



## **Improvement of logistics education from the point of view environmental management**

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The paper briefly presents the influence of environmental management on the improvement of the logistics education and research structure of the Department of Materials Handling and Logistics at the University of Miskolc, Hungary. The logistics, as an integrated science offers a very good possibility to demonstrate the effect of new innovative knowledge on the migration of the priorities of education and research of sciences. The importance of logistics in the field of recycling (or in wider sense in the field of environmental management) can be justified by the high proportion of logistic costs (as investment and operation costs) and these costs show that optimum logistic solutions are able to decrease the financial outcomes and lead to the establishment of a profitable system.

Technological change constantly creates new demands on both education and research. The most important objective of the department is to create a unique logistics education in the country. For this reason the department offered up-to-date integrated knowledge at all level: undergraduate, master degree and PhD education. The integration of logistics means traditionally the joint use of technology of material handling, method of material flow, technology method of traffic, information technology, management sciences, production technology, marketing, market research, technology of services, mathematics and optimization, communication technology, system engineering, electronics and automation, mechatronics [1, 3]. The education and research portfolio of the department followed this tradition till 1993. The new lectures in the field of sustainability (logistics of recycling, logistics of quality management and recycling, closed loop economy, EU logistics or global logistics) became more and more important in the logistics education.

The results of fast developments in closed loop economy, recycling, waste management, environmental protection are more and more used in the industry and this effected a revolutionary change in the education and research structure of logistics [2]. The European Community policy in the environment sectors aims at a high level of protection. Four principles were defined: the precautionary principle, the principle that preventive action should be taken, that environmental damages should as a priority be rectified at source and that the polluter should pay. All of these four principles have a very strong logistics background, especially in the field of import/export operations, traffic/transportation, inventory control, materials handling, fleet operations, customer service, supply chain management, distribution, strategic planning, warehousing, information systems of logistics, purchasing.

These facts effect the development of different topics of logistics in each field of the education of the department: collection logistics of used products (especially WEEE), optimization of collection systems, design and control of disassembly systems, distribution of fractions of disassembled used products, design and control of recycling parks, possibilities of virtual networks in the field of recycling logistics, integration of logistics, recycling and total quality management, identification systems and recycling, etc.

Within the framework of different supports our department has the opportunity to take part in European networks and research projects in the field of sustainability, environmental protection, recycling and closed loop economy. One of the biggest networks was developed within the framework of a Brite-Euram project entitled 'Closing the loop from the product design to the end of life technologies'. The importance of logistics is certified by the fact, that this network defined the milestones of the improvement of an economically beneficial closed loop economy as quality aspects, communication and marketing, logistics and qualification. Within the frame

of this project the logistics focused on the improvement of technologies (disassembly, reuse, refurbishment, remanufacturing and recycling), collection systems, and development of the concept for collection logistics and pre-disassembly, market survey in waste management.

The Regional Knowledge Centre of Mechatronics and Logistics Systems was established in 2005. The overall objective of Knowledge Centre is to develop knowledge-intensive mechatronics and logistics systems in the leading edge of the world and to integrate the results in the economy and society through utilising the knowledge. The realisation of the objective requires the establishment and operation of a networking system of relations between those involved in sciences, the economy and society. The knowledge centre is a “knowledge integration tool” of the university in the field of mechanical engineering, and plays an important part in the intensification of the integration of the philosophy of sustainability into the related sciences. The program of the knowledge centre is focused on three well definable strategic fields, which are the vertical elements of the model. These are the R&D programs: world of products, materials and technologies, and integrated systems. The programs cover the implementation of seven, internationally competitive, application-oriented part tasks. These seven part tasks and the sustainability are closely related. The realisation of the part tasks through networking offers considerable results and economical-ecological benefits, forth for the participants and the region. The activities include basic and applied research, experimental development, technology transfer, as well as education and training and preparing the new scientific generation. The horizontal elements of the model are given by the utilisation of knowledge that can be interpreted in different dimensions: technical/engineering, legal, sustainability, economic, and social. The program relies on the continuation of existing relations in networks, and its regional nature is embodied in the cooperation of the higher education institutes and companies of the three counties.

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