NABLADOT
INTRODUCTION TO THE COMPANY AND ITS SERVICES

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NABLADOT::()
INGENIERÍA COMPUTACIONAL DE FLUIDOS

- Established in 2010 by researchers specializing in Computational Fluid Dynamics (CFD) at the University of Zaragoza (2010). We offer:
  - Innovative character
    - We actively engage in research and development projects at both national and European levels
  - Business focus
    - We offer solutions tailored to the technical and economic needs of the companies
- Our team has experience across multiple sectors (see our Projects)

ENERGY SECTOR
- HSGR (combined cycles)
- Biomass boilers
- Molten salts heat exchangers
- Rotary kilns

HVAC AND AIR QUALITY
- Logistic centers
- Metro station
- Tunnels
- Pharmacy clean rooms

WATER SECTOR
- Hydraulic infrastructure
- UV water disinfection
- Aerobic reactors
- Anaerobic reactors

FLUE GAS CLEANING
- Wet flue gas desulfurization
- NH3 stripping
- Regenerative thermal oxidizer
- Bag filter

INDUSTRY
- Deoil tanks
- Valves
- Pneumatic transport
- Biomass rotary dryer

HYDROGEN SECTOR
- Combustion
- Substitution of fossil fuels
- Injection in gas pipelines
- Leaks / Dispersion

CHEMICAL SECTOR
- Pyrolysis reactor
- Fixed bed reactors
- Real-time energy audit

SMART CITIES
- Urban wind in real time
- Integration BIM & Simulation

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- Our clients and partners include:
  - Companies that design and manufacture equipment, processes, and products involving fluids
  - Engineering companies,
  - Firms that design, operate, and manage facilities related to energy, water, and air quality and HVAC systems
  - R&D centres
- We have extensive international experience, with most of our projects being carried out for exporting companies or companies developing projects abroad

RINGO VALVULAS
KALFRISA ENERGÍA Y MEDIO AMBIENTE
HAIZETEK SERVICIOS PARA LA FILTRACIÓN
lointek
IBERDROLA
SISENER INGENIEROS
endesa
IDOM
wood.
ArcelorMittal
Lab GROUPE ENIM
NORTEK FLUIDS TECHNOLOGY
edp hc energía

- We offer a wide range of services:
  - CFD simulation
  - Real time models (CFD simulation & Statisical Analysis & AI)
  - Statistical data analysis
  - Simulation & IoT (Sensors, Cloud Computing, Edge Computing)
  - Digital Twins
  - Collaboration in public funded R&D projects (wide experience in public funded R&D projects at national and European level)

nablaDot: For What?

+ We assist companies in the following ways:
  + Enhancing equipment and process design through simulations.
  + Conducting virtual tests to ensure that equipment, processes, or facilities meet specified requirements.
  + Troubleshooting issues that arise during equipment operation.
  + Scaling equipment and processes effectively.
  + Identifying unexpected problems in new designs.
  + Making informed decisions regarding design or operational changes.
  + Reducing uncertainties in equipment design and operation.
  + Providing better design tools.
  + Offering advanced tools for equipment operation, including simulation, IoT, and digital twin technologies.
+ As a result, companies can achieve:
  + Improved energy efficiency.
  + Reduced greenhouse gas (GHG) and other pollutant emissions.
  + Prevention of unexpected downtime in facilities and enhanced maintenance.
  + Achievement of Key Performance Indicators (KPIs) for equipment and facility design and operation.
  + Enhanced competitiveness
  + Cost savings through lower energy consumption and fewer unanticipated downtimes.
  + Assurance of the effectiveness of their investments.

nablaDot: CFD Simulation Examples

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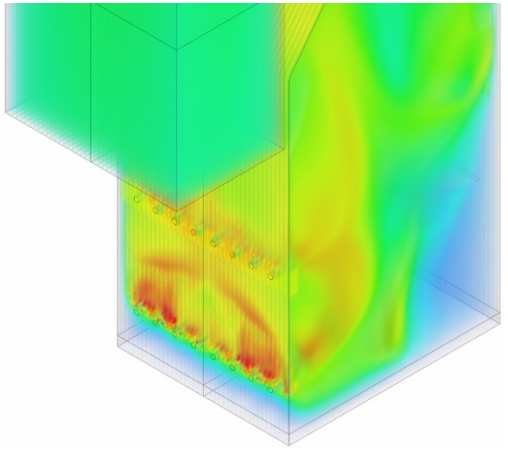
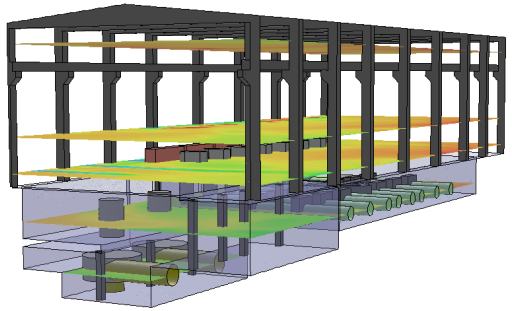
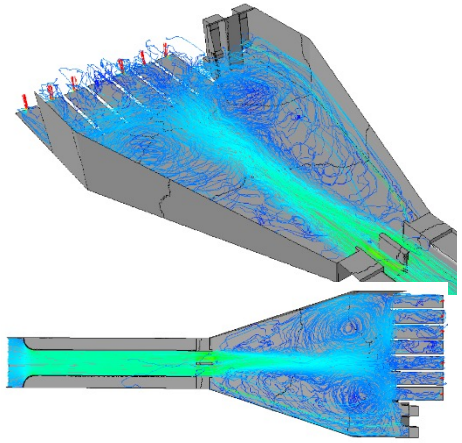
Energy
Biomass boilers



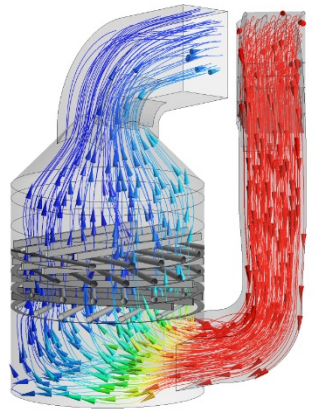
HVAC and Air Qualityç
Logistics warehouses



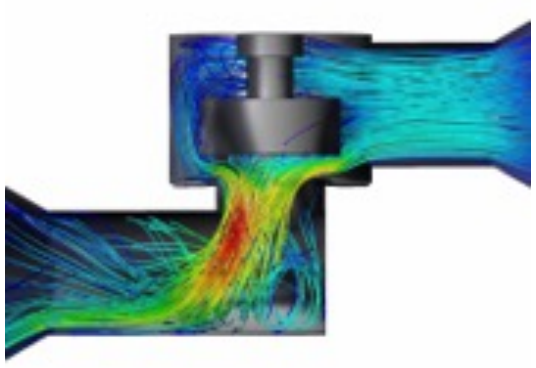
Water sector
Hydraulic infrastructures



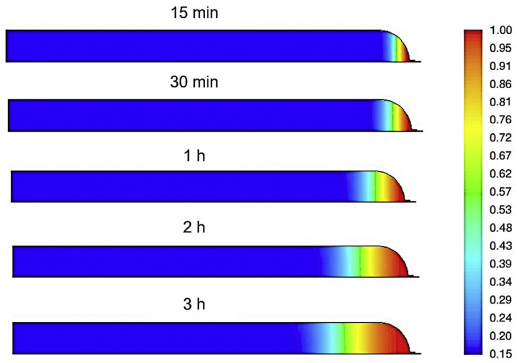
Flue Gas Cleaning
Desulphurisation



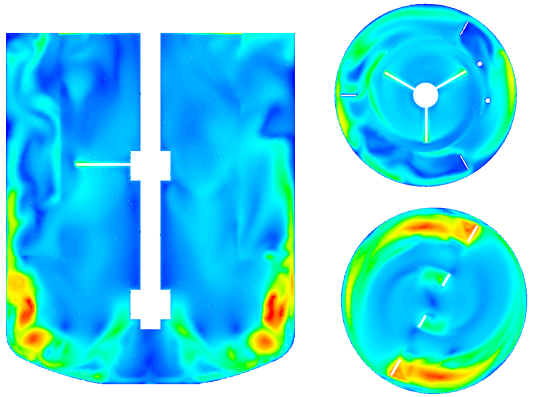
Industry
Valves



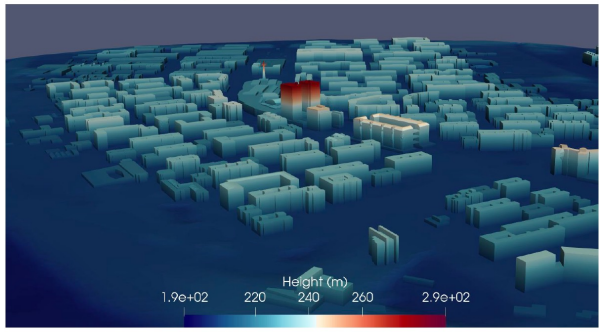
Hydrogen
Hydrogen injection



Chemical sector
Pyrolisys reactor



Smart Cities
Wind forecast in real time



+ Real-time model for the calculation of the CH4-H2 mix in natural gas pipes
  + More details at: *C. Montañés et al., Comprehensive assessment of hydrogen injection in natural gas networks: Using dimensional analysis and reduced-order models for mixture quality prediction, International Journal of Hydrogen Energy,* https://doi.org/10.1016/j.ijhydene.2024.09.045
+ Combination of CFD & Dimensional Analysis & Statistical Analysis

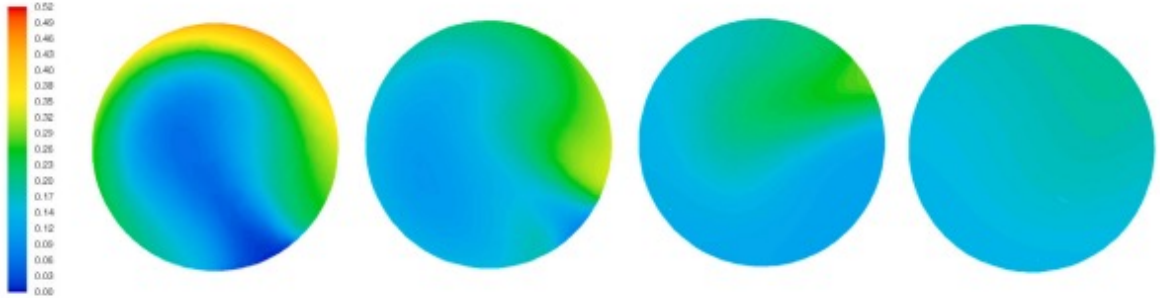


Fig. 3. Contours of H_2 mass fraction in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).

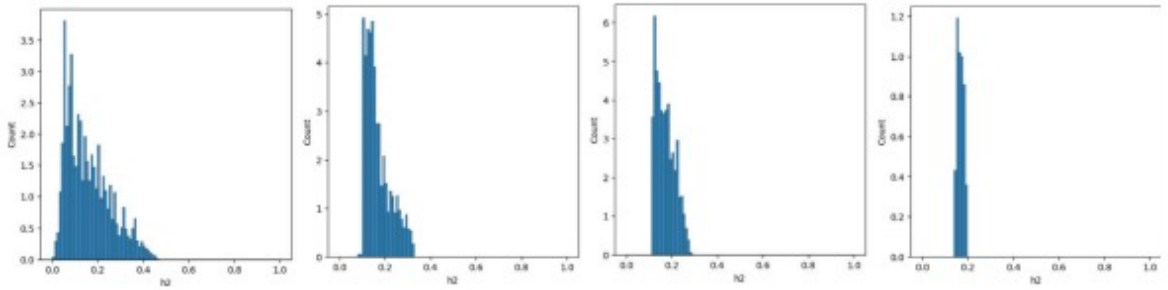


Fig. 4. Histogram of H_2 mass fraction (weighted with cross area) in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).

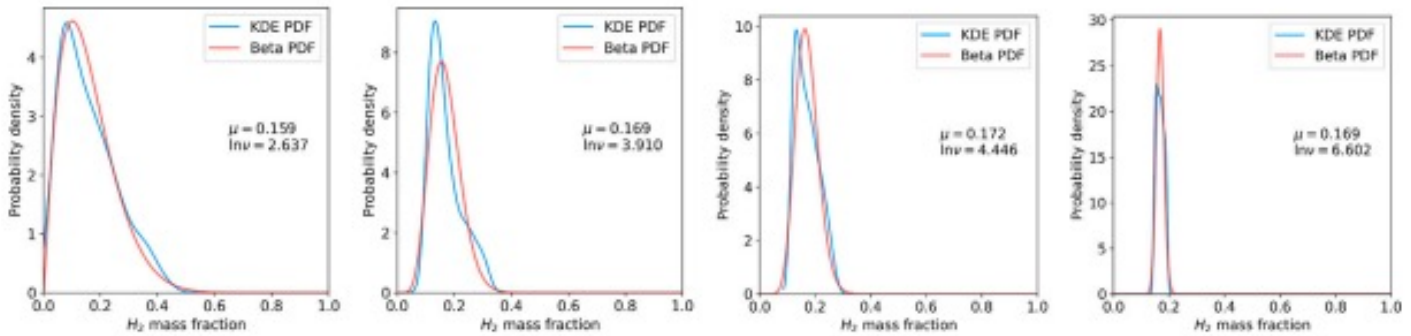


Fig. 5. PDF and beta approximation for H_2 mass fraction in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).

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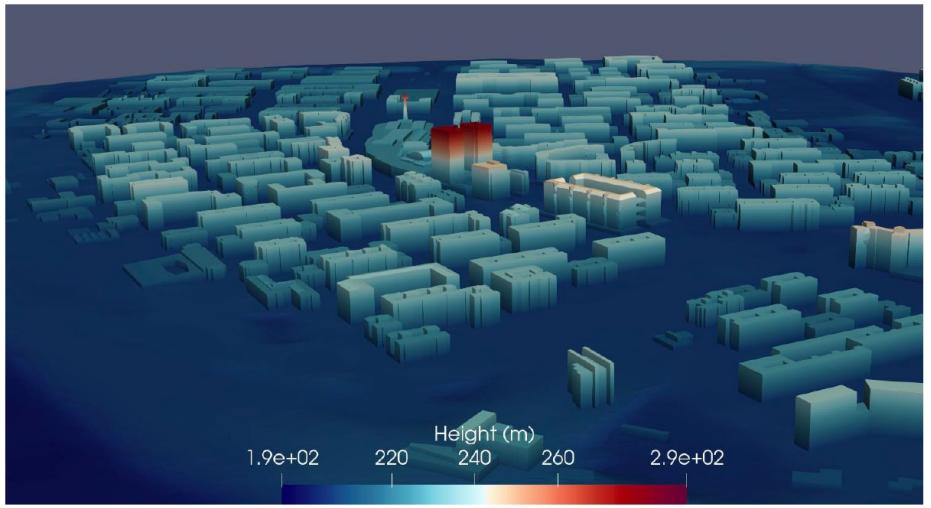
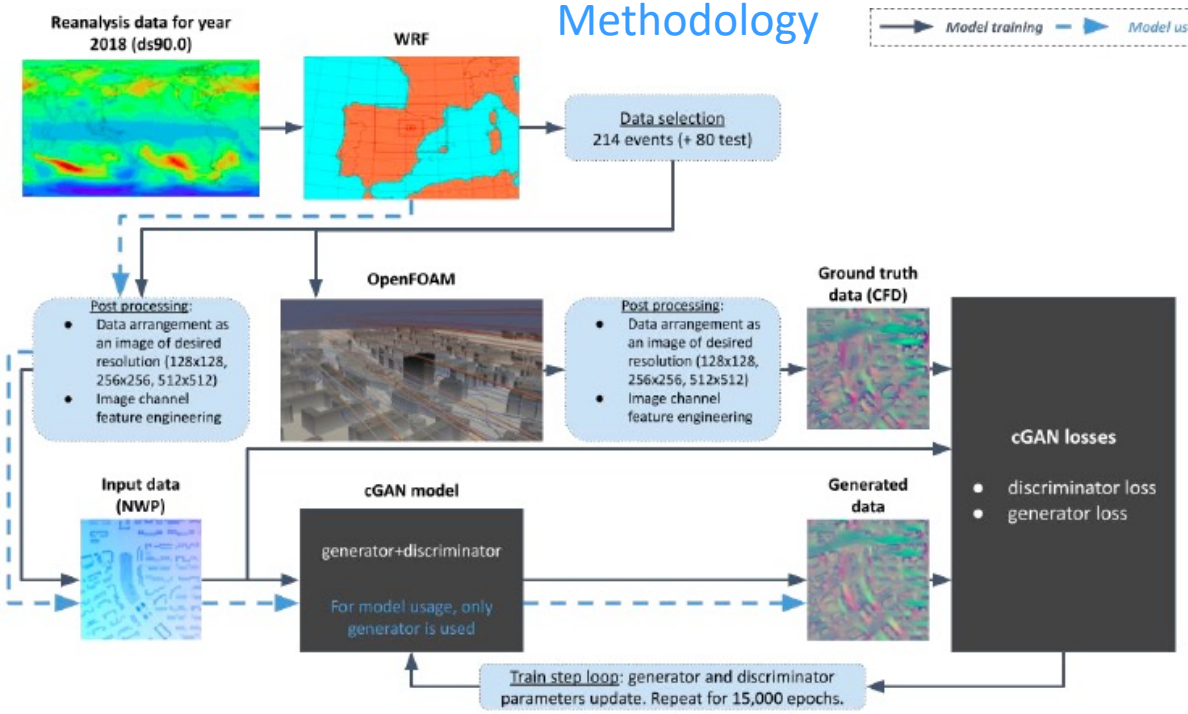
- High resolution urban wind in real time
  - Numerical Weather Prediction Models & CFD & AI
  - Multiple applications
    - Small wind energy
    - Air Quality
    - Forecast of extreme events
  - References: here

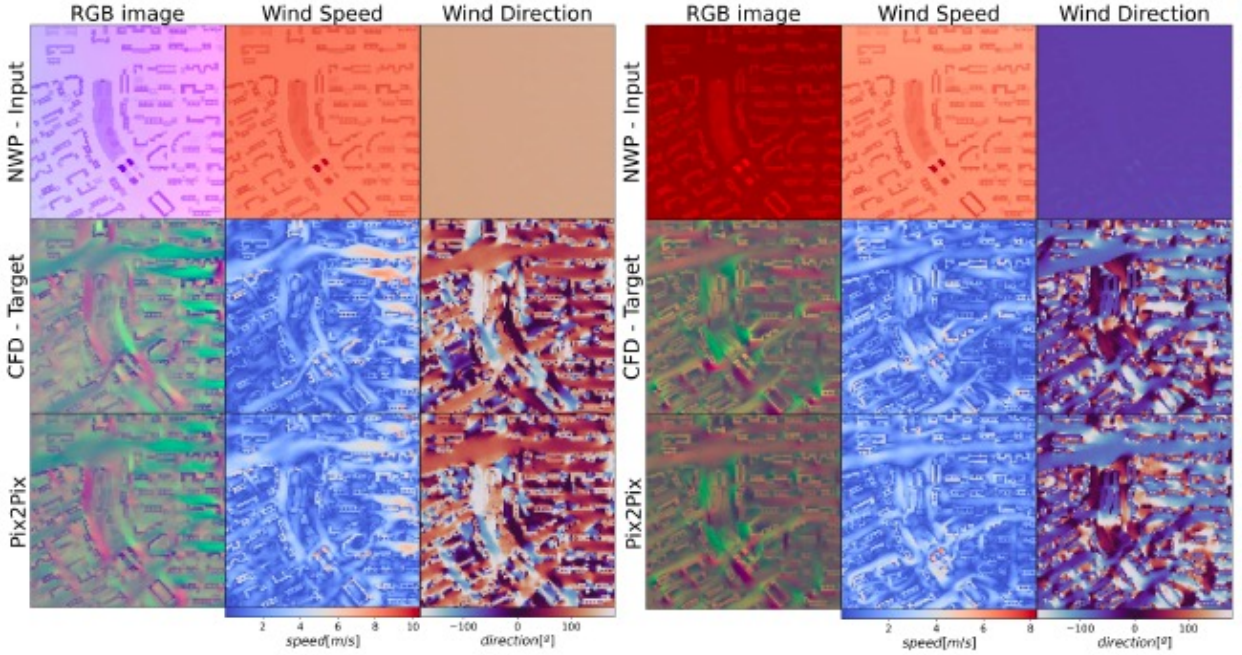
ZARAGOZA (ACTUR DISTRICT)



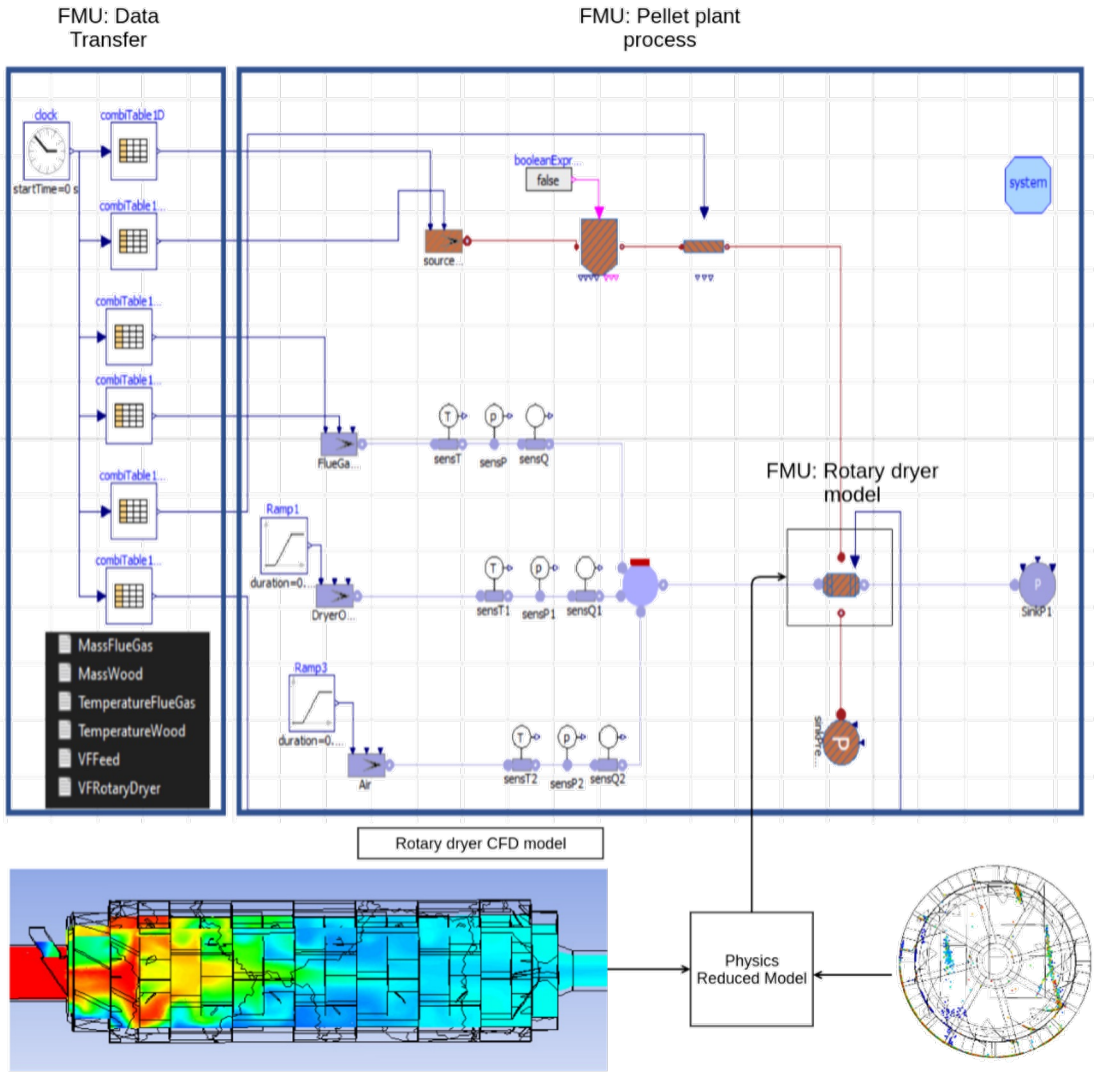
Methodology



Results

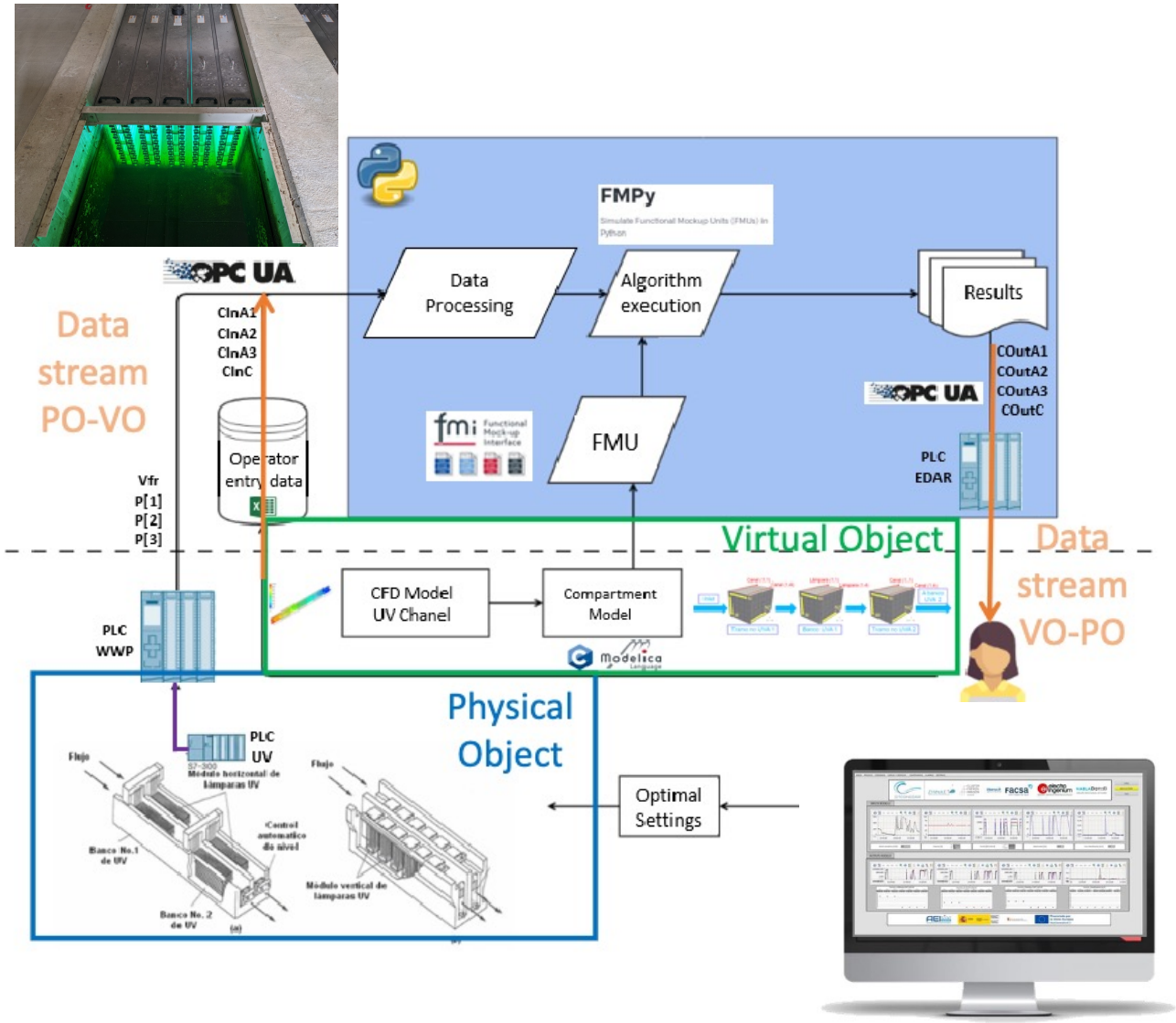


- Digital twin of a rotary biomass dryer
- Digital twin features:
  - Automatic communication with SCADA data
  - Automatic data processing
  - Real-time simulations of the operation of the rotary dryer using SCADA data as input
  - Selection of optimal operation configuration based on simulation results and data analysis
  - Co-simulation of the process and system control using FMUs
- The real-time model of the rotary dryer is developed from CFD simulations and Reduced Order Physics techniques



References: [European Biomass Conference](#) [Digital Twin Performance](#)

- Digital twin of a UV disinfection equipment for wastewater treatments
- This equipment accounts for 40% of the plant's electricity consumption
- Digital twin features:
  - Automatic communication with SCADA data
  - Automatic data processing
  - Real-time simulations of the operation using SCADA data as input
  - Selection of optimal operation configuration based on simulation results and data análisis
  - Co-simulation of the process and system control using FMUs
- The real-time model of the UV dsinfection equipment is developed from CFD simulations and Reduced Order Physics techniques



References: here

NABLADOT: EXAMPLES – DIGITAL TWIN

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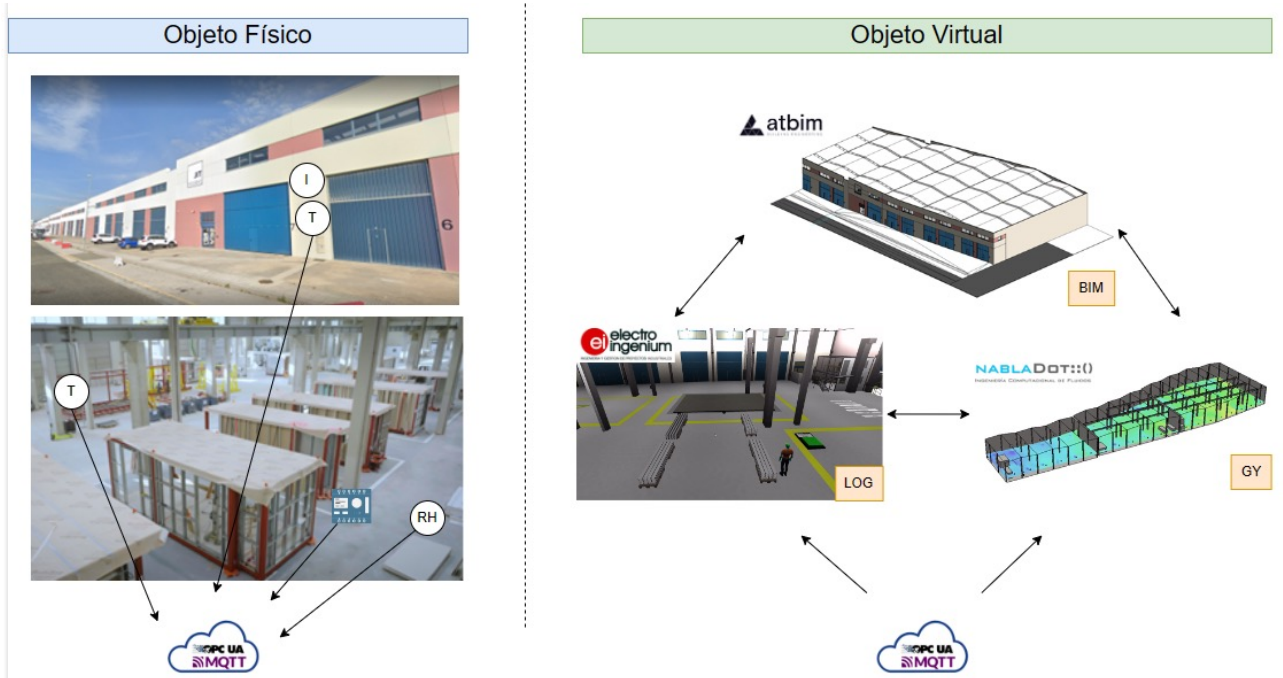
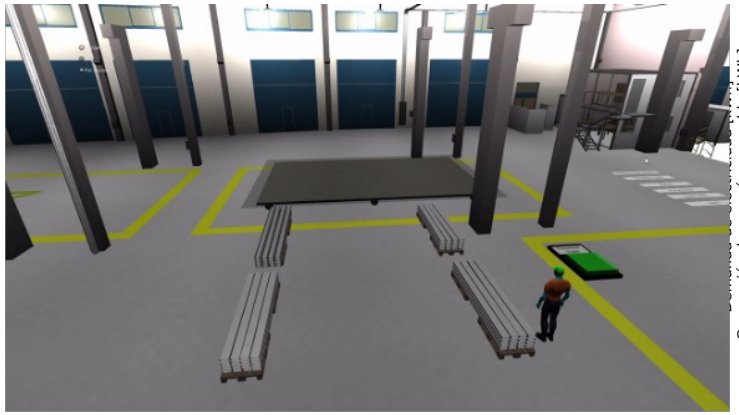
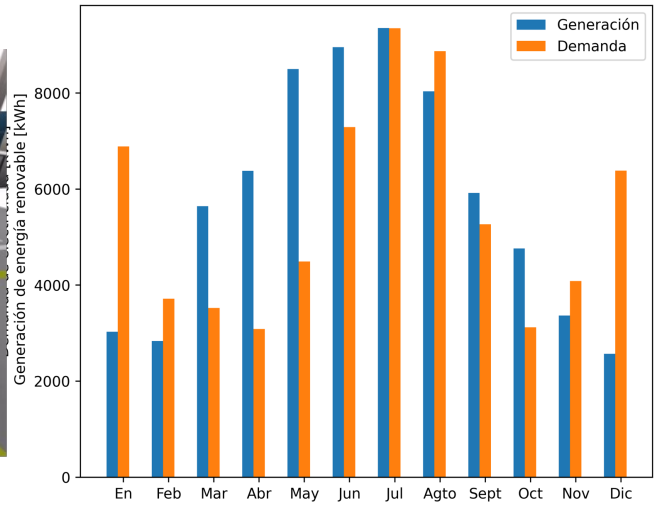
- Integration of BIM models, logistics models, and simulation
- Applied to the manufacturing industry (also applicable to other types of buildings).
- Characteristics:
  - Detailed geometry
  - Prediction of energy consumption/production, thermal comfort, and air quality
  - Simulation, visualization, and analysis of production systems and logistics processes to optimize material flow and resource utilization at all levels of your plant planning, from global facilities and local plants to specific production lines.
  - Reading real-time data from sensors and automated systems







- Project for the development of an innovative Digital Twin of Anaerobic Reactors for the Treatment of Industrial Wastewater
- Main Objectives:
  - Optimization of the operation (maximize biogas produced)
  - Avoid unexpected stops
  - Improve operator training
- Approach
  - Hybrid digital twin where data will be combined with real-time models based on synthetic data (from CFD simulations)
- The project is under development (funded by the Eurostars call)
- Project leader: Nabladot, S.L.

NABLADOT: EXAMPLES – DIGITAL TWIN & EDGE - CLOUD

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- Integrated Cloud-Edge System for Energy and Weather AI-based Power Prediction.Main Objectives:
  - Develop a service for short-term prediction (nowcasting) of the energy generation in photovoltaic plants using the FLUIDOS architecture https://fluidos.eu/
- Approach
  - Combination of sensor data, meteorological simulations, and AI techniques to improve nowcasting accuracy; and the creation of a service that can be easily replicated in any PV power plant.
- The project is under development (funded by FLUIDOS second open call)
- Project leader: Nabladot, S.L.

- Virtual sensors
  - Air quality in pig farms
  - Air quality is assessed across the entire farm using a combination of (few) air quality measurements and simulations
  - https://www.imasporc.com/proyectos/proyecto-amonia-4-0/
- Energy audit in real time
  - Implemented in the agrifood industry,
  - Sensors, data processing, and mathematical algorithms are used to determine the efficiency of equipment or processes in real time. This helps to issue alerts when efficiency decreases due to improper operation, equipment deterioration, or maintenance needs and to identify opportunities for energy improvement in equipment or processes.
  - The calculations can be done using local devices (Edge computing) without the need for cloud computing.

- Please don't hesitate to contact us if you are interested

CONTACT

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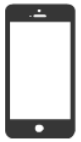
http://www.nabladot.com



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