World Transactions on Engineering and Technology Education
Vol.6, No.2, 2007

Heidegger's thesis on two kinds of thinking: methods to carry out engineering education

Georgy G. Rogozin

Donetsk National Technical University
Donetsk, Ukraine

ABSTRACT: In this article, the author deals with the problem of training students in the necessity to foresee the consequences connected with the introduction of technical innovations within the context of Heidegger's ideas about the interpreting thoughtful mood as an extremely important addition to calculative thinking in the traditional educational system. The efficiency of Heidegger's idea is considered at some lengths against the background of the characteristic consequences of introducing new techniques, texts of ancient literary heritage and examples connected with the manifestation of the theory of catastrophe in the fields of power engineering and coal mining industry. Recommendations are given relative to a methodical approach to solving problems when training students at the Bachelor level in the *Electrical Engineering* speciality offered at Donetsk National Technical University (DonNTU) in Donetsk, Ukraine.

INTRODUCTION

At present, technical and technological education is being developed under the conditions of scientific and technical progress, which is characterised by shortening the intervals between the conceptual phase and the introduction of new techniques. Given this condition, the probability exists for the detrimental effects of innovations, for instance, to one's health. At the same time, if the above mentioned innovations have gained widespread acceptance in the everyday life of many people, should the effect be attributed to the state or gain international significance?

The problem being discussed here leads to the question of how the scientific and technical level and the psychological persuasion of graduates from Donetsk National Technical University (DonNTU) in Donetsk, Ukraine, suit to the requirements of one of Heidegger's key ideas [1]. This is under conditions connected with the introduction of new techniques in large quantities all over the world and in all branches of industry.

In relation to the topic under consideration, the question arises of whether there is correspondence between a statement of the problem and the methodological arrangement of teaching the University's students in the context of the problem as it is set.

SCIENTIFIC AND TECHNOLOGICAL REVOLUTION

Down, down, down. Would the fall never come to the end?
Lewis Carroll: *Alice in Wonderland*, Chapter 1

Consequences and Perspectives

As a rule, the armament race excludes the logic of humanitarian thinking. This is in the sense that humanity falls prey to its own scientific and technical progress. One should bear in mind that the outlined situation becomes worse against the background of political conflicts between those states coming into existence as a consequence of economic or geopolitical contradictions.

The increasing interest in energy saving technologies is driven, to a large extent, as a means to reduce working expenses to recover the cost of one or another type of product competing on the national and world commodity markets.

At present, there is a marked improvement in some directions on the industrial scale connected with the development of environmentally appropriate technologies. Solutions to problems connected with restraining detrimental after-effects (requiring, as a rule, the concentration of capital from several countries) commence after the adverse effects have already manifested themselves. Nowadays, the world is saturated by technical facilities, providing reason enough to develop new and highly efficient technologies.

Examples can be found in such diverse fields of power engineering as burning coal at thermal power plants (energy production process) and driving various mechanisms by using induction motors (process of energy consumption).

Thermal power plants with new types of boilers that burn up coal at 900° C (instead of 1,400° C) utilise special constructions that exclude torch coal combustion and the formation of nitric oxides. A result of this innovation is that the efficiency of these thermal power plants increase from 35% to 55%.

The new technology based on the use of die-cast copper rotor cages allows for an increase of induction motor efficiency by 1.5-2.0% [2][3]. It should be remarked that the composition of load includes about 50% of induction motors.

When compared with a die-casting rotor with aluminium bars, induction motors with a die-casting copper rotor are distinguished by the following indices:

- Increase in efficiency by 2-3%;
- Improvement of the torque-slip characteristic by way of eliminating the inherent dip;
- Increase of locked and breakdown motor torques.

Unfortunately, the above mentioned considerable technological improvements were delayed by more than a century.

Messages from the Ancient Literary Heritage

Of particular interest are peculiar kinds of historical messages from generation to generation adduced in the Old Testament of the Bible. Such writings reflect the scope of knowledge and include the following:

> *18 Three things are too wonderful for me for I do not understand:*
>
> *19 the way of an eagle in the sky, the way of a serpent on a rock, the way of a ship on the high seas, and the way of man with a virgin* [4].
>
> *17 And I applied my heart to know wisdom and to know madness and folly. I perceived that this also is but a striving after wind.*
>
> *18 For in much wisdom is much vexation, and he who increases knowledge increases sorrow* [5].

The first and the second quotations cited above contain information on the phenomena being beyond the grasp of the mind (*non-cognizable* phenomena). Indeed, the indicated phenomena associated with the meteorological prognoses (weather forecast) and the mystery of intimacy between the man and woman (which is the mystery of man's essence) have not been cleared up till now.

The first text was written around 932 BC by the King Solomon of the Hebrews, who was famous for his wisdom and his wealth. The second text is also attributed to him [6].

The above lines should be perceived not only as the lack of knowledge but also as an address to future generations to be aware of social danger.

Theory of Catastrophe

An analysis of sophisticated non-linear technical systems, ecological processes, economic regimes, etc, can be inferred using the catastrophe theory [7]. Uneven changes to a system's condition are possible when the system operates at smooth changes and alterations in external conditions. It is significant that the catastrophic violation of stability can lead not only to the intensification of a system's condition but also its optimisation.

The latter consequence is a result of control without the appropriate feedback. In this case, deterioration can occur during the process of gradual motion in the best conditions. From the social viewpoint, it is obvious that catastrophes lead to a drop in the competences or the personal responsibility of specialists for the technical decisions made.

A description of the singularities of slow motions in relaxation systems with slow variables and the classification of local bifurcation in generic dynamical systems has been set forth by Koptikov, Kovalev and Spivakovski [7].

As an illustration of catastrophes, for instance in the field of power engineering, one can refer to a serious nuclear accident in the Ukraine at the Chernobyl nuclear power plant on 26 April 1986 and to heavy faults that have occurred in the USA, particularly, the breakdown of the New York power system on 11 September 1965. Various experts consider that only one of the most essential causes of the latter fault was associated with the insufficient use of operational measures.

In the field of the coal-mining industry, from evidence derived from a statistical analysis of data over the span of 10 years (1988-1998), the degree of risk (quality of explosions in the year unit of time) of the explosions in coal mines of the Ukraine is equal to:

- $5.10 \cdot 10^{-4}$ – in the tunnelling face;
- $1.85 \cdot 10^{-4}$ – in the longwall face;
- $1.45 \cdot 10^{-4}$ – in haulage drift (for a conveyor system) [8].

These figures show that the number of exponents obtained are more than two times greater than the normalised value equal to $1 \cdot 10^{-6}$/year.

Heidegger's Thesis on Two Kinds of Thinking

It is Heidegger's opinion that calculating thinking is being used in the design of technical devices and processes, as well as interpreting thoughtful mood.

There is a good probability that in the case being considered, the dangerous consequences could be foreseen through taking out timely NOT (as a suspended sentence, other than allowing a no appeal verdict) during the process of the comprehensive analyses embracing not only calculating thinking, but also the interpreting thoughtful mood about the consequence of using the decision made.

A peculiarity of the practical implementation of Heidegger's approach lies in that the interpreting thoughtful mood NOT should immediately go after every decision YES.

It is believed that Heidegger's idea has something in common with the above mentioned affirmation adopted from the Bible's Book of Ecclesiastes [5].

At present, the global phenomena occurring in nature, as well as flora and fauna, are subject to a severe comprehending thoughtful mood too. Changes in the mentioned spheres adequately reflect the influence of the scientific and technical revolution.

PROBLEMS IN MOULDING MODERN SPECIALISTS

Well-known methods that are intended for solving inventive problems are destined, as a rule, to achieve positive effects connected with decreasing expenditure. In particular, the textbook by Bekleshov makes the provision to execute the definite demands for technical and economical substantiation in the student's design [9]. These demands focus on the attainment of scientific and technical results, as well as the social efficiency, of the student's project that ought to be

estimated by the use of the following indices (maximum values):

- Significance: 0.5;
- Profundity of the look into a problem: 0.35;
- Probability of success: 0.15.

The results with regard to social impact should be evaluated quantitatively in the following manner:

- Air pollution index in the industrial premises;
- Air quality index in the industrial area;
- Safety level of the working conditions;
- Level of noise;
- Degree of illumination;
- Description of waste products;
- Thermal and moisture conditions.

In some instances, as a basis for appraising the obtained social results, the following state/national standards can be used:

- Regulations for safety measures;
- Physical indices of ecological conditions;
- Biological indices of ecological conditions.

It should be recognised that the following accompanying effects can be achieved when solving some social problems:

- Rise in labour productivity;
- Economisation of labour;
- Decline in occupational diseases.

It can be confidently said that the present level of the training of specialists who are well informed about the problems set forth above is the call of duty and dictates of reason. The substantiation of the grounds for the broadening of university courses by utilising new information is shown in Figure 1.

Students should be convinced of the necessity and vital importance of the conclusions made. There is good reason to train students to attempt to formulate the essence of the problem and how to overcome it. As this takes place, it is advisable that design methods, including synectics, be utilised [10][11].

The arrangement of practical work undertaken during the processes of moulding new attitudes to technical equipment and devices ought to be based on the new approach being carried out in the form of the inversion of the traditional purposes. A schematic diagram of this method is presented in Figure 2. It should be noted that the process of developing the interpreting thoughtful mood requires a great deal of effort on the part of tutors, as well as more prolonged students' exercises.

The methodical recommendations that are associated with the implementation of the interpreting thoughtful mood in the form of student's acquired habits are concerned with the disciplines integrated into the processes connected with production, transportation, distribution and the consumption of heat and electrical energy.

Information devoted to the problem under consideration is included in the study hours of the course and are described below.

The first year involves *Introduction to Electrical Power Systems and Networks*.

The second year incorporates:

- *Philosophy* (technology and philosophy);
- *Power Engineering Installations*;
- *Nonconventional Power Sources*.

The third year covers the following:

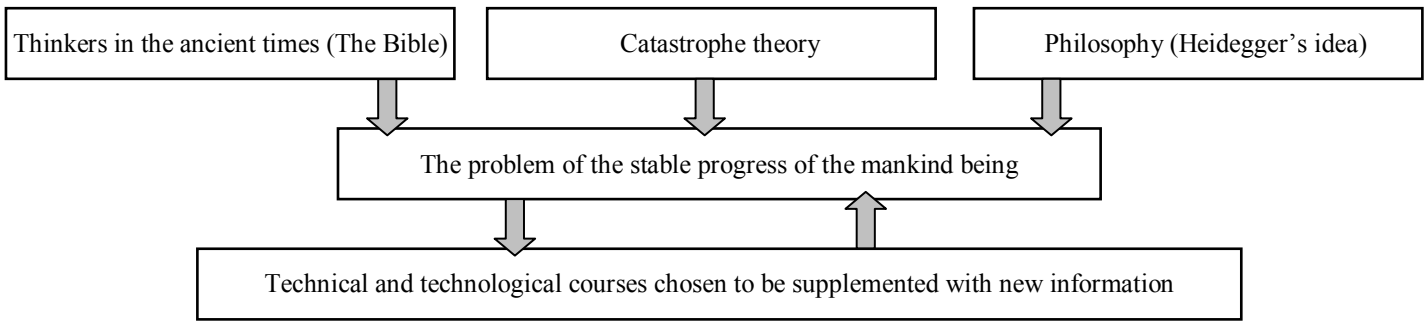

Figure 1: Simplified diagram representing the factors that are related directly to the problem of stable world progress.

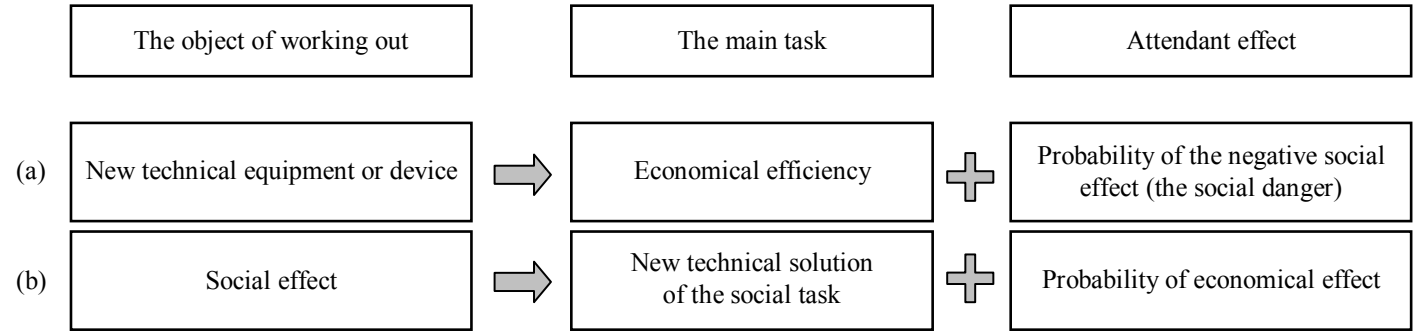

Figure 2: Inversion of the inventive tasks: (a) situation as it traditionally stands; (b) solution of the socially directed problems.

- *Psychology* (overcoming the social and psychological barriers in the course of innovation activities);
- *Sociology* (the social adaptation of personality in the course of innovation activities);
- *Electrical Machines*;
- *Fundamentals of Ecology* (ecological expertise to tackle social and humane problems associated with the introduction of new scientific and technical projects in industry);
- *Electrical Systems and Networks*;
- *Electrical Apparatuses*;
- *Power Engineering Economics* (innovative approaches in economics for scientific and technological advancements);
- *Safety of Vital Functions*.

The fourth year includes the following:

- *Energy Saving Technologies*;
- *Electrical Part of Power Stations and Substations*;
- *Industrial Safety Measures*.

For disciplines appertaining to the humanities in the above list show the lecture subject matter (in brackets) with regard to the direct relationship to the problem at hand.

Recommendations that are directed at developing persuasions that there is the necessity to decide NOT when evaluating the consequences of technical innovations to be brought into use predetermine the following:

- Application of the principle NOT as the dominating idea in determining the direction of the action when analysing the specific situation;
- Perception of the principle NOT as a moral habit necessary to overcome the psychological barrier that may be required to ensure moral norms at any technical and economic situation;
- Use of the principle NOT as a humanising element of techniques directed at attaining the main aim of engineering psychology associated with ensuring the accordance between techniques and the requirements to take into account the peculiarities of the person and his/her activities.

Turning attention from the technical and economic advantages of new technical objects to the social category involves the following:

- Understanding of the social value of the person in the community;
- Profound comprehension of ergonomic problems in the system: person – technique – environment.

The solution of problems of the new trend, as reflected in Figure 2b, extends students' knowledge within the sphere of their vocational guidance. It also leads to students' self-appraisal to enhance their personality.

CONCLUSIONS

The consequences of the technical revolution have convinced people of the truth of the statement that technical and technological innovations are worth consideration from the position of Heidegger's categorical appraisals of YES and NOT.

The all-embracing substantiation of the urgent decision to tackle current problems concerns not only the process of training calculating thinking in the university educational surroundings but also the interpreting thoughtful mood. This should allow graduating students to be able to stop the detrimental effects of technical innovations on the environment and to people's health.

In this article, the author gives recommendations relative to the methodological approach associated with the practical implementation of Heidegger's thesis on two kinds of thinking when training students in the speciality *Electrical Engineering* at the DonNTU.

The moulding of the interpreting thoughtful mood, as a new distinctive feature of the human character when training specialists at technical universities, will promote qualitative changes in their way of thinking and help satisfy the system requirements of technique – person – environment.

REFERENCES

1. Heidegger, M., *Gelassenheit.* Pfullingen: Günter Neske (1959).
2. Peters, D.T. et al, Improved motor energy efficiency and performance through the die-cast copper rotor. *Proc. 15th Inter. Conf. on Electrical Machines*, Brugge, Belgium, 71 (2002).
3. Patent No.21968, Ukraine, 6B 22D 19/00.
4. Proverbs 30:18-19. *The Bible*.
5. Ecclesiastes 1:18-19. *The Bible*.
6. *New Webster's Dictionary and Thesaurus of the English Language*. Danbury: Lexicon Publications (1993).
7. Arnold, V.I., *Catastrophe Theory*. Moscow: Nauka Publishers (1990) (in Russian).
8. Koptikov, V.P., Kovalev, A.P. and Spivakovski, A.V. About statistical standard of the explosion safety for coal mine areas in the Ukraine. *Coal of the Ukraine*, 5, 36-38 (1999) (in Russian).
9. Bekleshov, V.K., *Technical and Economical Substantiation of Degree Works.* Moscow: High School Publishers (1991) (in Russian).
10. Christopher, J., *Design Methods. Seeds of Human Futures*. New York: John Wiley & Sons (1982).
11. Gordon, W.J.J., *Synectics: the Development of Creative Capacity.* New York: Harper & Row (1961).