Environmental Engineering and Management Journal, September 2002, Vol.1, No.2, 107-118
http://omicron.ch.tuiasi.ro/EEMJ/

"Gh. Asachi" Technical University of Iasi, Romania

ICEEM /01 PLENARY CONFERENCE

TEN YEARS OF ENVIRONMENTAL ENGINEERING AND MANAGEMENT EDUCATION AND RESEARCH AT THE TECHNICAL UNIVERSITY OF IASI

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1. Past and tradition: Who we are?

From the University foundation in 1860, until 1912, the chemical education developed as part of the Department of Physical-Chemistry, at the Faculty of Sciences. As a part of this faculty, the Department of Chemical Technology (since 1992, Department of Environmental Engineering) appeared in 1912.

In 1937, after the Polytechnical School was created in Iasi, the Faculty of Chemical Technology was founded, with 4 years training for the chemical engineers graduates.

After 1948, within the Faculty of Chemical Technology, specialized departments were created, the training period being of 5 years, developing thus, the academic education in all the fields of chemical technology.

Starting with the university year 1970/1971, after Professor Mihai Dima has retired, the head of the Department of Chemical Technology became Professor Ion Curievici that was in the same time the Dean of the Faculty of Chemical Technology.

Professor Ion Curievici established a new trend for the education process within the Department of Chemical Technology, starting from the following 2 principles:

a) approaching of important common aspects for all the chemical technologies and presentation of general useful methods of thinking and action for chemical engineers;

b) development of new trends such as: conception of chemical and technological processes, optimization of the chemical processes, problems related to energy in the chemical industry, environmental and labor protection in the chemical industry.

Thus, within the course entitled *Bases of Chemical Technology*, a chapter referring to the Environmental Protection was developed, while in the research activity were approached themes such as: water and wastewater treatment, treatment of gaseous fluxes, waste treatment and recycling/reuse.

At the same time, within some of the specialization profiles, a course regarding the treatment of the wastewaters generated by specific industries was introduced (e.g. Textile and Leather industry).

It is worth mentioning that the research contract *Study regarding the nature and the methods for removal of suspended solids resulted from cooling water in order to recycle it*, realized at the request of the Chemical Company Pitesti, was one of the first contracts achieved for economical agents (finalized in 1973).

The Department of Environmental Engineering, created in 1992 at the Faculty of Industrial Chemistry (former Faculty of Chemical Technology) from the "Gh. Asachi" Technical University, Iasi, offers specialization studies (diploma of engineer, M.Sc. and Ph.D.) in the field of Environmental Engineering and Management, studies that are highly requested by students and society.

Since 1998, the subjects of studies for the diploma of engineer and M.Sc. programs are organized based on the transferable credit points system (ECTS).

In 1999, the Master of Science courses for the Environmental Management specialization were initiated, being completed in 2000 with the distance-learning program.

The Department of Environmental Engineering has relationships with many university departments and research centers from E.U. countries and awards (through the "Gh.Asachi" Technical University of Iasi of which it belongs) the Academic Titles "Doctor Honoris-Causa" to prestigious scientists.

2. Present: Environmental Engineering and Management education and research

2.1. Teaching and research activities in the Department of Environmental Engineering

The educational programs in Environmental Engineering and Environmental Management are briefly described by means of curricula, presented in Tables 1 and 2 that we have continuously updated considering national and international requirements.

2.1.1. Environmental Engineering studies

These studies are finalized with the diploma of engineer after 5 years of study, in the specialization *Environmental Engineering and Industrial Environment Protection.*

Table 1. Curricula for the first and the second years of study

YEAR OF STUDY I	*YEAR OF STUDY II*
Special Mathematics	Numerical Methods in Algebra and Mathematical Analyses
Environmental Biodiversity	Bases of Soil Science
Theoretical Mechanics	Hydraulics
Analytical Chemistry and Instrumental Analyses	Ecology and Eco-physiology
Physics and Biophysics	Organic Chemistry
Environmental Psychology and Techniques of Social Inquiry	Information Technology
Climatology and Meteorology	Descriptive Geometry and Drawing
Statistics	General Topography
Environmental Microbiology	Environmental Chemistry
Hydrobiology	Hydrology
	Materials Science and Engineering
	Eco-toxicology
	Practical period (technological)
Optionals:	
Inorganic Chemistry	Organic Biochemistry
Bio-inorganic Chemistry	Geology and Hydrogeology
Free choice disciplines:	
Psychology of Success	Elements of Macro and Micro Economy
Interpersonal Communication	Elements of Marketing
Other disciplines:	
Physical education Foreign languages	

Table 2. Curricula for the years of study III to V.

YEAR OF STUDY III	*YEAR OF STUDY IV*	*YEAR OF STUDY V*
Mechanical Engineering	Sensors in Environmental Control	Technologies and Biotechnologies for Wastewater Treatment
Sources, Processes and Pollutant Products	Catalysts and adsorbents in Environmental Protection	Technologies and Biotechnologies for Wastewater Treatment-project design
Radiochemistry	Biotechnologies in Environmental Protection	Technologies for soil decontamination
Radiation Sources and Protection Technologies	Management	Minimization of Pollutants and source reduction
Chemical and bio- chemical Thermodynamics and Kinetics	Chemical and Biological Processes Engineering	Environmental Impact Assessment

Table 2 (continued)

Transfer Phenomena and Unit Operations	Treatment Technologies for Drinking and Industrial Water production	Environmental Legislation
Transfer Phenomena and Unit Operations- project design	Technologies for Atmosphere Protection	Elaboration of diploma project (research and design)
Physical Chemistry of Poly-disperse Systems	Technologies for Atmosphere Protection-project design	Diploma project examination
Electrochemistry	Automation, Automatic Control and Monitoring in Environmental Protection	Diploma project defence
Bases of Technological Systems	Solid Waste Management	***Optionals*:**
Technological practical period	Technological practical period	Technological Disasters and Environmental Protection
Control Techniques of Biotechnological Processes	***Optionals:***	Environmental Policy Making
Optimization	Energy and Environment	
Technological practical period	Polymers for Environment	
	Corrosion and anticorrosive protection	
Free choice disciplines:		
Theory of Systems	Environmental economy	Principles for Reports realization and presentation
Bio-inorganic Products in the Environment (free discipline)	Integrated Systems for Environmental Applications	Integrated Systems for Environmental Applications
Integrated Systems for Environmental Applications	Ecological Management	

2.1.2. Master of Science programs

For the specialization Environmental Management, master of science courses, either as daily courses or distance learning (Table 3), offer the diploma of Master of Science after 2 semesters and 4 semesters, respectively.

2.1.3. Post graduate and continuous education programs in the fields of Environmental Engineering and Management

These programs have as purpose to develop the participants' abilities to identify and analyze the environmental related problems, as well as to find technical and managerial solutions for their solving in the context of sustainable development. Some of the courses organized within these programs are:

- Integrated Pollution Prevention and Monitoring;
- Technologies for Environmental Protection (water, air, soil);
- Environmental Management and Sustainable Development;
- Environmental Impact Assessment;

- Environmental Audit;
- Industrial Wastewaters Quality Management;
- Minimization of Pollutants and Waste Reduction;
- Risk Evaluation and Management;
- Modelling, Simulation and Optimization of the Environmental Processes;
- Environmental Legislation.

Table 3. Curricula for Master of Science programs

MASTER OF SCIENCE **Daily courses** **Distance learning program**
Environmental Audit Life-cycle Assessment Methods and techniques for Environmental Impact Assessment Minimization of Pollutants and Waste Reduction Eco-industry Environmental Integrated Management Energy and Environment Cost-benefit Analysis in Environmental Protection Risk Evaluation and Management Modelling and simulation of Environmental Processes Environmental Policy Making Interpersonal Communication
Within the distance learning program other optional subjects were included as well: Environmental Monitoring assisted by computer Environmental Legislation

2.1.4. Ph.D. Programs

These programs develop within: the *Chemical engineering field* (Environmental Engineering, Optimization of chemical/environmental processes, Environmental impact assessment) and in the field of *Material Science*.

The major trends of research activities within the Department of Environmental Engineering are:

- *Environmental impact assessment, environmental auditing;*
- *Environmental management and the implementation of EMS or integrated systems (quality-environment, quality-safety-environment);*
- *Wastewater treatment processes (conventional and advanced treatment processes);*
- *Water treatment for drinking or industrial purposes;*
- *Technologies for treatment of gaseous fluxes;*

- *Materials science and engineering;*
- *Automatic sampling, control and monitoring water and air quality (including software and implementation techniques);*
- *Biotechnologies applied in environmental engineering;*
- *Unit operations and processes engineering for environmental and chemical processes (including modelling, simulation, optimisation).*

2.2. Scientific and Educational Programs, co-operation and mobilities with EU/non-EU countries

Co-operation of the Department of Environmental Engineering has been realized with various academic and research institutes, by means of bilateral agreements or for specific project co-operation:

- Institute of Ecological Chemistry, Munich, Germany;
- Delft University of Technology, The Netherlands
- State University of Kishinew, Republic of Moldova, Department of Industrial and Ecological Chemistry;
- University of Pristina, Kosovo;
- University of Leeds, UK;
- University of Liverpool and Liverpool Hope University College, United Kingdom;
- University of Groningen, The Netherlands;
- University of Twente, The Netherlands;
- National Superior School of Electrochemistry and Electrometallurgy, Grenoble, France;
- University of Science and Technology, Lille, France;
- Littoral University, Dunkerque, France;
- Technical University of Munich, Germany.

2.3. International Grants

a) Bilateral Agreement for the Academic Year 1998- 1999, SOCRATES Program, Academic education (ERASMUS), The University of Leeds (subject area code: Environmental Risk Management and Advanced Water Treatment) (Env. Eng.);
b) Bilateral Agreements for the Academic Year 2002- 2003, SOCRATES Program, Academic education (ERASMUS) with University of Liverpool and Liverpool Hope University College (Env. Eng.);
c) MATRA, project RO/97/04: *Research and Information Centers in Romanian Moldova*, financed by the Dutch Ministry of Foreign Affairs, 1998- 2000 (InterMEDIU);
d) ECOLINKS Challenge Grant Agreement CGI-RO-20: *Recycling and Reuse of PET Waste in Iasi County, Romania,* 1999-2000 (Env.Eng and AOEESD);
e) EC project SCIPAS HPV1-CT-1999-00001: *Study and conference on improving public access to science by means of science shops* Project funded by the European Union, 2000-2001, FP5 (InterMEDIU);

f) EC project INTERACTS, HPV1-CT-2001-60039, *Improving interaction between NGOs, Science Shops and Universities: Experiences and Expectations*, 2002-2003, FP5 (InterMEDIU)
g) SOCRATES/CDI project *Management of Chemical Investigations in Environmental Protection,* 2000-2003, (Env. Eng);
h) ROM 012/98 PNUD program Agenda 21, *Elaboration of strategies for sustainable development of the city of Iasi*, 2001- 2003, (InterMEDIU)
i) ROM 99/008, BMBF-Germany and C-17172/1999, MCT-Romania: *Concepts and methodologies to minimize environmental impact from wastewaters-Textile Industry, a case study, 2002* (Env. Eng.).

Even this international Conference ICEEM 01/2002 organized by the Department of Environmental Engineering, gathering 75 participants from Romania and other 6 European countries (Germany, Denmark, The Netherlands, Sweden, Republic of Moldova) is an important event for our evolution as a department, both in the educational, but also in the research area.

2.4. Ph.D. theses realized within the Department of Environmental Engineering

Some of the most important results achieved at the Department of Environmental Engineering during the activities realised within the Ph.D. program and presented at international, national conferences and workshops are:

- Author: Eng. Carmen Teodosiu - *Optimization of an advanced wastewater treatment process for the removal of non-biodegradable organics and suspended solids* - 1998 (public presentation).

Ph.D. supervisor: Prof. Matei Macoveanu, Ph.D.

- Author: Eng. Igor Cretescu - *Contribution to investigation and optimization of the electrode processes applied for N, N – dimethyl-p-phenylendiamine electric synthesis and electrochemical wastewaters treatment* – 1999 (public presentation).

Ph.D. supervisor: Prof. Matei Macoveanu, Ph.D.

- Author: Eng. Gabriela Soreanu- *Contribution to the study and optimization of ion exchange processes applied for recoverable treatment wastewater resulted from galvanotechnics*- 2000 (public presentation).

Ph.D. supervisor: Prof. Matei Macoveanu, Ph.D.

- Author: Eng. Carmen Zaharia - *Optimization of different wastewaters treatment using polyelectrolytes* - 2000 (public presentation).

Ph.D. supervisor: Prof. Matei Macoveanu, Ph.D.

- Author: Eng. Maria Petruc - *Optimization of the treatment process for wastewaters resulted from machine manufacturing industry* - 2001 (public presentation).

Ph.D. supervisor: Prof. Matei Macoveanu, Ph.D.

- Author: Chem. Valeria Ditoiu- *Contribution to the environmental impact assessment for the mining activity on the ecosystems from Calimani area* –2002 (public presentation).

Ph.D. supervisor: Prof. Domnica Ciobanu, Ph.D.

2.5. Contribution to the development of university scientific research and to privatisation process in Romania

After 1990, in Romania, were made some modest attempts to set the scientific university research at its right place, as in the case of western countries, where requests from industry are finalized in many cases by university staff.

Unfortunately, the progresses are very difficult to observe and is still hard to understand the reason why the scientific university research is by far "The Cinderella" of the Romanian scientific research, as well as the reason why the research subjects proposed for the Master of Science Program or for the Ph.D. programs are not financed by the industry.

Does somebody who lives in Romania think that, without this manner to support the scientific university research (probably to the prejudice of the research developed in other institutes of the Romanian Academy or other national institutes) could ever reach the level that exists in the E.U. countries and, implicitly, the level of competitiveness envisaged for technical academic education?

We don't think this, so we have tried to approach research subjects which interest industrial agents and which posses, at least, a partial financial support. All of the finalized Ph.D. research themes within our department had a financial support, at least partially, given by some economic agents or important companies interested in their research.

Starting with 1994, when we have finalized the first contract regarding the environmental impact assessment (at the "Arctic" Gaiesti Company, which was further privatized with B.E.R.D help, as majority investor) until now, we have successful accomplished over 200 studies concerning the environmental impact assessments and audits.

The Department of Environmental Engineering and 4 persons from its academic staff are certified as environmental impact assessors by the Ministry of Waters and Environmental Protection.

We are very proud to mention that, through our studies and research we contributed to the privatization of important companies from Romania, such as: "PETROMIDIA" Navodari, "DAEWOO-HEAVY INDUSTRIES" Mangalia, the Shipyard of Constanta etc.

We have also brought our contribution by means of environmental impact assessment studies and audits necessary for the documentation needed in order to issue the environmental permits of the following companies: "TOMIRIS" Iasi, "TEROM" Iasi, "MOLDOPLAST" Iasi, "PETROFOREST" Piatra-Neamt, all the warehouses for oil products belonging to PETROM Company, from the Neamt, Iasi and Vaslui branches.

At the same time, we realized the environmental impact studies for "COCA-COLA" Company Iasi, "METRO" Iasi, "TEHNOPOLIS" Iasi Technological Park, "CARGO TERMINAL" of the Iasi Airport, etc. We have to mention that, considering the fact that these last two projects benefited by financial support through the PHARE program, for the accomplishment of these environmental impact studies, the E.U. directives in this field were considered (Council Directive 97/11/EC issued on 3 March 1997, amending the Directive 85/337/EEC issued on

27 June 1985 regarding the assessment of the effects of certain public and private projects on the environment).

At this moment, we are involved in solving the compliance programs for recently privatized economic agents, such as "TOMIRIS" Company, Iasi.

In the last two years, there have been initiated also environmental management specific activities. Environmental initial analysis or pre-feasibility studies were finalized or are still developing. We intend to co-operate, by means of contracts, with economic agents regarding the implementation of environmental management systems (we already have an assessed environmental internal auditor).

Of course, the fundamental research was not neglected, the results that have been obtained constituting the base that allowed us to successfully solve the direct contracts that economic agents from different counties from Romania requested (especially those in Neamt, Constanta, Iasi and Tirgoviste counties).

Within the Department of Environmental Engineering, were published over 150 scientific papers in specialized journals, 30 patents, and 18 books in central publishing houses. You will all have the chance to see some of these results (books, projects, studies) in an exhibition opened in the Hall of our Faculty.

We succeeded to launch in the MatrixRom Publishing House, Bucuresti, a new series entitled "Environmental Chemistry and Engineering", which represents us, in our opinion. In this series, five books have already appeared:

- *Advanced treatment of wastewater containing non-biodegradable organic compounds* (1998);
- *Ecological Chemistry* (1999);
- *Drinking and industrial water technology* (2001);
- *Ion exchange processes for environmental protection* (2002).

When discussing about enforcing university scientific research, we may also note an attempt made in Romania that is to establish at national level the Centers of Scientific Excellence, as well as the Research Centers.

The Department of Environmental Engineering, together with the Department of General Chemistry and that of Technologies of Inorganic Substances, succeeded in obtaining the certification of such a Research Center. in 2001: *Environmental Engineering and Impact Assessment*.

Unfortunately, at the national level, until now, nothing was done in order to consolidate these certified university research centers and also related to their real financial independence.

We have to mention that, not even within the Technical University of Iasi, the importance of existence and efficient functioning of these centers is adequately understood.

3. Future: The strategy of the Department of Environmental Engineering concerning the teaching and scientific activities

"The academic education without frontiers, global or transnational" or "the traditional university" as well as the relationships, which can be established between these 2 types of academic education development represent, at this moment, a dilemma not only for Romania but also for many other countries".

The European integration of the university education and research from Romania doesn't have to be an aim only, but at the same time, an opportunity to benefit, with more profoundness, from the most valuable university values and contribute thus to sustainable development.

The Department of Environmental Engineering from the Technical University of Iasi, develops its teaching and scientific activities complying with the tradition of the university school of industrial chemistry, but tries to continuously assimilate, as it is possible, the modalities, adopted at the European community level, concerning the role of university departments in the formation of specialists, and solving of problems related to economical development.

We do consider that the academic education must adapt itself at the market requirement but also to set up its own market such as:

- an internal market (candidate students that are interested to have the necessary background in Environmental Engineering and Management, economical agents interested in realising studies of impact assessment, audits, environmental management and engineering short trainings);
- an external market (co-operation in international programs, participation in teaching and research university networks, acceptance of some foreign universities' branches or establishment of branches abroad, etc.).

In this context, we intend to achieve the following objectives related to our future development:

- accomplishment of financial autonomy at the department level;
- continuous specialization and training of our teaching staff in university departments from or outside E.U;
- establishment of permanent contacts and co-operation regarding the teaching or research activities with universities and institutes from abroad;
- establishment of permanent contacts and co-operation with economic agents from Romania concerning proposal of solutions which can solve environmental problems;
- participation in research programs and networks at European level (Framework Program 6, for example).

For the next 5-6 years we are most interested in achieving the following priority objectives:

- accomplishment of financial autonomy at the department level;
- obtaining the international acknowledgement for the *"Environmental Engineering and Management Journal"*. First, we hope that the level of scientific contributions submitted to this Journal will be and remain very high, increasing thus its impact coefficient. Also, we would like to include in the Scientific Board of this Journal, around 40 members from abroad (from a total of 70 members that act as reviewers for this Journal);
- organizing an international Master of Science program (in English) in the specialization Environmental Management, with partners from E.U.
- obtaining of the ISO 9001 Quality Certification for the Laboratory of Environmental Quality Analysis;
- identification of financial sources and obtaining the support of the Ministry of Waters and Environmental Protection in launching a program for post-graduate

training through Master of Science - distance learning program, specialization Environmental Management. These programs have as target groups the staff of the Environmental Protection Inspectorate and local administration*;*

- proposing, with the support of the Ministry of Waters and Environmental Protection, of a legislative initiative in order to determine the economic agents with more than 30-40 employees to employ a graduate in the specialization Environmental Engineering.

We intend to develop the teaching and research activity in such manner as:

a) to be in accordance with the financial strategy adopted by our Ministry of Education and Research, without affecting the continuous adaptation process of education and research integration trends, in order to achieve integration the European university values;

b) to make a continuous exercise for a gradual passing to the financial autonomy of the department, which is unavoidable considering the integration into European Community structures;

c) to ensure the formation and consolidation of the Environmental Engineering specialization within the Faculty of Industrial Chemistry of Iasi, and also to promote our graduate students in Romania and abroad, through the results obtained in research and teaching activities, continuous education and awareness regarding sustainable development.

In the last two university years, we permanently have taken into account the economic indicators and quality criteria adopted in Romania, for ensuring the university teaching activity on real, economic bases.

What we have succeeded is presented briefly below:

a) *Economic indicators:*

- Number of equivalent students/teaching position = 14.83
- Number of equivalent students/square meters of surface of activity = 0.29

b) *Quality criteria*:

- Occupied positions: 80.95%
- Professors and Associate professors: 33.33%
- Teaching staff under 35 years old: 41.17%
- Teaching staff with Ph.D. title: 64.71%
- The evaluation of our courses by students and post-graduate students

As a consequence:

- In 2000 we have realized savings of budgetary funds of 160.000.000 lei (approximately 5000 USD).
- In 2001 we have realized savings of budgetary funds of 5200 USD.

This is not bad, and it is just a start, for sure!

Few comments concerning the budgetary funds may be added:

a. In fact, the budgetary funds savings are much bigger, since the other faculties for which we performed teaching activities (like Hydrotechnics, Textiles, Mechanical Engineering) pay us the salaries only, and do not contribute to the afferent utilities payment, as the Faculty of Industrial Chemistry does.

b. The fact that the Department of Environmental Engineering did not benefit by budgetary funds savings, even if these were realized by us. This situation is unfair and led to the perpetuation of disfunctionalities of other departments, with all the undesired implications, which have resulted from these.

We consider that this practice is a real problem and cannot lead to anything but to a continuous diminishing of the Faculty's prestige and to the inhibition of the initiatives made in order to adapt to the present life requirements, such as the alignment to the European University standards. We truly consider that, at this moment, only the application of economic indicators and quality criteria will help us encompass the vanities, inertia, lack of capacity to accept the reality and individual or groups' interests.

The policy of bringing everybody at the same denominator (used a lot in the past) must be left behind, and we have to accept the evidences and try to establish "durable" bases for our future activities in Romanian universities.

We cannot finish this presentation that was meant to cover not only a decade of our existence, but also to discuss our roots and future plans, without mentioning the names of those that have contributed and supported our ideas and development.

We would like to express our gratitude to:

- Professor Ovidiu Ianculescu (Minister-secretary of State, Romanian Ministry of Education);
- The members of the actual and past management of the Technical University (Prof. Mihai Cretu, our Rector, Prof. Ion Giurma, Prof. Victor Bulacovschi, Prof. Mihai Gafiteanu);
- The deans of our Faculty (Prof. Valentin Popa and Prof. Ion Balasanian) and of the Faculty of Hydrotechnics (Prof. Bartha and Prof. Ion Cojocaru);
- Our colleagues, staff members of the Department of Environmental Engineering, especially to those that made the efforts to develop new disciplines and research fields. Special thanks are addressed to my colleagues, Prof. Carmen Teodosiu and Prof. Maria Gavrilescu for their efforts made for the organization of this international conference and the appearance of the proceedings.

September 26, 2002