Belgian Industrial Furnaces & Thermoprocessing Equipment
Wire & packaging strip heat treatment lines
Batch annealing

Galvanizing plant & equipment

Premix combustion solutions

Forming & thermal solutions in glass sector

Industrial chamber furnaces

FIB BELGIUM S.A.
Avenue Landas 4 B-1480 TUBIZE - BELGIUM
T +32 (2) 332 17 17 F +32 (2) 376 37 11

info@fib.be
www.fib.be
Belgian Industrial Furnaces & Thermoprocessing Equipment
Cnud-Efco has over 58 years of experience in building annealing lehrs and tin bath roofs for the glass industry. We have delivered over 360 installations worldwide. We have extensive experience in engineering and construction of large thermal equipment projects. We are open to share our knowledge and our 10,000M2 state-of-the-art manufacturing facilities in Romania.

Are you interested in exploring how we can help you to turn your plans into high yield production assets? Contact us on the address below or visit www.cnudefco.com or www.cnudefco-metalconstruction.com.
Cnud-Efco has over 58 years of experience in building annealing lehrs and tin bath roofs for the glass industry. We have delivered over 360 installations worldwide.

We have extensive experience in engineering and construction of large thermal equipment projects.

We are open to share our knowledge and our 10.000M² state-of-the-art manufacturing facilities in Romania.

Are you interested in exploring how we can help you to turn your plans into high yield production assets? Contact us on the address below or visit www.cnudefco.com or www.cnudefco-metalconstruction.com.

CONTACT US TO TALK ABOUT YOUR PROJECTS AND PLANS

CNUD-EFCO INTERNATIONAL
T: +32 2 481 88 00
E: INFO@CNUDEFCO.COM
AGORIA, THE TECHNOLOGY INDUSTRY ASSOCIATION

1,700 companies in 10 fields of activity
Agoria brings together and defends the interests of all companies that manufacture and use technology. It is committed to the future of these companies and their 275,000 employees.

Agoria is a partner of over 1,700 companies (80% of which are SMEs) in 10 fields of activity, namely Information and Communication Technologies (ICT), Building Technologies, Contracting, Materials Technology, Subcontracting, Production Technology & Mechatronics, Transport Systems & Solutions, Energy Systems & Solutions, Environment Systems & Solutions, Aeronautic, Space, Security, Defence Technology.

www.agoria.be

Belgian Industrial Furnaces & Thermoprocessing Equipment

About this guide
This guide provides a practical overview of the Belgian providers of industrial furnaces & thermoprocessing installations as well as combustion equipment. It offers an overview of the products and services they offer and contact details of the companies participating in this guide. The categorization of companies with respect to their product portfolio should help readers to find their way. The second part of the guide provides an overview of the Belgian universities and research institutes active in domains related to the products and services of Belgian industrial furnaces & combustion equipment producers.

This introduction highlights the main trends with respect to industrial furnaces and thermoprocessing equipment.

Applications
The companies in this guide offer products and installations for treatment of steel wire, steel and non-ferrous metals production, flat and hollow glass production, brick and ceramics production, drying & surface treatment, as well as refractory products, burners and process control technology for a wide range of thermoprocessing applications.
Energy efficiency & emissions reduction
As the world is gearing up to achieve its ambitious but necessary goals on reduction of greenhouse gasses and clients aim to achieve higher production efficiency, the Belgian industrial furnaces, thermoprocessing & combustion equipment industry is making important progress on the eco-design of its products. Increased energy efficiency is achieved through the use of advanced firing techniques, innovative furnace design and increasing use of heat recuperation techniques. Continuous progress is also made in reducing emissions from industrial heating & thermoprocessing processes. This ensures compliances with stringent European energy efficiency and emissions legislation.

Safety
Safety is a key concern for Belgian companies active in the design & installation of industrial furnaces, thermoprocessing and combustion equipment. They constantly improve the design and controls of their installations, delivering CE-marked products and installations compatible with European Directives and norms such as the Machinery Directive, ATEX Directive, EN-746 and other safety norms, etc.

Industry and research institutes cooperate with industry to offer high-tech products
At the end of this guide, an overview of the Belgian universities and research institutes active in the domains of thermoprocessing and combustion is provided. The summary of their main research domains and experimental resources highlights Belgium’s excellence in this domain. The universities and institutes work together with the companies in this guide in researching and developing new technologies to continuously improve their products.

Responsible Agoria
Jef Seghers
Business Group Leader
Production Technology & Mechatronics
T: +32 2 706 83 91
jef.seghers@agoria.be
www.agoria.be

For additional copies of the business guide:
veronique.bonneau@agoria.be
Company Description

Arena Comet is a producer of Thermal Cleaning Equipment like Fluidized beds and Pyrolysis ovens. Mainly these machines are used for removing all kind of organic coatings from metal tools. The main application are the automotive, white good, plastic and textile industry, for removing paint or plastic from machine parts in the production process. Also the demand for using the technologie for waste incineration has been increasing recently. The company was established in 1997 and is employing 40 people. Arena Comet has daughter companies in Poland, Czech Republic and Turkey.

Products Description

Scirocco is the product name of the fluidized bed. The working principle is based on the evaporation of organic material in the pre-heated sand, bubbling at 450°C. Flue gases are treated in the after-burner and inorganic particles are captured in the ceramic filter, in order to comply with environmental legislation. Fluidized beds are high capacity machines since cycle time goes from 30 minutes to 1 hour. Pyrolysis ovens also evaporate organic material at 450°C but cycle time is 2 to 4 hours. The pyrolysis ovens are available in budget friendly machines called Diablo and custom made Santana ovens. All machines are EC approved, user friendly and safe and PLC controlled.
Belmeko

www.belmeko.be

Company Description

Belmeko is manufacturer of industrial ovens up to 450°C. The ovens are made to measure from A to Z: Belmeko has its own engineering, production, assembly and after-sales service.

There is the choice between gas, oil fuel or electrical heating.

With its experience of more than 30 years, Belmeko is The Specialist in Ovens situated in Oostkamp - Belgium. We can ship the ovens to everywhere in the world. Before transport, Belmeko has tested and totally programmed the ovens. After arrival at the customer, the oven only need to be ofloaded and is immediately ready to use.

Products Description

Belmeko is producer of ovens up to 450°C with gas, oil fuel or electrical heating. All the ovens are made to measure.

The applications of the ovens are very diverse:

1. heat treatment of aluminium, plastics,…
2. Drying after a chemical pretreatment;
3. drying of painted pieces (word, metal, plastics,…);
4. Curing of powder coat;
5. thermofixation of textile fibres;
6. drying of ceramic material;
7. Etc.
Ceratec

www.ceratec.eu

Address
rue du Touquet 228
7782 Ploegsteert
(Comines-Warneton)

Contact
Rik Vandenameele
Sales Director
T: +32 56 56 57 58
ceratec@ceratec.be

Company Description
Ceratec is active as an innovative solutions partner and offers turnkey solutions in 3 domains: Ceramics Equipment, Automation and Handling Solutions.

As a project-passionate venture with a multidisciplinary approach, our team of over 400 motivated employees wishes to find answers to the technical challenges set by our customers.

• Ceramics Equipment: we engineer and produce complete turnkey plants as well as equipment for the clay building materials industry (bricks, tiles, pipes, refractories).
• Handling Solutions: we deliver turnkey internal transport systems, handling machines, palletizing and wrapping systems. Purpose-built, or integrated in a global project.
• Automation: we are a leading provider of advanced automation and control solutions (PLCs, process control, robotics, AGVs).

Products Description

DRYING
• Chamber dryers • Tunnel dryers • Fast dryers
• Drying tests (labo) • Supervision software Ceraview
• Burner groups • Cogeneration • Dryer car handling systems

FIRING
• Construction of traditional kilns
• Integration of roller and shuttle kilns
• Use of different fuels possible • Refurbishment of kilns
• Supervision software Ceraview

HANDLING
• Transfer cars • Track equipment • Chassis and rails
• Setting in U- and H-cassettes • Turning devices
• Robot and servo-driven technologies
• Multi-gripper heads for high capacities • Defacing units
CMI Industry Metals
www.cmigroupe.com

Company Description
CMI Industry Metals provides products to heat treat a wide range of materials (steel, copper, brass, stainless steel, aluminum, zirconium, tungsten, titanium, beryllium, etc.) in a multitude of sizes, shapes and thermal cycles. By uniting the technological + industrial strengths of 3 market leaders in heat treatment: ATI Furnaces Europe, Stalproekt and Electrical Furnace Company (EFCO); CMI offers an extensive array of innovative + high-performing heat treatment furnaces complying with local, national and international safety + quality standards, including: AMS 2750 + NADCAP
For carbon, stainless + silicon steel, CMI has developed its innovative Optimfl@me® reheating furnace, providing substantially lower energy consumption + decreased oxidation of steel through optimized process control.

Products Description
HEAT TREATMENT FURNACES (batch + continuous):
BATCH FURNACES: Box Furnaces Tilt Top Furnaces Car Bottom Furnaces Atmosphere Bell Furnaces
CONTINUOUS FURNACES: Roller Hearth Furnaces Flexible Heat Treatment Line Rotary Hearth Furnaces Vertical Quench Furnaces Aluminum Melting Furnaces Continuous or Batch Line with Tray for Aluminum Wire Mesh Belt and Continuous Belt Furnaces
REHEATING FURNACES: Optimfl@me® walking beam: furnaces for slabs, blooms and billets Optimfl@me® walking hearth: furnaces for billets Optimfl@me® pusher furnaces: for slabs, blooms and billets Process Control: RTOP®: Furnace Level 2 Control System based on physical models according to the steel grade SMC®: Skid Marks Calculation model to increase heating quality Descalizer®: Scale Reduction on heated material
Cnud-Efco International NV/SA
www.cnudefco.com

Address
Noorderlaan 30
1731 Zellik (Asse)

Contact
Robert Lamy
Marketing & Sales
T: +32 2 481 88 00
Robert.Lamy@cnudefco.com

Company Description
Supplier of products and services to optimise the process of forming and annealing glass for glass manufactureres, including Research & Development, Design, Engineering, Technical Assistance.

Products Description
Annealing Lehrs for the hollow, flat and float glass industry. Tin bath roofs. Tin bath accessories (top rollers, dross box, tweel, coolers, cameras).
Drever International
www.drever.be

Company Description
Drever International, world leader in heat treatment of steel, is recognized by the largest steelworks as an expert in designing and developing high efficiency heat treatment equipment. Each member of Drever’s multidisciplinary team is an expert in his/her field and can study, conceive and develop engineering solutions required by producers of high quality steel used in most complex applications. As world leader in industrial furnaces and to remain at the forefront, Drever has invested in a particularly successful R&D department; since 1966, in collaboration with its customers, the company has already put on the market many innovations now considered as industry standards. It offers the benefits of long-standing engineering experience, cutting-edge technology, knowledge of processes, ...

Products Description
Continuous Annealing Lines for Carbon Steel Strips
Continuous Galvanizing Lines for Carbon Steel Strips
Stainless Steel Cold Rolled Annealing and Pickling Line
Stainless Steel Hot Rolled Annealing and Pickling Line
Carbon and Stainless Steel Strip Batch Annealing
Bright Annealing Line for stainless steel
Roller Hearth Furnace for Heavy Plates
Roller Pressure quench for Heavy Plates
Silicon Steel - Annealing and Coating Line
Silicon Steel - Annealing and Pickling Line
Silicon Steel - Decarburising and Coating Line
Silicon Steel - Flattening and Coating Line
Tube Annealing Lines - Mesh Belt
Tube Annealing Lines - Roller Hearth
Spares
Elster NV/SA with his 95 years experience is a specialist for flow measurement and systems focused on gas application. We offer solutions for every application either as single components or complete gas systems. The metering and regulation product range covers devices for measuring gas consumption as well as traditional gas regulators for low and high pressures.

Through their Elster Kromschröder and Eclipse brand name, Elster Kromschröder components and Eclipse burners are recognized as being of the highest quality well-known by manufacturers of heating systems and industrial furnaces for high and low temperature application.

We supply complete ready to operate gas systems to Aluminium, Steel, Ceramic and glass industries in accordance with international standards and regulations.

Products Description
Complete Kromschröder gas and air trains, Valves, filters, gas pressure regulators, Safety shut-off Valves, safety relief valves, air/gas ratio controls, Solenoid valves for gas, motorized valves for gas, tightness controls, linear flow controls, gear motors, valves and butterfly valves for air and fumes, Pressure switches for gas and air, Automatic burner control units and flame detectors with field bus interface, Industrial ECLIPSE burners, recuperative burners with high efficiency, flat flame burners, hot air burners, Low NOx burners, pilot burners, duct burners, Metering devices for gas, Ultrasonic, turbine, rotary, diaphragm meter with MID compliance, High pressure reducing and metering gas stations.

Complete heating systems for industrial furnaces.
FIB Belgium
www.fib.be

Address
avenue Landas 4
1480 Saintes (Tubize)

Contact
René Branders
CEO
T: +32 2 332 17 17
info@fib.be

Company Description
For 80 years, FIB Belgium is the leading company in heat treatment and premix combustion solutions. While its core activities remain in the sector of the metallic wire, FIB Belgium is a diversified industrial group active in 5 sectors and with references in more than 60 countries worldwide. FIB Belgium designs, engineers and manufactures complete heat treatment lines through a team of recognized experts. The mastering of the premix combustion technology allows FIB to be on the forefront of many applications requiring subtle control of the atmosphere in furnaces.

More information on our web site : www.fib.be

Products Description
- Heat Treatment lines for metallic wires and packaging strips
- Batch annealing furnaces for metallic wires
- Complete hot dip galvanizing plant and equipment for galvanizing structural elements
- Premix combustion solutions for the container glass industry
- Industrial chamber furnaces for various ferrous and non-ferrous industries
- Solutions for forming and annealing in the flat glass sector (www.termeca.be)
Serving the industry

Gouda Vuurvast Belgium NV specializes in engineering, supply, construction and maintenance of refractory linings in various industries. In maintenance our flexible approach always focuses on ensuring that, whether ad hoc interventions or scheduled activities, downtime is kept as short as possible. Our skilled and reliable professional staff is committed 24 hours a day, seven days a week to guarantee this. New projects for Original Equipment Manufacturers are executed in our workshop and/or on site. Our expertise focuses at Petrochemicals, Environment & Energy and Non-ferrous metals but also extends to sectors such as cement and steel.
Gouda Vuurvast Belgium
www.goudavuurvast.be

Address
Vosveld 13
2110 Wijnegem

Contact
Philip Knipscheer
Director
T: +32 3 326 57 00
philip.knipscheer@goudavuurvast.be

goedavuurvast.be

Company Description
Vuurvast Belgium NV, an autonomous operating subsidiary of Andus Group BV, specializes in construction and maintenance of refractory linings in various industries. Refractory installations are conducted in accordance with international safety- and quality standards. Gouda Vuurvast Belgium is continuously developing new and innovative refractory systems and application techniques.

Products Description
Engineering, supply and construction of refractory linings, for both new furnaces and maintenance work. Focus on Petro-Chemical, Waste & Energy, Non-Ferro industries.
Inductotherm Coating Equipment
www.inductotherm.be

Company Description
Inductotherm Coating Equipment is the worldwide leader in induction technology and is headquartered in Herstal, Belgium. Previously known as ACEC and later as Elphiac, we have been manufacturing induction heating and melting equipment for more than 80 years. We design and manufacture the most advanced induction equipment for the steel industry. The range of products include coating and premelt pots for hot dip galvanizing lines and strip heaters for drying, curing, galvannealing, reflowing, and heat treatment applications. In addition to this range of products, Inductotherm Coating Equipment SA, Belgium designs and supplies induction heating equipment for other applications. Visit our website: www.inductotherm.be

Products Description
Channel pots for zinc, aluminium-zinc, aluminium, ...:
Induction heaters for galvannealing: Our induction heating systems are with doorless inductors, edge heater, ...
Induction heaters for tin reflow: Our induction heating systems ensure a better quality of the strip and a reduction of the operating costs.
Induction heaters for drying and or curing organic coatings, paints, varnishes, ...: We offer induction systems for drying of insulating varnishes and curing of paints, for drying of water based coatings, ...
Induction heaters for boosters in annealing lines for heating the strip under protected atmosphere.
Transistorized high frequency inverters.

Address
rue P.J. Antoine 79
4040 Herstal

Contact
Gilles Fagnart
Sales manager
T: +32 4 248 94 11
mail@inductotherm.be
Company Description
KROHNE is a world-leading manufacturer and supplier of solutions in industrial process instrumentation. KROHNE Belgium is located in Groot-Bijgaarden. KROHNE ranks among the world’s leading companies involved in the development and production of innovative and reliable process measuring technology for all sectors around the globe. We provide our customers with optimal products and solutions which always meet or exceed their expectations in terms of quality, performance capability, service and design. Regardless of your industry, KROHNE offers you not only measuring and analytical devices for virtually any medium but also the expertise gathered by outstanding employees over decades, providing you with support when selecting devices and systems and designing measuring points.

Products Description
KROHNE offers a wide variety of process measurement instruments. In fact, we invented quite a number of them. We offer supporting products and services for 1-stop-shopping and in industries as widespread as oil and gas, water, chemicals, pharmaceuticals, food & beverages, mining and shipping.
Flow Measurement – Move into the lead
Level Measurement – For the highest level of quality
Temperature Measurement – A new degree of contact
Pressure Measurement
KROHNE Analysis Instruments – From the analysis to the solution
Innovative solutions in gas & steam measurement.
We can offer complete solutions – of which more to come.
LOI Fours Industriels s.a.
www.loi-fours.be

**Company Description**
Engineering office for industrial furnaces for ferrous and non-ferrous metals. (see website)

**Address**
rue de Fragnée 165
4000 Liège

**Contact**
Sybille Wechseler
Management assistant
T: +32 4 252 20 48
sybille.wechseler@tenova.com

**Products Description**
Batch Annealing furnaces HPH (Hydrogen High Performance)
Rolling Car Furnaces. (Heat treatment or Quenching)
With the Group, a wide range of other types of furnaces
(see website)
Pyronics International SA

www.esapyronics.com

Address
Zoning Industriel 4ème Rue 25,
6040 Jumet (Charleroi)

Contact
Michel Brancart
Marketing
T: + 32 71 25 69 70
marketing@pyronics.be

Company Description
Incorporated in 1965, PYRONICS INTERNATIONAL designs, manufactures and sells industrial combustion equipment throughout Europe, Africa and in the Middle East. Around 75% of the production is exported all over the world: China, India, Indonesia, Cuba, Brazil, Mexico,…
PYRONICS is a subsidiary of ESA SRL / ITALY (SMI Group)

Products Description
The range of products manufactured by PYRONICS is very wide and corresponds to numerous industrial applications like metallurgy (melting furnaces, heat treat furnaces, galvanizing), ceramic industry (tunnel kilns, batch furnaces,…), glass industry (melters, feeders, lehrs,…), chemical and petrochemical field (rotating kilns, pulp and paper machines,…), food industry (biscuits, milk dryer,…), small ceramic furnaces (art pottery), paint drying, plastic curing, drying process (ovens, dryers), galvanisation, …
Vesuvius Group

www.vesuvius.com

Company Description

Vesuvius is a global leader in metal flow engineering, providing a full range of engineering services and solutions to its customers worldwide, principally serving the steel and foundry industries. Vesuvius is a community of experts. Present around the world, we deliver solutions to our customers to improve their efficiency. The services we offer encompass design and engineering, products and operations management. Our global network of plants brings us within reach of our customers, serving them in real time, with the capacity and flexibility they need to respond to their markets’ demands.

The group comprises three global activities:
- Steel Flow Control - Foundry Technologies
- Advanced Refractories

Products Description

Vesuvius produces refractory products, dense as well as insulating, bricks as well as monolithics, to address the following end markets: - Iron & Steel - Foundry - Aluminium - Minerals Processing - Hydrocarbon Processing - Power Generation - Glass - Solar Energy

The businesses share a wide common technological base which gives strength to our people expertise.

Address
rue de Douvrain 17
7011 Ghlin (Mons)

Contact
Pascal de Bouw
Account Manager
T: +32 492 91 31 35
pascal.debouw@vesuvius.com
Wegra
www.wegra.com

Address
Lieven Gevaertlaan 8
3900 Overpelt

Contact
Eric Geysen
COO
T: +32 11 80 88 80
info@wegra.com

Company Description
Wegra has built up considerable expertise over the years in the field of infrared applications. Infrared heating offers, compared to traditional methods some significant advantages. Heating through infrared technology is extremely fast, and the heat transfer is direct, so no energy is lost. This not only provides interesting cost savings; it is also environmentally friendly.

Products Description
Infrared applications can be deployed in many different industries. They are used among others in the food industry, printing industry, in the processing of plastics, foils and adhesives; in short, anywhere where a heat source is used in order to accelerate the production process. The infrared applications Wegra offers are, starting from a few basic principles, always customized: tailored to your organization’s needs and requirements. The possibilities are endless. Please feel free to contact us to discuss what added value infrared can provide for you.
Yokogawa Belgium
www.yokogawa.com/be

Company Description
Yokogawa is a world leader in industrial automation and control, test and measurement, information systems and industry support. Our VigilantPlant concept is about delivering visibility, predictability and agility for reducing projects costs and risk, and enhancing enterprise efficiency and connectivity.

Products Description
Field Sensing, Network Based Control, Safety and Asset Management, Production Control, Service, Engineering and Solutions
Belgian Thermoprocessing & Combustion Research
BURN

www.burn-research.be

Address
Avenue F. D. Roosevelt 50
1050 Bruxelles

Contact
Francesco Contino,
Alessandro Parente
Associate Professor, co-head
T: +32 2 629 23 93
we-do-reply@burn-research.be

Research Topics
- Novel combustion technologies: combustor (flameless, oxy-fuel), internal combustion engine (LTC engines), micro gas turbine (mHAT)
- Kinetic mechanism reduction: Tabulation of Dynamic Adaptive Chemistry, Principal Component Analysis
- Non-conventional fuels: H2 enriched fuels, biofuels and biomass
- Pollutant formation: car on-road emissions particulate matter
- Turbulence/chemistry interaction
- Robust optimization and uncertainty quantification sensitivity analysis, validation of kinetic mechanisms, UQ large number of uncertainties, coupling of UQ with optimization, development of surrogate models

Experimental Resources
Engine test bench (1000 bhp, dynamic, with regulated and non regulated emissions)
MILD burner
Micro gas turbine (Turbec T100, 100kWe)
Centre de Recherche en Aéronautique  
www.cenaero.be

Address  
rue des Frères Wright 29  
6041 Gosselies (Charleroi)

Contact  
David Dumas  
Composite structures and processes team leader  
T: +32 71 91 09 72  
david.dumas@cenaero.be

Research Topics  
Cenaero is a private research center specializing in multidisciplinary simulation, design and optimization (fluid, mechanics, thermal and acoustics). We also are involved in developing innovative solution through modeling, simulation and optimization of manufacturing processes (welding, curing in or out of autoclave, heating, additive manufacturing) for metallic and composite structures. 
Our expertise in multidisciplinary simulation goes in pair with High performance computing capabilities to solve complex geometries and physics (Tier-1 supercomputing facilities).

Experimental Resources  
Numerical capabilities depend on in-house and commercial software (Abaqus, Fluent, Samcef,...)  
Our composites lab is equiped with:  
- An industrial oven of 1.5x1.3x1.7m capable of operating at a maximum temperature of Tmax = 300°C and  
- A 150 Ton hydridic press with a maximum capacity of 1.5x1.0x0.8m capable of operating at a maximum temperature of 200°C  
Both can be equiped with a 24 channel acquisition system to control and monitor the curing of composite structures.
Combustion, Fire and Fire Safety - Faculty of Engineering and Architecture - Ghent University

www.ugent.be/ea/floheacom/en/research/groups/fire

Research Topics

- Numerical simulations of non-premixed turbulent combustion
- Turbulence-chemistry interaction: transported PDF methodology
- (Auto-)ignition and lifted flame simulations by means of LES/CMC
- Spray combustion
- Differential diffusion effects in combustion
- Fire
- Numerical simulation of smoke and gas movement in compartment fires in complex buildings
- Flame spread simulations
- Car park fire safety
- Full scale fire tests (in the facilities of WFRGENT NV)
- Real-time fire development prediction

Experimental Resources

- Computer cluster and HPC facilities for simulations
- Collaboration with WFRGent for fire tests

Address

EA03
Sint-Pietersnieuwstraat 41
9000 Gent

Contact

Bart Merci
Full Professor
T: +32 9 264 33 14
Bart.Merci@UGent.be
Dépt d’Aérospatiale et mécanique
www.labothap.ulg.ac.be

Research Topics
1. Combustion control in boilers and furnaces by means of optical methods (flame spectroscopy); flameless (or mild) combustion in boilers and furnaces; wood pellets combustion in boilers (energetical and environmental performance)
2. Internal Combustion Engines: alternative fuels (oxygenated fuels, biodiesels, H2, …), new combustion techniques (GDI or FSI, HCCI) and engines with variable compression ratio
3. Thermo-hydraulic performance (modelling and testing) of different types (liquid-air or air-air) of heat exchangers for automobile industry and stationnery power plants
4. In-Flight LOX Collection for future launch vehicles (aerospace applications): air/H2 pre-cooler, air oxygen separator
5. New applications of the infrared thermography technique (not only for the buildings)

Experimental Recources
- Testing grounds for domestic heating boilers (from an outpower of 8 kW (wood pellets boiler) to about 380 kW (gas or oil fired burner));
- Testing grounds for internal combustion engines (with an electrical break up to 300 kW);
- Testing grounds for heat exchangers (with an electrical air humidifier up to 30 kW).

Address
Allée de la Découverte, 17
4000 Liège

Contact
Philippe Ngendakumana
Professor
T: +32 4 366 48 03
pngendakumana@ulg.ac.be
Research Topics
The research topics at the Thermal engineering and Combustion Lab are related to high temperature industrial furnaces:
- Experiments on lab scale furnaces (3 - 30 - 300 kW) : low NOx technologies with high temperature air preheating (flameless oxidation), Flexibility for low calorific value gases, air or oxy-combustion, burner characterization.
- CFD Modeling of reactive flow inside furnaces (ANSYS Fluent, Openfoam) and validation with experimental data.
- Modeling of furnaces: application to furnace design, control and optimization
- Modeling of radiative heat transfer in furnaces (fundamental)

Experimental Resources
Three experimental furnaces are currently operated. The first is a semi-industrial scale furnace with controlled temperature thanks to water cooled tubes, in which industrial burners can be characterized (max 300 kW). The second is similar but at 30 kW, with a simple injection configuration and in which air is electrically preheated up to 1000 °C. The last one, at 3 kW, is a coflow configuration without cooling for fundamental studies. The gaseous fuels considered are natural gas or online produced mixtures (\( \text{CH}_4, \text{CO}, \text{H}_2, \text{CO}_2, \text{N}_2 \)) and burnt with air, \( \text{O}_2 \) or enriched air. Wall temperature, in-furnace temperature and composition, flame visualization in UV is available on those furnaces which are currently used to study a low-NOx technology called Flameless Oxidation or diluted combustion.
Products

Markets & Applications
<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>Electric Furnaces</th>
<th>Induction Furnaces</th>
<th>Industrial Electric Heating Equipment</th>
<th>Fuel-Fired Furnaces</th>
<th>Other Furnaces &amp; Ovens</th>
<th>Vacuum Furnaces</th>
<th>Vertical Furnaces</th>
<th>High-Pressure Furnace Systems</th>
<th>Batch Furnace</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arena Comet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belmeko</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceratec</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMI Industry Metals</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crud-Efco International NV/SA</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tin bath accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drever International</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elster SA/NV</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>Wire processing equipment, general galvanizing, chamber furnaces</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIB Belgium</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fusiref Refractories S.A.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gouda Vuurvast Belgium</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inductotherm Coating Equipment</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Krohne Belgium</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOI Fours Industriels s.a.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rolling Car Furnaces, (Heat treatment or Quenching)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyronics International SA</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vesuvius Group</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>Electric Infrared furnaces &amp; applications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wegra</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yokogawa Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td>Fuel-Fired Furnaces</td>
<td>Other Furnaces &amp; ovens</td>
<td>Vacuum Furnaces</td>
<td>Vertical Furnaces</td>
<td>high-Pressure Furnace systems</td>
<td>Batch Furnace</td>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------------------</td>
<td>------------------------</td>
<td>-----------------</td>
<td>------------------</td>
<td>-------------------------------</td>
<td>---------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric Furnaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Induction Furnaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial heating equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Process firing equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>industrial burners for solids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>industrial burners for liquid fuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>industrial burners for gaseous fuels</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>inductive heating including HF and MF generators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>induction heating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>microwave heating, plasma heating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other components and accessories for industrial furnaces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recuperators, regenerators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>protective and reactive gas generating equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>environmental protection systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>control systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>heat-insulating and refractory material</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Services related to products</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>engineering, design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>assembly, commissioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>maintenance, inspection, repair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Arena Comet | ✓ | ✓ | ✓ | ✓ | ✓ |
| Belmeko | ✓ ✓ ✓ ✓ ✓ ✓ |
| Ceratec | ✓ ✓ ✓ |
| CMI Industry Metals | ✓ ✓ ✓ ✓ ✓ |
| Cnud-Efco International NV/SA | ✓ ✓ |
| Tin bath | accessories |
| Drever International | ✓ ✓ |
| Elster SA/NV | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| FIB Belgium | ✓ ✓ ✓ |
| Flame supervision | ✓ |
| Fusiref Refractories S.A. | ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Gouda Vuurvast Belgium | ✓ ✓ ✓ ✓ |
| Inductotherm Coating Equipment | ✓ |
| Krohne Belgium | ✓ ✓ |
| LOI Fours Industriels s.a. | ✓ ✓ ✓ ✓ |
| Rolling Car | Furnaces. (Heat treatment or Quenching) |
| Pyronics International SA | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Vesuvius Group | ✓ ✓ ✓ |
| Wegra Electric Infrared furnaces &amp; applications | ✓ ✓ ✓ |
| Yokogawa Belgium | ✓ ✓ ✓ |</p>
<table>
<thead>
<tr>
<th>MARKETS &amp; APPLICATIONS</th>
<th>Metal-working industries</th>
<th>Other industries</th>
<th>Metal-working industries</th>
<th>Other industries</th>
<th>Metal-working industries</th>
<th>Other industries</th>
<th>Metal-working industries</th>
<th>Other industries</th>
<th>Metal-working industries</th>
<th>Other industries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>melting of steel, iron and non-ferrous metals</td>
<td>✓</td>
<td>heating, preheating, holding</td>
<td>✓</td>
<td>heat treatment and surface treatment</td>
<td>✓</td>
<td>vapour deposition (PVD, CVD), coating</td>
<td>✓</td>
<td>Other industries</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Glass industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ceramic industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cement, lime and gypsum industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chemical industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Petrochemical and mineral oil industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other industries</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wood, plastics, textiles industry</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Companies Listed:**

- Arena Comet
- Belmeko
- Ceratec
- CMI Industry Metals
- Cnud-Efco International NV/SA
- Drever International
- Elster SA/NV
- FIB Belgium
- Fusiref Refractories S.A.
- Gouda Vuurvast Belgium
- Inductotherm Coating Equipment
- Krohne Belgium
- LOI Fours Industriels s.a.
- Pyronics International SA
- Vesuvius Group
- Wegra
- Yokogawa Belgium
Elma Multimedia publishes business-to-business media in close collaboration with branch and professional associations. We link the information needs of the coordinating organizations and their members to the advertisers’ needs. The result is a specialized, high value-added publication. This way Elma creates a meeting point for both customer and supplier. If you want to change “me” in “we”, contact us by the data below. We are pleased to help you.

Targeted ads?
1. Cut out on the dotted line
2. Turn 180°
When nothing is more important than reliability, who can you count on? KROHNE is the answer.

Reliability, precision and process certainty: with a wide range of industrial temperature assemblies, solid professional knowledge and outstanding application know-how the OPTITEMP line from KROHNE continues this long tradition in the field of industrial temperature measurement.

As well as delivering the pinpoint accuracy you need, we select materials that are ideally suited to your application – especially with regard to abrasion or corrosion resistance. In addition to a wide range of standard devices, we can also provide customised solutions.

KROHNE – Temperature measurement is our world.

Please see our website for more information.