The Influence of Industry Transformation in North-Moravian Region of the Czech Republic on Engineering Education at the Faculty of Metallurgy and Material Engineering

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Abstract *- The paper deals with organization and educational measures taken by the Faculty of Metallurgy and Material Engineering, Technical University Ostrava in the Czech Republic. The reorganization of education has been caused by the great changes in political and economical system in former socialist country after the year 1989, with respect to the anticipated industry developments in North - Moravien region.*

HISTORY

The Faculty of Metallurgy and Material Engineering is at present a part of Technical University of Mining and Metallurgy (V_B-TU) in Ostrava. The University is a continuation of the Mining College, established in Jáchymov (near Carlsbad) in 1716, as well as of the educational mining tradition of the world's first university level college of mining, established in 1763 at the renown Charles University in Prague as Academia Metallurgica - referred to by it's contemporaries as "omnia prima," i.e., the first of all. In 1770 this College was appended to a similar educational establishment at Baòska _tiavnica in Slovakia.

After the revolutionary years of the last century higher mining establishment war set up in Pøíbram in 1849, a location that was a centre of silver and lead mines, serving the northern parts of Austria-Hungary.

After the Nazi occupation of Czechoslovak Republic the University together with all of the other Czechoslovak Universities was closed down as a consequence of the student's demonstration on November 17th 1939.

After the liberation and the end World War II, the University was moved to Ostrava, the industrial centre of the North-Moravian region, in 1945. The Metallurgical Faculty, the second basic faculty of the University was established here in 1950.

Since the 19th century, the North-Moravian region has historically developed as one of the greatest industrial centres with concentration of mines, metallurgical, machine, and chemical industry, as well as coke and power plants.

During the fifty year period after World War II the faculty has been dynamically developing due to close co-operation with metallurgical industry. On the other hand, the very rigid system of the socialist economical planning, and one-side orientation on the co-operation with the east-block concentrated the production of metals mainly on pig iron and steel, which reached in former Czechoslovak Republic 1000 kg per capita. Also the school and educational system was very strongly affected by politics and ideology. The inflexibility of the socialistic system with its rigid centralised system of controls and orders, slowed down the faculty's progressives, and resulted in standardisation and diluting of its curricula.

The substantial changes in social establishment and economics, following the events of November 1989, have evoked and forced the necessity of industry transformation in the North-Moravian region towards modern technologies and diversification of export both to the western countries and the countries of the European Community. As far as the metallurgical industry was concerned, the decrease of steel and iron production - in comparison with the previous era - was expected.

EDUCATION

The above mentioned situation consequently caused the necessity of educational system transformation, modernisation of traditional branches and creation of new ones. This program had started in 1990. In 1991, the Faculty began to implement process of fundamental reform of its study system with respect to its special contents to reflect new requirements of the industry. The forms and content of study at the Faculty of Metallurgy and Material Engineering are now formulated based on strategic intentions and decisions of faculty management and its scientific council. During the process the faculty has used the experiences of western universities, especially of those, which had been similarly narrowly oriented in the past, e.g.,

Leoben - Austria, Clausthal, Freiberg - Germany. Numerous consultations between the professors of the faculty and management of different industrial enterprises have been undertaken, and as a result several proposals on the educational reform were submitted. The final draft of all of the proposals were supported by the Grant Agency of Department of Education of the Czech Republic.

The faculty now offers courses on three levels: Ph.D., MSc., and BSc. The lower form of education the BSc. Study is relatively independent, lasts three years, and is targeted particularly for external education of associate engineers. The graduates can select to continue their study for master's degree, upon taking two transition terms and passing some selected examination. The main forms of study are MSc. and Ph.D.

The master's pre-graduate study lasts five years. The first two years consist of classes generally common for all students. The content of this terms include basic natural and technical sciences. After four semesters, the students have to pass the first state examination. At the beginning of the third year the undergraduates are divided to take courses in particular branches of study. The study is then completed by the final state examination and the defence of thesis. The graduate obtains the title Engineer (Dipl. - Ing.), equivalent to MSc.

There are three leading branches in faculty education:

1. **Metallurgy**
   - Metallurgical Engineering
   - Foundry
   - Metal Forming
2. **Material Engineering**
   - Metallic Materials
   - Non-ferrous metals
   - New technical materials
3. **Process Engineering**
   - Chemical Engineering
   - Chemistry and technology of Fuels
   - Chemical and Physical methods of material testing
   - Chemistry and technology of Environment Protection

Process engineering bas been established as a new branch, which previously did not exist.

Furthermore, the following specialised education programs were modernized:

- Thermal Engineering and Industrial Ceramics
- Automation and Computer Technique in Metallurgy
- Quality Management
- Environmental Protection in Metallurgy
- Economics and Management in Metallurgy

Another form of education is external study, intended mainly for the people with some previous practice in the industry, who need to obtain higher qualification. This form of study lasts six years, and it is organised as regular consultations for a whole day, once or twice week. The academic requirements are identical with regular MSc. study. At present the number of participating students is fairly low.

The system changes in the educational programs have been reflected also in the faculty organisation. Some departments have been substantially reorganised, some new department have been established.

The reform places a great emphasis upon strengthening of theoretical fundaments, not only in the first years, but also in the specialisation branches on all levels of education.

The faculty also offers higher level of postgraduate education, Ph.D. in the following branches:

- Metallurgy (inclusive Chemical Metallurgy)
- Physical Metallurgy and limit state of materials
- Foundry
- Metal Forming
- Thermal Technique in Industry
- Chemical and Energetic Processing of Fuels
- Automation of Technological Processes
- Material Engineering
- Quality Management
- Management and Economics of Enterprises
- Environment Protection in Industry.

In all of these branches has the faculty the right to award a PhD. Degree, subject to candidate's defence of the doctorate thesis. The necessary preliminary for Ph.D. is a MSc degree. The candidates are selected in a competition. Having successfully completed this study, the graduates are granted the title of "Doctor" (Dr.), which corresponds to Ph.D.

The Ph.D. courses are organised again in two forms: internal, lasting three years, and external, lasting five years. The internal students become the members of the appropriate departments, are supported by state scholarship and must fulfil certain pedagogical duties. The external students are usually employed outside the University. Both groups have to pass an elaborate system of examinations, including foreign languages. The candidates' study is mentored by experienced professor or associate professors. At the end of the study they defend the doctorate thesis.

At present time the total number of regular students, passing different courses for master's degree is 1500, in addition 150 students of Ph.D. - courses. This number - 10% reflects the success of Ph.D. - courses.

Although the faculty remarkably expanded its activities into different industrial branches, it holds the monopoly position is in education of metallurgical engineers in the Czech Republic.

RESEARCH AND INTERNATIONAL ACTIVITIES

The research tasks are integral part of faculty educational activities. During the era of the socialist establishment, the research has been organised by the central state planning authorities. This has also considerably changed after 1989. The financing of research nowadays almost fully depends on the support of different grant agencies; the grants are gained on the basis of competition. The faculty has very quickly adapted to this situation. Within the frame of Technical University in Ostrava, consisting of six faculties, then - considering the total number of students and pedagogical staff - the faculty does not belong to the greatest ones. In spite of this situation, it covers 25 % of grant financial means, which are at disposal of the University. The staff of the faculty has solved different short-termed grants in appropriate branches. At present time, five departments of the faculty in co-operation with three metallurgical enterprises, participate on solving of a long-termed grant, concerning modern technology of continuous casting.

The economical, political and social changes since the year 1989 has also opened a broad opportunity for international contacts.

The faculty has ongoing co-operation contracts in research activities, education of Ph.D. students, and exchange of the pedagogical staff with the following Universities:

- Ecol Central de Paris (France)
- Universita La Sapiensa, Roma (Italy)
- Universita Degli Studi di Cassino (Italy)
- Politechnika Slaska Katowice (Poland)
- Politechnika Slaska Gliwice (Poland)
- South Illinois University, Carbondale (Illinois, USA)
- Montanuniversität Leoben (Austria)
- Bergakademie - TU Freiberg (Germany)
- Politechnika Czenstochowa (Poland).

The co-operation is developed within the frame of international programs BARRANDE, COPERNICUS, ACTION, TEMPUS, LEONARDO. The faculty is preparing to take part in programs SOCRATES and EUREKA.

The international program PHARE has helped the Technical University in Ostrava and the faculty to build the Central Analytical Laboratory, equipped with modern and high - technology equipment.

Many of visiting professors enrich the study program, some of faculty's teaching personnel work regularly or for a limited time-period in the universities abroad. Also the best students are given opportunities abroad in exchange intersrships, or time-limited employment.

CONCLUSION

The faculty of Metallurgy and Material Engineering has great historical tradition. The graduates of the faculty have always obtained leading position in industry, research and education sphere. The teaching staff has traditionally consisted of prominent experts, members of Czechoslovak and Czech Academy of Sciences. The faculty has given the country thousands of outstanding engineers, hundreds of Ph.D. and scores of Doctors of Science. In spite of a very complicated development, particularly during the era of the socialist government, the faculty has kept high professional standard, the graduates on all levels have been recognised not only in the country, but also abroad.
It seems that the reform has found acceptance in greater interess of the students as well as in the industrial sphere.

Although the historical tradition is important, it would not be wise to rely only upon it. The effort of faculty management and all personnel tends to meet the high international level of technical education and full participation in the international universities community. We are fully convinced that the patient and systematic work together with traditions of our predecessors will help us to succeed.