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**PHILOSOPHY OF TECHNIQUE AS WORLD OUTLOOK  
FRAMEWORK OF ENGINEER'S MORAL RESPONSIBILITY**

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**Abstract**

The paper shows how the introduction of a new subject “Philosophy of Technique” helps to implement ethical training of engineers. The purpose of this objective is to study the manmade factors of cultural and social development, technological determination of human life, evolution of a global social and natural system and artificial environment. Philosophy of technique analyzes technogeneous environment as a system-forming element of socio-natural artificial reality and technogeneous development as a stage in biosphere socialization. Change of the relation of people to the nature becomes the major feature of development of a civilization: the human ability to transform the nature is behind his ability to predict the results of transformation. Philosophy of technique sees a socio-natural sense of technical progress in the material world transformation and man’s personal life. The philosophical analysis of the engineering essence provides the world outlook framework for searching moral solution of modern social and ecological problems.

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**Keywords:** Philosophy of technique; higher school; engineering ethics; technosphere; global present-day problems; ecological crisis.

## 1. Introduction

A humanitarian effect upon engineering education caused by the necessity of technical progress humanization resulted in the realization of a gap existing in the common system of higher education: the domination of particular tool specialization of future engineers who having wide knowledge and ability in the field of techniques formation do not ask themselves a question of their non-technological consequences. The humanities teaching, first, philosophy must serve as a counteraction to negative consequences of scientific technical development which by the end of the XX-th century began to

threaten the civilization existence. The support in the formation of substantiated views on the world and the place of engineering in it are essential for a future engineer. Therefore, the formation of a sense of responsibility to the society and nature is one of the purposes of the humanities introduction in the curriculum of polytechnics. But the existing curriculums cope with this task not completely, therefore, it is necessary to update them.

### **1.1. Problem statement**

The growth of negative transformations in the Earth biosphere, man-caused changes in psychology and physiology of man himself became the result of technological progress. The essence of an ecological global problem or a broken interaction of society and nature forms an uncontrolled growth of man-caused environment and its negative effect upon biosphere. The manifestations of an ecological problem are the following: destruction of many kinds of plants and animals and a decrease of a biospheric variety; exhaustion of nonrenewable natural resources and degradation of renewable ones (soil, forests, fresh water); depletion of habitat possibility in absorption of waste products of human vital activities, climate changes and a possible growth of world ocean; biosphere satiation with elements of technological origin, particularly with chemical and radioactive constituent (Popkova, 2006). So, a human being and biosphere experience an impact of techniques: either adapt to them, or collapse (Demidenko, 2006). The modern biosphere condition is characterized as a global ecological crisis: global violation of biochemical and biological process orientation. The inevitable result of this is changes in environmental characteristics and mass extinction of the most organic world. This current ecological crisis influences the whole nature including the human himself. Consequently, it is possible to overcome this crisis only by common efforts. If the crisis existence is agreed upon by the majority of researchers, its causes and ways to overcome are still the issues to discuss. Firstly, ecological activities were considered as a hopeful way to regenerate the balance between the society and the nature. There was declared a universal goal to preserve the nature: for its achievement politics, economy and culture should be directed at environmental protection and enhancement, rational use and conservation of natural resources, providing good life conditions for the population and environmental safety. There were programs of technological and social events for preserving and restoring the environment introduced and adopted in international agreements. The aim of these activities was to minimize biosphere pollution and protection of flora and fauna (Popkova, 2015).

Nevertheless, the reduction of technogeneus influence on the nature due to rejection of excessive material needs and radical programs of changing human activities (for example, a program of “sustainable development”) remain on papers, and critical changes in biosphere are increasing. No doubt, technogeneus development leads new generations farther and farther from their biospheric existence. It seems that any attempts to overcome ecological crisis by means of biosphere rearrangement (without simultaneous adaptation of humans to its laws) are utopian. Both our inability to foresee all the results of technogeneus changes and inevitable growth of humanity material needs (which in the long run will require more natural resources) lead to the situation when implementation of introduced programs can only slow down technogeneus degradation of environment, but cannot stop it (Popkova, 2015). The reason of this, in the opinion of the majority of scientists, is technological progress. As its necessity for the development of mankind is evident, there were posed problems about possible limits of technological

growth – of the reconstruction limits both external environment and psycho-physiological properties of human organism (which transformation grows with the aid of technical means). Positive effects of a technological growth still prevail: this is a growth of human life span and living standard, the increase of possibilities for personal self-actualization, technological support for satisfaction of cultural needs. But optimistic ideas of technological progress solving all problems of mankind are based on the historical experience of previous centuries and they do not take into account the existence of technological growth limits. First of all, these are anthropogenic factors caused by an intermediate human position – human biospheric origin and a growing integration with techniques. A new stage on the way of technology can result in system transformations. It is evident that technological development approaches a stage upon which social motives must not intensify it, but restrain it pointing out to the insufficiently studied consequences of the next innovation and calling to the introduction not all technologically possible, but those affecting positively human life.

## 2. Methods

By the beginning of the twenty first century, there has been a global technological system, which covers all spheres of human life, formed on the Earth. This system not only meets his material needs and growing social and information needs but also substantially forms them through mass media. Philosophy uses the term “technogeneous environment” to define this process. Technogeneous environment which acquires system characteristics is also called technosphere, emphasizing that it has its own structure and activity rhythm. Technogeneous environmen includes technical objects and products. It also consists of objects which provide industrial and agricultural productions: buildings and facilities; power plants and power transmitting means; communications and information facilities, transportation means and transport infrastructure; means of forming and maintaining the environment suitable for staff vital activity; facilities for non biospheric waste recovery and restoration of ecological characteristics of biospheric environment; material objects, connected with production management and its informational support. The results of technogeneous process are both inanimate objects and living creatures such as plants and animals which are created artificially (by selection or genetic transformation): their life is supported according to technological processes (animal confinement, plant growing by hydroponics and others). Technogeneous environment also includes biocenoses transformed by humans (agrocenoses and others), in which natural composition of species and energy flows have been changed. As a result, biological interconnections in the basis of such biocenoses are controlled by technological laws. All these objects made by engineering activity refer to moral responsibility of the human, and first of all, of the engineer who is designing them (Popkova, 2015).

It is the man (a technosphere creator) who is considered a source of negative consequences of technogeneous growth, and he is responsible for their elimination. Since the origin of technogeneous transformation is the revolution of world outlook (when the man was recognized as “the king of nature”), there is a consideration: the cause of uncontrolled technological growth is the wrong attitude to biosphere or the ideology of nature conquest, and to overcome the crisis we should pay much more attention to ecological issues in culture and morality. The supporters of this point of view suggest that we should change human consciousness (reorientate it from technogeneous to humanitarian, from anthropocentric to ecocentric and so on). Ecological ethics is also considered hopeful: it introduces flora and fauna into the

field of human moral responsibility. But is it possible for people who do not treat humanely each other to consider other creatures' interests? Development of ecological ethics and ecocentric world outlook faces the same obstacles which was the cause of the ecological crisis itself: predatory attitude to the environment. Moreover, there are social mechanisms of technological growth: they make the connection between human consciousness and his activity nonlinear, mediated by historically established social conditions that lead to difficulties with reorientation of human activities (Popkova, 2015). Philosophical analysis is necessary at the point where human's free will should be taken into account. Philosophy has been studying technical activity for a long time. The problem in technical world control (or at least predictability of its transformations during the introduction of new engineering solutions) is not only a philosophical problem, but also a scientific-practical one. Those aspects of it which are subject to the introduction of the philosophical thought belong to the explanation of techniques functioning, identification of its limits and development stages, and also objective factors – both creating man-caused environment, and created under its influence (Gorokhov, 2014; Rozin, 2015). There is a philosophical subject which deals with the investigation of similar problems and which is called as a philosophy of technique. In such a way in the end of the XIX-th century, there was the field of social-philosophical investigations striving for the complex analysis of technique as a factor of civilization development (Gorokhov, 2007; Rozin, 2008; Cheshev, 2006). Engineering is the result of human activity and its negative aspects – human activity consequences, therefore, the investigations of regularities in the development of technical reality are inseparably linked with the analysis of its consequences for biosphere and human life. The control of the technique growth and its functioning is essential, because as engineering systems develop and man-caused environment created by them has taken on a global scale and obtained almost the whole territory of the planet surface. A purposeful creation of strategies coordinating human technical activities is necessary.

Philosophy of technique is a field of philosophical investigations directed to the comprehension of engineering, definition the laws of its development, evaluation of its impact upon society, culture and man and the forecasting of further processes in technogeneous world. The increased man-caused pressure upon biosphere and mankind which became evident by the end of the XX-th century requires a theoretical analysis of the processes in the formation and functioning of artificial environment. Separate kinds and aspects of technique are studied by different scientific disciplines, but only philosophy of technique investigates the phenomenon of technique as a whole. The consideration of technique without taking into account the technological world interactions with biosphere and society exhausted its potentialities. Philosophy of technique deals with the analysis of the consequences of technogeneous development - a technology effect upon man and biosphere. A current view upon the problems of technique in domestic thought is presented by works of E.V. Girusov, V.G. Gorokhov, E.S. Demidenko, V.A. Kutryyov, B.I. Kudrin, N.N. Moiseiev, V.M. Rozin, O.D. Simonenko, V.S. Stepin, A.D. Ursul, V.V. Cheshev and others (Gorokhov, 2007; Rozin, 2008; Cheshev, 2006). Among foreign philosophers and sociologists investigating techniques it should be expedient to mention E. Agazzi, T. Adorno, Z. Bauman, D. Bell, U. Beck, E.Giddense, M. Castels, H. Lenk, G. Markuse, L. Memford, H. Ortegu-e-Hasset, A. Peccei, F. Rapp, G. Ropol, H. Skolimovski, O. Toffler, A.Turen, J. Forrester, E. Fromm, M. Foucault, F. Fukuyama, Yu. Habermas, M. Haidegger. M. Horkhaimer, H. Shelski, J. Ellule, A. Etsioni, E. Younger, C. Yaspers (Lenk, 1996; Tavrizyan, 2009). Technique analysis, according to the words of V.M. Rozin, begins with the

recognition of culture crisis and requires “comprehending engineering as a moment of this trouble”. The main purpose of philosophy of technique is the development of methods for the present-day ecological crisis solution, that is, “ideas for the limitation of engineering extensive development”. With respect to engineering, one has to solve not only essentially engineering problems, such as effectiveness, reliability and so on, but arise philosophical problems – “technique fate, technique sense, coexistence with technique” (Rozin, 2006). The problems facing techniques philosophy are as such: what is the nature of engineering, how technique relates to other fields of human activity ... when technique arises and what stages it passes during its development, whether technique really threatens our civilization ... how technique affects man and nature, and, finally, what are outlooks in the development and changes of engineering” (Rozin, 2006). The search of answers helps critically estimate modern civilization and understand that its problems are inseparable from common ways of tool thinking and action. It becomes clear to what extent “a modern man is built in a technological process ... and directed towards it”. Not only an average person, “as a social individual is completely conditioned on images and values of technogeneous civilization“, but “those, on whom today the development of modern technology depends, including authorities, specialists and experts, who think within the bounds of realities of technogeneous civilization” (Rozin, 2006).

### **3. Results**

At the modern stage of engineering development, the larger creditability have models presenting it as an autonomous system developing irrespective of human perception. A common idea of artificial world as a result of purposeful human activities faces human inability to predict the influence of separate technological innovations (beyond the boundaries of an industrial region proper) or control a technical reality. A deliberate creation of separate technological systems and a sufficiently high degree of their control will join a spontaneous formation of the technogeneous environment. The technological innovations were introduced by people for life improvement and satisfaction of own needs. The technogeneous environment performs these problems giving a possibility for the growing population of the Earth to obtain all necessary things for the existence. But the existence of modern man is machined completely. During man’s interaction with technical environment, new requirements are formed. A process of biosphere socialization means its changes under the influence of human industrial activities become more and more evident. In the modern world, engineering surrounds man mediating all human ties with nature and forming technogeneous environment to which it is necessary to adjust. The essence of technosphere is paradoxical: it is artificial by origin, but exists as a natural, independent, of man or even mankind. Separate negative components of technogeneous environment were never the ends of human activities (for instance, air and water environment pollution) and required equipment for their overcoming. Philosophy of technique sees a socio-natural sense of technical progress in the material world transformation and man’s personal life. The analysis of technogenic content in global problems of the present is carried out; the consideration of their essence is performed in the context of the historical development of mankind and its basic vector – the increase of human life artificiality and biospheric regularities displacement. A hypothesis of the beginning of the technologization process of man and human social-cultural life caused by an increasing isolation of people from biosphere and actual human locking in technosphere is offered. For instance, urbanization became a social mechanism of

technogeneous environment formation (causing technologization of man himself, and also the forms of human work, relations, and leisure); at that, it catalyzed the process of special technogeneous culture formation. More than this, the analysis of technogeneous physiological and psychological human transformation often puts some thought about possible transformation of human society into a post-human society which is a totality of not biological beings, but bio-socio-technogeneous ones. The philosophy of technique continues the analysis of technogeneous environment as a system-forming element of socio-natural artificial reality and technogeneous development as a stage in biosphere socialization. The investigation of the effect of technogeneous environment development upon life and nature is necessary, the identification of regularities of the biosphere technologization process and definition of the level of admissible technological changes in eco-systems beyond which the irreversible ecological processes can begin (Popkova, 2006).

#### **4. Discussion**

The conclusions which philosophy of technology has made by the present moment represent the world outlook framework for ecological and engineering ethics. Relying on them it is possible to state ethics principles reasonably and show both engineer's moral responsibility essence and the limits of his possible activity. Technogeneous environment has contradictory nature. On the one hand, it broadens ecological niche of people and maintain their existence (making comfortable artificial environment and meeting his material needs); on the other hand, technogeneous impact has more and more negative influence on biospheric life in general and on physical (and psychological) state in particular. It provides social and cultural development and creates difficulties. Therefore, the interaction of technogeneous environment and biosphere cannot be realized thinking that the main target is to preserve the nature "untouched". Scientific-technical progress helped to solve many problems – increased the standards of living, equaled incomes of peoples from various social segments of the people (promoting elimination of social conflicts) and so on. It is hardly possible to imagine the traditional society as perfect, "ecological". During historical development adverse natural factors and laws (biological, climatic and others) have been forced out by technological means. We cannot forget about positive consequences of technological growth (which dominate just now): increasing duration of human life and its material standard, grown opportunities of individual self-fulfillment and of satisfying cultural needs. Probably, the objective causes of technogeneous conflicts are essential technosphere contradiction – between rational origin of some technical objects and spontaneous (unpredictable and uncontrolled) nature of technosphere existence on the whole. There are objective factors which provide the autonomy of technogeneous environment and complicate its transformation. Human activity, besides direct consequences, has a lot of unpredictable side effects; and with increasing technical equipment these side effects begin to prevail. The human ability to transform the nature is behind his ability to predict the results of transformation. The current suggestions of making economy more ecological have a significant drawback – a lack of social mechanism to implement them. Some conscientious people take the information about crisis seriously, but the majority of people are not going to sacrifice current needs for the sake of future welfare. The main obstacle to implement any global program is social and political disconnectedness on our planet. Naturally, biosphere can overcome the crisis itself as it has a mechanism of autoregulation and drastically change the characteristics of the natural environment; but the results of this activity for humans will be

catastrophic (Popkova, 2015). So, the investigations carried out by philosophy of life spheres in modern society, to which technique is directly relevant, offer sufficient amount of substantiated concepts of techniques essence and regularities of technical development; they give a system assessment of technogenic effects upon society, culture, biosphere. Philosophy of technique shows that making technogeneous civilization more human and ecological requires taking into account many factors.

Modern tendencies making environmental measures easier can be the following:

- 1) scientific-technical progress resulting in a better level of human knowledge, information distribution, an increase in human education;
- 2) growing international integration helping to work out and implement more complex programs of interstate activities including environmental measures;
- 3) democratization of state structure giving the opportunity for more people to get information on environment and to have influence on socio-economic processes;
- 4) growth of social and occupational mobility providing emancipation from stereotypes;
- 5) social mechanism of globalization which forms not only common environmental, cultural and political space, but also the feeling of common responsibility for this space on the global scale.

This way means significant difficulties. Modern tendencies making environmental measures harder can be the following:

- 1) a gap of economic and military-political standards of two civilizations - post-industrial and traditional; its overcoming within traditional technical development is problematic;
- 2) information technologies development which allows to manipulate the mass conscious;
- 3) growth of consuming orientation leading to unwillingness of people to be involved in self-education and to limit meeting their needs;
- 4) technologizing mass conscious which estimates life only from the pragmatic point of view and does not pay attention to remote consequences;
- 5) forming “world city” – a unified technospheric environment, where people do not have a direct contact with biosphere and a feeling of emotional involvement in it (Popkova, 2015).

## 5. Conclusion

While working out and teaching engineering and ecological ethics, one should:

- 1) consider the Earth’s biosphere as a system which is of the highest complexity of all known to mankind, and admit attempts to build artificial environment (despite technological advances) to replace biosphere as undesirable;
- 2) should be aware of their biosphere nature (despite technological progress) which means not only the need for biospheric resources, but biosphere laws being in action inside a person;
- 3) take into account incomplete knowledge about the activity of biospheric laws and especially the mechanisms of its self-regulation that should lead to special care during its transformation;
- 4) focus on maximum conservation of species and ecological communities, hence it is necessary to take special care when introducing new species obtained by artificial means;
- 5) transfer the attention of people from consumer perspectives to their creativity;
- 6) focus on the reduction of industrial and domestic wastes to the level corresponding to the possibilities of the biological cycle;

7) aware of own values in any life form (regardless of having pragmatic interests) and taking into account the interests of species along with economic considerations.

The rules mentioned above will be implemented by means of the following measures:

1) creation (with the help of international organizations) of an information network of research stations covering the entire territory of the Earth with the purpose of controlling the state and changes of atmosphere, water, soil, etc.;

2) design and implementation of new ways of industrial wastes utilization, which allow one to approach the closed technological cycles;

3) strict socio-environmental monitoring of possible environmental difficulties during accelerated technological growth in countries with a traditional economy, material and scientific support of the technological leaders;

4) creation of a broad program of struggle against degradation of natural habitats (desertification, etc.) with appropriate information support;

5) analysis of available technologies to determine their impact on environmental pollution in order to increase the share of less harmful;

6) generating the safest industrial and household infrastructure, particularly to minimize the environmental pollution;

7) search and implementation of environmentally sound and economically efficient energy types to replace the burning of organic substances;

8) establishment of a network of research institutes monitoring biosphere transformation under anthropogenic influence of territories and giving recommendations to reduce the negative consequences of anthropogenic impacts;

9) development and introduction of new resource and energy saving technologies, the study of biosphere processes in order to create biotechnologies;

10) mass introduction of environmental education (especially in the higher education) with the aim of creating a world outlook favorable for biosphere preservation (Popkova, 2015).

In such a way, the study of philosophy of technique in a higher education institution will help to solve some problems, first, give a future expert essential data of current stages in technogeneous civilization development, make an acquaintance with methods of a critical analysis of generally accepted opinions and will serve one of the ways for the professional and personal potential growth. The course of philosophy of technique is one of the basic courses intended for the world outlook formation of an engineering expert. In the current world for which engineering is a system-forming principle, the creation and introduction of new technical equipment must be unavoidably anticipated with a humanitarian estimate – prediction of their influence upon man and natural environment.

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