

# Social-Oriented Disciplines: Essential Part of the Heat Engineering Students Education

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**Abstract:** Current movement of Ukraine towards free-market economy meets with serious difficulties, and to overcome it society needs qualified specialists of energy professions with developed ecological mentality and knowledge of business, marketing, management. During last decades situation developed in such a way, when our students, having excellent preparation on fundamental and theoretical discipline (on-example, thermodynamics, heat- and mass transfer and others) did not get sufficiently profound knowledges and skills in the field of social relations, work with the people in the field of production and business. Currently we work on the correction of this state of affairs. So, within the framework of the European Council REAP program in the co-operation with Portsmouth University we develop a scholastic module of discipline "Energy management", work on the perfection of the cycle of ecological-related disciplines. The data on the Curricular content and structure changing for the Heat Engineering and Thermal Central Station students during last years is given in the paper.

**Keywords:** education, curriculum, energy, management

## 1 Introduction

After disintegration of the Soviet Union in 1991 independent Ukraine has selected the path of the development directed to socially oriented market economy. The pace of conversions is not so high, as it would be desirable, however common tendency is not subject to doubt, and return to the old system with the rigid centralized planning and resource distribution is impossible.

This transition period is complicated by high-gravity crisis in all branches of industry, including its power sector, brings up new in principle requirements to preparation of the specialists in the branch of the power and heat engineering.

## 2 General situation

Since 1971 the «Industrial Heat and Power Engineering») faculty of (DonSTU) trains engineers in the field of Heat Engineering and Energy Saving and since 1994 - in the field of Steam Power Plants too. Total annual admission of the students is about 80 persons. In accordance with current reform of higher education system in Ukraine, since 1998 our students may graduate with degree of Bachelor, Specialist or Master of Heat and Power Engineering.

Great experience accumulated by our chair allows us to train highly skilled specialists. That is confirmed by the testimonials obtained from employers of our former students, and results of State attestations and accreditation carried out by Education Ministry of Ukraine during last year. Our specialties had been conferred the fourth, highest level of accreditation

However it is necessary to mark, that the educational process in many respects is still based on the principles of the obsolete totalitarian model of economy. In that time the schedules of higher organs realized in developments of the largest research and design institutes was gospel truth for students and teachers. The extensive path of progressing of power engineering with centralized heat and power supply, building of super-powerful generating units was envisioned mainly. The critical approach to tendered developments was not encouraged.

However over the last years it becomes clear urgent need in perfection of the curricula with consideration

of the country motion towards free-market economy model. For instance, we are carrying out permanent renovation of materials on the management and marketing bases; on the modern trends in the domestic Power Industry, namely: decreasing of the average unit capacities, conversion of the gas and oil fired steam generators into coal fired, more and more strict environmental pollution limitations, etc.

### **3 Energy management**

Prosecution develops, in particular, in direction of saturation of 'old' and 'new' disciplines by data on energy saving and environmentally friendly technologies, on newest management methods and processes parameters control. One of most vivid examples demonstrating tendency of changing curricula is the current introduction of course "Energy management".

In this discipline we meet such problems of great social importance as World Fossil Fuel Reserves and Historical Lives of the Fossil Fuels; The Greenhouse Effect; the Model for Global Warming; Global Energy and Environmental Management; Energy and Environmental Analyses of Products; Energy Consumption in Manufacturing and its Conservation; Water Conservation and many others.

The industry of Ukraine, including its power sector, is in a state of crisis for a number of years. Unfortunately, at the expense of an own mining our country can cover only 10-15 % of need for natural gas, 20-25 % for oil, and only for coal the complete self-support is possible. The employment of expensive import fuel aggravates competitiveness of the Ukrainian goods in the world market. Lowering of overall production of energy carriers, cutting of solvent demand leads to decreasing of the investments in new construction and modernization of machinery. In result the specific consumption of energy on unit of released product considerably exceeds appropriate average values in the countries of European Economic Community. At the same time it is known, that the methods of energy management frequently allow to gain significant effect by introduction of very cheap or even free measures. Therefore industry feels acute need for the experts in the field of power engineering having a deepened preparation in the given direction.

The analysis of the educational schedules of higher educational institutions of east Ukraine displays, that in total discipline "the Power management" is not taught, the retraining of the experts in the given direction is not carried on.

Now basic principles and methods of Energy management are taught to the students while reading courses "Engineering Thermodynamics", "Theory of heat and mass-transfer". "Boiler installations", "Designing, mounting and maintenance of power installations" and some others, about 30 hours of studies in total. We plan to introduce obligatory teaching of discipline "Energy management" during fourth year, approximately 36 hours of the lectures, 18 hours of practical studies and 18 hours of laboratory training.

It is necessary to mark, that a number of the teachers of our faculty are members of the staff of the Energy Management Centre attached to DonSTU. Main functions of this Centre are: training in the field of energy management for specialists of enterprises and institutions; energy audit and giving out recommendations on energy saving and new technologies; advertising, marketing and information; dealer work; participation in the energy market and rendering of legal and technical assistance in mutual payments for energy carriers; organisation of conferences and business meetings. Centre uses material resources and enlists leading scientists and teachers of DonSTU including 10 Doctors of Sciences. In turn, technical aid of the Centre allows us to use in the education process the set of modern instruments that is enough for any energy audit including Combustion Analyser QUINTOX, Ultrasonic Liquid Flow Meter PORTAFLOW, Electro Consumption Analyser CIRCUTOR data collection device "Squirrel 1003" and the others.

Such instruments and experience, accumulated by Centre, rise efficiency of the educational process, allow to carry out practical and laboratory training on Energy Management problems.

At a current stage we are working on comparison of our studying time and schedules with modern scientific-and-methodic level reached in the given direction in the leading university centres of West. Within the framework of the program of Regional academic partnership which is carried out together with the Portsmouth university (Great Britain) under aegis of the European Council, in particular, we had developed the educational module of discipline "Power management".

### **4 Another courses**

The course, introduced last year, "Alternative energy sources", is acquainting students with such extremely perspective for Ukraine, but not developed at all branches, as wind, geothermal and solar power systems.

New course "Testing and Reliability of Heat Power Installations" is directed to form the critical approach to

machinery, tendered by the manufacturers, skilled in independent defining of its characteristics.

The course "Intensification of Heat and Mass Transfer Processes", allows the student familiar with the theory of Heat and Mass Transfer, to master methods of sharp rise of an overall efficiency of existing and designed aggregates, in particular, such questions, as strife with burn-out in the steam generators, finning of the surfaces, etc.

The course "Protection of an environment in a power system " was exposed to multifold revising. Now it includes the requirements of the new legislation of Ukraine, modern methods and instruments of control of environmental pollution and ways of strife with them.

The discipline "Organization, planning and management in a power systems" is transition and in further will be replaced by above-mentioned course "Energy management".

## **Conclusions**

Thus, the system of training of heat and power engineering students in DonSTU tries to follow changes occurring in economy of Ukraine.

Above mentioned courses, such as "Energy Management", "Alternative Energy Sources", "Testing and Reliability of Heat Power Installations", "Intensification of Heat and Mass Transfer Processes ", "Protection of an Environment in a Power Systems", "Organization, Planning and Management in a Power Systems" allow to form the experts ready to work in new conditions, and capable to supervise over conversions occurring in power sector of economy. Essential components of training of the expert are solid fundamental, language and computer training, that allows our graduates to work successfully in Ukraine and abroad.