

Part A. PERSONAL INFORMATION

First name	Ana		
Family name	Lazaro Fernandez		
Open Researcher and Contributor ID (ORCID) (*)	0000-0001-7360-4188		

A.1. Current position

Position	Associate professor, TU
Initial date	3th, July 2017
Institution	Universidad de Zaragoza
Department/Center	Departamento de Ingeniería Mecánica. Area: Máquinas y Motores Térmicos
Country	Spain
Key words	Thermal Engineering, Energy Integration, HVAC, Thermal Energy Storage

A.2. Previous positions (research activity interruptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
05/10/2014-02/07/2017	Profesor Contratado Doctor
08/10/2009-04/10/2014	Lecturer (Profesor Ayudante Doctor) *2010 and 2013, 5 months maternity leave*
05/10/2006-07/10/2009	Assistant Lecturer (Profesor Ayudante)

A.3. Education

PhD, Licensed, Graduate	University	Year
PhD	University of Zaragoza	2009
Chemical Engineer	University of Zaragoza	2005

Part B. CV SUMMARY (*max. 5000 characters, including spaces*)

Ana Lázaro Fernández, Chemical Engineer from the University of Zaragoza (2004), is Associate professor at the Thermal Engineering Division of the Mechanical Engineering Department at the University of Zaragoza, Spain. She has taught courses in Thermodynamics, Thermal Engineering, Heat Transfer, Energy Optimization and HVAC.

In 2009 she obtained the PhD degree with European Mention under the Interuniversity Doctorate Program on HVAC and Energy Efficiency in buildings. Since 2005 she is member and currently co-leading (January 2023) the Research Group on Thermal Engineering and Energy Systems (<http://i3a.unizar.es/es/content/gitse>). This group is recognized as a reference research group by the Government of Aragon and is part of the Engineering Research Institute of Aragón (<http://i3a.unizar.es>). She is from October 2023 Infrastructures and services deputy director of the Engineering Research Institute of Aragón.

Her current research is focused on energy integration, more specifically on the integration of in thermal energy storage system in polygeneration systems. She leded two public funded projects on this topic: DISTRITES-ENE2014-57262-R, HYBRITES-ENE2017-87711-R and is currently co-leading a third one TRIGENSOL-PID2020-115500RB-I00. She participated in the EERA JP Smart Cities executive committee and in the SHC-Task 55 and task 68 of the International Energy Agency. Besides the regular participation in international conferences in this field, in 2021 she chaired the Sixth International Conference on Polygeneration (ICP2021). Currently she is coordinating the project "Innovative Strategies for Sustainable and Smart Polygeneration Systems: A Focus on Life Cycle Assessment, Predictive Control Models, and Tailored Thermal Energy Storage Systems" (Sustain³), grant PID2023-148958OB-C21.

Her research starts focused on the field of thermal energy storage (TES) using Phase change materials (PCM), heat exchangers, PCM slurries and thermophysical properties determination. Energy efficiency in buildings was the main application for this research. She has participated or lead 18 public contracts (3 of them were European, e.g. COST ACTION TU0802) and 15 private contracts with industry. She was member of the User Selection Panel of the project SFERA-III (H2020-INFRAIA-2018-1, 823802). Currently she leded a coordinated research

project with University of Basque Country and CIEMAT entitled “Smart Thermal Energy storage for decarbonization of the energy sector, STES4D (TED2021-131061B-C31).

Her research activities are also devoted to collaborating with different research stake holders and institutions to promote an effective technological development. She participated in several working groups on TES in the framework of International Energy Agency (ECES annexes 17, 20 and joint ECES-SHC 42 and 58). She coordinated one subtask of the task 58 and of the SHC task 67. She coordinated also the crosscutting working group on thermal energy storage of the technological platform FUTURED. She is member of the HVAC&R technical association (ATECYR). She was co-advisor of two PhD Thesis. She carried out short research-stays at ZAE Bayern (Germany, 3 months, 2005), University of Birmingham (UK, 1 week, 2017), The Aeronautical Technological Institute (Brazil, 2 weeks, 2019). She is author of more than 40 papers indexed in Scopus with more than 3500 cites and her Scopus h-index is 22 (May 2025). Number of publications in the first quartile (Q1):33. She has been granted with 3 periods of six years research (2005-2010,2011-2016, 2017-2022).

During her academic career she has collaborate with companies in both, research projects (Abengoa, CIAT, Valeo, BSH among others) and contracts, managing with Dr. Monica Deldado the thermophysical properties laboratory at the University of Zaragoza. Currently, she is advisor of an industry PhD, Hector Peña in the framework of one of these collaborations with industry.

Part C. RELEVANT MERITS

C.1. Publications

1. Rinaldi, G.,Lázaro, A.,Delgado, M.,Marín, J. M. ,Verda, V., 2024, Use of a low-cost phase change material emulsion in de-centralized thermal energy storage for district heating network enlargement. *Energy*, 306, 132517, <https://doi.org/10.1016/j.energy.2024.132517>
2. Pinto, E.S.,Serra, L.M., Lazaro, A. 2022, Energy communities approach applied to optimize polygeneration systems in residential buildings: Case study in Zaragoza, Spain. *Sustainable cities and society*, 82, <https://doi.org/10.1016/j.scs.2022.103885>
3. Pina, E.A., Lozano, M. A., Serra, L.M., Hernández, A., Lázaro, A.. 2021. Design and thermoeconomic analysis of a solar parabolic trough – ORC – biomass cooling plant for a commercial center *SOLAR ENERGY*. 215, pp.92-107. ISSN 0038-092X. <https://doi.org/10.1016/j.solener.2020.11.08>
4. Pinto, E.S., Serra, L.M., Lázaro, A. Optimization of the design of polygeneration systems for the residential sector under different self-consumption regulations(2020) *International Journal of Energy Research*, 44 (14), pp. 11248-11273. 7 times cited DOI: <https://doi.org/10.1002/er.5738>
5. Pina, E.A., Serra, L.M., Lozano, M.A., Hernández, A., Lázaro, A Comparative analysis and design of a solar-based parabolic trough-ORC cogeneration plant for a commercial center(2020) *Energies*, 13 (18), art. no. 4807, 2 times citedDOI: <https://doi.org/10.3390/en13184807>
6. Pinto, E.S., Serra, L.M., Lázaro, A. Evaluation of methods to select representative days for the optimization of polygeneration systems (2020) *Renewable Energy*, 151, pp. 488-502. 14 times cited DOI: <https://doi.org/10.1016/j.renene.2019.11.048>
7. Guillén-Lambea, S., Carvalho, M., Delgado, M., Lazaro, A. Sustainable enhancement of district heating and cooling configurations by combining thermal energy storage and life cycle assessment (2020) *Clean Technologies and Environmental Policy*, 6 times cited DOI: <https://doi.org/10.1007/s10098-020-01941-9>
8. Lazaro, A., Peñalosa, C., Solé, A., Diarce, G., Haussmann, T., Fois, M., Zalba, B., Gshwander, S., Cabeza, L.F. Intercomparative tests on phase change materials characterisation with differential scanning calorimeter (2013) *Applied Energy*, 109, pp. 415-420. 100 times cited DOI: <https://doi.org/10.1016/j.apenergy.2012.11.045>
9. Delgado, M., Lázaro, A., Mazo, J., Marín, J.M., Zalba, B. Experimental analysis of a microencapsulated PCM slurry as thermal storage system and as heat transfer fluid in

laminar Flow (2012) Applied Thermal Engineering, 36 (1), pp. 370-377. 73 times cited DOI: <https://doi.org/10.1016/j.applthermaleng.2011.10.050>

10. Delgado, M., Lázaro, A., Mazo, J., Zalba, B. Review on phase change material emulsions and microencapsulated phase change material slurries: Materials, heat transfer studies and applications (2012) Renewable and Sustainable Energy Reviews, 16 (1), pp. 253-273. 305 times cited DOI: <https://doi.org/10.1016/j.rser.2011.07.152>

C.2. Congress

More than 60 conference contributions in international conferences (Eurosun, Solar World Conferences, Enerstock, International Conference on Polygeneration among others), 3 out of them are invited papers and more than 15 contributions to national conferences.

C.3. Research projects,

Sustain³ Innovative Strategies for Sustainable and Smart Polygeneration Systems: A Focus on Life Cycle Assessment, Predictive Control Models, and Tailored Thermal Energy Storage Systems Code: PID2023-148958OB-C21 Funding Entity: AGENCIA ESTATAL DE INVESTIGACIÓN Participant entity: I3A - Universidad de Zaragoza (coordinator) and University Basque Country Duration: 3 years, since 01/09/2024-31/12/2027 Total amount: 175.00 € Main researcher: Ana Lázaro Fernández

STES4D Smart Thermal Energy Storage for decarbonization of the energy sector: energy integration Code: TED2021-131061B-C31: Funding Entity: AGENCIA ESTATAL DE INVESTIGACIÓN Participant entity: I3A - Universidad de Zaragoza Duration: 2 years, since 01/12/2022 - 30/11/2024 Total amount: 126.500 € Main researcher: Ana Lázaro Fernández

TRIGEN-SOL-Synthesis and optimisation of carbon neutral trigeneration systems based on solar thermal energy and biomass assisted by thermal energy storage Code: PID2020-115500RB-I00 Funding Entity: AGENCIA ESTATAL DE INVESTIGACIÓN Participant entity: I3A - Universidad de Zaragoza Duration: 3 years, since 01/09/2021 till 31/08/2024 Total amount: 193.600 € Main researcher: Ana Lázaro Fernández; Luis María Serra de Renobales

IEA-SHC Task 68 EFFICIENT SOLAR DISTRICT HEATING SYSTEMS. Countries: Austria, China, Denmark, Poland, Germany, UK, Netherlands, Spain, Switzerland, Sweden, Turkey, Duration April, 2022 - March, 2025 Main researcher: Dr. Klaus Lichtenegger (Austria)

IEA-SHC Task 67 Compact Thermal Energy Storage Materials within Components within Systems Countries: Austria, Belgium, Canada, Denmark, France, Germany, Italy, Netherlands, Portugal, Slovenia, Spain, Switzerland, Sweden, Turkey, UK, USA Duration October, 2021 - September, 2024 Main researcher: Wim Van Helden (Austria)// Andreas Hauer, Germany Subtask leader: Ana Lazaro

HybriTES-Thermal Energy Storage Integration into hybrid thermal generation in District Heating and Cooling using Heat Pump, Solar Energy and Biomass. Code: ENE2017-87711-R.

Funding Entity: MINECO (Programa estatal de I+D+i orientada a Retos)

Participant entity: I3A - Universidad de Zaragoza Duration: 3 years, since 01/01/2018 till 31/12/2020. Amount of funding: 120.000 € Main researcher: Ana Lázaro Fernández

IEA-SHC Task 55 Integrating Large SHC Systems into DHC Networks Participant countries: Austria, Canada, China, Denmark, Germany, Spain Duration: 4 years. Since 1 September 2016 till 31 August 2020 Main Researcher: Sabine Putz (SOLID, Austria)

DISTRITES: Integration of Thermal Energy Storage (TES) into District Heating and Cooling systems to increase the solar fraction and renewable energy sources. Code: ENE2014-57262R. Funding Entity: MINECO - Plan Nacional de I+D+I (Programa Energía) Participant entity: I3A - Universidad de Zaragoza Duration: 3 years, since 2015 to 2017 Amount of funding: 214.170 € Main researcher: Ana Lázaro Fernández

IEA-SHC Task 45 Large Scale Solar District Heating and Cooling Systems

Countries: Austria, Canada, China, Denmark, France, Germany, Italy, Spain. Duration: 4 years. Since 1 January 2011 till 31 December 2014 Main researcher: Jan Erik Nielsen (PlanEnergi Zealand, Denmark)

IEA-SHC Task 42 Compact Thermal Energy Storage. Countries: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Spain, Switzerland, Sweden, Turkey, UK, USA Duration January 2009 — December 2015. Main researcher: Matthias Rommel Switzerland// Andreas Hauer, Germany

Joint Action Plan on Energy Efficiency for Smart Cities Funding Entity: Campus Iberus. Participant entity: I3A - Universidad de Zaragoza Duration: 20/11/2015-act. Main researcher: Mónica Delgado Gracia

C.4. Contracts, technological or transfer merits,

ESTUDIO TÉRMICO PARA EL TRANSPORTE DE SÓLIDOS Y LÍQUIDOS A BAJA TEMPERATURA COOL EVERYWHERE, S.L.. IP: Ana Lázaro Fernández. (Escuela de Ingeniería y Arquitectura - Universidad de Zaragoza). 08/02/2016-P2M11D. 4.533,87 €.

HEAT STORAGE BSH ELECTRODOMESTICOS ESPAÑA, S.A.. IP: Ana Lázaro Fernández. (Escuela de Ingeniería y Arquitectura - Universidad de Zaragoza). 01/06/2014-P1Y4M. 111.035,65 €.

IMPARTICIÓN DEL CURSO: MATERIALES DE CAMBIO DE FASE EN EL SECTOR TEXTIL Y DEL CALZADO CENTRO TECNOLÓGICO DEL CALZADO. IP: Ana Lázaro Fernández. (Escuela de Ingeniería y Arquitectura - Universidad de Zaragoza). 15/05/2012-P1M1D. 2.750 €.

ALMACENAMIENTO DE ENERGÍA TÉRMICA MEDIANTE MATERIALES DE CAMBIO DE FASE Y SU APLICACIÓN A LOS SISTEMAS DE CLIMATIZACIÓN MEDIANTE ENERGÍA SOLAR COMPAÑÍA INDUSTRIAL DE APLICACIONES TERMICAS IP: M^a Belén Zalba Nonay (Escuela de Ingeniería y Arquitectura - Universidad de Zaragoza). 01/10/2008-31/12/2012-157.077,92 Euros

Private contracts in the Thermophysical Properties Laboratory, global amount>28.000€