







IGNACIO VERDUGO

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Industrial Engineer, Master and PhD in engineering - ENTJ

INTRODUCTION

As an Industrial Engineer, I specialize in leading multidisciplinary teams for the implementation of advanced technologies that drive digital transformation in industry and academia. My expertise includes the integration of Industry 4.0 solutions, such as new fuels, artificial intelligence, and machine learning, to optimize operational processes and improve real-time decision-making. I am particularly focused on the development and adoption of sustainable energy sources, such as green hydrogen, which I consider a key piece in the transition to a cleaner and more efficient energy model. Through these emerging technologies, I seek not only to generate business value but also to contribute to the development of a more sustainable future for the industry. My leadership is focused on guiding teams towards continuous innovation, fostering an environment of collaboration and adaptability to meet the challenges of today's technological environment, and ensuring that the solutions implemented are both strategic and scalable.



ACADEMIC BACKGROUND

Universidad Técnica Federico Santa María, Chile

September 2021 - August 2025

PhD. in Applied Engineering

Renewable liquefied gas (e-LG): a carbon-neutral alternative to LPG for sustainable energy transition, together with GASCO (Chile)

Universidad Técnica Federico Santa María, Chile

March 2018 - June 2020

Master of Sciences in Industrial Engineering

Candle flame soot sizing by planar time-resolved laser-induced incandescence

Universidad Técnica Federico Santa María, Chile

March 2012 - June 2020

Industrial Engineering

COURSES

Massachusetts Institute of Technology

February 2021 - April 2021

Machine Learning: Tecnología en la toma de decisiones

www.credential.net/ff000148-43ff-48e1-b525-f580fe75d293

Google

May 2024

Introduction to AI and Machine Learning on Google Cloud

<https://tinyurl.com/2hcurat2>

GiZ-PtX Hub

October 2024

Renewable Power-to-X basics (spanish)

<https://tinyurl.com/mry8yvkn>

Santander X

May 2025

Make better data-driven decisions: Power BI (spanish)

WORK EXPERIENCE

SIDELEC LTDA. – Electrical Engineering Services Company

January 2023 – January 2025

- “Contract Administrator – Substation Protection Replacement Projects: Alameda, Chumaquito, Lo Miranda, Cachapoal”

- Research and Development Project Engineer. See projects developed in the Project Experience section.

- “General Coordinator of the Fair”

PROJECT EXPERIENCE SELECTION

- “Gap Diagnosis in Entrepreneurship and Innovation for Technical-Professional and Rural High Schools in Regions V, VI, and XII”

- “Technical Feasibility of Incorporating Variable Proportions of Butane in Liquefied Petroleum Gas (LPG) in Chile”

- “Scientometric Data Management Workshop: Application to Articles and Patents”

- “Technical Feasibility of Incorporating Ratios of DME Variables in Propane in Chile DME Variables in Propane in Chile”

- “Additive studies for blending: Gasoline and Diesel”

- “Performance of Propane Mixtures with H_2 in different proportions”

- “Diploma in Efficient Energy Conversion of the Rotary Kiln: Clean Combustion and Reduction of Thermal Losses”

- “Incorporation of Methanol to Gasoline: Analysis of combustion, emissions, carbon footprint and costs”

- “Pre-feasibility study for the production of synthetic fuels in Chile”

- “Greener Atacama: Implementation of ESG and sustainability framework in companies”

RESEARCH EXPERIENCE

- Towards cleaner combustion: Characterization of the sooting propensity of biofuels. Fondecyt project #1161453. ANID, Chile. As student.
- Understanding Wildfire Hazards Posed by. Ignition in Continuous and Discontinuous. PIA/ACT172095 (Hi-Map Project). ANID, Chile. As student.
- Soot production from liquid fuels in laminar diffusion flames: application to gasoline surrogates. Fondecyt project #1191850. ANID, Chile. As technical staff.

- Understanding Soot Evolution and Morphology in Non-Premixed Steady and Forced Flames. Fondecyt project #1191758. ANID, Chile. As external support.

Research visit in CORIA Lab, Normandie Univ, INSA Rouen Normandie, France

May 2023

- Non-intrusive experimental measurements of soot concentration, velocity, temperature and its maturity, as well as species such as OH and PAHs generated by a biofuel flame. ECOS/ANID C19E01.

LECTURER EXPERIENCE

Part-time lecturer in Universidad Técnica Federico Santa María, Chile

July 2020 - present

- *Introduction to energy project management. Industrial engineering course.*
- *Introduction to Industrial Engineering. Industrial engineering course.*
- *Introduction to Industrial Engineering. Master in Asset Management (MGA) course.*

ISI PUBLICATION SELECTION

1. Cepeda, F. , Nobakht, A., **Verdugo, I.**, Fuentes, A., Dworkin S., Karatas E., The effect of pressure over soot maturity in laminar ethylene flames, *Combustion and Flame*, 274-113977 (2025). <https://doi.org/10.1016/j.combustflame.2025.113977>
2. A. García, **I. Verdugo**, J.J. Cruz, F. Escudero, ..., R. Demarco, J. Yon, A. Fuentes, Effect of hydrogen addition on soot maturity and volume fraction of ethylene non-premixed flames under different oxygen indices, *Proceedings of the Combustion Institute*, 40 (2024). <https://doi.org/10.1016/j.proci.2024.105539>
3. M. Littin, F. Escudero, J.J. Cruz, **I. Verdugo**, D. Chen, R. Demarco, A. Fuentes, Understanding soot production in a Jet A-1 laminar coflow non-premixed flame, *Proceedings of the Combustion Institute*, 40 (2024). <https://doi.org/10.1016/j.proci.2024.105534>
4. C. Barrera, V. Castro, F. Escudero, J.J. Cruz, **I. Verdugo**, J. Yon, A. Fuentes, Maturity characterization of soot in laminar coflow diffusion flames of methane/anisole under different oxygen indices, *Experimental Thermal and Fluid Science*, 111101 (2024). <https://doi.org/10.1016/j.expthermflusci.2023.111101>
5. Cruz, J.J, Escudero, F, **Verdugo, I.**, Rivera, P., Gutiérrez-Cáceres, N., Yon, J., Fuentes, A., Sooting propensity and maturity of gasoline/anisole blends in a laminar coflow diffusion flame, *Fuel*, 345 (2023), <https://doi.org/10.1016/j.fuel.2023.128091>.
6. Escudero, F., Cruz, J.J., **Verdugo, I.**, Gutiérrez-Cáceres N., Liu F., Yon J., Fuentes, A., Effect of maturity on soot volume fraction measurements using the AC-LII technique in a laminar coflow ethylene diffusion flame, *Proceedings of the Combustion Institute*, 39 (2022). <https://doi.org/10.1016/j.proci.2022.10.013>
7. Escudero, F., Demarco, R., Cruz, J.J., **Verdugo, I.**, Carvajal, G., Olivares, G., Valenzuela, F., Han, D., Lin, H., Fuentes, A., Determining spatially-resolved thermal radiation from non-intrusive measurements of soot properties, *Applied Thermal Engineering*, 215 (2022). <https://doi.org/10.1016/j.applthermaleng.2022.118968>
8. Cruz, J.J., **Verdugo, I.**, Gutiérrez-Cáceres, N., Escudero, F., Demarco, R., Liu, F., Yon, J., Chen, D., Fuentes, A., Soot Volume Fraction Measurements by Auto Compensated Laser-Induced Incandescence in Diffusion Flames Generated by Ethylene Pool Fire, *Frontiers in Mechanical Engineering*, 7 (2021). <https://doi.org/10.3389/fmech.2021.744283>
9. **Verdugo, I.**, Cruz, J.J., Álvarez, E., Reszka, P., Figueira da Silva, L. F., Fuentes, A., Candle flame soot sizing by planar time-resolved laser-induced incandescence. *Sci Rep - Nature* 10, 11364 (2020). <https://doi.org/10.1038/s41598-020-68256-z>
10. Patiño, F. , Cruz, J.J., **Verdugo, I.**, Morán, J., Consalvi, J.L., Liu, F., Du, X., Fuentes, A., Soot primary particle sizing in a n-heptane doped methane/air laminar coflow diffusion flame by planar two-color TiRe-LII and TEM image analysis, *Fuel* 266, 117030 (2020). <https://doi.org/10.1016/j.fuel.2020.117030>

ISI PUBLICATIONS CURRENTLY UNDER REVIEW

1. Avendaño, C., **Verdugo, I.**, Bustos, F., Jerez, A., Demarco, R., Multilevel feasibility assessment for solar potential: Solar Sustainability Score (S3), Preparing for Energy.
2. Sagredo, S., **Verdugo, I.**, Martin, P., Fuentes, A., Forecasting renewable LPG demand in the long-term for the determination of public policies, Preparing for Energy.
3. Alarcón, F., Littin, M. **Verdugo, I.**, Fuentes, A., Demarco, R., Mechanistic investigation of soot and NO_x suppression in iso-carbon propane coflow flames by Dimethyl Ether addition, Preparing for Journal of the Energy Institute.
4. Carrasco, F., Kristjanpoller, F., **Verdugo, I.**, Viveros, P., Integrating advanced forecasting with dispatch policy to support decarbonization goals, Preparing for Utilities Policy.
5. **Verdugo, I.**, Martin, P., Escudero, F., Pinto, P.E., Demarco, R., Yon, J., Fuentes, A., Soot propensity of a new renewable carbon neutral LPG fuel, Preparing for Proceedings of the Combustion Institute.
6. Binder, B., **Verdugo, I.**, Escudero, F., Demarco, R., Comprehensive Feasibility Study for the Implementation of a Lithium-Ion Battery Recycling Plant in Chile, Preparing for Journal of Cleaner Production.

PARTICIPATION IN CONGRESS

- Participation at the Chilean-German Summer School on Power-to-X!, Universidad de Magallanes. January 2025, Punta Arenas, Chile.
- **Verdugo, I.**, Martin P., Gonzalez E., Fuentes, A., Electric synthetic liquified gas (e-LG) combustion properties assessment, **Accepted** at the 2nd Global Science Conference, LPG Week. November 2024, Cape Town, South Africa.
- **Verdugo, I.**, Martin P., Richard F., Fuentes, A., Electric synthetic liquified gas (e-LG) compatibility assessment, **Accepted** at the 1st Global Science Conference, LPG Week. November 2023, Rome, Italy.
- Participation at the Princeton-Combustion Institute Summer School on Combustion and the Environment, Princeton University. June 2022, Princeton, United States.

TECHNICAL SKILLS

Programming:	Python, SQL, MATLAB, FORTRAN, ML models, for data treatment and visualization
Softwares:	MS Project, RETScreen, Crystal ball, KB3, BPM, AutoCAD, Inventor, SolidWorks, ProEngineer, PowerBI
Skills:	Leadership, Teamwork, Project management, Data treatment, visualization, and presentation of results
Topics of interest:	Energy, Projects, PtX, ESG governance, Sustainability, Research, Innovation, Green Hydrogen, Data Science, Machine Learning, Artificial Intelligence
Languages:	Spanish, English, Portuguese

PROFESSIONAL REFERENCES

Rodrigo Demarco:	Adjunct Professor UTFSM, 📞 (56 9) 52383893, ✉️ rodrigo.demarco@usm.cl
Esteban Villarroel:	Comercial Manager SIDELEC, 📞 (56 9) 40270670, ✉️ evillarroel@sidelec.cl