

#### **Energy Efficiency**



Passive Architecture HVAC systems Refrigeration Technology Thermal Comfort

#### **Thermal Renewable Energies**



Solar Cooling Geothermics Aerothermic systems Photovoltaic glazing

## **Human resources**



#### **Director:**

Dr. Ismael Rodríguez Maestre

**Industrial Engineer** 

#### Team:



Dr. Pascual Álvarez GómezCivil EnginerDr. Juan Luis Foncubierta BlázquezIndustrial ErDr. Fco. Javier González GalleroPhysicistMr. Gabriel González SilesIndustrial ODra. María Jesús Jiménez ComeChemical ErDr. Jesús Daniel Mena BaladésChemistDr. Francisco José Sánchez de la FlorIndustrial ErDr. Enrique Ángel Rodríguez JaraIndustrial ErMs. Irene Sánchez OrihuelaMechanical

Civil Engineer Industrial Engineer Physicist Industrial Organization Engineer Chemical Engineer Chemist Industrial Engineer Industrial Engineer Mechanical Engineer

#### Staff (May, 2024) :

- Full-time professors (10)
- Research professors (3)
- Researchers hired with projects (2)
- PhD students (6)
- Master's students (7)

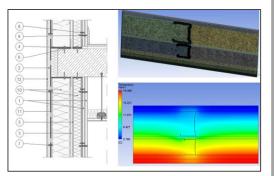


University (UCA) Technology-based company

# **Technology Transfer**



### Energy Consulting



Energy audits Industry/Tertiary sector Thermal and fluid-Dynamic Design (CFD) Building Energy Regulation Modelling of energy systems (TRNSYS) Energy modelling of buildings (eQuest)

- Audits: Blow door, gas analyzer, thermal comfort, heat-flux meter, ultrasonic flow-meter, thermohygrometer.
- ✓ **Thermal Design**: ANSYS-CFX, FLUENT.
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### Software Development

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**Energy simulation models:** 

- Desk and/or web (client/server side)
- Building/termal systems coupling
- Integration of control strategies

Integration into BMS / digital twins

- ✓ HPL Computing cluster: HPC computing cluster: R424E3 V2, comprised of four nodes with two parallel Xeon E5-2620v2 6core processors at 2.1 GHz, 64 GB of DDR3 RAM, and 256 GB of RAM.
- ✓ Intermediate workstations: customised per project/researcher

### **Test/Accreditation of equipment**

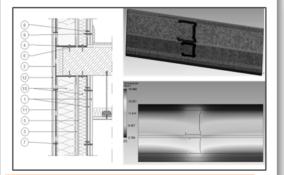


Testing of prototypes / patents Certification of thermal performance

- Double climatic chamber: testing of thermal and/or hygrometric performance and test of material permeability..
- Hydronic facility: Testing of heat production or exchange equipment up to 25 kW of cooling/heating capacity. Flow and temperature control.



#### Energy Consulting



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# EC - Example 1

## HOSPITAL "PUNTA EUROPA DE ALGECIRAS"

#### Methodology based on improvements from experimental measurements

- ✓ Boiler efficiency
- ✓ EER/COP of chiller plants (BdC)
- ✓ Quality of power supply
- ✓ Thermal Comfort
- $\checkmark$  Air infiltration
- ✓ Thermal Transmittance
- Ventilation flow rates through conduits
- ✓ Pipe thermal insulation

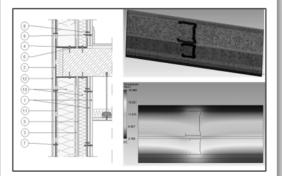








#### **Energy Consulting**



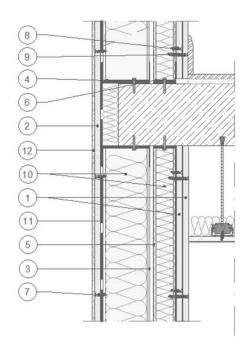
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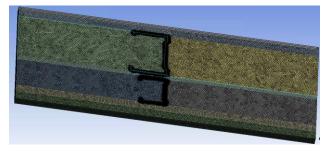
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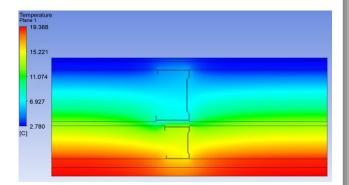
## EC - Example 2

#### THERMAL-HYGROMETRIC CHARACTERISATION OF THE "INTEGRA-PLACO" SYSTEM (Saint Gobain)

Thermal and hygrometric characterisation of different variants of a façadeenclosure system (called Integra-Placo) and compliance with regulations

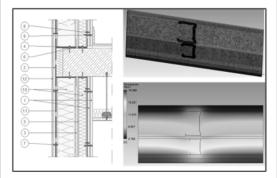








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Modelling of energy systems (TRNSYS)

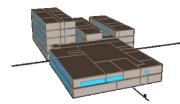
Energy modelling of buildings (eQuest)

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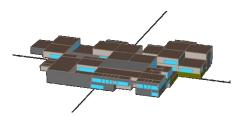
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## EC - Example 3

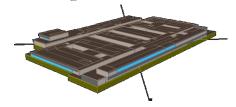
Compliance with CTE-HE and Energy Certification for Large Tertiary Sector



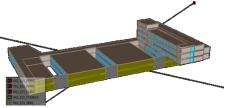
Bio-Science Building University of Murcia



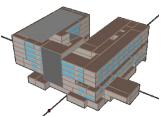
Medical centre «Cruz Humilladero» Malaga



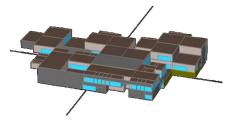
Hospital Roquetas de Mar



Faculty of Documentation University of Murcia



Maternal & Child Hospital Málaga



PTA Building Malaga



#### Software Development

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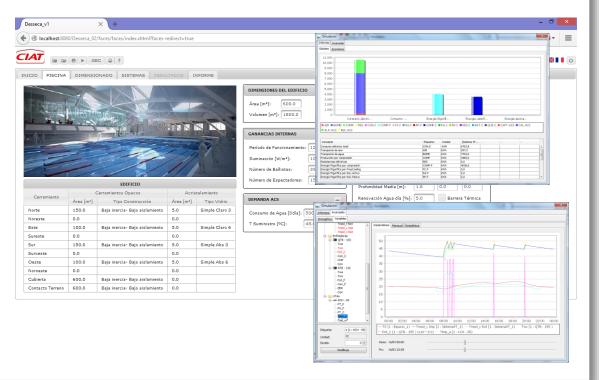
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SD - Example 1

Modelling and programming of a simulation tool for indoor swimming pool equipment and air conditioning systems (DESSECA)

Funded by: Period: *CIAT, CTA, IDAE* 2012-2014 (2 years)

Software for sizing and simulation of dehumidification equipment for indoor pools.





#### Software Development

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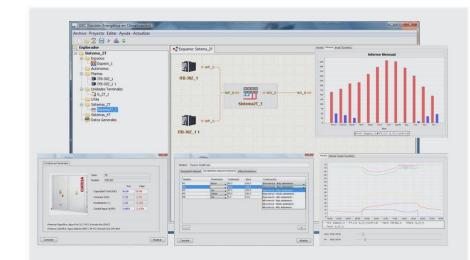
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## SD - Example 2

### Energy Management in Air Conditioning (GEC)

#### Simulation program of Air Conditioning systems

- Annual simulation with a time-step of 5 minutes
- Building model
- Stand-alone A-A & W-A systems
- Convection correlations
- Showcase tool



# **Patent development**

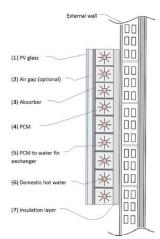


Test/Accreditation of equipment



Testing of prototypes / patents Certification of thermal performance  Integration of photovoltaic and electrochromic glasses in thermo-electric solar energy generation devices with phase change materials for buildings (SMART-PVT).





- Double climatic chamber: testing of thermal and/or hygrometric performance and test of material permeability..
- Hydronic facility: Testing of heat production or exchange equipment up to 25 kW of cooling/heating capacity. Flow and temperature control.



# **Cooperation interests**

## **PhD Theses**

- Integration of photovoltaic and electrochromic glasses in thermo-electric solar energy generation devices with phase change materials for buildings (SMART-PVT). Grant Ref. PID2021-123562OB-I00 funded by MCIN/AEI/ 10.13039/501100011033 and by the European Union.
- New control system for a ventilated façade by using PV and EC devices: Numerical and experimental validation of a new patent (patent under review).
- Concentrated solar power plant for green H<sub>2</sub> production: Sizing, modelling, and simulation of alternative principle schemes
- High-temperature aerothermal energy for the decarbonization of tertiary sector buildings.

## **Research Project**

Integration of renewable electric energy generation and storage systems and DHW in multi-family residential buildings: Demonstration Building

Call: UE (Jan 2025)

Members: 6 universities + 4 companies



# Contact

#### **Director:**

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