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Editorial

In 2024, 204 companies received support from Certech in their innovation process, 21% of which were new prospects. A total of 750 R&D and service contracts were handled. The turnover associated with these private sales was higher than ever before. The major market segment for 2024 was (bio)chemistry & life sciences (35%) followed by environment and energy (30%), automotive (14%), and polymer materials (12%).

Two projects received funding from the European Union's Horizon Europe research and innovation program. Both projects aim to scale up and demonstrate a sustainable, safe, and economically viable production process for new biobased chemicals. The six projects submitted in the Interreg VI France-Wallonie-Vlaanderen program were granted, covering Certech's strategic areas, such as innovation for improved health, circular and biobased materials, innovations for agile and safer design and manufacturing.

While sharing the Walloon Region's ambition to strengthen the Centres de Recherche Agréés (CRAs) by developing links and synergies to maximise their impact on the economy, Certech disengaged from the CISMIC "*Centre d'Innovation Stratégique pour les Matériaux Innovants et Circulaires*" initiative. The Board of Directors, with the support of Certech's staff and management, will continue to develop ways to strengthen the research and innovation landscape in the Walloon Region. To do so, other avenues are being actively explored in order to create synergies in line with Certech's strategic priorities.

I would like to thank all Certech employees for their support, commitment, great achievement, and their resilience throughout this year.

Catherine Henneuse
Deputy General Manager

1. PRESENTATION OF CERTech ACTIVITIES

Certech is a research and development partner and supplier of analytical and technological services for companies involved with activities related to (bio)-chemistry: life sciences, environment and energy; automotive, polymers. Our mission is to provide sustainable innovative solutions to improve or develop products and processes to meet industrial and societal needs.

The research & development strategy is based on the synergies of three main themes, namely: polymer materials technology, chemistry & industrial processes, environment, all three being supported by an analytical & technological services platform.



ENVIRONMENT

Our industry partners benefit from Certech's forty five years of experience in the field of gas emission, process optimization and improved materials with reduced environmental impact. Research and Development activities include air quality, health and safety, energy, and circular economy.

Certech is approved for the atmospheric pollution control (odor, volatile organic compounds) by the Walloon region and is an active member of 11 working groups over different Technical Committees from ISO, CEN, Afnor.

Air Quality, Health & Safety

Atmospheric pollution and ambient air

In the field of outdoor environment, sampling, on-line measurements, and analysis (odor and gaseous effluents) are offered. Environmental impact is evaluated via simulations of atmospheric dispersion and neighbourhood direct assessment. Remediation pilot equipment based on catalysis or scrubbing is also available. A mobile laboratory is dedicated to carry out environmental diagnostics. It is equipped with several sampling equipment and measuring devices for the analysis of atmospheric emissions and ambient air.

Occupational hygiene and indoor air quality

Key expertise in workplace and indoor air assessment includes sampling and analysis of dusts, aerosols, microbiological and chemical components, noise, measurement of nanoparticles and biological agents, determination of organic vapours, evaluation of personal protective equipment (PPE), probability assessment of workstation exposure and characterization of ATEX (ATmosphere EXplosive) atmosphere, generation of controlled atmosphere and sensors efficiency evaluation.

Energy and circular economy

The European Green Deal and the accelerating use of renewable energy sources driven by the need to mitigate the effects of climate change has significantly increased market needs in the field of energy saving, renewable energy production, storage, distribution, and end-use.

Driven by the concepts of sustainability, expertise in chemistry for renewable energy applications has been built up by working on efficient and green materials, energy production and storage, chemical storage, sustainable and innovative process.



CHEMISTRY AND INDUSTRIAL PROCESSES

In the current era of globalization and capital mobility, European chemical industry must accelerate its pace of innovation to remain in a leading position. Capitalizing on its core expertise in chemistry, process intensification and continuous flow chemistry, Certech aims to develop factory of the future and smart (bio)-chemistry platforms adapted to the main industrial chemical sectors: Specialty Chemicals and Life Sciences

Factory of the Future - Intensified/continuous processes

Process Intensification is based on the use of small volume reactors, continuous processes, high temperatures and pressures, better heat, and mass transfer. It leads to improved quality products, increasing yields, reduction of investment costs, lower energy consumption and reduced environmental and safety risks. It is a multidisciplinary approach to improve process technology and the underlying chemistry at the same time.

Micro/Mesofluidic reactors

Multipurpose flow reactors enabling continuous (bio)-chemical/biotech processes are available. Main features of this type of equipment are the outstanding mixing and heat exchange, low internal volume with high residence time allowing the use of low quantities of reactants with an output of 5 kg a day.

Pilot reactors are also available to perform synthesis under strictly controlled experimental conditions in gas, liquid phase but also slurries. Different applications are covered including fine chemicals, medicinal chemistry, biotechnology, green chemistry, and polymer chemistry.

Chemical recycling (Plastic-to-Liquid, Plastic-to-Gas)

Chemical recycling is a process which either breaks down or selectively dissolve plastic waste into their chemical constituents and converts them into useful products like basic chemicals, new polymers/oligomers, or specialty chemicals. Specific skills and equipment able to reach high pressures and temperatures are used in the field of recycling and valorisation of plastic waste materials in a continuous way.

Certech also has a strong expertise in the field of catalytic pyrolysis for waste to hydrocarbons transformation, with potential valorisation for the synthesis of new polymers.



POLYMER MATERIALS TECHNOLOGY

Certech expertise in polymer and composite materials ranges from analysis and development (formulation, blending...) to transformation and processing, thereby offering a broad and diversified technical and scientific support to partners and customers looking for a broad expertise in the field of material science.

To address environmental concerns which have become a major topic for industry these last years, Certech has acquired a strong expertise in materials and processes with reduced environmental impact, from biobased materials to the mechanical and chemical recycling processes for plastics and composites. This expertise also includes the development of lightweight materials as well as odor and emissions from materials



Odors and emissions from materials

Certech offers R&D support, testing and consulting in the field of materials interaction with the environment. New requirements from end-users (e.g., low odor and emission products, non-intentionally added substances NIAS), new directives and regulations (e.g. new car manufacturers standards, migration concerns, health, and environmental regulations) have a clear influence on product market acceptance and require reliable laboratory testing conditions. By combining its skills in air sampling and analysis with its expertise in materials technology, Certech has developed leading edge know-how in assessing and managing gaseous emissions produced by materials. This expertise includes emissions from transportation or building materials, migration phenomena and organoleptic contamination of packaging materials. Certech works in partnership with suppliers, manufacturers, and end-users in order to achieve materials emission levels that are complying with the market needs. Remediation is also proposed and can involve formulation of less odorous and less emissive products and/or using innovative processes (dry air degassing, devolatilisation and stripping). Certech has been selected as the Belgian expert for the drafting of the European Standard EN13725 "Air quality – Determination of odor concentration by dynamic olfactometry", EN16846-1 "Photocatalysis", ISO 16000 standards "Indoor air" and ISO 12219 "Interior air of road vehicles". Performance evaluations of air purification units are also offered.

(Bio-based) Polymers and composites

Certech develops materials and their processing conditions to respond to the most stringent market needs. The intrinsic properties, the cost of raw materials and additives, their origin, processing and manufacturing conditions, health and environmental impact, recyclability are key parameters considered for the development of new materials. Know-how has been acquired by Certech in the formulation and modification of petroleum-based and bio-based thermosets and thermoplastic materials like wood plastic composites, bio-based composites, barrier additives for packaging, functional additives, and bio-polymer formulations. Preparation of hybrid materials (sol gel, specialty and multifunctional coatings, zeolites chemistry, cellular materials) is also one of the key competences.

Certech has also acquired expertise in the field of material substitution for the plastics and composites sectors, aiming at replacing raw materials which are raising potential health or sustainability issues.

Mechanical recycling (Plastic-to-Plastic)

Recycling of materials is one of the most challenging issues from a sustainability point of view. Certech can provide sorting and separation services and performs the processing of solid wastes into new materials. Assistance in material identification, processing, formulation, and evaluation of recycled materials performance is also provided. Odors and emissions associated with recycled polymers can also be managed (sampling, characterisation, and remediation).

Lightweight materials: development of polymer foams

Today, environmental concerns play an increasingly central part in all the sectors of activity (building, transport, energy, ...) and there is an increasing need for more performing and lighter materials. For that purpose, foamed polymers are very interesting materials thanks to their acoustic and thermal insulation properties, lower density, mechanical properties, and competitive price. Foamed polymers are found virtually everywhere in a wide variety of applications such as packaging, cushioning of furniture, insulation, structural parts in automotive ...

In order to deliver R&D support to customers and partners, Certech has implemented several activities linked to foaming: physical and chemical foaming, development and optimization of formulations, development and optimization of processes.

ANALYTICAL & TECHNOLOGICAL SERVICES

Industry partners benefit from the support of a wide range of advanced characterization tools. The analytical equipment covers the physical, chemical but also sensorial properties determination:

- Physical analysis: mechanical, rheological, thermal, dynamic mechanical, morphological, barrier properties, molecular weight distribution, polymer degree of branching.
- Chemical analysis: chemical composition determination of resins and polymers, additives, fillers, qualitative and quantitative determination of complex mixtures, traces analysis, non-intentionally added substances (NIAS), reverse engineering.
- Sensorial analysis: odor and organoleptic properties.



A 1000 m² application hall is available with highly flexible equipment designed for the simulation of industrial processes:

- Polymer materials: drying, mixing, pelletizing, extrusion, foaming, injection moulding, resin transfer moulding (RTM), compounding. The available output ranges from 5g to a few tens kg/h of processed materials.
- Process intensification: versatile continuous reactors adaptable to project needs, 20 litres continuous reactor for catalytic pyrolysis, autoclaves from 75 to 1000 ml for high temperature and high-pressure chemical treatment, spray-drying.



ECO-RESPONSIBILITY – ENVIRONMENTAL IMPACT

A carbon footprint reduction program has been started in 2017, including installation of solar panels, upgrading the heating system control, replacing compressors, optimising HVAC programs, changing lighting from conventional to LED, improving offices insulation. In the period 2020-2024, gas and electricity savings of respectively 59% and 37% were achieved, which correspond to 405 tons of CO₂. In 2024, in line with its commitment to reduce its environmental impact and to develop sustainable products and processes, Certech has installed 443 additional photovoltaic panels on its buildings. The installation will produce a total of 242 MW.h of renewable energy per year and will reduce annual consumption by a further 22%.



2. R&D COLLABORATIVE PROJECTS



In 2024, Certech was involved, either as lead partner or partner, in 14 collaborative projects, 8 of which were kicked off during the year. The funding sources were the European Regional Development Fund (ERDF, “Just Transition Fund” and “Interreg VI France-Wallonie-Vlaanderen”), Walloon Region (Marshall Plan & Digital Wallonia), Federal Government (Energy Transition Fund) and the European Commission Horizon Europe framework program.

ONGOING PROJECTS

Project	Description	Partnership	Funding
H ₂ .be	Easy hydrogen storage with advanced, innovative, safe and cost-effective materials	Certech, UCLouvain, industrial partner	Energy Transition Fund (Federal Government)
Chimérique2	Industry 5.0 in the fields of chemistry, life sciences	essenscia, Greenwin, Plastiwin, Infopôle, Cetic, Sirris, Certech	Digital Wallonia

Project	Description	Partnership	Funding
PUR4UP	Design of new finished products incorporating high quality recycled plastics from end-of-life vehicles (ELVs) and waste of electrical and electronic equipment (WEEE)	Industrial Partnership, Certech, ULIège	Marshall Plan MecaTech
SFP Liner	Development of a flexible class A structuring liner-resin system for metal pipes network distribution (high temperature application and drinking water) with extended lifespan (50 years)	Industrial Partnership, Certech, Celabor, Centexbel, ULIège	Marshall Plan Greenwin

Project	Description	Partnership	Funding
UP_PLASTICS	Ecodesign of plastic materials for construction and building	UMons, UCLouvain, ULIège, CTP, Buildwise, Materia Nova, Certech, Celabor, Centexbel	ERDF
RECYAGE	Study of ageing on different time scales of recycled thermoplastic polymers and methodology for predicting long-term behaviour	Certech, Sirris	Win4Collective

NEW PROJECTS

Project	Description	Partnership	Funding
HARDMat (EXTREMAT)	Formulation of Tungsten Carbide/Cobalt (WC-Co) Composite and Polymer Blends for Advanced and Environmentally Friendly Additive Manufacturing	CRIBC, Certech, UMons, Sirris	Just Transition Fund
RE-ASSIGN	Supporting companies in the integration of recycled plastics	Certech, CTP, Centexbel, CREPIM, IMT Nord Europe	Interreg VI FWVI supported by the ERDF & Wallonia
COMPOVERT	Development of functional composite materials with plant reinforcement	Certech, URCA, ULIège-GxABT, CRITT MI, IMT Nord Europe	Interreg VI FWVI supported by the ERDF & Wallonia
AGILITY	Processing of technical and filled polymers by 3D printing for maintenance applications and rapid tool manufacturing	CRITT MI, CRIBC, Certech, IMT Nord Europe	Interreg VI FWVI supported by the ERDF & Wallonia

Project	Description	Partnership	Funding
Inside 3D	Development of personalized medical and pharmaceutical devices by 3D printing	CHU Lille, UMons, ULille, Centrale Lille, UGent, Eurasanté, UZGent, Certech, CNRS, VIVES Zuid, CRIBC	Interreg VI FWVI supported by the ERDF & Wallonia
NEXT-STEP	Production of sustainable and biodegradable materials based on 3-methyl-d-valerolactone (3MdVL)	AIMPLAS, Mevaldi, BBEPP, PDC, FIBENOL OU, UGent, UNIROMA1, Certech, DBFZ, Altar, Adidas AG	EU Horizon Europe-JU CBE
BIOSAFIRE	Development and manufacture of new, more sustainable and safer materials using biobased functionalised additives based on lignin and tannins to improve fire resistance	GAIKER, Noma Resins, Nordtreat Oy, VTT, Aislamientos Térmicos de Galicia, Sinergia Consulenze, PDC, TEMAS Solutions, Rymatex, Viba Agile Innovation, RISE, SII, Greendecision, apcl advertising product company, Fraunhofer-Gesellschaft, INSST, Arcelik, Vertoro, Centro Ricerche per la Chimica Fine, Refisa, EPSAN	EU Horizon Europe

Project	Description	Partnership	Funding
Elast2Sustain	Sustainable thermoplastic elastomers (TPEs) from bio-based or recycled materials	Centexbel, Certech, URCA, ULille, KULeuven, EuraMaterials	Interreg VI FWVI supported by the ERDF & Wallonia
OBIWAN	From organic waste to chemical building blocks via biogas: an integrated (bio) chemical carbon cycle including CO2 recovery	UGent, CNRS, Certech, UTC	Interreg VI FWVI supported by the ERDF & Wallonia

HARDMat



The HARDMat project focuses on the formulation of Tungsten Carbide/Cobalt (WC-Co) composite and polymer blends for additive manufacturing (AM, also known as 3D printing). Traditional ceramic manufacturing methods have limitations for complex shapes, often requiring additional machining. In comparison, AM technologies enable the creation of more complex parts with precision and generally without additional processing.

Specifically, metal material extrusion (metal MEX) AM is appreciated for its simplicity and cost-effectiveness. This process includes the preparation of metal powders and polymer binders in a mixture, 3D printing, debinding, and sintering to obtain metal parts.

In the HARDMat project, Certech aims to develop new ceramic materials based on tungsten carbide/cobalt by carrying out the following tasks:

- Selecting suitable thermoplastic polymer binders and additives with a low environmental impact.
- Utilising recycled carbide feeds for mixing with binders.
- Producing granules and powders for AM processes used by the partners.

RE-ASSIGN



As part of the European Green Deal and its objective of a climate neutral Europe in 2050, the transition to a circular plastics economy constitutes a major challenge for a large number of companies. At European level, the use of recycled plastics in finished products is becoming increasingly necessary, given the “Circular Plastics Alliance” initiative, the new regulation on packaging and packaging waste (PPWR) and the tax on plastics. The regions of the cross-border territory have also taken clear steps towards an obligation in terms of recycled content.

In this context, the cross-border RE-ASSIGN project (REcycling pLAStics deSIGN) aims to support companies in their transition to a circular economy through the development of plastic products incorporating recycled materials (Design from recycling) from post-consumer or pre-consumer streams.

Certech is conducting the project and will contribute to the following activities:

- Optimization of mechanical and chemical recycling processes
- Formulation of compounds integrating the maximum content of recycled materials allowing to achieve the targeted specifications
- Development of characterisation methods for recycled plastics to address critical issues related to legacy additives, substances of concern and the presence of NIAS (non-intentionally added substances)
- Characterisation of odors and VOC (volatile organic compounds) emissions from recycled products

COMPOVERT

Biobased materials and products have a major role to play in the transition to a circular bioeconomy in order to meet the ambition of the European Union (EU) which aims in its Green Deal for a climate neutral Europe in 2050.

In this project, Certech will develop biobased composites with interesting properties (antioxidant, antibacterial, antistatic, ...) by valorising regional agricultural by-products.

Certech activities within the project are based on our following expertise:

- Development of thermoplastic polymer matrices based on modified biobased raw materials
- Formulation and process of biocomposites
- Physico-chemical and mechanical characterisation of the biocomposites
- Characterisation of Volatile Organic Compounds and odors emissions from biocomposites

AGILITY

Additive manufacturing processes offer a wide range of possibilities for targeted applications that take advantage of its design freedom and flexibility.

This project aims to support companies through innovation and applied research in the additive manufacturing of technical and filled polymers for maintenance applications and rapid tool manufacturing.

Certech will provide its expertise in the following tasks:

- Selection and formulation of materials: Certech works on the selection and formulation of polymer materials, including thermoplastic matrices, ceramic and metallic fillers, as well as various additives.
- Filament extrusion: using knowledge developed in other projects, Certech develops the extrusion of calibrated filaments of these formulations for additive manufacturing.
- Material characterisation: Certech conducts complementary characterization tasks, including microscopy analyses and tests of mechanical, rheological, and physicochemical properties, to validate the materials according to the requirements defined by the targeted industrial applications.

Inside 3D

3D printing (3DP) is a promising technology for personalising medicinal drugs, medical devices and educational models. In France and Belgium, 3DP is mainly outsourced, which generates high costs and limits its accessibility. Bringing it in-house in hospitals could reduce time and costs but requires for the Franco-Belgian region some coordination and significant regulatory adjustments. The INSIDE 3D project aims to develop these technologies for educational and medical uses, to better integrate 3DP into the healthcare ecosystem, and to inform professionals about its applications in personalised medicine, while strengthening cross-border cooperation.

As part of this project, Certech will focus on the formulation of polymer materials with active ingredients and other excipients. These formulations will be specifically adapted to additive manufacturing and the implementation of a personalised medicine.

Certech will contribute to the following cross-border activities:

- The identification of commercially available raw materials suitable and compliant for pharmaceutical use
- Formulation by hot melt extrusion of a polymer materials with active ingredients that meets the specifications of the therapeutic application.
- Processing of this innovative materials as filaments or granules compatible with 3D printing.
- Physico-chemical characterisation of the materials and semi-finished products (filaments, granules, etc.).
- Preliminary 3DP testing on filaments using FDM (Fused Deposition Modeling).



Next Step



NEXTSTEP



Scaling up sustainable and biodegradable materials is crucial for the future advancement of European industry. Currently, many bio-based alternatives struggle to compete with established fossil-based chemicals due to challenges in environmental, economic, and societal performance. To overcome this, the NEXT-STEP project aims to scale up and demonstrate a sustainable, safe, and economically viable production process for a new chemical platform, the 3-methyl-d-valerolactone (3MdVL) that will improve the sustainability and recyclability of polyurethane (PU) products and unlock new engineering plastic applications for polylactic acid (PLA) co-polymers. This initiative seeks to address environmental concerns while fostering the adoption of bio-based materials in various industries.

As partner of this research project, Certech is in charge of the following tasks:

- Supporting the upscaling of production by characterising lab and pilot samples of 3MdVL, its precursor as well as its hydrogenation product.
- Contributing to a safe and sustainable by design (SSbD) approach through safety assessment (risk analysis, air quality analysis and implementation of practical solutions at industrial scale).
- Processing and characterizing the target PLA co-polymers and foamed non-isocyanate PU (NIPU) derived from 3MdVL, in order to benchmark these with existing products on the market.
- Investigating various chemical recycling technologies for the new polymers, in order to validate these in terms of energetic cost and efficiency of the process (conversion degree).

Elast2Sustain



Recycled or bio-based materials have a major role to play in the transition to a circular bioeconomy to meet the ambition of the European Union, which aims in its Green Deal for a climate-neutral Europe by 2050.

In this project, Certech collaborates to the study of chemical recycling by pyrolysis of thermoplastic elastomers, in order to confer durability to these materials whose properties are very useful and innovative (shape memory, conductivity, malleability under pressure, etc.).

Certech's activities within the framework of this project are based on its following expertise:

- Chemical recycling of thermoplastic elastomers
- Factory of the future
- Intensified / continuous processes
- Heterogeneous catalysis

- Characterization of the physicochemical properties of oils resulting from the pyrolysis of thermoplastic elastomers

OBIWAN



Certech is involved in a project converting organic waste streams into advanced chemicals and sustainable aviation fuels. After an initial anaerobic digestion for biogas production, a mixture of methane (CH₄) and carbon dioxide (CO₂), a subsequent chemical conversion will convert the CO₂ into the valuable chemicals. The excess of carbon will be then captured as solid carbon with applications in e.g. gas cleaning or tires. The project aims to develop a technology to mitigate climate change, not only by avoiding greenhouse gas emissions but also by turning these gases into valuable products.

Certech activities within the project are based on our following expertise:

- Analysis and gas purification
- CH₄ and CO₂ separation
- Solid synthesis such as MOF (Metal Organic Framework)
- Process intensification

Biosafire



BIOSAFIRE will develop and upscale innovative products upgrading nature's best fire retardants: lignins and tannins. To ensure that these novel products are safe and sustainable, while retaining their desired technological functionality, they will be thoroughly assessed by applying the Safe and Sustainable by Design (SSbD) framework at different stages of their development and the results will be iteratively fed into the further design and optimisation of the technologies. Involving the full material value chain, these flame retardants will be upscaled to a prototype in operational environment and demonstrated in four sectors of applications (naval, railway, marine, home appliances and wood coatings).

More specifically, Certech's tasks in the project are:

- Volatile Organic Compounds (VOC) and odors characterization of flame retarded materials
- End-of-Life validation activities, including mechanical recycling evaluation of thermoset and thermoplastic materials formulated with the new biobased flame retardants.

NEW EQUIPMENT

Digitization of a pilot reactor for chemical recycling

Certech invested in digitization to sustain its expertise in the field of thermo-chemical recycling for the pilot transformation of mixed and/or contaminated plastic waste into valuable products, providing alternatives to landfilling and incineration. Certech equipment comprise laboratory-scale reactors as well as an advanced pilot reactor (20 L) allowing the evaluation on a larger scale, in a batch or continuous mode with the use of an extruder for feeding continuously the reactor.

Previously, during pilot experiments, several types of data (temperatures, mixing speed, electric consumption, produced gas volume) required manual collection, leading to fastidious checking and re-encoding work. With the help of motivated co-workers and sub-contractors' teams, Certech began an advanced digitization process of this pilot reactor.

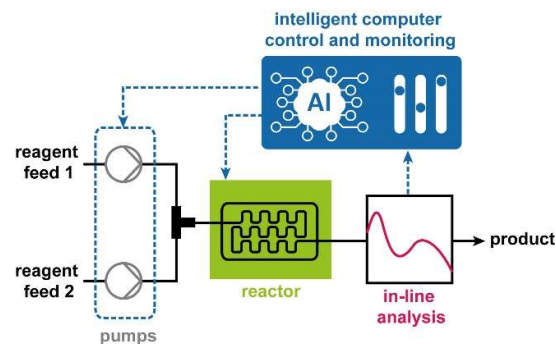
These deep modifications include the implementation of a PLC (Programmable Logic Controller) and the generation of a local Wi-Fi allowing to control the heating, the agitation of the reactor, and collecting more frequently and accurately eleven temperature points, volumetric gas flow, two energetic consumptions, and pressure measurements at three critical points for enhanced safety during experiments. Enhancement of safety was also achieved via an encasing within a transparent protective enclosure. The digitization of this pilot reactor has therefore simplified the collection of the various data, allowing it to further increase the useful time spent on important process points as well as order and safety.



Certech digitized pilot line for pyrolysis of waste plastics, comprising a single screw extruder (left) feeding plastic waste in continuous mode to a 20 L reactor with a collection station (right), encased within a transparent protective enclosure.
Copyright@ Certech 2024.

In the future, the implementation of artificial intelligence will be evaluated in order to quickly adapt the process to variations in the physical chemistry of incoming flows.

New Process Analytical Technology (PAT) equipment



Process Analytical Technology (PAT) - advanced automation and digitalization,
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As part of our research and development efforts in the fields of **process intensification** and **continuous flow technologies**, Certech acquired a compact **inline UV-vis** device, complementing our in-line FTIR detector. These PAT devices will be key to advancing innovative and smart continuous flow platforms for synthetic (bio)chemistry.

Continuous monitoring is essential to ensure and maintain control, safety and performance of synthetic (bio)chemical processes. **Process Analytical Technology (PAT)** – initially introduced by the US FDA in the pharmaceutical industry and defined as “a system for designing, analyzing, and controlling manufacturing through timely measurements (i.e., during processing) of critical quality and performance attributes of raw and in-process materials and processes with the goal of ensuring final product quality”– plays a pivotal role in this direction and has become increasingly important in the development and operation of **continuous flow processes**, whether in the context of R&D or manufacturing activities.

PAT tools provide **real-time** (or near-real-time) insights into reaction composition, enabling the monitoring of key indicators such as product quality and productivity. These extended capabilities facilitate the implementation of **advanced automation and digitalization** strategies to enhance process efficiency, sustainability, robustness and reliability. For example, data from PAT devices allows the implementation of **active process control** strategies (such as feedback loops) to automatically and rapidly detect disturbances and adjust, in real time, the process accordingly (comprising the timely

diversion of non-conforming materials), thus ensuring operational stability and consistency, as well as facilitating product release validation. In R&D, PAT has become instrumental in accelerating discovery, understanding, and optimization through for instance combination of PAT-integrated flow reaction platforms, automation, self-optimization algorithms and **artificial intelligence**.

Acquisition of a new sputter coater/evaporator for SEM observation

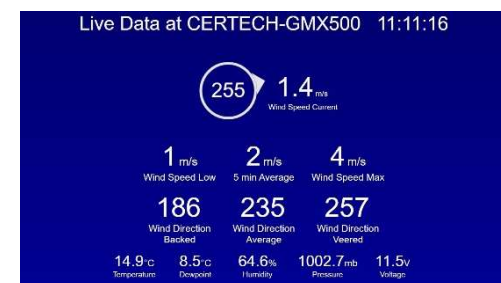
Certech has acquired a new sputter coater/evaporator for preparing scanning electron microscopy specimens. Sputter coating is used to provide an electrically conductive thin film representative of the surface topography, reduce charging effects and thermal damage, and enhance secondary electron emission. Various metals can be deposited, such as gold or platinum. This instrument can also be used to evaporate carbon conducting coatings for EDX microanalysis, using carbon cords.



Copyright@ Quorum

Acquisition of a new compact weather station

Certech has acquired a new compact weather station for its activity in air quality assessment, among others for odor impact studies. Easily transportable, quickly operational and allowing online measurement, it can be installed as close as possible to the study area. It will allow Certech expert team to have direct remote access to local meteorological parameters (wind speed & direction, temperature, humidity, atmospheric pressure) during their odor field inspection. These data, sometimes combined with dispersion models, are very useful to establish a correlation between the odor observations and their potential sources in order to understand and reduce olfactive impact of industrial site.



Weather station (left) and online data monitoring (right), Copyright@ Certech 2024

3. INDUSTRIAL COLLABORATIONS

R&D PROJECTS and SUPPORTS

Certech collaborates with industrial companies in their development projects and fosters technological innovation. Concrete solutions, in-depth assistance and technical advice are provided by teams with recognised skills and knowledge. Semi-industrial and pilot equipment are also made available to industrial partners.

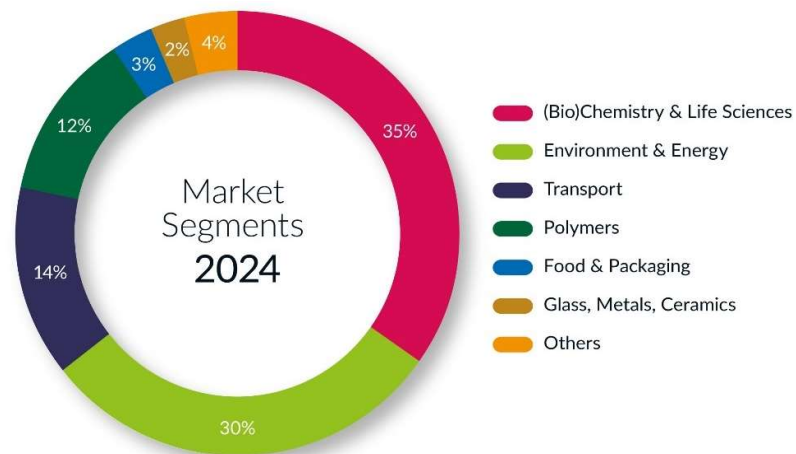
Experts are available for companies looking to improve their products/processes or looking to develop new products/processes. Support projects include feasibility studies, assistance or collaboration on R&D projects, technological transfer or the introduction of new products and processes, help with drafting new specifications, etc. This guidance activity is supported by literature survey, which enables experts to stay permanently up to date about the scientific and technical progress made within their field of competence which presents a high potential for industrial innovation.

Services activities include analytical support using a wide range of advanced equipment, problem solving, quality control and regulatory assessment.

In 2024, 204 companies received support in their innovation process, 42 (21%) of which were new prospects. A total of 750 contracts were handled.

INDUSTRIAL TURNOVER BREAKDOWN INTO SEGMENTS

The major market segment for 2024 was (bio)chemistry & life sciences (35%) followed by environment and energy (30%), automotive (14%), and polymers (12%).



SUCCESS STORIES

Synthesis mRNA drug substances in continuous flow

mRNA vaccine technology has seen significant breakthroughs within the last decades, as recognized through the 2023 Nobel Prize in Physiology or Medicine. These scientific advances have enabled the fast response to the Covid-19 pandemic, with the first approved mRNA vaccines (Moderna and Pfizer/BioNTech) developed in record time after the genome sequencing of the SARS-CoV-2 virus and its spike protein. This has represented a milestone in medicinal sciences, and likely has unravelled new hopes and avenues in medicine using mRNA as a platform drug. This success also tantalized pharmaceutical companies to strengthen their investments in RNA technology for both prophylactic and therapeutic applications, several mRNA vaccines being currently in various stages of clinical trials for uses ranging from infectious diseases to (personalized) cancer therapies. This year, Moderna's mResvia mRNA vaccine against respiratory syncytial virus (RSV) infection in older adults has been approved by both the FDA and European Commission.

One of the most salient advantages of mRNA-based drugs lies in the single, standardized, in vitro transcription (IVT) manufacturing process used to synthesize mRNA constructs from linearized DNA templates. This enzymatic process, most often mediated by a bacteriophage T7 RNA polymerase, is largely independent of the DNA sequence – allowing thus to rapidly access a wide range of synthetic mRNA and address various biological targets.

Yet, there remains a certain number of challenges ahead to realize the full potential of mRNA technology. Beyond mRNA sequence optimization, capping, purification and encapsulation – together with the evolving regulatory framework related to mRNA – stability issues (requiring for instance complex cold-chain logistics) and production costs constitute two priority incentives for the future to make the mRNA technology available to all.

In this direction, the development of intensified end-to-end processes for on-site on-demand production of mRNA drug products may be part of the answer. As such, Quantoom Biosciences has pioneered the development of such affordable and accessible production technology platforms for local, decentralized production of mRNA. Next to its modular Ntensify® mRNA solution, essentially based on (sequential-staggered) batch processes, Quantoom Biosciences actively investigates the implementation of continuous flow technologies to leverage the many benefits of this production mode in terms of process control, efficiency, and scalability. In collaboration with Certech, a first microfluidic IVT reactor prototype confirmed the possibility to synthesize mRNA drug

substances in continuous flow. Further work is ongoing to integrate the additional upstream steps in the continuous flow process.



Quantoom
Biosciences

Collaboration with Indaver on the development of a process to recover chemicals from plastic wastes.



Indaver - Plastics2Chemicals – Antwerpen. Copyright@ Indaver 2024

Addressing the challenges of achieving sustainability and circularity, chemical recycling technologies provide alternatives to landfilling and incineration by converting mixed and/or contaminated plastic waste back into ‘virgin-like’ raw materials. Certech has many years of expertise in the field of (thermo)chemical recycling for the transformation of plastic waste into valuable products. Certech equipment comprises laboratory-scale reactors for exploratory tests as well as a pilot reactor (20 L) allowing the evaluation on a larger scale, in a batch or continuous mode.

Indaver, a leading company in recycling activities, has been collaborating with Certech on the development of a process to recover chemicals from plastic wastes. These products can be valorized as raw materials to synthesize new polymers, for example for the production of food packaging (direct contact).

Within the frame of its advanced recycling of end-of-life plastics (“Plastics2Chemicals”), Indaver has built in Belgium a plastic waste pretreatment facility (Willebroek) and an advanced recycling plant (Port of Antwerp). This recycling plant started its operations in 2025 at 26 000 tons per year, the goal being to expand it further by 2028 into Europe’s largest depolymerization facility, with a capacity of 65,000 tons per year.

Development of a method for determining the tensile properties of composite pipes



Accessory developed by Certech for the determination of the tensile strength of thermoset polymer pipes (ISO 8521:2020 standard) - Copyright@ Certech 2024

Certech is collaborating with the company Norditube as part of the SFP Liner project, the objective of which is to develop new solutions for the rehabilitation of underground pipes by trenchless lining, a technology that avoids excavation, offering the possibility to renovate hard-to-reach pipelines more quickly. This innovative project focuses on the development of composites, combining high-performance thermosetting resins with new hybrid textiles, intended to renovate and improve the durability as well as the resistance of underground infrastructures for drinking water and steam (heating) applications.

As part of this project, the two partners have developed a new mechanical test in accordance with the ISO 8521:2020 standard, which makes it possible to determine the initial circumferential tensile strength of thermosetting polymer pipes reinforced with glass fibres. This advance makes it possible to better evaluate the performance of the materials developed as part of the project and to ensure their long-term reliability.

For this purpose, Certech uses the high-performance test bench available on its materials technology platform, combined with an accessory specially machined for the test and allowing the characterization of pipe sections.

Certech provides support and expertise for characterization of VOC and odor emissions, as well as solutions for odor remediation and development of low odor/low VOC materials.



During PRSE 2024 show, Zeochem (www.zeochem.com – one of the leading manufacturers of adsorbents, including zeolite molecular sieves) launched the new ZEOflair™ powder odor removal additives designed for mechanically recycled resins.

Certech supported Zeochem for the evaluation of the efficiency of these developments through:

- production of small batches of additivated Post Consumer Recyclates (PCR) materials in controlled environment to avoid cross-contaminations (extrusion)
- global odor evaluation (intensity and qualitative assessment) by trained expert panellists
- evaluation of the odor concentration by dynamic olfactometry according to EN 13725
- evaluation of the VOC emissions of injected plates produced from the additivated batches of PCR materials in microchambers (μ CTE-TD-GC-MS according to ISO 12219-3)
- characterization of the mechanical properties of the injection moulded plates (impact and tensile properties)

For the identification of the odorous compounds and chemistry/odor correlation, Certech provides also GC-TOFMS/Sniffing analysis. The Time-of-Flight Mass Spectrometer (TOFMS) offers a powerful combination of sensitivity and spectral quality for improved screening of VOC and detection of odorous compounds at trace levels. Combining GC-TOFMS/Sniffing with comprehensive two-dimensional chromatography GC $\times$ GC-HRTOFMS enables the characterization of complex samples such as PCR materials by enhancing the peak capacity and the separation power.

<https://zeochem.com/our-products/odor-control-zeolites/>

MMAtwo project funded by the European Commission under Horizon 2020



MMAtwo's innovative concept for PMMA waste recycling through depolymerization successfully handled both post-industrial and post-consumer end-of-life PMMA waste, thereby converting difficult to recycle waste that would otherwise be landfilled or incinerated into high quality secondary raw material.

The MMAtwo EU-funded project Team is proud to have received the "Project of the Month" award by CORDIS, the EU Research Results platform. The project has also been referenced as Success Story by A.SPIRE, the European Association committed to manage and implement the Processes4Planet co-programmed Partnership, which represents innovative process industries, 20% of the total European manufacturing sector in employment and turnover, and more than 170 industrial and research process stakeholders from more than 20 countries spread throughout Europe.

QUALITY

Renewal of the ISO 9001:2015 quality management system certification for the period 2022-2025.



Air quality: renewal of our Walloon Region approval

Certech's approval by the Walloon Region in the context of air quality and atmospheric pollution has been renewed for a period of 5 years. This covers sampling, analysis, testing and research as well as measurement by dynamic olfactometry and odor detection threshold with human assessors.



Wallonie

Certech supports companies in the context of their regulatory requirements and the evaluation of treatment solutions. The parameters of interest, sampling techniques and analyses are discussed with each customer, in compliance with the specifications. We also develop specific methods when required. Certech's expertise covers a wide range of parameters and chemical pollutants, with the unusual feature of combining skills in odor analysis (including chemical identification of the molecules responsible for the nuisance).

Car Manufacturers approvals according to the technical requirements of ISO 17025 to measure odors and VOCs on materials and parts:

PSA/Stellantis approval for the following tests:

- VOC analyses according to D10 5495-E & CS-13398
- Aldehydes and Ketones analyses according to D40 5535-E & CS-13398
- Odor according to D10 5517-G and LP-463KC-09-01



Renault Nissan approval for the period 2021-2024 for the following tests:

- VOC and aldehydes & ketones analyses from materials after conditioning in micro-scale chamber according to RNES-B-20116 v1.1
- VOC, aldehydes & ketones, odor analyses from entire parts after conditioning in 1 m3 chamber test according to RNES-B-00114 v1.1 and RNES-B-00096 v1.1
- Odor from materials according to RNES-B-00096 v1.1
- VOC analyses according to D42 3109-C and D413144-A
- Aldehydes and Ketones analyses according to D40 3004-A



Toyota Motor Europe recognition as an authorized laboratory to perform testing on parts /materials according to the following standards was granted for the period 2023-2025:

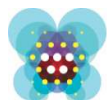
- TSM0505G-1A: Smell Quality of non-metallic materials
- TSM0508G: Volatile Component measurement method using sampling bag
- TSM0512G: Part volatile component measurement method using large sampling bag



Financial incentives for industry

Technology vouchers/Technical feasibility studies (Wallonia)

Certech is certified to the "Chèques-entreprises/Chèques Technologiques" program funded by Wallonia to support SMEs developing a new product, process or service that requires scientific validation.



Chèques-entreprises

KMO Portefeuille (Flanders)

Certech is eligible for technological consulting and contracting supported by Flanders via the KMO-Portefeuille.



Research tax credit (France)

The accreditation by the French authorities to the Research Tax Credit (CIR) is valid for the period 2020-2024. This mechanism provides a tax advantage to companies subject to income tax. CIR finances all R&D activities: basic research, applied research and experimental development.



PARTICIPATION in TECHNICAL STANDARDISATION COMMITTEES



Thanks to its expertise based on R&D activities, Certech is an active member of several technical standardisation committees dealing with air quality, odors, volatile organic compounds (VOC) and photocatalysis.

Certech is helping industry professionals to:

- understand the aspects related to technical and scientific standardisation and regulations.
- stay up to date with methods and trends in standardisation and regulations in their specific sector.
- Implement the standards in their daily activity.

ISO/TC 146	Air quality
CEN/TC 264	Air quality
ISO/TC 176	Quality management and quality assurance

EVENTS: Launch events of the cross-border RE-ASSIGN & COMPOVERT projects

In 2024, two events were organised for the launch of the two Interreg VI France-Wallonie-Vlaanderen projects led by Certech:

- RE-ASSIGN on 20/11/24 in Ostend (B)
- COMPOVERT on 28/11/24 in Douai (F).

These workshops were an opportunity for the project's consortium to meet with various stakeholders and members of the value chain in order to detail the context, the challenges and the main research and development actions of these cross-border projects co-funded by the European Union (ERDF) and Wallonia.



4. PARTICIPATIONS and COLLABORATIONS

PROFESSIONAL BODIES



www.essenscia.be



www.idea.be



www.wal-tech.be

CLUSTERS



www.greenwin.be



www.polemecatech.be



www.src.ulb.be



www.valbiom.be



<https://www.wagrallim.be>



www.biowin.org



www.4spe.org



www.gn-meba.org



www.clusters.wallonie.be



www.clusters.wallonie.be



www.bsoh.be

COLLABORATIONS



Certech is an Authorised Partner Laboratory from Agilent Technologies. The collaboration covers all aspects of molecular weight and chemical composition distribution by gel permeation chromatography (GPC), temperature rising elution fractionation (TREF) and odors and emissions from materials using thermal desorption gas chromatography mass spectrometry (TDS-GC-MS).



Editors in Chief of the Editorial Board of the International Journal of Polymer Analysis and Characterization (IJPAC).

Referee for the following journals: ACS Applied Polymer Materials, ACS Catalysis, Catalysis Communications, Catalysts, ChemCatChem, Chemistry Eur. J., European Journal of Inorganic Chemistry, Food Packaging and Shelf Life, Materials, Macromolecules, Molecules, Nanomaterials, Organic Letters, Polymer Chemistry, Polymers, RSC Advances, Synthesis, Solvent Extraction and Ion Exchange, Synthesis, Ultrasonics Sonochemistry, Frontiers in Chemical Engineering

Guest Lecturer at UCLouvain university (*Sustainable treatment of industrial and domestic waste; Safety in the industry; Sampling techniques and air analysis*) and Savoie University (*Process Intensification-Flow Chemistry-Sustainable Chemistry*)

5. PUBLICATIONS, LECTURES & ATTENDANCE at CONFERENCES & TRADE SHOWS

Scientific Papers:

- Influence of the processing parameters on the degradation of poly(lactic acid) (PLA) and poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) and modification of their molecular weight using chain extenders, A. Boborodea, F. Cordenier, C. Lemenu, L. Panarisi, P. Le Maître, S. Denis & P. De Groote, International Journal of Polymer Analysis and Characterization (abbreviated: Int. J. Polym. Anal. Charact.), DOI: 10.1080/1023666X.2024.2369901

Lectures:

- Migration testing from plastics materials: Analysis of trace levels in water by automated high-capacity sorptive extraction and GC-TOFMS, C. Brasseur, 1st Green Analytical Chemistry Workshop, Paris, 5-6 février 2024
- La formation et l'optimisation de l'acquisition des images en MEB, A. Jadin, Ecole d'été de microscopie électronique à balayage et de microanalyses, GN-MEBA, Nancy, 1-5 juillet 2024
- Le microscope électronique à balayage à effet de champ (MEB-FEG), A. Jadin, travaux dirigés, Ecole d'été de microscopie électronique à balayage et de microanalyses, GN-MEBA, Nancy, 1-5 juillet 2024
- L'observation et l'analyse d'échantillons fragiles et isolants en MEB, A. Jadin, travaux dirigés, Ecole d'été de microscopie électronique à balayage et de microanalyses, GN-MEBA, Nancy, 1-5 juillet 2024
- Influence de la polarité du polymère (matrice) sur les mécanismes de rupture de fibres lignocellulosiques en extrusion bivis, F. Berzin, L. Lemkhanter, C. Marcuello, B. Chabbert, V. Aguié-Béghin, M. Molinari, R. Castellani, B. Vergnes, B. Goffin, Journées Fonctionnalisation et formulation de matériaux biosourcés, Reims, 1-2 octobre 2024
- Le projet transfrontalier RE-ASSIGN (REcycling pLAStics deSIGN), B. Goffin, Événement de lancement, Oostende, 20 novembre 2024
- Projet transfrontalier COMPOVERT : composites fonctionnels à renfort végétal, B. Goffin, Événement de lancement, Douai, 28 novembre 2024

- Caractérisation des polymères par MEB, A. Jadin, Journées Pédagogiques GN-MEBA, Paris, 2-3 décembre 2024
- Présentation du projet RE-ASSIGN, B. Goffin, Rencontres transfrontalières : projets en scène, Événement annuel Interreg France-Wallonie-Vlaanderen, Lille, 18 décembre 2024

Standards:

- ISO 16000-9:2024. Indoor air - Part 9: Determination of the emission of volatile organic compounds from samples of building products and furnishing - Emission test chamber method
- ISO 16000-11:2024. Indoor air - Part 11: Determination of the emission of volatile organic compounds from samples of building products and furnishing - Sampling, storage of samples and preparation of test specimens
- ISO 16000-33:2024. Indoor air — Part 33: Determination of phthalates with gas chromatography/mass spectrometry (GC/MS)
- ISO 16000-40:2019/Amd 1:2024. Indoor air — Part 40: Indoor air quality management system — Amendment 1: Climate action changes
- EN 16976:2024 Ambient air - Determination of the particle number concentration of atmospheric aerosol
- ISO 6323-1:2024: Workplace air — Determination of arsenic and arsenic compounds by electrothermal atomic absorption spectrometryPart 1: Arsenic and arsenic compounds, except arsine by ET-AAS
- ISO 21438-2:2024: Workplace atmospheres — Determination of inorganic acids by ion chromatography — Part 2: Volatile acids, except hydrofluoric acid (hydrochloric acid, hydrobromic acid and nitric acid)
- ISO 7935:2024: Stationary source emissions. Determination of the mass concentration of sulfur dioxide in flue gases. Performance characteristics of automated measuring systems
- ISO 12141:2024 : Stationary source emissions — Determination of low range mass concentration of dust — Manual gravimetric method

Poster

- Continuous synthesis of hydrophobic ionic liquids (poster), J.Estager, QUILL25-MSILDG conference in applications of ionic fluids, Belfast, 2-3 septembre 2024

Conference and Trade show Attendance

Event	Date	Location
The Green Analytical Chemistry	05&06-02-2024	Paris, France
Rédaction d'un accord de consortium : un Workshop pour se lancer	06-02-2024	Gosselies
Introduction to Biology - The Secret of Life (part 2) - MIT	01-03-2024	Webinar
High Capacity Sorbtive Extraction - The analytical scientist platform	21-05-2024	Webinar
Congrès Plasturgie & Environnement	22&23-05-2024	Douai, France
GFSV (Groupement Français des Spectroscopies Vibrationnelles), 30èmes journées scientifiques "Spectroscopies et Imageries vibrationnelles: quand l'échantillon et/ou son environnement de mesure deviennent un défi"	22&24-05-2024	Chamonix, France
PRS	19&20-06-2024	Amsterdam, Pays-Bas
BIOWINNOVATION LAB	20-06-2024	Namur
GN MEBA : Ecole d'été	30-06 au 05-07-2024	Nancy, France
QUILL25-MSILDG conference on applications of ionic fluids	02&03-09-2024	Belfast, UK

S3 Congress 2024	02&03-10-2024	Remote
Seminaire Catalyse Franco-Belge	15-10-2024	Webinaire
Cosmetic 360	16&17-10-2024	Paris, France
Sorptive Extraction Fundamentals and Applications: Extracting More with SPME and HiSorb - Separation Sciences	29-10-2024	Webinar
Evénement de lancement du projet transfrontalier AGILITY	12-11-24	Charleville-Mézières, France
Congrès Polepharma Industrie du Futur 7ème édition	13&14-11-2024	Chartres, France
Plénière Plastiwin	14-11-2024	Gembloux
4th International Conference on a Circular Economy for Plastics and Textiles + Evénement de lancement du projet transfrontalier RE-ASSIGN	19&20-11-2024	Oostende
Evénement de lancement du projet transfrontalier COMPOVERT	28-11-2024	Douai, France
GN MEBA : Comment caractériser au MEB une grande diversité de matériaux	02&03-12-2024	Paris, France
Evenement "interfacer les automates à l'heure de l'IoT"	11-12-2024	Gosselies, Belgique
Webinar Rheology: Explore Anton Paar's New Brabender Instruments for the Polymer Industry	10-12-2024	Webinar
Evénement annuel du programme Interreg VI France-Wallonie-Vlaanderen	18-12-2024	Lille, France

6. KEY FIGURES

Balance sheet

Assets	2024	2023	Liabilities	2024	2023
Fixed assets	1.061.530	1.175.032	Reserves	5.620.172	5.572.970
Scientific equipment and installations	1.061.530	1.175.032	Restricted funds and other reserves	3.623.948	2.228.173
			Accumulated reserves	1.658.711	2.863.954
			Investment subsidies	337.513	480.843
Current assets	8.565.493	7.781.991	Provisions for contingencies and losses	224.911	191.543
Accounts due within one year	1.568.477	1.711.721			
Cash investments	3.742.653	3.723.421	Debt	3.781.940	3.192.511
Cash	2.420.484	1.819.974	Accounts payable after one year	1.466.935	1.466.935
Adjustments (accrued income)	833.880	526.875	Accounts payable within one year	2.147.885	1.545.761
			Adjustment accounts	167.120	179.815
Total assets	9.627.023	8.957.023	Total liabilities	9.627.023	8.957.023

Income statement	2024	2023	Workforce	2024	2023
Turnover	5.149.346	4.237.932	Total Headcount	33	33
Industrial projects	3.229.495	3.007.714	Total FTE	30,6	30,7
Public research subsidies	1.395.534	607.603	FTE Scientists	27,4	27,3
Depreciation subsidy allowances	143.330	259.421	FTE Technicians	1	1
Other revenues	380.987	363.194	FTE administrative staff	2,4	2,4
Expenses	4.449.464	3.960.640			
Supplies and services	1.351.240	1.192.376			
Salaries	3.098.224	2.768.264			
Depreciation, provisions, and loss of value	509.729	570.612			
Financial revenues	36.688	163.098			
Financial expenses	4.486	7.590			
Other expenses and Taxes	31.823	5.936			
Net Result	190.531	-143.749			

Certech Management Team

General Assembly - Board of Directors

				Industry	
General Assembly	UCLouvain	Eric Gaigneaux			Board of Directors
		Nathalie Burteau			
		Karine Glinel			
		Jean-Christophe Renault			
	TotalEnergies	Philippe Lodefier	Chairman	√	
	Dow Silicones	Serge Creutz		√	
	Cargill	Stéphane Biltresse		√	
	Veolia	David Benanou		√	
	GMA Consult	Gisèle Maréchal		√	
	it4ip	Yves-Jacques Schneider		√	
	Grando	Yves Charlier		√	
	IDEA	Maïté Dufrasne		√	
	Guest	Thierry Randoux	General Manager		
	SPW-EER	Emmanuel Delhayé	Observer		

General Management

General Manager	Thierry Randoux
Business Manager-Deputy General Manager	Catherine Henneuse

Auditor

Avisor scrI	Dorothee Hurteux
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Certech (Centre de ressources technologiques en chimie) asbl
Rue Jules Bordet, 45 - Zone Industrielle C - B 7180 SENEFFE - BELGIUM
TVA BE 0470.677.454 ING BE87 3701 1282 1494
Tél. +32 64 520 211- - e-mail: info@certech.be
www.certech.be

