanently undervalued in the Russian society. Any crisis has complex consequences for the system itself and for all individuals, in particular. In the present day social conditions the issues of safety have been gaining in importance, accentuating contradictions between general theoretical fundamentals of safety and standards of their practical implementation.

The issue is becoming even more complicated because of fast historical transformations. Social conditions and characteristics are changing extremely, impeding the traditional and natural theoretical



development of social safety. To date, the evolution of theory through accumulation and systematization of facts and their further interpretation and generalization, as well practical model building, are parallel processes, taking place in the same time continuum. This feature in the development of social safety emphasizes the relevance of expansion and transfer of systematic research results in the society. Nowadays, a high level of safety can be guaranteed in the society, provided that the gap between science and management, theory and practice is as closed as possible.

## 2. Problem statement

Social aspects of safety imply a multidiscipline research domain on the edge of sociology, psychology, law and social philosophy. This recently established field of research is hardly thought to be a new level in reality investigation or an object, type of activity field unknown before. It is likely a new level of understanding of common and well-known facts in our life. This is a domain discourse conditioning activities of groups and individuals in the process of manufacturing. Within this domain some efforts are made to determine appropriate strategies of activity in order to reduce risks and estimate a risk tolerance. In fact, these are limits, guaranteeing certain safety of our manufacturing activities (being safe in a broad sense of this word - for living beings, personalities, representatives of certain cultures and ethnic groups, elements in the entire life system in the world).

Safety is a complex phenomenon, depending on stability and (or) repetition of the situation, therefore, on its predictability. As the development of a situation has expected or predictable results a working system can save energy, resources, so it can be considered as a positive characteristic. In simple words, safety is seen as a lack of hazards, protection against hazards [1]. Industrial safety can't rely on the lack of hazards only, because any manufacturing activity is implemented in different conditions, therefore, this definition is not a complete one for current industrial safety.

Anthropogenic and natural environment are two principally different phenomena. There are no entirely positive or negative phenomena in nature, since there are only constituents in the common process of planet existence. However, elements of the manufacturing system function on the base of other principles. Each anthropogenic system is a separate structure with a preset purpose of its activity, for which other systems, e.g. human beings, are irrelevant. Therefore, industrial safety arrangements can be viewed as a secondary function of activity in this anthropogenic system. An anthropogenic system can't respond flexibly, so human life safety in manufacturing conditions depends on two factors, first, preset restrictions of an anthropogenic system, second, human behavior (directly or indirectly).

Some employees don't obey industrial safety rules; as a result, it is a statistically frequent cause of diseases, disabilities and even death of people. According to the statistical data almost 37.6 thousand industrial injures were registered in Russia in 2017, including 5.96 thousand serious or fatal accidents; 1.6 thousand people died [2]. The data over a longer period confirm this tendency: «above 75 % accidents are caused by organizational issues and the so-called «human factor» (insufficient organization of the manufacturing process, violation of labor safety rules, gaps in training, violation of labor discipline)» [3]. The main tendency is also found in various industries. According to monitoring carried out by the Ministry of Energy of the Russian Federation: «there is a slight change only in basic industrial injures in 2018 in comparison with 2016 and 2017» [4]. In most cases employees are responsible for injures: no labor safety trainings are carried out, any protection equipment isn't used, labor safety regulations are violated, and jobs are performed without being registered. The data above emphasize a low level of industrial safety in the Russian society. Findings of sociological surveys confirm the dimension of this problem: health care is not important «in the system of life values Russian population; in the scale of relevance it has third or fourth position» [5]. This feature of culture even worsens the issue of safety, including industrial safety.

As for human safety parameters of the anthropogenic environment are modified and tested, stated in several technical documents and standards, can be checked in a formal way, therefore, easily controllable. First of all, it is relevant for technologically up to date manufacturing processes. To date,

parameters of the anthropogenic environment correlate with the capacities available in the society for safety protection, so they are harmless for infrastructures.

However, a behavioral factor depends on numeral conditions, has a multiplicative effect, therefore, it is hard predictable, requiring other forms of control. A multifactor nature of a behavioral effect on human safety in industry is complicated, being an interesting research domain, consequently. An individual is a main risk for human safety in a complex industrial system. Two options (scenarios) are possible and are realized:

1 development of a person, his/her social and psychical qualities, e. g. self-control, discipline, intended obeying of safety regulations etc.

2 creation of closed anthropogenic systems capable for functioning without a human interference in certain situations.

The second scenario guarantees a wider range of safety; as a consequence, the development of manufacturing processes is oriented towards this model. The implementation of this scenario is limited: it is more cost-intensive, science-demanding, correlates with scientific and technological advances, so its introduction can be facilitated.

The first option is less efficient, but more affordable at a current level of manufacturing technologies and infrastructure. As a result, this scenario was the first developed in history. Then these two scenarios were combined, in future the first scenario will be gradually substituted by the second one. However, the first scenario can't be stopped in certain industries. It is important for an employer to realize which efforts and manufacturing conditions can provide a high level of safety, which behavioral skills and personality traits of employees, and also their correlation are required.

### 3. Discussion

Safety is interrelated with any activity. It can be neither absolute nor absolutely objective. In fact, safety is a relative phenomenon, caused by historical, cultural and situational factors. Safety of a living system always comprises objective and subjective constituents [6]; it implies the absence of danger and behavior identical to a situation. Taking into consideration current manufacturing conditions, human safety depends on a person's behavior. A certain level of safety in industry and manufacturing processes can be guaranteed, provided that various regulations and laws are obeyed, contributing, therefore, to human safety in industry. To sum up, observance of industrial labor safety regulations is a principal mechanism of human safety. Inconsistency and ambivalence of this condition is caused by a social character of this managerial mechanism. The observance of safety regulations depends on human behavior only. Numerous studies confirm this fact, indicating that a current manufacturing process is «safe work, which presupposes physical and psychological willingness of employees with certain professional skills and motivation for observance of rules and functions according to labor safety rules» [7].

All employees of a company are informed about the system of safety regulations, since recruitment in the Russian Federation is based on a certain procedure. This procedure comprises two obligatory phases:

- familiarization of an employee with labor safety regulations accepted at this enterprise;
- registration of an employee in a training log;
- signature of an employee;
- date of training.

This procedure is carried out on a regular basis (period varies for different manufacturing processes).

Procedures subject to formal control (registration, person's signature, date of training) are usually registered in a log and checked regularly. However, it is difficult to guarantee socially-caused characteristics of labor safety training, their regular control is low efficient and might be more cost-intensive than a monitoring procedure on the whole. Socially-caused characteristics include guidelines of training, level of its implementation, awareness and responsibility of employees, motivation of an

employee for observance of industrial safety regulations, importance and relevance of these regulations in the value system of an employee, etc.

Experts claim, that almost all accidents have numerous causes, result from accidental coincidence of events, but happen basically due to violations of industrial safety regulations [8, 9].

The observance of these regulations should be provided by certain organizational measures taken to prevent industrial injures. They include:

- «training and testing of knowledge on labor safety regulations, safe methods and work procedures;
- all types of training on labor safety and fire safety briefing;
- traineeships and shadowing;
- emergency prevention measures and fire safety trainings;
- further training courses» [10].

However, the majority of violations are registered in organizational measures. All efforts to raise the control level have a short-termed effect. At the same time, improvement of technical, technological and sanitary and medical aspects of industrial safety is in focus of the society and state. The reason might be also worsening physical health of population, which, in its turn, deteriorates psychological abilities to withstand workloads. «In the foreground there are issues of psychological and physiological stress employees have, improvement of work conditions dependent on physical factors is less important. It is possible due to dropping physical stress alongside with growing psychological and physiological stresses, this combination causes chronic fatigue, mental overstrain, bad relations with other employees and managers» [11]. That is why a mainstream direction of current management is motivation of employees for safe work. Managers have a need to identify the effect of motivating influence, and form a positive attitude of workers to safe work.

Safe behavior in industry relies both on professional knowledge, skills and abilities and motivation of an employee. Therefore, the control of human activities is possible exclusively through the control of his/her inner motivation. In the field of industrial safety motivation aims basically at making personal more interested into strict obeying of regulations.

Safety culture, importance of its implementation and development has been in the focus of discussion in recent years, since safety depends both on the external control and on activities of all employees. The principal object of protection is an individual; the secondary important ones are infrastructure and manufacturing processes. In fact, the problem is how to protect a person against him/herself in the manufacturing process. A manufacturing infrastructure reflects a technological essence of the present day human life. Urban conditions also cause numerous problems in interaction with the infrastructure [12]. Therefore, social aspects of industrial safety are integral constituents of a more general problem of social development. To a certain extent this issue can be solved via introduction of breakthrough educational technologies, and infrastructural advances. To date, digital technologies are to be used in Krasnoyarsk («Digital city, a pilot project of Rosatom) as an urban space with a high safety level. However, the principal issue is still a complex character of the internal motivation for safe behavior.

#### **4. Conclusion**

The life of each individual comprises several occupational spheres. Labor is one of the most important constituents. Industrial safety of a person is a mainstream direction in the development of a social state. «In present a system of management in Russia has been modernized from the standpoint of labor safety, a cost-based model, based on compensation for industrial injures should be replaced by a new model for assessment and control of professional risks, supporting preventive measures to protect life and health of people in industry. The statistics indicate a general drop of accidents in industry. However, this trend is incomparable with other technologically developed countries. In total, these data demonstrate a worsening tendency of industrial injures as compared with countries Germany, Japan» [9]. At the same time the problem of underestimated social aspects of industrial safety is still sharp. A high level of control can't be guaranteed all the time. A great number of disasters and

accidents caused by a social factor emphasize the importance of this problem. The development of safety culture is supposed to become a priority in the Russian society. The implementation of this approach is to be carried out in two spheres: transformation of public values and active use of advanced technologies in education and control. For instance, enterprises of nuclear industry managed to achieve a high level of industrial safety. To date, safety can gain in importance as the value of human life is reconsidered. A level of industrial safety correlates with the level of industrial development and can be viewed as a universal integral criterion of economical or social development of the company.

### 5. Acknowledgements

Statements of this paper have been discussed with practicing University colleagues, because issues of safety culture are relevant for everybody, irrespectively to the occupational field. We highly appreciate a possibility to get an external feedback. This feedback makes it possible to get an insight into another point of view, make our own attitude more precise.

We are grateful to the Committee of the 1<sup>st</sup> International Scientific and Practical Conference «Breakthrough technologies and communications in industry» for kindness and professionalism, publication of this paper would be impossible without their competent assistance.

### References

- [1] Prohozhev A A 2005 General theory of national security // <http://uchebnik-online.com/129/173.html>
- [2] Industrial injuries in the Russian Federation 2018 // [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/wages/working\\_conditions/](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/wages/working_conditions/)
- [3] Types and causes of occupational accidents 2016 // <https://rosmintrud.ru/labour/safety/206>
- [4] The Ministry of energy of the Russian Federation: the office site 16 10 2018 // <https://minenergo.gov.ru/node/4497>
- [5] Safina L 2011 *Economics* 11 p 89-92 // <http://ecsocman.hse.ru/text/50315452/>
- [6] Plyushch I V 2018 *Problems of scientific thought* 12 vol 1 15-18
- [7] Koshechkin Y V, Barabanova S N 2015 *Bulletin of rural development and social policy* 12 p 38-40
- [8] Social status and standard of living of the Russian population: 2004-2017 [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/publications/catalog/doc\\_1138698314188/](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138698314188/)
- [9] Buhtiarov I V, Izmerov N F, Tihonova G I, Churanova A N 2017 *Problems of forecasting* 5 (164) 140-149
- [10] Schennikov N I, Pachurin G V, `Kuragina T I, Mejenin N A 2013 <http://window.edu.ru/resource/152/79152/files/Мон%20%20Иен%20и%20др%202013.pdf>
- [11] Morgunov E B 2010 *Personnel management* 6 26-30
- [12] Plyushch I V 2017 *Pedagogy* 3 64-69