

# LCE2006 - 13<sup>th</sup> CIRP International Conference on Life Cycle Engineering

## Conference chairman

Prof. Dr. Ir. Joost R. Duflou

## Organising Committee

Dr. W. Dewulf (K.U.Leuven), Chairman

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Ing. T. Devoldere (K.U.Leuven)

Mrs. L. Notré (K.U.Leuven), Conference secretary



Dear LCE2006 Participant,



On behalf of the Organising Committee we would like to welcome you to the 2006 issue of the CIRP International Conferences on Life Cycle Engineering.

After an extensive review procedure, starting from over 165 received proposals, finally 124

contributions were selected for presentation at this conference. 168 participants from 26 different countries have registered, assuring that the conference will be a true opportunity for international exchange of viewpoints and experience in the domain of Life Cycle Engineering.

While preparing the programme as included in this booklet, an effort was done to cluster the presentations thematically. Furthermore, the session Chairmen have been asked to rigidly stick to the time schedule, in order to facilitate switching between sessions. We sincerely hope that will maximise your opportunity to attend sessions of interest.

Besides the paper presentations, a number of social events have been organised for which you are cordially invited. On Wednesday evening a guided tour along some of the historical neighbourhoods of Leuven will allow you to reach the conference dinner venue while walking through a UNESCO recognised world heritage site. On Thursday we advice you to skip dinner and join us for the reception in the "Hallen" by occasion of which the results of the International Student Contest "Designing a Sustainable Future" will be announced. As conference participants you can contribute to the selection of the Public Award winner for this contest.

The Organising Committee has done its utmost to assure good logistical support for the event. If, however, at any moment during the conference, you would require any further assistance, please do not hesitate to direct yourself to the conference secretariat or to address one of the support staff members, who will be happy to assist you.

Wishing you a fruitful and enjoyable stay in Leuven

Yours sincerely

Prof. Joost Duflou  
LCE2006 Chairman

Dr. Wim Dewulf  
Organising Committee Chairman

## CONFERENCE INFORMATION

### Conference venue

City campus of the Katholieke Universiteit Leuven  
Mgr. Sencie Institute  
Erasmusplein 2  
3000 Leuven  
Look for the signs LCE2006

### Conference secretariat

During the conference sessions a permanent secretariat on the 1<sup>st</sup> floor of the conference building will be open. The conference secretariat can be reached at [LCE2006@mech.kuleuven.be](mailto:LCE2006@mech.kuleuven.be) or at the telephone number + 32 479 62 63 86.

### Name badge

Access to conference sessions, company visits and social activities is gained by showing your conference badge. Please wear your name badge at all occasions during the conference.

### Preparing for presentations

Please bring your presentation preferably on a memory stick or on CD-ROM. To assure a fluent transition between speakers, all presenting authors are asked to meet their session Chair and to prepare their presentation in the respective session rooms at latest 10 minutes before the start of the session during which they will present.

## SOCIAL EVENTS

### Guided tour of Leuven

*Wednesday May 31<sup>st</sup>, 07.00 PM*

Leuven is often called the open air museum of the past. Follow the guide past the flamboyant Gothic town hall and its 236 statues, past Saint Peter's church which is after more than 500 years still missing its towers, past the University library conceived as an American memorial to the Great War of 1914-1918,... This one hour walk along the most interesting places of Leuven starts at the town hall, and will lead you to the Faculty Club by 8.00PM, at the right place and time for the next LCE2006 social event.

### Conference dinner

*Wednesday May 31<sup>st</sup>, 08.00 PM*

The LCE2006 conference dinner will take place at the *Faculty Club*, located in the medieval Infirmerie of the *Groot Begijnhof*. This 'garden of the Begijns' was founded in the 13<sup>th</sup> century outside the town wall of the time. The *Begijns* or *Beguines* were female followers of the mystical movement that emerged as a reaction to the growing material and formal aspirations of the regular clergy. The beguines lived like regular nuns, but did not make the same perpetual vows. In March 2000 the buiginages were included in the UNESCO World Heritage List.

### Conference reception with Belgian Culinary Delights

*Thursday June 1<sup>st</sup>, 08.00 PM*

All participants are invited to enjoy the Belgian cheese and beer buffet, offered at the University Hall (Naamsestraat 22). The K.U.Leuven was founded in 1425 by Pope Martin V as the first university in the Low Countries and is nowadays the oldest Catholic university in the world still in existence. The foundation of the university came just in time to give the city a new passport to future wealth and fame. The cloth industry had been Leuven's prime source of prosperity, but lost its importance at the beginning of the 15<sup>th</sup> century. Very symbolic for the situation in Leuven is the University Hall, which used to be the cloth hall of the city. In 1679 the city sold the building to the university and a second floor was added above the Gothic ground floor.

**Ecover**

Ecover was established in 1979 as the first large scale producer of environmentally friendly detergents. Many people were attracted by Ecover's innovative company philosophy, in which respect for people, animals and the environment are at the forefront. When expanding its factory in the 80's, they strive to build the ultimate ecological factory. With a great deal of effort, passion and research, the impossible was achieved within three years. The first ecological factory in the world had become a reality. A grass-covered roof, the first ecological air-conditioner and walls made of waste are just some of the examples of how this factory looks like. But this is not the end. Ecover is constantly looking for new opportunities to improve their environmental profile resulting in many innovative ideas about entrepreneurship and environmental factories.

**Umicore**

Umicore is a materials technology group. Its activities are centered on four business areas: Advanced Materials, Precious Metals Products and Catalysts, Precious Metals Services and Zinc Specialties. Each business area is divided into market-focused business units. Umicore focuses on application areas where it knows its expertise in materials science, chemistry and metallurgy can make a real difference, be it in products that are essential to everyday life or those at the cutting edge of new technological developments. Umicore's overriding goal of sustainable value creation is based on this ambition to develop, produce and recycle materials in a way that fulfils its mission: materials for a better life.

**Photovoltech**

As a spin-off of IMEC, Photovoltech has a variety of innovative technologies at its disposal. Its isotropic texturization production process delivers cells that combine an outstandingly uniform appearance with high efficiencies (up to 16% and more). The premium product in the cell range is the MAXIS BC+ cell, a unique Back Contact Cell which offers enhanced visual appeal because there are no bus bars on the front. The 'metallization wrap through' process allows the electrodes to be passed through the cell.

**Weather**

May is late spring in Belgium, with the daily temperatures ranging from 15°C to 20°C, although occasionally the maximum may reach 25°C. On average, the weather is sunny with a few days of rain during the month. An umbrella and a light raincoat are advisable.

**Opening hours banks and stores**

Banks are generally open from 09.00 a.m. till 3.30 p.m., department stores from 09.30 a.m. till 6.00 p.m., while most other shops stay open from 09.00 a.m. till 06.00 p.m. Mid-day, most shops generally remain open, although you may find a few closed from 12.00 till 02.00 p.m. Money changing after banking hours is possible at the airport.

**Credit cards**

Shops and restaurants usually accept major international credit cards such as EuroCard-MasterCard, Visa, American Express, Diners Club, etc., with a preference to EuroCard-MasterCard and Visa.

**Electricity**

The electric power is 220 V AC, 50Hz.

**Car rental**

If you wish to rent a car, it is often advantageous to do so from your own country, often in conjunction with the purchase of your airline ticket. Local car rental companies are : AVIS, Budget, Car Rental, Hertz, Europcar. The speed limit on freeways and divided four-lane highways is 120 km/h. On most other roads, it is 90 km/h, but in towns and cities, you are restricted to 50 km/h. Wearing seat and shoulder belts is mandatory for both the driver and passengers.

**Taxi service**

Taxi service in Leuven is available at telephone number: 016/20.20.20 (Taxi Breckpot).

## TIMETABLE

		Stream A	Stream B	Stream C	Stream D	Stream E
		Wednesday, May 31st, 2006 - Morning			Wednesday, May 31st, 2006 - Morning	
08u00	09u30	Registration			Registration	
<b>Plenary</b>		Opening session <i>Chair: Joost Duflou</i>			Opening session <i>Chair: Joost Duflou</i>	
09u30	10u00	Conference opening <i>Joost Duflou, Chairman LCE2006</i> <i>Ludo Froyen, Dean K.U.Leuven Faculty of Engineering</i>			Conference opening <i>Joost Duflou, Chairman LCE2006</i> <i>Ludo Froyen, Dean K.U.Leuven Faculty of Engineering</i>	
10u00	10u40	Keynote lecture: The EuP Directive: a framework for continuous improvement of the environmental performance of energy-using products <i>Michail Papadoyannakis, European Commission</i>			Keynote lecture: The EuP Directive: a framework for continuous improvement of the environmental performance of energy-using products <i>Michail Papadoyannakis, European Commission</i>	
10u40	11u20	Keynote lecture: Ford of Europe's Product Sustainability Index <i>Wulf-Peter Schmidt, FORD</i>			Keynote lecture: Ford of Europe's Product Sustainability Index <i>Wulf-Peter Schmidt, FORD</i>	
11u20	11u45	Coffee break			Coffee break	
<b>1</b>		Integrated Product Policy <i>Chair: Wulf-Peter Schmidt</i>	Ecodesign - Methods and Tools (1) <i>Chair: Chris Paredis</i>	End of Life Vehicles (1) <i>Chair: Joeri Van Mierlo</i>	Product Data Management <i>Chair: Helmut Bley</i>	Life Cycle Costing of Manufacturing Systems (1) <i>Chair: Liliane Pintelon</i>
11u45	12u10	The Use of LCA in the European Integrated Product Policy <i>Yannick Le Guern</i>	Transparent translation of design data to environmental impact data <i>Sandra Häggström</i>	Fate of aluminium from end-of-life commercial vehicles: preliminary results of a European study <i>Artur Tavares</i>	Metal Inserts and Hazardous Content in Light Weight Composite Structures in the Context of Recycling <i>Anna Hedlund-Åström</i>	Asset Life cycle Management: A Key Factor in the Acquisition of Capital for Technology Intensive Companies <i>Jörg Saxler</i>
12u10	12u35	LCA Center Denmark, status and perspectives for dissemination of IPP and Life cycle thinking in Industry <i>Michael Hauschild</i>	Integration of LCA and ecodesign guidelines in a virtual CAD framework <i>Federico Cappelli</i>	Cost Models for Increased Value Recovery from End-of-Life Vehicles <i>Gareth Coates</i>	Electronic Service Book <i>Martin Ota</i>	Quality oriented Productive Maintenance within the life cycle of a manufacturing system <i>Martin Siener</i>
12u35	13u00	Steel and IPP - European steel industry initiative: promoting sustainable development through eco-design <i>Clare Broadbent</i>	Sustainable Design of modern industrial products <i>Fumihiko Kimura</i>	Consideration of Sustainable Manufacturing in Chinese Automobile Industry: Framework & Priorities <i>Ming Chen</i>	Annotation as a base to improve in-service feedback exchange during life cycle of complex systems <i>Yves Keraron</i>	Calculation and optimisation model for costs and effects of availability relevant service elements <i>Niggeschmidt Stephan</i>
13u00	14u30	lunch			lunch	

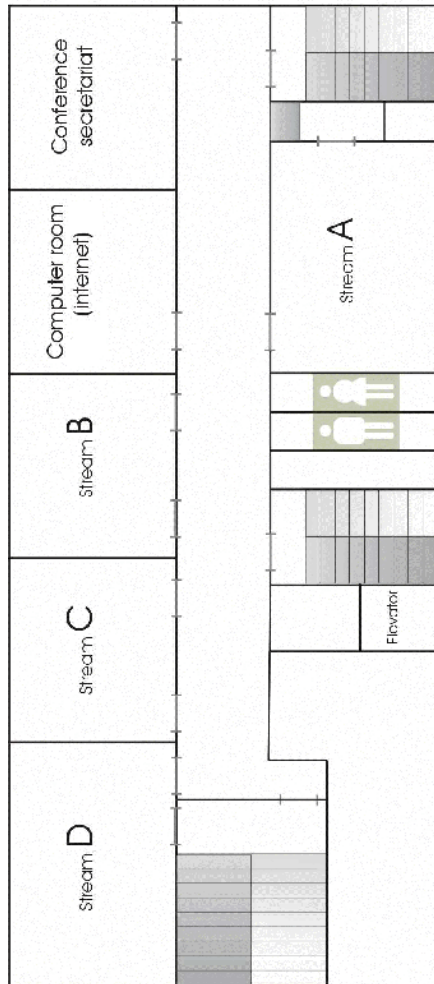
		Stream A	Stream B	Stream C	Stream D	Stream E
		Wednesday, May 31st, 2006 - Afternoon			Wednesday, May 31st, 2006 - Afternoon	
2		LCA - Methods and Tools (1) Chair: Michael Hauschild	Life Cycle Simulation Chair: Shozo Takata	Design for Disassembly, Recycling and Remanufacturing (1) Chair: John Sutherland	The Role of Customers and Other Stakeholders Chair: Hartmut Kaebemick	Life Cycle Costing of Manufacturing Systems (2) Chair: Joost Duflou
14u30	14u55	Evaluation of the environmental impact of buildings, including quality and financial cost Karen Allacker	Integrated Ecosystem Landscape and Industrial Modeling for Strategic Environmentally Conscious Process Technology Selection Bert Bras	Triz applied to innovate in design for disassembly Daniel Justel	Evaluating Customer Requirements in Eco-VA Tomohiko Sakao	Mechatronic-oriented Engineering of Manufacturing Systems Taking the Example of the Body Shop Jens Kiefer
14u55	15u20	The Role of the Social Dimension in Life Cycle Engineering Margot Hutchins	The eco-efficiency of lifetime prolongation strategies for washing machines Tom Devoldere	A Design Support Framework for Wheelchairs Recycling Reidson Gouvinhas	A hierarchical approach to stakeholder engagement Namy Espinosa-Orias	Bayesian Nets for Life Cycle Cost Forecasting Danina Janz
15u20	15u45	Upscaling effect and Life Cycle Assessment Maiya Shibasaki	Supporting Product Lifecycle Management by Automated Simultaneous Engineering (aSE) Jörg Feldhusen	Material Hygiene, An EcoDesign Mindset for Optimized Material Use Jan Johansson	Product Information for Sustainable Consumption considering the EUP Directive Christoph Herrmann	Life-cycle orientated development of machine tools Alwin Harms
15u45	16u10	Development of Life Cycle Impact Assessment by Using NETS Scheme Sate Sampattagul	Life Cycle Simulation of Products in a Competitive Market Hitoshi Komoto	Product Structuring - the core discipline of Product Lifecycle Management Eduardo Zancul	Controlled Apeal Product Design - a Life Cycle Role for Affective (Kansei) Engineering Thomas Childs	Life cycle oriented valuation of manufacturing flexibility Niklas Möller
16u10	16u35	Developing a LCA software in Hungary Timea Molnar Siposné		The development of a Remanufacturing Design Platform Model (RDPM): applying design platform principles to extend remanufacturing practice into new industrial sectors Steve Barker	An economic perspective on remanufactured products: industrial and consumption challenges of life cycle engineering Michaud Céline	
16u35	17u00	Coffee break			Coffee break	
3		LCA - Cases (1) Chair: Wim Dewulf	Ecodesign - Methods and Tools (2) Chair: Yasushi Umeda	End of Life Vehicles (2) Chair: Alain Bernard	Product Service Systems (1) Chair: Jack Jeswiet	Life Cycle Costing of Manufacturing Systems (3) Chair: Dirk Cattrysse
17u00	17u25	Comparison of the Environmental impact of 5 Electric Vehicle Battery technologies using LCA Julien Matheys	An analysis of the technological development of the Transparent Building Envelope using the TRIZ trends of evolution Salmaan Craig	The Volkswagen-SiCon Process: Eco-efficient solution for future end-of-life vehicle treatment Stephan Krinke	Life-Cycle Assessment of Film and Digital Imaging Product System Scenarios Bert Bras	A Life Cycle Cost Framework for Automotive Production Lines Maria Papariello
17u25	17u50	Environmental Impacts of Crystalline Silicon Photovoltaic Module Production Erik Alsema	From Life-Cycle Assessment to systematic integration of environmental criteria inside product development process Francesco Schiavone	A Design Framework for End-of-Life Vehicle Recovery Chris Edwards	A Representation of a Product-Service System During its Design Phase. A Case Study of a Helium Liquefier Peggy Zwolinski	A Life Cycle Cost Calculation and Management System for Machine Tools Rafael Enparantza
17u50	18u15	LCA to assess the environmental impacts of a chemistry-free technology: a case study for Agfa-Gevaert Carolin Spirinckx	The (development) life cycle for packaging and the relation to product design Jos Oostendorp	Environmental analysis of car recycling processes in Poland Robert Lewicki	From Manufacturing Green Office Furniture to providing Sustainable Workplace Services: A necessary change in practices, tools and approaches Nabil Boughnim	
19u00	20u00	Guided tour of Leuven			Guided tour of Leuven	
20u00		Conference dinner			Conference dinner	

		Stream A	Stream B	Stream C	Stream D		
		Thursday, June 1st, 2006			Thursday, June 1st, 2006		
4		LCA - Methods and Tools (2) <i>Chair: Bert Bras</i>	Ecodesign - Implementation (1) <i>Chair: Eric Lutters</i>	Design for Disassembly, Recycling and Remanufacturing (2) <i>Chair: Günther Seliger</i>	Product Service Systems (2) <i>Chair: Daniel Brissaud</i>		
08u30	08u55	Environmental Indicators & Engineering: an alternative for weighting factors <i>Marten Toxopeus</i>	An ecodesign case study of the award winning TinyLab™ <i>Frank O'Connor, Simon O'Rafferty</i>	Concepts and verification model of pressure triggered one-to-many disassembly fasteners <i>Barbara Willems</i>	From LCA to PSS - Making leaps towards sustainability by applying product/service system-thinking in product development <i>Niki Bey</i>		
08u55	09u20	Analysis of the concept of sustainability: definition of conditions for using exergy as a uniform environmental metric <i>Eric Coatanea</i>	Implementation of sustainable manufacturing practices in SMEs – Case study of a New Zealand furniture manufacturer <i>Rainer Seidel</i>	Optimal heat-reversible snap joints for frame-panel assembly in aluminum space frame automotive bodies <i>Kazuhiro Saitou</i>	A Procedural Methodology for Transition to Reuse Business <i>Kobayashi Hideki</i>		
09u20	09u45	Proposal of the index to measure total performance through product life cycle <i>Keijiro Masui</i>	The Spanish Eco-design standard implementation in SME's <i>Yolanda Nuñez</i>	Systematic design of connections <i>Jan Klett</i>	A Comparative Study of Models of Remarketing <i>Anton Vrij</i>		
09u45	10u10	Comparison of life cycle assessment methods, application to a wastewater treatment plant <i>Stéphane Lassaux</i>	Methodology and tool adjustment for the application of Ecodesign within the Colombian context <i>Sjors Witjes</i>	Design for Optimal End-of-Life Scenario via Product-embedded Disassembly <i>Kazuhiro Saitou</i>	An Interactive Design Methodology for Service Engineering of Functional Sales Concepts – A potential Design for Environment Methodology <i>Erik Sundin</i>		
10u10	10u35	Coffee break			Coffee break		
5		LCA - Cases (2) <i>Chair: Jo Dewulf</i>	Ecodesign - Implementation (2) <i>Chair: Tetsuo Tomiyama</i>	End of Life Processes (1) <i>Chair: Nabil Nasr</i>	Supply Chains and Reverse Logistics <i>Chair: Patrick Beullens</i>	Meeting CIRP Theme group on LCA <i>Organiser: Michael Hauschild</i>	
10u35	11u00	4 types of drinking cups used on events: Life Cycle Assessment and Eco-Efficiency Analysis <i>An Vercalsteren</i>	Study of the ecodesign integration process in French companies <i>Tatiana Reyes</i>	How can Remanufacturing processes become leaner? <i>Erik Sundin</i>	Collection Rate Estimation Model in Closed Loop Manufacturing <i>Shozo Takata</i>	Meeting Room 1	
11u00	11u25	Developing the use of environmental impact assessment in commercial organisations: a case study of formway furniture <i>Gayathri Babarenda Gamage</i>	Analysis of Key Success Factors for Eco-Business through Case Studies in Japan <i>Shinsuke Kondoh</i>	Flat Screen Monitor Disassembly and Testing for Remanufacturing <i>Sebastian Kernbaum</i>	Modelling Oligopolistic Closed Loop Supply Chains <i>David Hammond</i>		
11u25	11u50	Total Fuel Cycle Emissions from Marine Vessels: A Well-to-Hull Analysis with Case Study <i>James Winebrake</i>	Designing support for manufacturing SMEs approaching environmentally conscious design and clean production - learning from UK survey results <i>Tim Woolman</i>	Product and Process Assessment for Remanufacturing of Computer Controlled Automotive Components <i>Rolf Steinhilper</i>	The migration of Life Cycle Paradigm into the Manufacturing Engineering <i>Carmen Constantinescu</i>		
11u50	12u15	Toward Sustainable Production in the Canadian Oil Sands Industry <i>Anthony Halog</i>	Using Sustainability for Competitive Advantage <i>Rainer Seidel</i>	Environmental Issues within the Remanufacturing Industry <i>Erik Sundin</i>			
12u15	13u15	lunch			lunch		
13u15	18u30	Company visits			Company visits		
20u00		Conference reception			Conference reception		

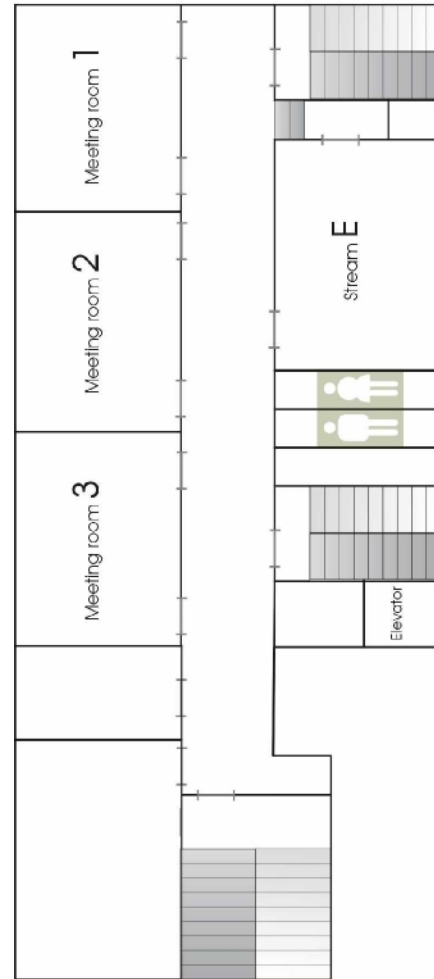
		Stream A	Stream B	Stream C	Stream D
		Friday, June 2nd, 2006		Friday, June 2nd, 2006	
<b>Plenary</b>		Plenary session Chair: Wim Dewulf		Plenary session Chair: Wim Dewulf	
08u30	09u10	Keynote lecture: The Challenge of Closed-Loop Supply Chains <i>Luk Van Wassenhove, INSEAD, France</i>		Keynote lecture: The Challenge of Closed-Loop Supply Chains <i>Luk Van Wassenhove, INSEAD, France</i>	
09u10	09u50	Keynote lecture: Remanufacturing: A Key Enabler to Sustainable Product Systems <i>Nabil Nasr, Rochester Institute of Technology, USA</i>		Keynote lecture: Remanufacturing: A Key Enabler to Sustainable Product Systems <i>Nabil Nasr, Rochester Institute of Technology, USA</i>	
09u50	10u30	Keynote lecture: Environmentally Sustainable Manufacturing: A Survey on Industry Practices <i>Hartmunt Kaebemnick, University of New South-Wales, Australia</i>		Keynote lecture: Environmentally Sustainable Manufacturing: A Survey on Industry Practices <i>Hartmunt Kaebemnick, University of New South-Wales, Australia</i>	
10u30	10u55	Coffee break		Coffee break	
<b>6</b>		Uncertainty elements in LCE Chair: Fumihiko Kimura	Ecodesign in the Automotive Sector Chair: Tom Roche	End of Life Processes (2) Chair: Jack Jeswiet	Cleaner production (1) Chair: Hendrik Van Brussel
10u55	11u20	An Approach to Robust Decision Making under Severe Uncertainty in Life-Cycle Design <i>Chris Paredis</i>	Eco-Design of Automotive Electrical and Electronic System - The SEES Project, <i>André Greif</i>	Un-printing toner: early results, <i>Thomas Counsell</i>	Metrological approaches for meeting the requirements of clean production, <i>Michael Oberhausen</i>
11u20	11u45	Eco-PaS: a web-based tool for streamlined LCA under uncertainty <i>Wim Dewulf</i>	Eco-design for materials selection in automobile industry, <i>Heloisa de Medina</i>	Environmental Impact of Ship Hull Repair, <i>Dimitris Mourtzis</i>	Electrical Energy Requirements for Manufacturing Processes, <i>Timoty Gutowski</i>
11u45	12u10	Combined assessment methods for decision support in product development <i>Eric Lutters</i>	Survey of Eco Design and Manufacturing in Automotive SMEs, <i>Alireza Veshagh</i>	Municipal waste management pilot studies based on life cycle approaches, <i>Karol Koneczny</i>	Vault structures enabling sustainable products, <i>Frank Mirtsch</i>
12u10	12u35	Fuzziness: Making Streamlined LCA More Sensitive <i>Gontran Bage</i>	A method for recycled plastic integration in the automotive industry, <i>Carole Maudet</i>	Laser Assisted Dry Ice Blasting Approach for Surface Cleaning, <i>Robert Hollan</i>	The input of the operation period to the technical objects' environmental impacts, <i>Jedrzey Kasprzak</i>
12u35	13u50	lunch		lunch	
<b>7</b>		LCE Education Chair: Günther Seliger	Ecodesign in the EEE sector Chair: Theo Geerken	End of Life Processes (3) Chair: John Sutherland	Cleaner Production (2) Chair: Daniel Brissaud
13u50	14u15	Sustainable Product Design, Engineering and Management Education for Industrial Design Engineering <i>Casper Boks</i>	A new comprehensive methodology for the evaluation of product sustainability at the design and development stage of consumer electronic products <i>I.S. Jawahir</i>	Materials Flow of Platinum Group Metals <i>Christian Hagelüken</i>	Turning with Environment-Friendly Cooling Method Using Water Evaporation (New Eco Design For Supplying Water and Its Evaluation Using Life Cycle Assessment) <i>Ikuo Tanabe</i>
14u15	14u40	Games as Learning Tools to Promote Environmentally Benign Systems <i>Jacqueline Isaacs</i>	LCA and Ecodesign in the German Electronics Industry <i>Benjamin Kuhirke</i>	Removal of Welded Hardfacings by Abrasive Water Jet Machining <i>Robert Veit</i>	LCA as eco-design tool to support the development of injection moulded products <i>Marco Recchioni</i>
14u40	15u05	Reasons and objectives for Life Cycle Engineering at an Undergraduate Level <i>Jack Jeswiet</i>	Balancing Environmental Performance with Sales Functionalities in Packaging for Consumer Electronic Products <i>Renee Wever</i>	Key questions of ICT waste management in Hungary and in Slovenia <i>Adrienn Buday-Malik</i>	Environmental Product Lifecycle Assessment- Customizing the enterprise specific manufacturing processes <i>Stefan Feickert</i>
15u05	15u30	The watermill of Rotselaar: a multidisciplinary design project <i>Tiene Nobels</i>	Ecodesign Toolbox for Electrical Equipment <i>Wim Deprez</i>	End-of-Life Management of Shoes and the Role of Biodegradable Materials <i>Theodoros Staikos</i>	Environmental Impact Assessment of Grind Hardening Process <i>Dimitris Mourtzis</i>
<b>Plenary</b>		Closing session Chair: Joost Dufflou		Closing session Chair: Joost Dufflou	
15u30	15u55	Closing lecture: Promoting life cycle thinking at the global level - Perspective of the Life Cycle Initiative and linkages with the Marrakech Process <i>UNEP, Sonia Valdivia</i>		Closing lecture: Promoting life cycle thinking at the global level - Perspective of the Life Cycle Initiative and linkages with the Marrakech Process <i>UNEP, Sonia Valdivia</i>	
15u25	16u00	Conference closing		Conference closing	

**PARALLEL SESSIONS LOCATION**

1<sup>st</sup> Floor

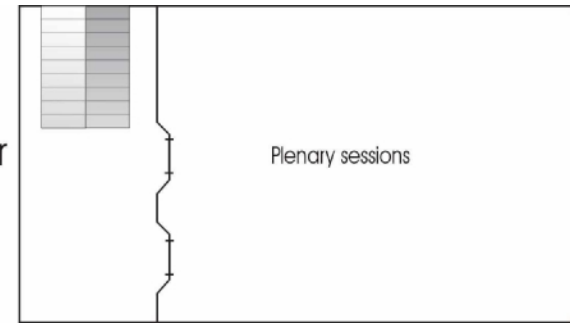


2<sup>nd</sup> Floor

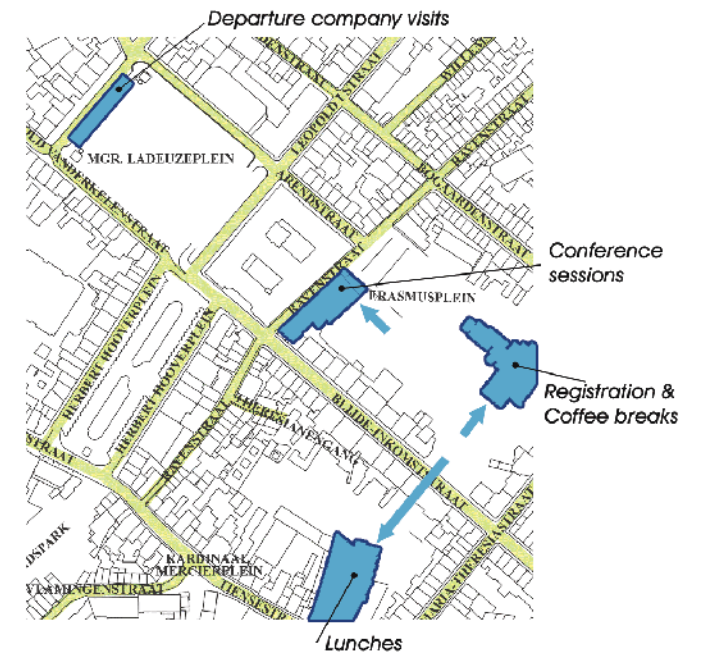


**PLENARY SESSIONS LOCATION**

4<sup>th</sup> Floor



**CONFERENCE AREAS**



## STUDENT CONTEST 'DESIGNING A SUSTAINABLE FUTURE'



As a co-event to the LCE2006 conference, the student contest "Designing a Sustainable Future" was organised, fostering the sustainable mindset of design students. The contest welcomed creative entries that combine high-quality design with a distinct contribution to the goal of sustainable need-fulfilment. The jury assigned priority value to environmental, economical and social benefits throughout the life cycle of the proposed design.

During the LCE2006 conference reception, the 12 laureates will show a poster and/or a prototype of their designs. Moreover, the winners of the contest will be announced and will receive their prize out of the hands of the Belgian State Secretary for Sustainable Development and of representatives of contest sponsors. Finally, the winner of the 'public award' will be selected by the LCE2006 participants present at the conference reception.

