Marcelo Andre Muro Alvarado

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About me

Results-driven Control Engineering Researcher with a Master's Degree in Automation & Control Engineering. Skilled in object-oriented modelling, simulation, and control system design, with a focus on innovative thermal power plants. Proven 3-year experience as a researcher, complemented by industry experience as a maintenance engineer in mining. Fluent in English and Spanish, with professional working proficiency in Italian.

Education

Politecnico di Milano, Master of Science in *Automation and Control Engineering* — Milan, ITALY, 2019 – 2021

- GPA: 4.0/4.0
- **Coursework:** Advanced Process Control, Automation of Energy Systems, Software Engineering.
- **Thesis project:** Modelling, simulation and control of the Allam cycle.

Universidad Nacional de Ingenieria, Bachelor of Science in *Mechatronics Engineering* — Lima, PERU, 2010 – 2013

- GPA: 3.8/4.0
- **Coursework:** Process Control, Numerical Analysis, Analysis & Control of Robots.
- **Thesis project:** Design of a Drum Level Fuzzy Controller of a Heat Recovery Boiler.

Experience

Ricerca sul Sistema Energetico, Researcher — Milan, ITALY, 2023 – present

- Developed an open-source Modelica library for simulating and optimizing District Heating Networks, using experimental data to enhance energy flexibility within multi-energy systems.
- Designed and validated simulation models for hydrogen blending in natural gas networks, focusing on gas quality assessment and improving network dynamics through advanced modeling techniques.

Politecnico di Milano, Research Fellow — Milan, ITALY, 2021 – 2023

- Modeled and simulated an oxy-fuel combustion plant, contributing to the development of low-carbon thermal power generation technologies.
- Developed a model-based control system using Modelica, integrating both traditional and advanced control strategies to enhance system flexibility and performance.

Politecnico di Milano, Masters Student — Milan, ITALY, 2019 – 2021

- Specialized in automation and control system design, focusing on modeling, simulation, and advanced control techniques such as Linear Quadratic and Model Predictive Control.
- Conducted a master's thesis on the control of advanced thermal power generation systems, applying model-based control approaches to improve flexibility and performance.

Nexa Resources, Contract Management Analyst — Lima/Pasco, PERU, 2018 – 2019

- Managed service contracts by evaluating performance, optimizing costs, and identifying value-capturing opportunities, supporting maintenance managers in pro-

duction operations.

- Analyzed contract performance through KPIs, financial projections, and cost simulations, ensuring alignment with budget and forecast.
- Implemented improvement strategies to enhance contract efficiency, serving as the interface between outsourced services and operational areas.

Nexa Resources, Maintenance Engineer — Lima, PERU — 2015 – 2018

- Managed contract services and the maintenance inspection department, overseeing seven direct employees and over 100 outsourced personnel while ensuring compliance with HSE regulations.
- Coordinated maintenance inspections, supervised execution, and contributed to safety, environmental care, and continuous improvement in maintenance activities.
- Developed preventive maintenance plans, defined technical scopes for tenders, and evaluated technical proposals for outsourced maintenance contracts.

Nexa Resources, Maintenance Trainee Engineer — Lima, PERU — 2014 – 2015

- Applied technical knowledge in maintenance engineering within the mining industry, supporting preventive maintenance planning and failure analysis of critical equipment.
- Developed technical scopes and maintenance programs for sustaining projects and plant shutdowns, utilizing PMI methodology and risk analysis.
- Supervised key maintenance activities during plant shutdowns, monitored spare parts availability, and participated in tenders and technical evaluations.

Publications

Implementation of an Experimental Facility for District Heating Networks Flexibility Assessment — Oct 2024

C. Anderis, ***M. A. Muro Alvarado***, R. Lazzari

10.23919/AEIT63317.2024.10736713

Development and Experimental Validation of an Open-Source Model Library for District Heating Network Simulation — Set 2024

M. A. Muro Alvarado, C. Anderis, R. Lazzari, L. Nigro, A. La Bella

10.1109/OSMSES62085.2024.10668994

Projects

Multi-Energy System Library — github.com/RSE-TGM/multienergysystem

- Developed a Modelica library, *MultiEnergySystem*, for studying interactions between thermal, gas, and electric systems. It includes models for district heating and gas distribution networks, as well as capabilities for modeling specific fluids like real gases.
- Tools Used: Modelica, Dymola

Technologies

Languages: Modelica, MATLAB, Python, C++

Softwares: Dymola, OpenModelica, MATLAB/Simulink