

POST - GRADUATE STUDIES AS AN IMPORTANT FACTOR OF COLLABORATION BETWEEN TECHNICAL UNIVERSITY AND INDUSTRY

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Abstract — *The Silesian University of Technology, the second biggest Polish technical university located in the middle of old industrial region the Upper Silesia has put a special emphasis into a collaboration with industry. One of the important factors of such collaboration seems to be continuing education of industrial managers who in Polish conditions have got mostly engineering background. The paper presents a review of post-graduates studies offered by the university. The studies have covered new ideas and concepts in almost all-engineering disciplines. A good example of such kind of studies seems to be eight years old project of the American-Polish Post-Diploma Studies on Environment-Friendly Restructuring of heavy Industry organised jointly with University of Minnesota. 162 top managers from 85 enterprises representing different kinds of heavy industry have graduated the studies receiving prestigious certificate authorised by two partner universities.*

Index Terms — *Collaboration between university and industry, post-graduate studies, American-Polish cooperation.*

INTRODUCTION

The Silesian University of Technology, the second biggest Polish technical university, is located in the Upper Silesia: industrial region being a national centre of heavy industry with mining, metallurgy, power engineering, chemical engineering and other kind of enterprises. The main university campus is located in Gliwice, smaller ones are in other Silesian cities including Katowice, the capital of the Upper Silesia. The university is divided into 12 faculties (schools) mentioned below in alphabetical order [1] Architecture, Automatic Control, Electronics and Computer Sciences, Civil Engineering, Chemistry, Electrical Engineering, Mining and Geology, Power and Environmental Engineering, Mathematics and Physics, Mechanical Engineering, Material Sciences and Metallurgy, Organisation and Management, Transport (reopened in 2002)

The area of research and educational interest covered all engineering disciplines. The university has provided lectures for more than 30 000 students. It has put a special emphasis into collaboration with industry. As it was mentioned above the region have a lot of enterprises from different kinds of heavy industry like mining, power engineering, metallurgy of steel and iron industry, non-ferrous metals, chemical and mechanical engineering. The enterprises are in a middle point of difficult restructuring processes. Both sides: university and industry are strongly involved in close collaboration in area of research and education activities. One of the parts of such collaboration seems to be a continuing education. In case of the university it takes a form of post-graduate studies.

POST-GRADUATE STUDIES OFFERED BY THE SILESIAN UNIVERSITY OF TECHNOLOGY

The Silesian University of Technology has offered a rather long list of post-graduate studies mainly pointed to industrial managers and higher managerial staff [2]. A number of the post-graduate studies have increased from several years, but nowadays it seems to be stabilised (fig. 1)

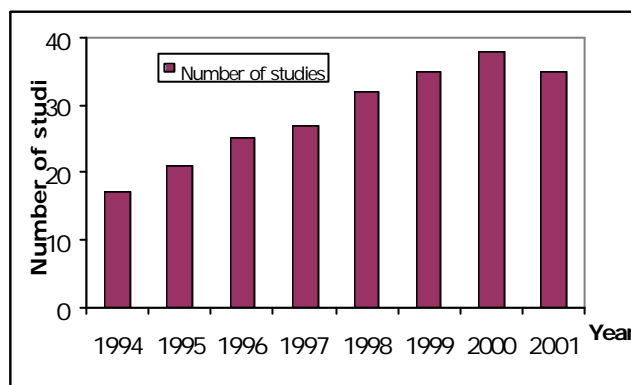


FIGURE. 1
POST-GRADUATE STUDIES OFFERED BY THE SILESIAN
UNIVERSITY OF TECHNOLOGY IN YEARS 1994-2001

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Similar tendency could be observed in case of number of participants (fig.2)

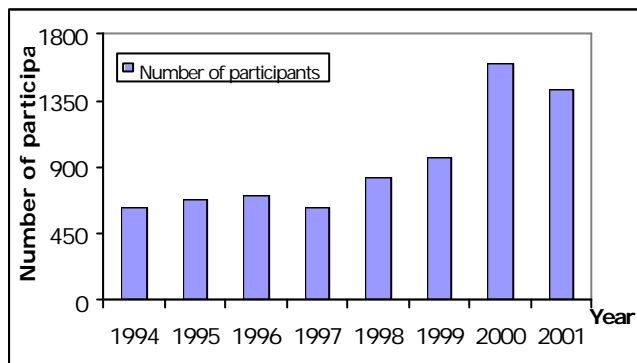


FIGURE. 2
NUMBER OF PARTICIPANTS OF POST-GRADUATE STUDIES
OFFERED BY THE SILESIA UNIVERSITY OF TECHNOLOGY IN
YEARS 1994-2001

Below are shortly described some typical post-graduate studies offered by the faculties of the university.

Faculty of Automatic Control, Electronics and Computer Sciences offered four kinds of studies connected with computer networks, microcomputer systems, databases. Faculty of Electrical Engineering has offered very important studies dealing with market of electric energy, heat and multimedia services. The faculty of Power and Environmental Engineering has offered six types of studies. One of them entitled "Safety of Working Environment" was organised with collaboration with American University. Faculty of Mechanical Engineering has organised eight different types of the post-graduate studies. Six of them have dealt with technological issues. Two remaining ones have connected with quality and environmental management systems. The Faculty of Organisation and Management offered eleven studies. There are some examples of the studies:

- Quality management in enterprises,
- Legal basis of management of the enterprise,
- Using of information technologies in management,
- Human Resources. Innovation.

Some studies are offered for public sectors for instance: Management and Administration in Health protection. Faculty of Organisation and Management of the Silesian University of Technology has organised for several years the studies: Modernisation, Restructuring and Development of Industry and Regions. The studies are organised in close collaboration with French partners: L'Ecole des Mines des Saint Etienne and L'Ecole des Mines de Nancy. Faculty of Materials Sciences, Metallurgy and Faculty of Transport, which till 2002 worked as one faculty, have offered nine studies. Four of them were connected with transport issues. Three other are dealt with practical application of

information technology in material processing technologies. Two remaining studies have got the international character. One of them was pointed to academic teachers. It has been organised jointly with Austrian and Czech partners. It is connected with the IGIP Poland activities. The Studies are described in details in separate paper published in the conference proceedings [3]. The topic of the last studies was connected with restructuring of heavy industry processes. It is described in details in next point of the paper.

AMERICAN-POLISH POST-GRADUATE STUDIES AS AN EXAMPLE OF CLOSE COLLABORATION WITH INDUSTRY

Basic Information

The American-Polish Post-Diploma Studies have undertaken the ambitious task of training directors and senior executives in Upper Silesian industry. In the course of two-semester studies they were supplied with a considerable amount of managerial and technological knowledge. The curriculum had been based on some American models: similar programs applied in American universities were used. The curriculum for the American-Polish Post-Diploma Studies was developed by a team of experts from the Silesian University of Technology and the University of Minnesota as a part of the Environmental Training Program for Central and Eastern Europe (ETP) financed by the United States Agency for International Development (USAID). ETP covered 6 countries in the Central and Eastern Europe (Poland, the Czech Republic, Slovakia, Hungary, Rumania and Bulgaria). It was supervised by a consortium consisting of a few American universities and other institutions, presided over by the Polish-born Prof. Zbigniew BOCHNIARZ - director of the Center for Nations in Transition at the Hubert H. Humphrey Institute of Public Affairs, University of Minnesota [4].

The American-Polish Post-Diploma Studies were inaugurated in the autumn of 1994, after an agreement had been signed between the Faculty of Materials Science, Metallurgy and Transport of the Silesian University of Technology and the Hubert H. Humphrey Institute of Public Affairs, University of Minnesota [5].

There were 8 cycles of the studies in the years 1994-2002. The first cycle was pointed to top managers of steel and iron industry – 38 participants, 35 graduates [6,7,8]. The participants of the second cycle of the studies were recruited mainly from non-ferrous metals industry. 24 of 28 participants graduated the program and received diplomas [9,10]. The third cycle of the studies was directed to power engineering – 35 participants, 30 graduates [11,12]. In case of the fourth cycle participants came from different kinds of heavy industry (mining, metallurgy, power engineering, civil engineering) – 15 participants, 15 graduates [13]. The fifth cycle of the studies was offered also for managers of

different kinds of heavy industry – 23 participants, 22 graduates [14,15]. Majority of participants of the sixth cycle of the studies came from power engineering sector - 17 participants, 16 graduates [16,17]. The seventh cycle of the studies have grouped mainly representatives of power engineering – 20 participants, 20 graduates [18]. Currently the eight cycle of the studies have been provided. 14 participants have represented power engineering sector. Majority of them comes from the Southern Energy Concern a new company grouping eight power plants and heat power stations from the region. Graduation ceremony of the eight cycle of the studies has been scheduled for the first half of next year.

Diploma theses

The diploma theses prepared by the participants have been closely connected with industry. They successfully defended at the end of the studies have been put in practice in the industrial environment and have brought huge economic gains and good ecological results. A short review containing some examples of the diploma theses are presented below.

In the first cycle of the studies one of the topics was connected with pro-ecological modernisation of Roll Casting Department in the Buczek Steel Plant in Sosnowiec. The modernization consisted of replacement of gas and arc melting technology with induction melting and using proper technological devices. Concrete ecological effects were achieved: elimination of noise source and lighting noxiousness, considerable restraint of emission of dust and gas, reduction of wastes and slag and improvement in furnace operations.

One of the topics of diploma theses defended during the second cycle of the studies was connected with activities of the WTÓRMET enterprise – the firm specialised in recycling. It was justified the selection necessity and processing from above waste following specific mass materials: used, reinforced car tires, beverage bottles PET, aluminum cans. The difficulties in the problem settling resulted from wrong tradition, because the Polish existing ecological laws, created programs and regulations, deals the waste management problem in the third order - after air and water protection. This is the main reason of underdevelopment of this field and required mentality changes of the whole society.

In the third cycle of the studies one of the papers was entitled: Technical and economical complexions of SO₂ emission limitation in the Power Plant Laziska. The enterprise has taken a wide range of actions aiming reduction of its negative influence on natural environment. Concrete actions were described in details in the thesis. The adopted solutions to reduce SO₂ emission (using for instance semi-dry technology) allow the plant to meet all world-standard environmental requirements. Unfortunately it is connected with high capital expenditures as well as the rise of unit production costs of electric energy.

President of the Board of the Mining-Metallurgical Plant "White Eagle" – participant of the fourth cycle of the studies has prepared a diploma thesis which considered a modernisation of fire process technology in the company. Increasing economical efficiency and decreasing harmfulness of the environment was achieved as a result of application of the new technology. Battery scrap smelting process in rotary-oscillatory furnace for lead production in the enterprise was modernized in early 90's to match environment protection requirements. The only method of further growing the production of a lead from the battery's scrap is application the new furnace heat system with oxygen-fuel burners. This method has many advantages like intensification of furnace charge smelt process, use up the fuel and fumes system reduction, waste amount reduction.

One of the papers of the fifth cycle prepared by former Polish Ministry of Industry dealt with the pro-innovation policy of the Power Plant Laziska and its impact on the reconstruction of the company. The most important result of the policy is broad reconstruction and modernization of Power Plant Laziska resulting in the extension of the working of the oldest carbon coal fired power units in the Polish power sector by minimum 20 years. The equipment was readjusted to strict ecological standards. Innovative solutions elaborated in the Power Plant Laziska are used in many Polish and foreign power plants e.g. in India, Ukraine, Czech Republic and Slovakia. The Power Plant Laziska was awarded with several honorable prizes for instance they received 15 gold medals at the international Exhibition of Inventions and Innovations - "Eureka" in Brussels.

Reduction of the nuisance of the Power Plant Jaworzno for environment in the technical restructuring aspect of installed equipment – it was a topic of one thesis of the sixth cycle. It describes the activities of the plant aiming at the modernization of the devices installed here as far as their exploitation is concerned in the aspect of the environment. There were some achieved results of the activities mentioned below: reduction of dust, sulfur dioxide, nitric oxides and carbon dioxide emissions, elimination of the storage the sewage treatment plants enabled the sewage treatment to the level requirements determined in the water-law permission of wastes. As a final results of the actions ISO 9002 and ISO 14001 standards certified the plant.

Some papers considered more broad topics important not only for the company but also for the region. An example of such a thesis entitled "A general assumptions of regional multiutility and multiservice enterprises" was prepared during seventh edition of the studies by president of the board of the Bedzin Power Distribution Company. The paper deals with a general idea of regional, infrastructure enterprises which could offer to customers delivering of all kinds of energetic and electronic media like: electricity, gas, water, radio and television, telephones, internet, The enterprise deals also with picking of wastes and sewage.

It is necessary to undertake high level of all defended theses. Practically all the theses were implemented into the

practice. 21 diploma theses were evaluated as extremely good and distinguished by the examination council.

Statistics data

Trying to summarize eight years of the American-Polish Post-Graduate Studies it is necessary to mention that during that period of time 190 senior managers from 89 different institutions participated in the Studies. (fig.3) [19]. They represented main branches of Polish heavy industry like: steel and iron, non-ferrous metals, power engineering, mining, chemistry etc.

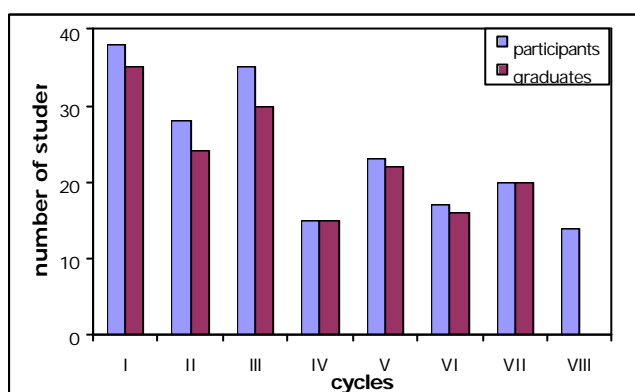
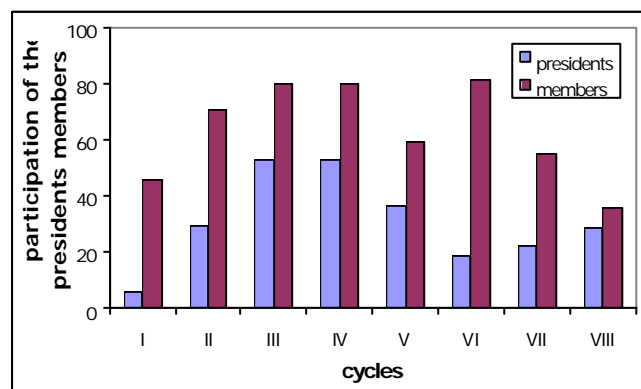


FIGURE. 3
PARTICIPANTS AND GRADUATES OF THE STUDIES FOR
FOLLOWING CYCLES

162 of them representing 85 enterprises graduated the studies receiving prestigious diplomas authorised by both partner universities. Among the 162 alumni, directors and members of the board of directors in their respective institutions were in a clear majority (60.9%) (fig.4).

FIGURE. 4



PARTICIPATION OF THE PRESIDENTS OF THE BOARD AND MEMBERS OF THE BOARD IN THE CYCLES OF THE STUDIES

Alumni Club

The alumni have established an Alumni Club, which serves as a platform for discussion and sharing one's views. During last years members of the club have met several times to discuss on different topics, trying to establish joint opinions and present them to the public.

Completing the studies had also positively influenced professional careers of many former students. The co-operation between the Silesian University of Technology and the heavy industry in the region had tightened up.

Future prospective

The demand for the studies is still quite high, and despite the fact that US AID has stopped his activities as well as financial support in Poland. The last four courses were fully self-sufficient. The eight cycle of the studies started just few months ago will be terminated in May 2003. In future it is planned to transform the studies into regular post-graduate program pointed to medium level managers graduated engineering studies about 5-6 years ago.

CONCLUSIONS

Post-graduate studies seem to be an important factor of collaboration between industry and academia. It is especially distinct in case of a big technical university located in the industrial region. The Silesian University of Technology has offered a quite long list of post-graduate studies covering such topics like for instance: restructuring of industry, innovative technologies, environment, management and marketing. Some studies are organized jointly with foreign universities from Europe and America.

The American-Polish Post-Graduate Studies on Environment Friendly Restructuring of Heavy Industry organised jointly with University of Minnesota seems to be a good example of such collaboration. During last eight years 162 presidents of the boards or representatives of higher managerial staff graduated the studies receiving prestigious certificates authorised by both partner universities. All the graduates have prepared valuable diploma theses. Majority of the theses was implemented to the practice giving concrete ecological and economic advantages.

14 participants who have currently participated in the studies should graduate the program next year. Based upon eight years experiences it is planned in the nearest future to start with a regular post-graduate program pointed to medium level managers having engineering background and about 5-6 years of industrial experience.

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