CETMA

TECHNOLOGIES DESIGN AND MATERIALS EUROPEAN RESEARCH CENTRE

COMPANY PROFILE

SUMMARY

PROFILE

CETMA can be counted among the research organizations at the international level called RTOs (Research and Technology Organizations). It performs independent research and provides specialized consulting services to companies and institutions.

Thanks to the research projects undertaken independently CETMA generates new knowledge and enrich the skills of its personnel, encouraging growth and highly qualified human capital consolidation. The staff, once trained, is used to adapt the acquired knowledge to the needs of companies want develop new products and processes.

With his way of working CETMA implements a concrete technology transfer: the knowledge produced by its researchers and technologists, thanks to self-research projects, are employed and adapted to solve its customers' innovation issues.

In this CETMA believes and invests every day.

Mission

The consortium carries out applied research, experimental development and innovation, increasing and integrating knowledge related to pervasive and enabling disciplines such as materials engineering, computer engineering and design.

Using this knowledge in an integrated form, it stands as a multidisciplinary center for the innovation of products, processes and services.

The activities on which CETMA focuses its efforts are as follows:

- the development of skills and expertise on innovative technologies on advanced materials and their applications;
- the development of specialized software for engineering innovative applications, manufacturing and services;
- the develpement of skills on product design and product development aimed at product innovation.

Vision

CETMA operates in the full awareness of the innovation process importance for the economic and social development of society and at the same time that it is a complex, risky and multi-disciplinary process, which requires interaction and cooperation among different actors of the Innovation System. CETMA is a connection and integration element among different key actors of Innovation: producers, final users and mediators of knowledge.

Know-how

The know-how generated by means of independent research projects is translating in an increment of CETMA capacities to provide technical-scientific consulting to Small, Medium and Large Enterprises, starting virtuous processes of technology transfer and such competences generated within Consortium laboratories find application in innovative services provided to its clients.

Shadeholders

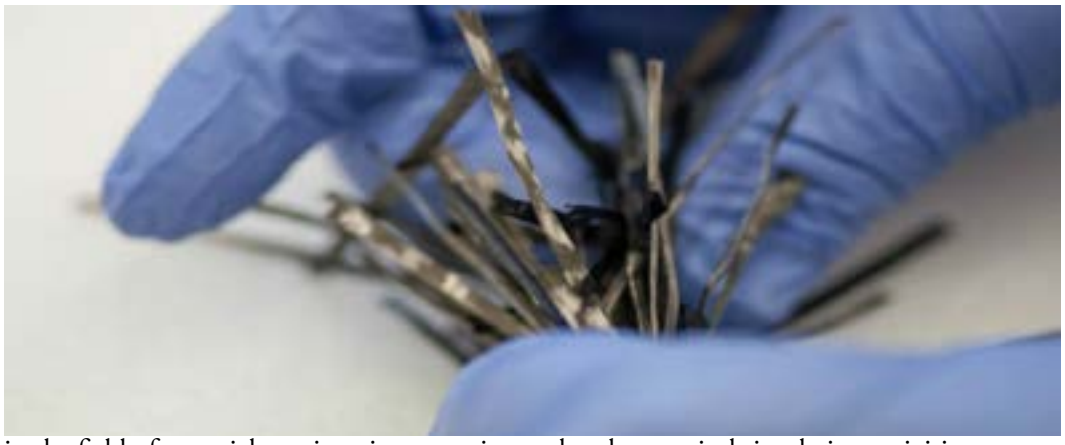
CETMA shareholders are the following: ENEA (50%), University of Salento, D'Appolonia S.p.A. (GE), Digimat Srl (MT), Marlanvil S.p.A. (BG), RINA Service S.p.A. (GE), Telcom S.p.A. (BR), Sysman Srl (BR), Veneto Nanotech (PD), Lattanzio Group S.p.A. (RM), Axist Srl (TO), .

Human Capital

CETMA counts in its staff nearly a hundred people, mostly engineers, much more than the national average for similar facilities (in private, the average is 2.7 employees per local unit and in public companies is of 39.2 employees per local unit) .It also uses the staff of its consortium members, who are involved in the Consortium's projects in relation to their specific competencies.
CETMA is a young, dynamic, and innovative environment, full of daily challenges. Our staff is strongly motivated, united by passion, dedication and professionalism. Researchers and technologists with solid skills able to respond in a resolute and attentive way to the needs of innovation of our customers.
Constant and targeted investments in research and development have led CETMA to boast a highly qualified human capital today, whose specialist skills are offered as a premium service to all those companies that intend to carry out development and innovation projects.

DEPARTMENT OF MATERIALS AND STRUCTURES ENGINEERING (MAST)

The Department of Materials and Structures Engineering (MAST) coordinates and carries out activities of applied research in the field of the advanced materials, encouraging the development of products and innovative processes.
By enhancing a nd integrating the in-house and its own partners know-how in materials engineering, the department promotes the technological transfer towards various industrial sectors, such us civil, mechanical and transportation engineering. The department has skilled personnel



in the field of materials engineering, experimental and numerical simulation activities.
The constant commitment in auto-financed research projects, the continues investment for the personnel training, the steady participation to international workshops and specialized fairs, allow to the working team, to face with competence all problems related to advanced materials field and the associated transformation technologies.
In the carrying out of the normal activities, the research team cooperates with technicians and researchers who work at consortium partners and other scientific partners headquarters.

The Department is divided into three areas:

- TEC Area- Tecnologie e Processi
- MAC Area - Materials and Characterizations Area
- SIM Area - Modelling and Simulation
- DCE Area - Diagnostics and Civil Engineering Area

For further information:

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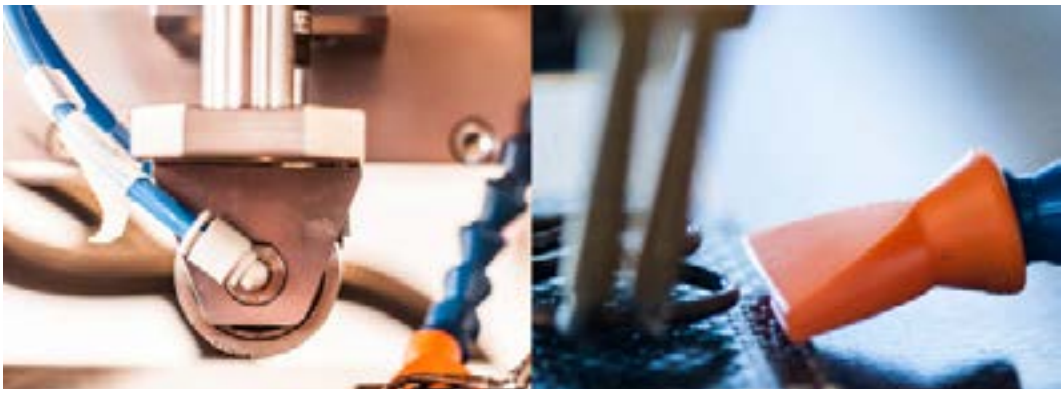
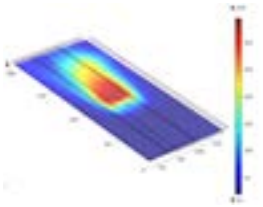
TEC Area - Technology and Processes Area

Technologies and Processes (TEC) Area supports companies in upgrading/optimization/implementation of manufacturing processes **for composite components**, with R&D, innovation and industrialization activities that can be chosen/detailed on the basis of the company capabilities and of the specific needs of the customers:



- **replacing** of traditional materials **with composite materials**;
- identification/**design of the composite material** most suitable for specific applications;
- **design** of the composite **component**;
- study of **innovative transformation processes for polymeric and composite materials**;
- process **optimization** with respect to specific objectives (cost, eco-sustainability, waste minimization, improvement of productivity and quality of the article, etc.);
- support in the identification and use of appropriate **funding instruments**.

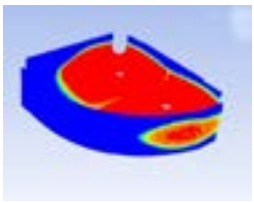


Induction welding of composite materials

In order to achieve these objectives, CETMA proposes appropriate strategies, previously shared with the customer, providing, if necessary, both process experimental tests (lab scale and pilot scale) and simulations of materials/components/processes using CAE tools. The activities can be characterized by different levels of innovation, depending on the mission and objectives of the company: existing and consolidated solutions in the field of polymers and composites can be used, through technology transfer procedures, or innovative materials/technologies deriving from R&D activities can be developed and implemented.

Low cost processes for composite components wirh complex geometry

Compression moulding of thermoplastic composites



Simulation of RTM processes

Development of sandwich panels for biomedical applications

Development of components/processes for the aeronautical sector

MAC Area - Materials Technology and Processes Area

Materials and Characterizations (MAC) Area of CETMA supports companies in all the stages of product development, from the choice of the material to prototypes development and pre-series production. The main skills relate to **polymeric and composite materials and their transformation processes**.

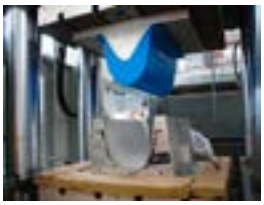
MAC Area is able to dialogue with all the stakeholders of the supply chain: material developers, equipment producers, manufacturers of semi-finished products and components, end-users. Thanks to twenty years of experience, the **availability of a qualified laboratory** and the continuous exchanges with the industry and other public and private research centers, the MAC Area is able to provide rapid, effective and comprehensive responses in the following activity fields:

- **characterization** of polymeric, composite and stone materials;
- **product/process development** for polymeric and composite materials;
- support to composite materials developers for **the time-to-market shortening**;
- development of plastic **recycling** processes;
- **support and training** of specialist personnel;
- **REACH & CLP** compliance services;
- support in the identification and use of appropriate **funding instruments**.

Recycling processes for polymers and composites

Design of materials and components

Polymeric, composite and bio-based materials



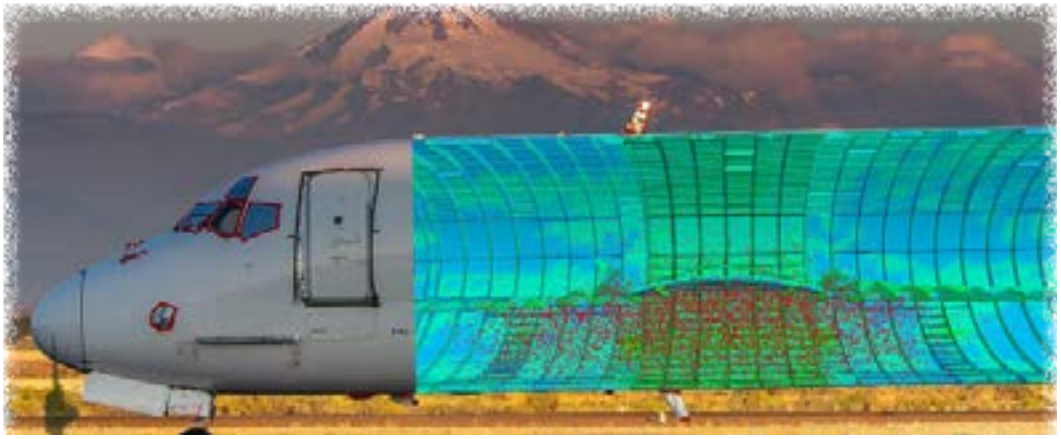
Processi di trasformazione per polimeri e compositi

Design, manufactoring and validation of prototypes

Physical-chemical, thermal and mechanical characterization of materials and components

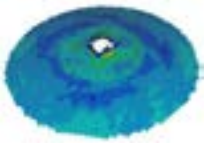
SIM Area - Modelling and Simulation Area

Modelling and Simulation Area carries out research activities and high-tech services to innovate products and processes. The activities are performed by means of the most **advanced CAE technologies (Computer Aided Engineering) and by experimental characterization**.



Main skills are:

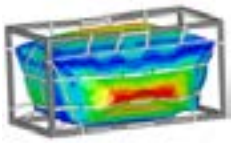
- **numerical modelling and analysis of complex phenomena** (thermos-fluid-dynamic analysis, structural simulations, fluid-structure interaction, dynamic analysis, crash, explosion);
- **development of numerical- experimental methods** to study the behaviour of **advanced** and traditional **materials** (polymers, ceramics, composites);
- physical and mechanical **characterization of ceramic and composite materials**;
- high performance computing and immersive visualization (Virtual Reality Center).



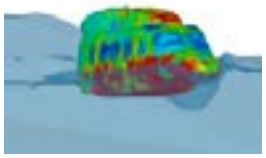
Numerical modelling and experimental characterization of innovative materials

These activities are aimed:

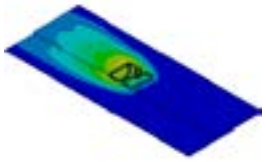
- to evaluate and to optimize the performance of a product / process compared with established targets;
- to evaluate the impact of the innovation in a system or in a product;
- to minimize the time to market, arriving at the experimental phase with an optimized solution.



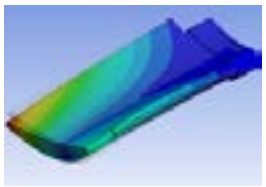
Blast simulation of an innovative container for the air transport



Impact and ditching analysis of a complex structure



Thermo-electro-magnetic analysis of an induction welding process

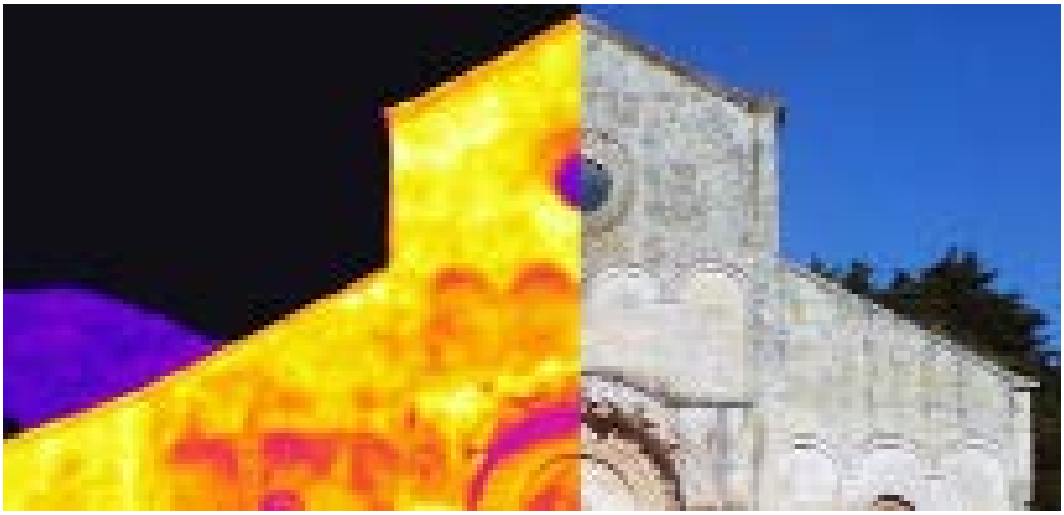


Numerical modelling and testing of ceramic materials (investment cast process)

Thermo-Fluid Dynamic Analysis of toxic releases from industrial plants

DCE Area - Diagnostics and Civil Engineering Area

The Area has the aim of making technology transfer of materials and techniques in civil engineering field, with particular attention to the problems of **seismic protection, diagnostics, structural health monitoring, sustainability and energy efficiency**.



Services offered are:

- development and characterization of **innovative and eco-friendly materials and products**, feasibility analysis and technical-economic evaluation for the upgrade of traditional productive processes, prototyping, validation;
- structural modelling, analysis and design, **reinforcement and seismic upgrading** of structural elements with traditional and innovative materials (Composites, Shape Memory Alloys – SMA), design of software tools for calculation and for design support, supervision of works;
- **physical-mechanical characterization** of traditional and innovative materials, static and dynamic tests on structural elements, durability testing, thermal conductibility measures;
- **diagnostics investigations** (IR thermography, sonic and ultrasonic testing, sclerometrics), **assessment of the energy efficiency of building envelopes** (thermal bridges, insulation losses), **quality control** of FRP reinforced structures;
- design and development of **FRP smart devices** with embedded optical sensors, for contemporary **structural strengthening and real time monitoring**;
- development and application of diagnostic methodologies with IR thermography for **quality control and optimization of products and industrial processes**;
- **specialized training** (non-destructive techniques, materials for building, structural strengthening).

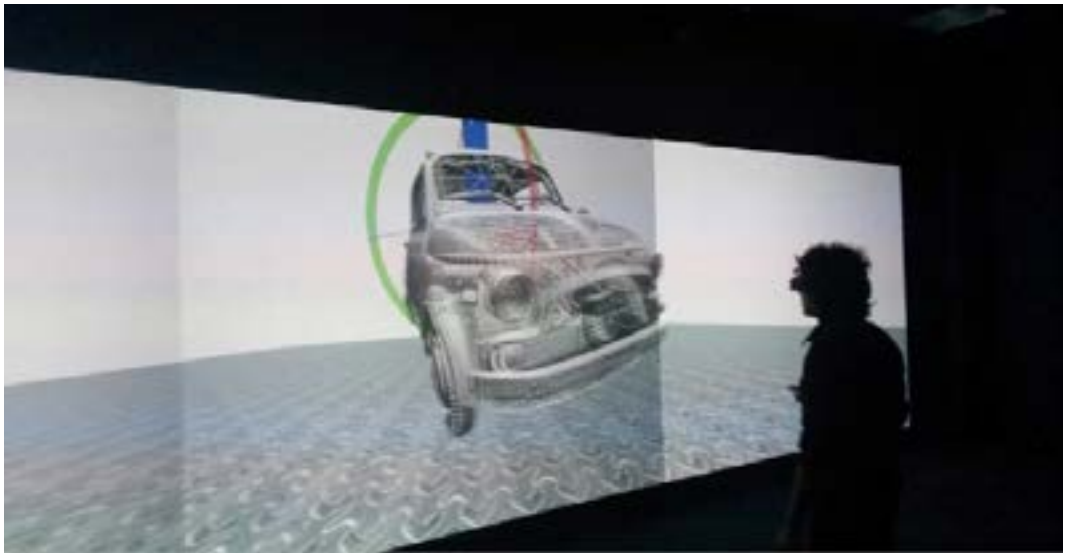
Lighweight concrete with recycled aggregates (RAEE, PU, plastics of discard from MSW, tyre rubber) for thermo-acoustic insulation

Shape Memory Alloy based device fot the stabilization of the draught strength of vaulted masonry structures

Strengthening and real time monitoring of a masonry structure with smart rebar

DEPARTMENT OF INFORMATION TECHNOLOGY (INFO)

The Information Technology Department aims at promoting applied industrial research activities and technological transfer in the field of Information and Communication Technologies (ICTs). In particular it develops advanced information systems in specific contexts related to Product Engineering, Logistic, Transports, Knowledge Management, Virtual Reality and Data Processing, and Advanced Visualization. INFO department is composed by researchers and technicians specialized in ICTs with problem solving and working team skills.



The continuous learning on the job, the certification and the interactions with the world best practices, make working teams able to solve any ICT problem.

The Department is divided into four areas:

- VAM Area - Virtual, Augmented Reality and Multimedia Area
- CAU Area - Automation and Control Area
- SIK Area - Information System and Knowledge Management Area

For further information:

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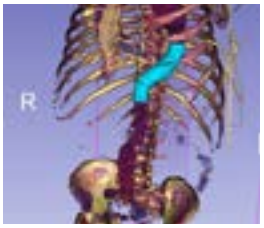
VAM Area - Virtual, Augmented Reality and Multimedia Area

For over 10 years Virtual, Augmented Reality and Multimedia Area (VAM) has developed expertise and experience in the field of virtual interaction, multimedia production, software and app development, image processing and experiential space design. It operates in the sectors of industry, cultural heritage, entertainment and health.

VAM main activities are:

- **Multimedia advanced 3D production**;
- **Virtual Reality** and **Augmented Reality**;
- **CAD design** and **virtual prototyping**;
- **Real-time platform simulators** and **collaboration sistems**;
- **GIS** - Geographical Information System;
- **Filming**, **editing** and **compositing Video / Audio HD**;
- **Graphic design** and **communication design**;
- Multi-platform **software** and **mobile application** interface design;
- Photogrammetry and **3D photographic virtual tour**;
- **Advanced Image Processimg**;
- **Interactive spaces design**: museums, public spaces and entertainment smart areas;
- **Game design**;
- **DUNE.** solutions developing.



Medical data processing

CETMA/DUNE. Virtual presentation software

Cultural Heritage and new interactive media

Health and medicine software and interface development

Stereoscopic and virtual reality solutions

Multimedia production

CAU Area - Automation and Control System Area

Ambient Intelligence, Energy Efficiency, Mechatronics are the main research assets in the Control and Automation Unit that promotes regional, national and European action in partnership with enterprises and public authorities.
The Control and Automation Unit works on innovative and sustainable solutions to improve energy efficiency and the use of renewable energy sources at home, in public buildings and neighborhoods.

Intellibed, letto per degenza e somministrazione di terapia in stroke unit

The Control and Automation Unit works on innovative and sustainable solutions to improve energy efficiency and the use of renewable energy sources at home, in public buildings and neighborhoods. The Control and Automation Unit also works on systems t**o enhance the quality in life of elderly and disabled people** developing **medical device to support diagnosis and prognosis in neurodegenerative** Alzheimer's and Parkinson's diseases and in post-stroke post-ictus **rehabilitation**.
The available expertise allows to offer services for product and process innovation in Industrial Automation, Robotics, Mechatronics, distributed control, Medical Devices, Home Automation for Ambient Assisted Living, Building Automation for energy efficiency, Sensors, process control, Tracking systems and Wireless technologies,data acquisition and processing, embedded systems, integration of hardware and software technologies.

System for morphological and superficial characterization of objects

EnRT-Controller controls presence and activities of people and optimizes the use of energy in public building

Evaluation of district energy performance and new business models in energy distribution

Energy Manager optimizes the use of renewable energy sources

Framework for post stroke neuro-rehabilitation in upper limb

SIK Area - Information Systems and Knowledge Management Area

Information Systems and Knowledge management (SIK) Area conducts applied research in ICT sector and provides services for process innovation, using the most advanced information and communication technologies.

Main skills are the **design and development of ICT solutions** for the civil, social, industrial and military sector, particularly:

- Web services, web applications, desktop applications, mobile App, as for example:
  - **Web GIS**
  - Engineering **calculation software**
  - Integrated solutions for **RFID tracking**
  - Solutions for integration of **sensors and electronic devices** (in the medical field, home automation, etc.)
  - Solutions for **integration with control systems**
  - Solutions for **Multimedia Totem**
  - **Cooperative Working** Platforms
- Business Process Analysis and Reengineering (**BPR)**
- **Expert Systems, Machine Learning**
- **Knowledge Representation, Semantic Web, Open Data**
- ICT **Training**, **Feasibility** analysis of ICT solutions, **Refactoring** and optimization of existing systems.

Solutions for Tourism and Cultural Heritage with Web GIS

RFID Tracking of goods and persons

Solutions for Mutimedia Totem

Engineering calculation software - CAD Comp

DEPARTMENT OF DESIGN (DES)

The Department of Design operates in close relation with the other departments, providing its own competences in each phase of product development. The design research is addressed to innovation and to give an original contribution to the industrial and technological culture of the territory. The innovative design represents the strategic tool for each industrial reality, that want compete in a context of increasing competition. The application of research activities aims to interpreter and develop novel technological and productive opportunities in new functional, formal and communicative qualities to be transferred to "product system". The Department dedicates, also, its own competences to graphic design addressed to different application fields.

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The Department of Design supplies specialized IndustriaI Design activities, which have been classified by NACE (Nomenclature des Activités économiques dans les Communautés Européennes) as follows: "creating and developing designs and specifications that optimize the use, value and appearance of products, including the determination of the materials, mechanism, shape, color and surface finishes of the product, taking into consideration human characteristics and needs, safety, market appeal in distribution, use and maintenance".

The Department works on research and development projects for enterprises which intend to invest in innovation and differentiation of their own product-services, both in terms of existing products improvement and radically new product generation. Its team support the enterprises in the definition of design-oriented products able to influence the market positioning.
It offers a wide range of services through the whole product development process management and works in a prevalent way in the following IndustriaI Design sectors: Medicai, Lighting, Packaging, Interior, Furniture, Transportation and Outdoor Design.

Services offered are:

- technical services for enterprises in the activities of industrial product development;
- design for manufacturing;
- technological dervices of rapid prototyping, pre-series, rapid-manufactoring;
- ergonomics;
- design for sustainability;
- design protection services.

Set of outdoor furniture in rotational molding

Pole for tranport services reservation

Plastic maracas made from reclycled absorbent products

Bench made with plastic reinforced profiles

LABORATORIES

CETMA is equipped with advanced technology laboratories and relies on the professionalism of young researchers, whose skills are offered as advanced service to all enterprises interesting to carry out innovation projects.

CETMA Virtual Reality Center (CVRC)

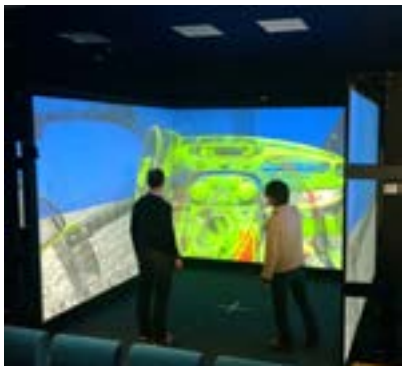
CETMA Virtual Reality Center (CVRC) is the laboratory of CETMA Consortium, for **advanced visualization** and **immersive systems**. The CVRC visualized immersive, collaborative and interactive 3D scenarious in the following application fields: **design review**, **simulation**, **training**, **edutainment** and **communication**.

The display system is characterized by the system MOVe of the BARCO; it consists of 3 movable screens (each of which is characterized by a surface area of 3.2m x 2.4m for a total of 9.6 meters long and 2.4 meters height) whose side walls can be rotated from CADWALL configuration to a CAVE configuration. This particular feature allows you to enjoy different scenarios and allows simulations of both interior design and style.

The **display system** is represented by 3 projectors that allow both MONO and active STEREO visualisation.

The **Computation System** is characterized by ORAD cluster technology, consisting of 12 DVG-10 for a total of 24 Render Nodes based on Nvidia technology and cluster of workstations equipped with NVIDIA Quadro graphics card.

The laboratory is used to display immersive and collaborative multiview software applications (design and developed in CETMA) and allows to use wired/wirless tracking devices.

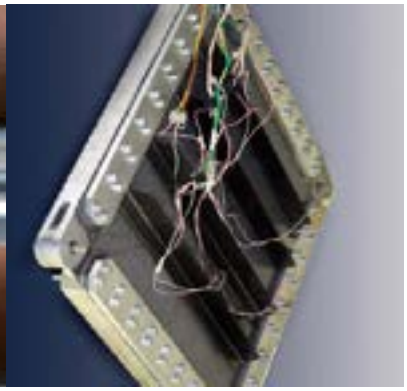


Following the services offered by CETMA, related to CVRC:

- High for design review and communication sessions
- Digital prototype test with CETMA's software
- Cultural Heritage 3D Visualisation

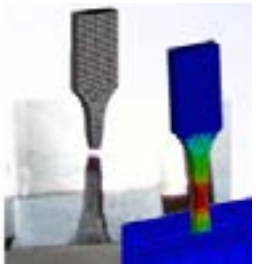
Laboratory of Materials Technologies

The Laboratory of Materials Technologies of CETMA is a center of excellence that supports companies in the characterization of materials and components.



The Laboratory offers the following services on **polymeric**, **composite** and **stone materials**:

- Production of specimens for testing;
- Mechanical characterization;
- Thermal characterization;
- Physical-Chemical characterization;
- Testing of small/full-scale components: test design with the support of FEM analysis, implementation of the tool, testing and analysis of the results.



Test design with the support of FEM analyses

All tests are performed, on the basis of the customer requirements, according to national or international Technical Standard. In the absence of Reference Standard, the Laboratory also provides the test design.

The Laboratory is a qualified supplier for customers operating in the aeronautical sector.

Testing of small/full-scale components

Mechanical characterization

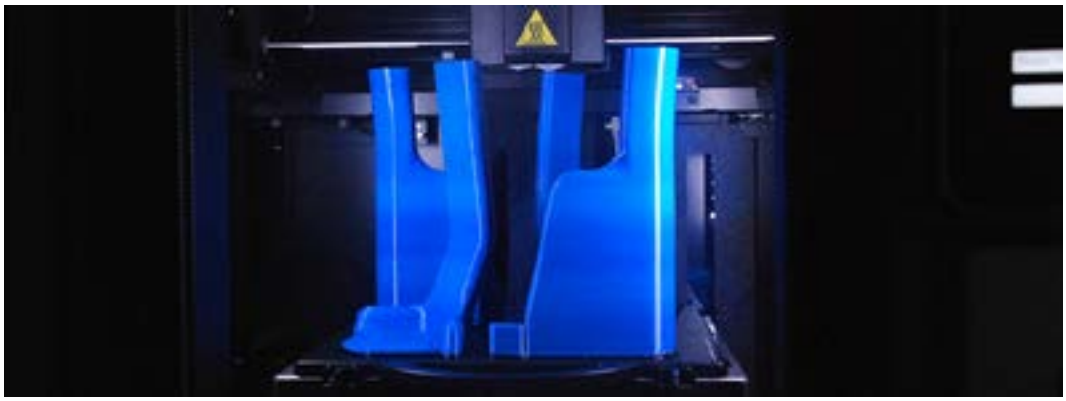
Thermal characterization

Physical-chemical characterization

Specimens for testing

Laboratory of Prototyping and Ergonomics

The Laboratory of Rapid Prototyping and Ergonomics is a physical space to support design and ergonomic analysis activities. It offers services of solid modeling and optimization of 3D models for rapid prototyping, with the identification of materials and techniques able to answer to target design requirements.



All tests are performed, on the basis of the customer requirements, according to national or international Technical Standard. In the absence of Reference Standard, the Laboratory also provides the test design. The Laboratory is a qualified supplier for customers operating in the aeronautical sector.

Within the laboratory, you can find different sets for the following evaluations typologies:

- Product and interface usability;
- User-product-environment interaction with digital human modelling software.

Small series. Prototype of carter for rehabilitation device. Materials: ABS. Technology: FDM

CETMA PROTOTIPA is a direct service of the Laboratory that allow in a easy and fast way to realize physical prototypes in several materials, with very high precision and versatility. A rapid and free quoting format is available on-line, with detailed information on models and prices. CETMA prototipa is able to design and prototype unique pieces and small series of components or products on custom demand. We support students, makers and companies on making of prototypes to be used for functional tests o for promotional events/ idea launch. You can also activate optional services of surface finishing, photography, packaging and design protection.

Small series: Jewels Collection. Technology: Polyject

Rapid tooling - Mould for rubber bumper. Material: ABS. Technology: FDM

Automotive components for high temperature conditions and environments. Technology: Polyject

Full Scale Prototypes - Assembly of carter for ASRV (Automated Storage Retrieval Vehicle)

Optional services: Surface Finishing - Prototype of suspension ceiling lamp

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