Applied Engineering in Brussels

How the University Colleges of Brussels contribute to R&D

By InduTec

InduTec asbl - Technological Transfer Center

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Foreword

INDUTEC, the Technology Transfer Centre for your Innovation (www.indutec.be)

InduTec is a dynamic Technology Transfer Centre whose mission is to enhance the exchange of technology and innovation between companies and industrial engineering faculties in the Brussels Region. By monitoring projects from concept to implementation, *InduTec* offers promotional opportunities and state-of-the-art experience to those faculties, and enables companies to reap the benefits of a quality science 'business incubator'.

A company's technological knowledge base is the foundation on which internal product and process innovations are generated. However, technological knowledge is not accumulated solely through internal learning processes. Increasingly, companies are turning to external sources in the technology supply chain to acquire the technological know-how they need to introduce product and process innovations. Thus, the successful structuring and executing of partnerships with external "technology source" organizations, such as the Technology Transfer Centre - *InduTec*, is often critical to competitive success in technologically dynamic environments.

The research activities of the industrial engineering faculties in the Brussels Region are future-oriented and innovative. The industrial engineering faculties collaborate with industrial and economic actors in Belgium and abroad through

- contract research (industrial research projects, technical feasibility studies, pre-competitive development, …)
- economic valorisation (transferring R&D results through existing or new companies)
- protection of intellectual property, licencing agreements, spin-off guidance, ...

It all passes through *InduTec*, that knows how and where to find the appropriate competencies in the industrial engineering faculties to respond to the requests of industry.

If you are looking for new partnerships in managing your technological innovation, do not hesitate to contact our Technology Transfer Centre.

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Areas of Expertise

Areas of Expertise

Industrial Technologies & Material Technologies

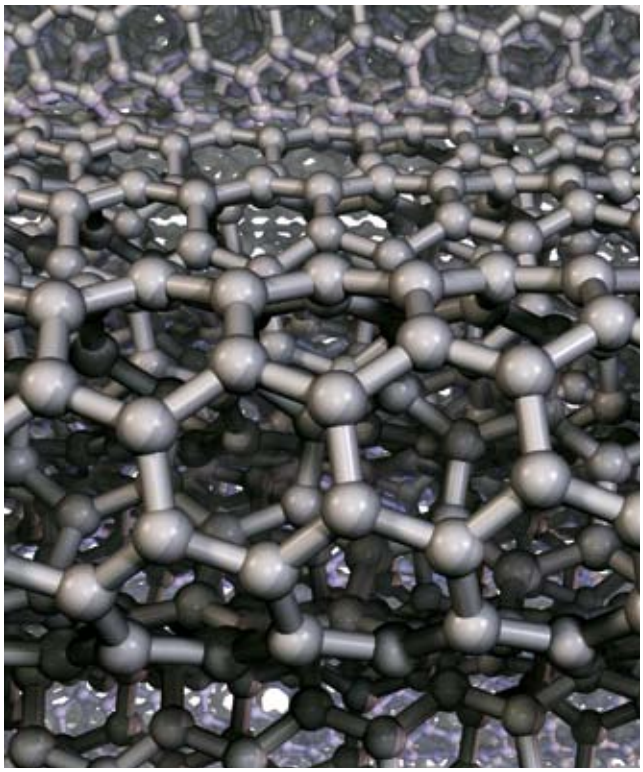
The institutes have expertise in a number of fields within Industrial and Material Technologies.

Industrial Process design, control and automation
Within the field of Industrial Technologies one area of focus amongst our institutes has been in the design and automation of industrial processes. Tools have been developed to optimize process automation and control. A Schneider certified training centre (which forms part of HEPHS) can address any issues amongst industry within the field of process automation by establishing specific training and collaborative research to meet the demands of industry.

Industrial manufacturing
Expertise is provided on the analysis of industrial manufacturing from a dynamic perspective. The evaluation may include product life-cycle analysis and the quantification of material and energy flows in industrial production (the method of production and product flow management) leading to authentication of the industrial process from a dynamic perspective.

Our laboratories are equipped with design software allowing CAD and FEA and dedicated machining tools (CNC, milling, turning etc.) for the manufacturing of equipment, parts and components required for the research programs.

Materials
There is also strong expertise in the use of building materials such as wood, steel and concrete; unique expertise in Belgium in relation to the characterization and formulation of coatings; advanced knowledge in the degradation of materials (corrosion) and the handling of radioisotopes and a dedicated Physical Chemistry and Catalysis Research Unit.



The following research units are involved in Industrial and Material activities:

Mechanical & Thermal Engineering Unit, HELDV - ECAM
Mechanical Conception Laboratory, HELDV - ECAM
Civil Engineering Unit, HELDV - ECAM
Electrical & Automation Engineering Unit, HELDV - ECAM

Electrical & Automation Engineering Unit, HEPHS - ISIB
Industrial and Environmental Chemistry Unit HEPHS - ISIB
Nuclear Physics and Radiation Laboratory, HEPHS - ISIB

Electromechanical Unit, EHB - IWT

Coatings, HELDB - IM
Organic Chemistry Engineering Unit, HELDB - IM
Physical Chemistry and catalysis Unit, HELDB - IM

RECENT RESEARCH PROJECTS

Archeometry

Abstract: The application of physical and physicochemical methods to the study of ancient objects and/or their restoration; implementation of analyses by XRFA, PIXE, Raman, Auger, SEM.

Scientists: J. Guillaume (ISIB).

Partners: VUB, ULg, ERM, CVUT Prague, Université de Florence, Musée de Mariemont, Musée de Hanoï, Musée Groothuus, musée ethnographique de Paris, musée de la cathédrale de Liège, Ville de Gand, MRAH.

Technological Domain & Keywords: PIXE, RAMAN spectrometry, metallography.

Paint Cell

Abstract: A study of the frescoes in the chapel of the chateau of Ponthoz. Participation in the scientific study of the oeuvre of Lambert Lombard; analysis of four pictures in the context of the 2006 review.

Scientists: J. Guillaume (ISIB).

Partners: Institut Royal du Patrimoine Artistique, Université de Gand.

Technological Domain & Keywords: X-ray fluorescence.

COMBALSI *- restoration of concrete*

Abstract: The restoration of concrete; a method for combating concrete degradation of the alkali/silica type in existing construction.

Scientists: M. Gilmard (ECAM), J-P. Dupont (ECAM), P. Tilman (ECAM).

Partners : NORTEX S.A. (BOURCY Jean-Claude).

Parc scientifique des Isnes GEMBLOUX.

Technological Domain & Keywords: concrete, civil engineering, building engineering, electrochemistry, electro-osmosis, material technology.

Rockwool

Abstract: To issue a scientific opinion in the form of a technical report that technologically endorses (recommends) an innovative and competitive industrial method for manufacturing wool from volcanic rock.

Technological consultancy: implementation of feedstock, fusion of the rocks and refining, drawing out and fashioning, feeding the furnace and transportation of raw materials.

Scientists: L. Hocks (ISIB).

Partners: INISMA (BCRC).

Technological Domain & Keywords: Process plant validation, volcanic rockwool.

Rockwool Lubricants

Abstract: Characterizing and synthesizing lubricants with the aim of maximizing technological demands amongst the aeronautical, automotive, industrial textiles and civil engineering markets. A modified lubricant will represent an asset and have a positive value compared with its competitors (lubrication, mutual adherence of fibres, adapted mechanical properties depending on the usage, the sector under consideration etc.).

Scientists: E.Gicquel (IM).

Partners: Isomatex s.a.

Technological Domain & Keywords: chemical synthesis.

Keywords: industrial coating, silanates, matrix, fibre, industrial textiles.

Simulation of impact on motorcycle helmets

Abstract: LS-DYNA numeric simulations of motorcycle helmet crash tests according to the ECE 2005 standard. (Motorcycle helmets were previously developed using CATIA V5). The research also involves the mechanical characteristics of the materials used in the helmets and upgrading designs of virtual helmets.

Scientists: A. Mercier (IRISIB), Fr. De Blandeer (ISIB).

Partners: ULB, ERM, Lazer Helmets.

Technological Domain & Keywords: elastoplasticity, dynamic simulation, non-linear finite element analysis, fracture analysis.

Areas of Expertise

Industrial Technologies & Material Technologies

CONSULTING SERVICES

INDUSTRIAL PROCESS DESIGN, AUTOMATION & CONTROL

- Training in PL7pro & Unity programming languages for industrial process automation (Schneider certified)
- Consulting services and training in Ethernet Industrial Network (Modbus, ASI-bus, CANOpen)
- Consulting services and training in SCADA technology for industrial process management (VIJEO Scada software)
- Design and modelling of Human Machine Interface for industrial applications (VIJEO Designer Software)

INDUSTRIAL INSTALLATIONS

- Design and upgrading of mechanical industrial machinery (instruments, parts and components)
- Analysis and design of hydraulics, aeraulics and HVAC circuits
- Management of computer-integrated manufacturing processes (the method of production and product flow management).
- Electrical audits of industrial installations
- Lighting engineering for industrial applications
- Consulting services and training in fluid flow simulation (CFD) for industrial, aeronautic and aerodynamic flows

MATERIAL TECHNOLOGY

- Basic training in x-ray fluorescence and x-ray diffraction
- Degradation of materials
- Handling radioisotopes
- Thermoluminescence and age estimation

PHYSICAL CATALYSIS

1. Characterization of all catalytic reactions through noble and transition metals
2. Research and optimization of the catalyst, the choice of catalyst, optimization of the catalytic method (yield, selectivity, average lifetime of the catalyst, activity of the catalyst, energy cost etc.)

Characterization of the catalyst's support, deposited metal and catalyst:

- Density of porous substances
- Catalytic activity
- Extent of metal dispersion
- Metal content of a specific surface
- Point of zero charge
- Specific surface area (BET method)
- Surface acidity

CONSTRUCTION TECHNOLOGIES & BUILDING MATERIALS

- Advice in geotechnic engineering, topography and geodesy related to building and civil engineering
- Expert evaluation (use and design) of construction materials: steel, wood and concrete
- Advice in building pathology
- Design and upgrading of thermal and acoustic insulation
- IR-thermography for thermal building deficiencies

COATINGS

- Formulation of new coatings
- Coating prototyping and duplication
- Coating characterization and analysis
- Coating techniques and measurements according to ISO/ ASTM standards

SPECIALIST EQUIPMENT

CIVIL ENGINEERING

- Total stations, theodolites, levels
- Analysis of materials strength: strains, deflections and loads (testing portal frame, flexural and compression testing machines up to 300 T)
- Properties of construction materials and assessment of mechanical behaviour
- Evaluation of soil mechanics (effective stress, shear strength etc.)

A climatic chamber may be used to perform tests under specific climatic conditions.

COATINGS

The Coatings Unit is equipped with a full range of equipment allowing tests to be conducted on coatings to ISO/ASTM standards.

- Bending test on cylindrical mandrel
- Glossmetry
- Clemen test (adherence, durability, hardness)
- Climatic chamber for Suntest
- Covering power evaluation
- Cross Cut test
- Mixer
- Normalized chemical tests
- Pencil hardness test
- Viscosity
- Washability test (USUBEL wear test)

ELECTRICAL ENGINEERING

- ABB ACS300 Drive: digital servo-amplifier
- Fluke scopemeter (+ Flukeview software)
- Fully equipped Schneider certified center
- Leroy-Somer servomotor
- Semikron didactic module: power electronics didactic test bench
- Telemecanique ALTIVAR drives (31, 45, 61 and 71) for (a) synchronous AC motor
- Telemecanique RECTIVAR drives for DC motor
- Socomec power inverter
- Uninterruptible power supplies (UPS) - 60, 80 kVA
- Photovoltaic solar power supplies (1kWp and 300 Wp)

MACHINING

- 3-axes Mikron CNC milling machine
- 6-axes ABB anthropomorphic robot
- Cincinnati Machining Center
- CNC lathe
- Festo Robot assembly station
- Flexlink assembly systems
- Parallel lathe
- Milling machine
- Universal grinding machine

MECHANICAL ENGINEERING

- 6bars/100 m^3/h pumping capacity
- Car engine test bench
- Citroën C3 full vehicle with integrated engine test bench capacity
- Hydraulic channel
- Kuka robot
- Low speed wind tunnel
- Mindstorm Lego for robotic applications
- Khepera robot for robotic applications
- Pump and ventilator test bench

Areas of Expertise

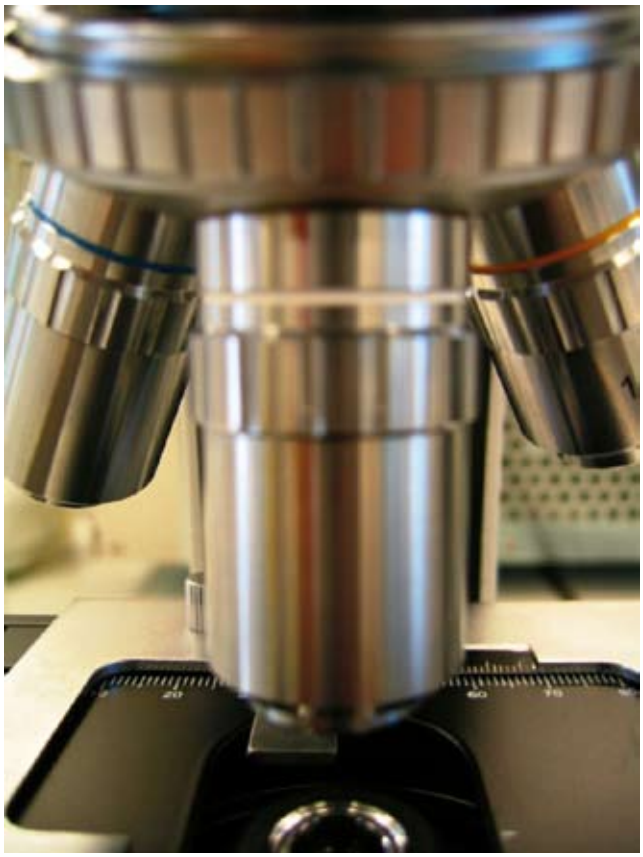
Industrial Technologies & Material Technologies

METALLOGRAPHY

- Dilatometer
- Metallographic microscopes
- Polishing equipment
- Tensile testing machine (50kN & 200kN)
- Ultrasound welding control systems

METROLOGY

- Electronic micrometer (0.1µm)
- GEOPAK, SCANPAK, TRANSPAK: 3D data analysis and Coordinate Measuring Machines (CMM) programming module
- Profile projector (0.01mm)
- SGIP Universal measuring Machine
- Universal Co-ordinate measuring machine MITUTOYO BX 303 (µm)



NUCLEAR RADIATION MEASURING & MONITORING

- Coincidence measurement
- Controlled atmosphere furnaces (Tmax: 1200°C)
- Electrochemical cyclic voltammetry
- Irradiators 137Cs (Gy/min) et 60Co (Gy/min)
- Liquid scintillation
- Neutron measurement: BF3, stilbène
- Nuclear contamination monitor
- Nuclear Radiation counter: alpha, beta, gamma
- Radiation dosimetry:
  - bubble dosimeter
  - ionisation chambers
  - plastic scintillators
  - proportional counter
  - radiochromic film
  - red perpex
  - thermoluminescent dosimetry
- Radiochemical hoods
- Radon measurement alpha traces, activated carbon, Lucas cells, continuous radon monitor, calibration room
- Spectrometers: alpha, gamma, X, FTIR
- Thermoluminescent measurements
- X-ray fluorescence on samples and in situ
- Zeeman-effect Spectrometer

PHYSICAL CATALYSIS

- BET apparatus for determining specific surface areas (BET method)
- Chemisorption for metal dispersion evaluation
- Liquid phase HP reactor (100 bars),
- Low pressure reactors (atm. 10 bars, 40 bars)
- Solid analysis: TGA, DSC
- Solid characterization: TPO, TPD, TPR
- MALVERN Laser: particle size analysis and micrometry

WW

- Electric welding station
- TIG & MIG welding station (ultrasound welding control)

SPECIALIST SOFTWARE

CAD/CAM/CAE/FEA

- AlphaCAM V5: CAD/CAM system for the manufacture of metal, wood and stone parts
- Autocad: CAD software products for 2- and 3-Dimensional design and drafting
- CATIA: Fully integrated CAD/CAM.FEA suite including PLM
- DELMIA: Robotics integration software
- LS-DYNA: Specialist software for the mechanical analysis of non-linear dynamic systems
- SAMcef: Finite element analysis software
- Solidworks: 3D Mechanical Design and 3D CAD Software
- Tecplot: Advanced engineering plotting software suited for CFD/FEA, post-processing of data and accurate charting

CFD

- Fine: Software package for fluid flow analysis
- Xfoil: Subsonic Airfoil Analysis and Design

ELECTRICAL & ELECTRONIC ENGINEERING

- Calculux: Lighting application software
- Protel: Design of printed circuit boards
- Schneider Unity Programming language
- See-technical: Electrical design software
- Siemens PL7pro: Programming language
- Simplorer: Simulation software for high performance electronic design
- Spice: Electronic design software
- TR-ciel: Electrical installation software
- Viewlogic: Very high speed hardware description language for integrated circuits
- VIJEO designer SCADA: Design tool for control application
- VIJEO SCADA: Supervisory Control and Data Acquisition

FUZZY LOGIC

- FuzzyTECH: Software development tools for fuzzy logic and neural-fuzzy solutions
- VisSim: Modelling and simulation of complex dynamic systems

NUCLEAR ENERGY ASSESSMENT

- ANISN: 1-Dimensional discrete ordinates transport code for neutron and gamma calculations
- Beamline Simulator: Easy-to-use charged particle optics program (used for first order beamline design work)
- EGS4: Monte Carlo code for simulations of the transport of electrons and photons in arbitrary geometries
- COSYMA: Program package for assessing the off-site consequences of accidental release of radioactive material into the atmosphere
- MCNP4: General Monte Carlo radiation transport code capable of transporting neutrons, photons and electrons through virtually any material in various geometries.
- MCNPX: Expanded version of MCNP, capable of transporting almost any particle at virtually all energy ranges
- ORIGEN: Isotopic depletion and decay analysis program designed to provide fast characterization of nuclear fuel under irradiation and decay conditions.
- UMG: Neutron field characterization
- WinAxil: X-ray analysis software

PROCESS DECISION & MULTI-CRITERIA ANALYSIS

- Decision Lab: Multi-criteria decision support system based on the multi-criteria decision methodology (PROMETHEE & GAIA)

PRODUCT LIFE CYCLE ASSESSMENT

- Eco Invent: Life cycle assessment software

Areas of Expertise

Industrial Technologies & Material Technologies

STRUCTURAL ENGINEERING

- SCIA (*): Structural engineering for the construction industry

GENERAL DATA PROCESSING

- Aspen Plus: Software package designed to allow the user to build a process model and then simulate the model
- Matlab: Numerical computing environment and programming language.
- Simulink: Environment for multi-domain simulation and Model-Based Design for dynamic and embedded systems.
- Labview: Platform and development environment for a visual programming language
- SURFER8: 3D surface modelling package used for terrain modelling, landscape visualization, surface analysis, 2D map generation etc.

(*): Academic licenses cannot be used for third party consulting and training