
Fernando Manuel Gómez Castro

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Professional Profile

I am a Renewable Energy Research and Development Engineer with more than ten years of experience working in advanced solar energy technologies, engineering simulation, and experimental research. My professional work focuses on developing and optimizing renewable energy systems that improve sustainability and energy efficiency in buildings and infrastructure.

My expertise lies in combining experimental engineering research with advanced computational modeling to analyze complex solar energy systems. I specialize in solar thermal regeneration technologies, photovoltaic system performance modeling, and sustainable cooling systems that contribute to reducing global energy consumption and environmental impact.

During my doctoral research at the University of Kassel, I led a comprehensive engineering research project focused on solar collector/regenerator systems used in liquid desiccant air-conditioning technologies. This research initiative involved managing a €360,000 research project budget, designing experimental testing systems, developing computational models, and evaluating heat and mass transfer processes in solar thermal systems.

Throughout my academic and professional career, I have collaborated with international research teams, contributed to scientific publications, and presented research findings at major renewable energy conferences. My work supports the development of sustainable building technologies and innovative renewable energy systems.

Core Professional Competencies

- Renewable Energy Systems Engineering
- Solar Thermal Energy Technologies
- Solar Air-Conditioning Systems
- Photovoltaic System Modeling
- Computational Engineering Simulation
- Heat and Mass Transfer Analysis
- Experimental System Testing and Validation
- Energy System Optimization
- Parametric Simulation Studies
- Scientific Research and Technical Documentation
- Data Analysis and Engineering Interpretation
- Multidisciplinary Engineering Collaboration

Technical Expertise

- Engineering Simulation & Modeling Tools

COMSOL Multiphysics
Wolfram Mathematica
F-Chart EES
Ray-Tracing Simulation Tools
Programming Languages

Fortran
C++

Engineering and Data Analysis Platforms

OriginPro
IBM SPSS Statistics
AutoCAD
Microsoft Office Suite
Microsoft Project
Microsoft Visio

These platforms support my work in engineering simulations, system performance modeling, data interpretation, and renewable energy system optimization.

Major Engineering & Research Achievements

Doctoral Research Project Leadership

During my PhD research, I led an engineering research program focused on improving the efficiency of solar thermal regeneration systems used in liquid desiccant air-conditioning technologies.

Key aspects of this project included:

- Managing a research budget of approximately €360,000
- Designing experimental solar regenerator test systems
- Conducting advanced heat and mass transfer analysis
- Developing simulation models to evaluate system performance
- Validating simulation results through laboratory experiments

This work contributed to improving the design and scalability of solar cooling technologies for sustainable building systems.

Solar Thermal System Development

A central focus of my research has been the development and optimization of solar collector/regenerator technologies used in solar-powered cooling systems.

My contributions include:

- Experimental testing of solar regeneration systems
- Parametric simulation studies to optimize system performance
- Evaluation of energy efficiency and system scalability
- Development of improved design configurations for solar collectors

These efforts support the advancement of renewable cooling technologies, which are increasingly important in reducing energy consumption in buildings.

Photovoltaic Modeling and Energy Performance Analysis

I have developed computational models designed to analyze photovoltaic module performance under complex environmental conditions, including non-uniform radiation patterns and temperature variations.

These models enable engineers to:

- Predict photovoltaic energy production

- Analyze thermal behavior in PV modules
 - Improve system design and performance reliability
 - Understand the impact of environmental conditions on solar energy output
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Ray-Tracing Analysis for Solar System Design

One of my technical contributions includes the development of ray-tracing simulation tools used to evaluate shading effects in building-integrated photovoltaic (BIPV) systems.

These tools allow engineers to better understand how urban environments affect solar performance and assist in designing more efficient solar installations.

Professional Experience Highlights

Scientific Employee

Esslingen University of Applied Sciences – Germany

In this role, I conducted advanced modeling and evaluation of rainwater-based cooling systems and cistern infrastructure aimed at improving sustainable water and energy usage in building systems.

My responsibilities included:

- Engineering simulation and system performance modeling
 - Analysis of experimental data
 - Technical documentation and research reporting
 - Supporting engineering decisions for sustainable infrastructure projects
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Doctoral Researcher

University of Kassel – Germany

As a doctoral researcher, I conducted extensive multidisciplinary research on solar collector/regenerator systems used in liquid desiccant air-conditioning technologies.

My work involved:

- Developing computational models using Wolfram Mathematica
 - Conducting controlled laboratory experiments
 - Analyzing heat and mass transfer processes
 - Publishing scientific research findings
 - Presenting research at international conferences
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Academic Researcher

Stuttgart University of Applied Sciences – Germany

During my work at Stuttgart University of Applied Sciences, I conducted research on solar thermal regeneration systems used for renewable air-conditioning technologies.

Key responsibilities included:

- Coordinating solar thermal experiments
- Performing system sizing and engineering evaluation
- Verifying simulation models using COMSOL Multiphysics and EES
- Supervising international engineering students on research projects

Selected Research Publications

I have contributed to several international research publications and conference proceedings focused on renewable energy engineering.

Selected research topics include:

- Heat and mass transfer in solar collector/regenerator systems
- Performance optimization of solar thermal regeneration technologies
- Photovoltaic module performance under non-uniform radiation
- Solar air-conditioning systems and sustainable cooling technologies

My research has been presented at major international conferences including:

EuroSun Conference

Solar World Congress (SWC)

International Conference on Energy Sustainability

These publications contribute to advancing knowledge in renewable energy systems and sustainable building technologies.

Academic Education

Ph.D. Mechanical Engineering

University of Kassel – Germany

My doctoral research focused on the theoretical and experimental investigation of heat and mass transfer processes in solar collector/regenerator systems used in liquid desiccant air-conditioning technologies.

Master of Science – Sustainable Energy Competence

Stuttgart University of Applied Sciences – Germany

Graduate studies focused on renewable energy technologies, thermodynamics, scientific modeling, and sustainable energy resource management.

My master's thesis analyzed the thermal behavior of photovoltaic modules under uneven illumination conditions in tropical climates.

Bachelor of Science – Engineering Physics

Autonomous University of Yucatan – Mexico

My undergraduate research focused on photovoltaic system modeling and solar radiation distribution using computational simulation techniques.

Professional Impact

My professional work aims to contribute to the advancement of renewable energy technologies and sustainable infrastructure systems. By integrating experimental engineering research with computational modeling, I develop solutions that improve the efficiency and performance of solar energy technologies.

Through scientific research, international collaboration, and engineering innovation, I continue to support the development of renewable energy systems that reduce environmental impact and promote long-term sustainability.

Sincerely,

Fernando Manuel Gómez Castro

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