

Rejtő Sándor Faculty of Engineering**Institute of Media Technology****Address: Doberdó út 6, H-1034 Budapest, Hungary****Tel.: +36-1-666-5980****Fax: +36-1-666-5678****E-mail: endredy.ildikó@rkk.bmf.hu****Homepage: <http://www.rkk.bmf.hu>****Head of Institute: Dr. habil Ildikó Endrédy****1 Introduction**

The Institute of Media Technology of the Rejtő Sándor Faculty of Engineering is a unique educational and research institution with a staff of 27 on the fields of print industry and paper and packaging technology. The staff includes 2 professors, 5 associate professors, and 4 adjunct professors.

2 Educational Profile

Educational activities are concentrated on the field of printing and media technology, paper and packaging technologies.

Print and Media Technology Specialisation

In the past 30 years the most fundamental changes happened to printing industry in its 550-year history. In the past decades technological development accelerated due to the rapid evolution of computer and information technologies. State-of-the-art printing technologies process digital data from the pre-press to the printing stage. Image and text processing is maintained electronically, novelties are also developed on the field of plate-making for the evolving computer-to-plate and cylinder-to-plate technologies.

The advantage of digital technologies regarding presses is twofold: both the control systems and digital printing technologies benefit from it.

In accordance with the changes of the past decade and free market economy our teaching materials are revised and updated from 1994. Starting in the year 2000 two specialisations are offered for second year students:

- media technology,
- print industry.

Media Technology Specialisation

Engineers who obtain a degree in this specialisation will be able to design traditional and electronic printed products as well as printed and digital media products. Students are introduced to modern hardware tools and the fundamentals of multimedia. A broad range of employment possibilities are open to our graduated students on the media and marketing fields of the labor market.

Print Industry Specialisation

Education on the print industry specialisation focuses on the fields of traditional and digital plate-making, printing and binding technologies. Our students are introduced to recent printing technologies at printing houses; in the laboratories of the faculty they learn how to use measurement equipment for material investigation, color measurement and special purposes.

Graduated students are employed on various fields of the printing and media industry.

Papermaking and Processing Specialisation

Papermaking has a more than 2000 year old history. The ancient manufacture craft has developed to a modern giant paper industry. Our life could not go on without paper; we come across paper products everywhere. In Hungary they modern paper making and processing is at a high technological level, where the high quality products are produced by computer controlled machines. Paper factories are located in Budapest, Lábaltan, Balatonfűzfő, Diósgyőr, Dunaújváros and Szentedre, paper processing plants can be found all over the country. The tasks of our young graduated engineers will be to develop paper products and paper technology, supervise and control company processes. Students at the Papermaking and processing department get acquainted with the raw materials and Technology of papermaking and with the operation of machines. In the laboratories students have the possibility to make different quality papers and examine their properties. Our department has good connections with the Hungarian and International companies. Our international relationships make it possible for the students to study abroad as well. In cooperation with the Sopron West Hungary University the PhD degree can be obtained in this specialization. Young engineers find jobs in paper factories or processing plants at commercial firms or at the agencies of foreign paper companies.

Packaging Technology Specialisation

In the 20th century the quick progress of the industrial production and the expanding of consumer society resulted in the outstanding development of packaging technology. The appearance of the great choice of plastics beside the conventional packaging materials like wood, paper, metal and glass have also contributed to the development of packaging just like the increased esthetical, hygienic demands and the widening possibilities of transportation.

In 1985 the specialized training of engineers for packaging technology started and today this type of education still exists in our institution. Our graduating students are qualified for producing packaging materials, controlling and organizing of packaging plants and they are already to take part in the technical designing of costumers collecting and transporting packaging. Recently the development of the educational infrastructure has accelerated. We established a laboratory with special equipments and instruments for the examination of packaging materials. In the field of the technical (practical) training the set up of a CAD laboratory was a significant step ahead. In this laboratory all the necessary equipments, computers and software can be reached for computer aided designing of up-to-date paper and packaging products. In order to be able to create marketable, salable products students can study construction drawing, aesthetics, commercial printing technology and environmental studies as well. Young engineers graduated of Packaging technology have to know the means of distribution, transportation and storage and the possible facts which may cause damage of goods during these processes otherwise there is no chance for the protection of goods. Students get introduced to the demand of application and consumption of packaging too.

For foreign language-speaking students the ERASMUS program provides the possibility to study several weeks (or a semester) at European higher education institutions (or occasionally overseas). After Graduating, young engineers can find jobs at many areas of industry (food, pharmaceutical-engineering industry, etc) for there is a considerable need of learned experts of packaging technology).

3 Research and Scientific Activities

The rapid technological changes induced the development of equipment at our institute. We have a long and good partnership with the small and medium size companies of the paper and printing industry and sales representatives of large international companies in Hungary. Technological and measurement equipment buys are financed almost solely by the fund sponsored by the companies that employ part-time students.

The developments include the setting up of a small, but up-to-date image and text editing laboratory, the improvement of our measurement laboratory on the fields of color measurement and investigation of printing materials and substrates.

The laboratory for package investigation had been recently completed and equipped with special devices. The establishment of a CAD lab for designing paper products and packaging devices was a significant improvement regarding educational facilities. In the same time the development of a multimedia laboratory started.

In the past 4 years the above improvements were achieved by a 50M Ft investment of industrial partners. These developments provided a basis for staff and student research. Furthermore our industrial partners contribute to educational and research activities with interesting presentations and also by introducing their production equipment.

Research work of our institute is realized through supervising theses and student scientific projects; by the innovation fund sponsored by industrial partners, and also by participating in international projects.

Research Areas

Printing and Media Technology

- digital printing,
- surface investigation of digital printing substrates,
- development of a control and test system for state of the art reproduction process synchronization,
- development of a control and test system for quality control and synchronization of technological systems for homeland print industry,
- rheology of printing inks and dyes,
- color measurement in print industry.

Paper and Packaging Technology

- Developing of maturing for the Investigation of the Specific surface of Cellulate and Paper
- Production of Graft Cellulose Fibres for Synthetic Papers,
- Investigation of the Permeability of Fibron Structured Packaging Materials Having Porous and Closed Surface,
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Developing of Maturing for the Investigation of the Specific surface of Cellulate and Paper

In order to develop new packaging combinations with improves mechanical, closing and oecological properties it is necessary to know the structure of the paper-based packaging materials.

The mechanical, physical and chemical properties of the fibres of packaging papers can be characterized by their specific surface area. In the course of the laboratory tests the specific surfaces of different grades of spruce cellulose fibres beaten to different extents and cured in different ways were determined using the molecular methylene bleve adsorption method in liquid medium.

The aim of our investigation was develop an experimental method based on colloid chemical sciences and to study its application possibilities.

Production of Graft Cellulose Fibres for Synthetic Papers

The behavior of paper made on a paper machine by planking the fibres – despite the development of ingredients used in paper industry – depends first of all on the physical and chemical properties of cellulose fibres. With the advance of paper-synthetics combinations, however, several disadvantageous properties of paper due to the behaviour of fibres can be excluded.

- the paper or cellulose is associated with finished synthetics or semi-finished synthetic products
- the other way to produce paper-synthetics system is the modification of cellulose itself.

As the cellulose itself has a polymer structure, it can only produce block or graft copolymers. The synthesis of cellulose block copolymers cannot be widely applied for the chemical modification of cellulose, since it essentially changes the physical structure of cellulose block or graft copolymers. The synthesis of cellulose block copolymers cannot be widely applied for the chemical modification of cellulose, since it essentially changes the physical structure of cellulose.

The chemical modification of cellulose fibre by graft copolymerization is of great importance because, by grafting a relatively small amount of monomers, this natural macromolecular material can be provided with a number of new advantageous properties. Graft copolymerization makes it possible to produce industrial cellulose fibres which can be successfully applied for making special, marked paper, and it can be also used as binder fibres of synthetic papers.

Our studies aimed at finding the answers to the questions whether industrial wooden cellulose can be grafted with vinyl-acetate and how the grafting reaction depends on the composition and properties of cellulose.

Next we analyse the formation of free radicals acting in radical copolymerization of cellulose, then we analysed the whole copolymerization process by tracing the changes in magnetic susceptibility.

Investigation of the Transport Properties of Plastic Packaging Materials

Permeability is a very important material property of plastics. Many technical products such as machines, apparatus should be protected against corrosion. On the other hand a lot of various foods and other perishable products, e.g. pharmaceutical preparations can only made ready for the market, transportation and distribution by means of a suitable packaging. In our experiments we studied the dependence of oxygen permeability of plastic on the applied temperature, relative humidity and the thickness of different BOPP films. The oxygen transmission rate was measured by OX-TRAN 2/20 laboratory tester of MOCON.

Investigation of the Permeability of Fibron Structured Packaging Materials Having Porous and Closed Surface

The properties of paper-synthetic combinations are mainly determined by the finishing material, the basic paper material by the technological parameters and in addition by the direction of the transport phenomena. Because of the application technology aspect it is important to study the influence of the direction of transport effects and their rules. First we examine the direct-dependence of the transport phenomena in paper-synthetic combinations and offer it the robe of the other effects. Anvery objects of the investigations the agnas PVDC dispersion coatea papers have a special importance because of the packaging technological apeate, so fibre measurement are made on there combinations.

Research on the fields above were reported in scientific publications.

Our first work financed by the innovation fund was in cooperation with the company BETA-ROLL.

The objective of this work was the laboratory investigation of roll coating in inking and dampening units of offset presses, to improve quality, and to achieve compatibility with new materials.

Our tasks were:

- measurement of sample surface energy,
- investigation of printability properties using special laboratory equipment at given speed, pressure and temperature for various kinds of inks and dampening solutions.

Results of this work were presented in journals and conferences.

Thesises, Student Research Projects (TDK)

From the year 2002, 175 thesises were completed at the Department of Print Industry including 65 industrial and 110 department offered topics. The works were chategorized: image and text processing 77, materials investigation 15, color measurement 29, traditional printing technologies 29, digital printing technologies 17.

Department publications in the last 5 years include 2 foreign language and 71 hungarian journal papers, 4 textbooks and 2 expert books, 23 conference presentations, 7 student research projects.

At the Department of Paper and packaging technology during the same period of time 217 thesises were completed, 114 industrial and 103 department issued tasks. The cathergorized distribution of the thesises: package design 29, package technology 59, paper processing technology 11, plastic processing 7, materials 12, packaging machines 23, food product packaging 29, quality assurance 20, paper technology 23, paper-making technology 4.

Publications at the Paper and Packaging Technology Department include 3 foreign language and 8 hungarian journal papers, 8 conference papers, 1 textbook, 2 patents, 1 book.

Participation in International Research Programs

International Master of Print and Media Technology EU-project (2002-2005)

In the framework of the three-year Socrates/Erasmus program representatives of 15 institutions of European higher education had been working together on a master program to be introduced on the field of printing and media technology.

The primary objective of this program is to unite knowledge, experience and resources of the individual European educational institutions. In 2004 the preparatory visit was hosted by our faculty.

The program will start in 2006, following the accreditation process, for experts holding a university degree, with the provision that students will study in at least two partner institutions. The language of the courses will be English.

Specialisations in preparation:

- digital media,
- printed media,
- publishing.

Hungary was represented by the Department of Print Industry of the Institute of Media Technology of the Rejtő Sándor Faculty of Engineering during the preparatory program. According to the educational module students will be offered to study two semesters at our faculty.

Participation in the COST E32 Action

The objective of the COST (European Cooperation in the field of Scientific and Technical Research) program is to provide a platform for researchers of member countries where to present and distribute their scientific work and experience, and to learn about new investigation methods and technology.

The topic of the COST E32 (2004–2007) program is ‘Characterization of surfaces for improved printing paper grades’. The main goal is to characterise paper surface in order to improve print quality and to establish measurement methods that relate the printability of substrates with the surface topology and chemical properties.

Two working groups were established:

- surface chemistry of substrates (WG1),
- surface structure of substrates (WG2).

Institute of Media Technology

16 countries joined the E32 program (Bulgaria, Croatia, Finland, France, Germany, Hungary, Italy, Holland, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, UK). Hungary is represented by the Print industry department of Budapest Tech.

Researchers of the 16 member countries participate in meetings two times a year, where they present and debate the outcomes of their research; in 2005 the host of this meeting was the RKK of Budapest Tech.

Hungarian-Slovenian Bilateral Scientific and Technological Project

The Hungarian-Slovenian Bilateral Research and Technology Cooperative Commission has approved a project, in the framework of this project staff of the Institute of Media Technology will conduct research work.

The title of the two-year (2006-2007) project is 'Assessment of print quality on textile and graphic materials for medical and hygiene applications'.

Our partner institution is the Institute of textile, graphic technologies and design of the University of Ljubjana. The objective of the collaboration is to exchange knowledge and experience regarding, present investigation methods and equipment.

SOCRATES/ERASMUS Mobility Program

The objective of this program is to contribute to the development of European institution of higher education, and thus improve the position of the future Europe in the global competition. The Erasmus program makes it possible for institutions of higher education to participate in projects with European partner institutions, which facilitates their development. The most important element of this program is student mobility which sponsors 3-9 month scholarships for exchange students between 2 institutions. In the framework of this program each semester 2-3 students of our Institute study abroad, also 1-2 foreign students study in our Institute.

European Digital Media Management Intensive Program

Our departments contributed to the European Digital Media Management (EDMM) summer university held 24th August – 14th September this year. 8 significant European partner institution participated including 35 students and 11 lecturers. During the three weeks 3 courses were offered for students from Finland, the UK, Germany, Belgium, the Netherlands and Hungary. The topics included digital printing techniques, surface design, environmental and company management in print industry. Professors from Artevelde Hogeschool Gent (Belgium), FH Stuttgart (Germany), HTWK Leipzig (Germany), Bergische Universitat Wuppertal (Germany), London College of Printing (UK), EVTEK Espoo (Finland), Hogeschool AVANS (Holland) and Budapest Tech were the lecturers of the summer university.

During the project works international groups of students prepared posters leaflets, greeting cards, CD covers and labels (Digital Publishing course), or transfer prints on textile and leather works (Surface Design).

Our institute maintains partnership with significant European institutions of higher education.

International partners:

Artevelde Hogeschool Gent (Belgium)
Copenhagen Grafic Arts Institute (Denmark)
FH Stuttgart (Germany)
HTWK Leipzig (Germany)
Bergische Universitat Wuppertal (Germany)
London College of Printing (UK)
EVTEK Espoo (Finland)
Université Nancy 2/IUT (France)
TE I of Athens (Greece)
Hogeschool Brabant (The Netherlands)
Warsaw University of Technology (Poland)
EIVD Lausanne (Switzerland)
Instituto Politécnico de Tomar (Portugal)
University of Ljubljana (Slovenia)