INFORMAZIONI PERSONALI

Barbara Zardin

Modena (Italia)
+393519285889
barbara.zardin@unimore.it

Gender Female | Bith Date 12/05/1978 | Nationality Italian

EDUCATION AND TRAINING

June 2008

PHD in Mechanical Engineering at University of Bologna

Doctor of Philosophy in Mechanical Engineering ("Ingegneria delle Macchine e Sistemi Energetici") at the University Of Bologna, June 2008 with a thesis: "Modellizzazione Numerica e Caratterizzazione Sperimentale di Macchine e Componenti Oleodinamici", (Numerical Modelling and Experimental Characterization of Hydraulic Components), Advisor Prof. Ing. Massimo Borghi.

October 2003

Master of Science in Mechanical Engineering at the University of Modena and Reggio Emilia

Master of Science in Mechanical Engineering at the University of Modena and Reggio Emilia, October 2003, 110/110 cum laude. Area: Fluid Power, thesis concerning numerical modelling of the behaviour of external gear pumps and motors.

WORK EXPERIENCE

Since September 2021

Associate Professor at Enzo Ferrari Engineering Department, University of Modena and Reggio Emilia

Associate Professor at Enzo Ferrari Engineering Department, University of Modena and Reggio Emilia in "Fluid Machineries and Energy Conversion Systems" ING-IND/08 since September 2021.

September 2019

Habilitation ASN

Italian National Habilitation as Associate Professor for 09/C1, SSD ING-IND/08

March 2018

Spin off Society SmartFluidPower

Together with the research fellows of the fluid power group @DIEF, she founded **SmartfluidPower Project**: development of a complete environment for the dynamic and functional simulation of fluid power systems and components.
https://smart.fluidpower.it/

December 2010

Full time Researcher (Assistant Professor) at Enzo Ferrari Engineering Department, University of Modena and Reggio Emilia

Full time Researcher at Enzo Ferrari Engineering Department, University of Modena and Reggio Emilia, from December 2010 to August 2021.

January 2008– December 2010

Post doctoral research assistant at Enzo Ferrari Engineering Department, University of Modena and Reggio Emilia

She has been pot-doctoral research assistant under the supervision of Prof. Massimo Borghi at the Enzo Ferrari Engineering Department for four years after the Phd Course, focusing activity on modelling and simulation of fluid power components and systems, and application of DOE approaches for the design, simulation and experimental characterization of valves.

December 2004– December 2007

PHD Course at University of Bologna "Fluid Machineries and Energy Conversion Systems" ING-IND/08

She defended her Phd Thesis on June 2008: "Modellizzazione Numerica e Caratterizzazione Sperimentale di Macchine e Componenti Oleodinamici", ("Modelling and simulation of fluid power machines and valves") tutor Prof. Ing. Massimo Borghi.

December 2003 – December 2004

Research Grant Spinner Project

Research grant Spinner: cooperation with Salami Spa, analyses of external gear pumps and motors

TEACHING

2009 - 2022

Teaching at the Engineering Department Enzo Ferrari, University of Modena and Reggio Emilia

Since 2019/20 she is teaching:
- Simulation of fluid power systems and components for mobile applications, Master Degree's Course in Vehicle Engineering, Engineering Department Enzo Ferrari, University of Modena e Reggio Emilia.
- Automotive Fluid Power Systems, Master Degree's Course in Advanced Automotive Engineering, MUNER, Motorvehicle University of Emilia-Romagna.
- Fluid power components and systems, (part of the course together with Prof. Massimo Borghi) Master Degree's Course in Mechanical Engineering, Engineering Department Enzo Ferrari, University of Modena e Reggio Emilia.

Since 2020/21 she is teaching:
- 0d Fluid dynamic analysis with Open source software (Open Modelica), Short course for the Industrial and Environmental Engineering Phd Course, University of Modena and Reggio Emilia.

2004 - 2014

II level master course in Fluid Power – UNIMORE (1 year specialization course after the engineering master degree title)

Teaching: UNI-ISO Standard for experimental characterization of positive displacement machines and valves; Filtration and Contamination of the mineral oil; cylinder and motors; pressure, flow rate and directional valves; modelling and simulation of fluid power components and systems

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PERSONAL SKILLS AND COMPETENCES

Native Language: Italian

Other languages

	COMPRENSIONE		PARLATO		PRODUZIONE SCRITTA
	Ascolto	Lettura	Interazione	Produzione orale	
English	C1	C1	C1	C1	C1

Livelli: A1/2 Livello base - B1/2 Livello intermedio - C1/2 Livello avanzato
Quadro Comune Europeo di Riferimento delle Lingue

ORGANISATIONAL SKILLS AND COMPETENCES

- Organinzing and tutoring research activity of the research group, and research activty for research contracts
- Tutoring students and Phd students
- Team working and survising the activity of the spin off society
- Managing risky situation in mountain enviroment, teaching avalanche seminars at the Italian Alpine Club, Scuola CAI Bismantova, Reggio EMilia

TECHNICAL SKILLS AND COMPETENCES

- Fluid dynamic simulation with different approaches (0d, 2 and 3D)
- Writing numerical algorithms in different languages (C, Matlab, OpenModelica, Visual Basic) to simulate fluid power systems and components
-Steady state and dynamic analysis of fluid power systems and components
- Experimental characterization with labview and National Instruments devices and with Arduino

Modelling, Simulation analysis tools

Simulation and mdelling:
- AMESim
- OpenModelica
- OpenFoam
- Ansys
- Matlab

Design:
- SolidWorks
- AutoCAD

Others:
- Office: Word, Excel, PowerPoint, Outlook, Access
- WordPress

Languages:
- VBA
- Modelica
- C++
- Fortran

Driver license

Italian driver license B

RESEARCH TOPICS AND PROJECTS

Research activity has concerned fluid power components and systems for both industrial and mobile applications. Both numerical simulation and experimental analysis have been developed through the years.
Fluid power systems for mobile applications: modelling and simulation of the systems, their duty cycles and the fuel consumption, the power flows; identification of the more dissipative parts or components; analysis of alternative and more efficient components and architectures. Some examples of applications below:
-Study of the translation of excavators, road roller vehicles, tractors, wheel loaders: modelling and simulation of the hydraulic circuits, study and optimization of braking and speed up phases, study of the variable displacement mechanism which enables to change the vehicle speed.
-Study of the energy dissipation of the hydraulic circuit in agricultural tractors, wheel loaders, excavators: these are a typical load sensing multi actuators application, to overcome the limits of this kind of circuit alternative architectures based on independent metering concept and electrically controlled proportional valves and variable displacement pump have been studied. Hybrid solutions for off road vehicles are also considered in this topic.
-Study of different hydraulic press architectures and other industrial machinery circuit layouts and energetic evaluation
Fluid Power components: lubrication on the oil gaps for positive displacement machines, flow forces on valves, dynamic behaviour of pumps and motors.
-Study of the **lubricating gaps of external gear machines and axial piston swashplate machines**: this aspect is of vital importance for the evaluation of mechanical and volumetric efficiencies, for the optimization and improvement of machine behaviour and in order to raise the power to weight ratio of the machine. Optimal efficiency means lower energy consumption and this aspect is fundamental especially in mobile applications. The research has been conducted developing and using home-made numerical codes which allow to solve Reynolds equation inside the lubricating gaps; a numerical procedure able to find both the pressure distribution and the gaps geometry during machine operation has been developed. The influence of operating and design parameters has been studied enabling to use the code in order to improve the design process of the machines studied. Analysis of the lubricating gaps in hydraulic servo-cylinders.
-Study of the **dynamic behaviour of external gears and axial piston swashplate pumps and motors**: lumped parameter models of these kind of machines has been developed using a commercial software; pressure transients within the machine chambers, instantaneous flows, forces and torques are the output of these models which enables to study the influence of the main operating and geometric parameters on the machine behaviour. The topics of pressure peaks and cavitation within the volume chambers, influence of the valve plate (axial piston machine) or of the bearing blocks geometry (external gear machine) have been addressed.
-**Modelling and experimental characterization of proportional directional valves and pressure and flow rate valves**: study of the metering characteristics, energy dissipation evaluation, dynamic response, experimental characterization at the test rig.
The research activities have been conducted using both commercial and home-made software (Matlab language, OpenModelica, Fortran and C language). Moreover, when possible, also experimental characterization of hydraulic pumps, motors and proportional valves has been realized using hydraulic test rigs and data acquisition devices with Labview and Arduino software interfaces.
In 2017, together with the research fellows of the fluid power group @DIEF, she founded **SmartfluidPower Project**: development of a complete environment for the dynamic and functional simulation of fluid power systems and components. **https://smart.fluidpower.it/**

Participation to Peer Reviewed National or International Research projects

-PRIN07: Soluzioni innovative per la riduzione del consumo energetico di circuiti idraulici per trattrici agricole" cod. 2007Y3N8B7, 2 years project. (Innovative Solutions for the reduction of energy dissipation in agricultural tractors), researcher.

-INTERMECH InterMech - MO.RE. , Centro Interdipartimentale per la Ricerca Applicata e Servizi nel Settore della Meccanica Avanzata e della Motoristica dell'Università di Modena e Reggio Emilia. http://www.intermech.unimore.it/site/home/gruppi-ricerca-e-trasferimento-tecnologico.html, researcher and member since February 2022.

-DORNA - Development of high reliability motor drives for next generation propulsion applications - Progetto europeo H2020-MSCA-RISE-2019 –01/03/2020 - 28/02/2024.

-Prototipo di sistema di alimentazione e controllo idrogeno allestito su veicolo dimostratore a Fuel Cells, durata 01/01/2020 - 31/12/2022. Progetto LEGGE REGIONALE N.14/2014 DOMANDA DI CONTRIBUTO PER L'ACCESSO ALL'ACCORDO REGIONALE DI INSEDIAMENTO E SVILUPPO - IN ATTUAZIONE DELL'ART. 6 LR 14/2014 - BANDO 2019. (Hydrogen delivering and metering system prototype for on road vehicle), researcher.

-TASC – trattrici agricole smart and clean, POR-FESR 2014-2020 Asse 1 Azione 1.2.2 durata: 04/07/2019 - 03/07/2021. (Smart and Clean Agricultural Tractor), researcher. https://www.tascproject.eu/.

-FACT Future of the Agricultural Tractors, Progetto cofinanziato dal fondo europeo di sviluppo regionale PR FESR Emilia Romagna 2021/2027

- H2Ref-Demo è cofinanziato dall'Unione Europea attraverso il programma "Horizon Europe" incluso nel "Clean Hydrogen Partnership" (grant agreement No. 101101517).

Recognitions/ Awards

-5th PhD Symposium on Fluid Power, July 2008, Kracow, Polonia, "Most Outstanding Contribution Award" the presentation "Modelling and Simulation of External Gear Pumps and Motors".
-The scientific paper presented at the ASME Imece 2015 Congress "Axial Balance of External Gear Pumps and Motors: Modelling and Discussing the Influence of Elasto-hydrodynamic Lubrication in the Axial Gap" has been selected to be published on the Special Issue Advances in Multidisciplinary Engineering, © 2016, The American Society of Mechanical Engineers (ASME), 2 Park Avenue, New York, NY 10016, USA (www.asme.org)

Editorial board, organization of congresses

-Guest Editor for Gear Pumps and Motors, a special issue of Energies (ISSN 1996-1073). This special issue belongs to Energies, 2020 - 2022
https://www.mdpi.com/journal/energies/special_issues/gear_pumps_motors)
-Member of the Organizing Comittee for ATI Congress, edition 74 , at Enzo Ferrari Engineering Department, 11/09/2019-13/09/2019, https://www.atinazionale.it/2019-comitato-organizzatore
-Member of Scientific Committee of the Global Fluid Power Association PhD Symposium, October 2022, Napoli, https://www.gfps2022.com/committees/

PAPERS and PUBLICATIONS of the last 5 years
SCOPUS Author ID: 21744167200

ORCID https://orcid.org/0000-0002-5494-3157

Google Scholar : https://scholar.google.it/citations?user=s67UqtUAAAAJ&hl=it

2024 - Fluid dynamic parameters of naturally derived hydroxyapatite scaffolds for in vitro studies of bone cells
E Salerno, A d'Adamo, G Corda, C Ongaro, B Zardin, G Orlandi, A Ruffini, J Bertacchini and D Angeli

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2023 - Modelling of a Gerotor pump including the evaluation of the micro-movements of the external gear
Totaro, G., Zardin, B., Borghi, M., Scolari, F.

2023 - UV picosecond laser processing for microfluidic applications
Siciliani, V. ; Betti, A.; Ongaro, C.; Orazi, L.; Zardin, B.; Reggiani, B.

2023 - Experimental measurements and CFD modelling of hydroxyapatite scaffolds in perfusion bioreactors for bone regeneration.
D 'Adamo A.; Salerno E.; Corda G.; Ongaro C., Zardin B.; Orlandi G.; Bertacchini J.; Angeli D.

2022 - System for Recovering Energy in Hydraulic Circuit by Using a Small Pelton Turbine
Rizzoli, M., Cillo, G., Zardin, B., Manfredi, D., Borghi, M.

2022 - Generation and Validation of a Multibody Real Time Model to Design and Optimize Hydro-Pneumatic Suspension Systems for Off-Highway Vehicles
Fornaciari, A., Zardin, B., Borghi, M.

2022 - An Alternative Solution for Microfluidic Chip Fabrication
Ongaro, C.; Betti, A.; Zardin, B.; Siciliani, V.; Orazi, L.; Bertacchini, J.; Borghi, M.

2022 - Liquid flow in scaffold derived from natural source: experimental observations and biological outcome
Salerno, Elisabetta;Orlandi, Giulia;Ongaro, Claudio;d'Adamo, Alessandro;Carnevale, Gianluca;Zardin, Barbara;Bertacchini, Jessika;Angeli, Diego

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2021 - Lumped parameter model of vane pumps developed in OpenModelica environment.
Zardin, B. Cillo, G., Rizzoli, M., Borghi, M.

2020 - A study on PVD coatings for reduction of friction and wear of swashplate axial piston pumps and motors
Sola, R; Veronesi, P; Zardin, B; Borghi, M

2020 - Analysis of the flow force compensation in relief valves with conical poppet
Fornaciari, A.; Zardin, B.; Borghi, M.; Ceriola, M.

2020 - Modelling of hydraulic locking balancing circumferential grooves for servo-cylinders' piston
Natali, E.; Zardin, B.; Cillo, G.; Borghi, M.

2020 - The Hydraulic Power Generation and Transmission on Agricultural Tractors: Feasible architectures to reduce dissipation and fuel consumption-Part 2
Casoli, P.; Zardin, B.; Ardizio, S.; Borghi, M.; Pintore, F.; Mesturini, D.

2020 - The Hydraulic Power Generation and Transmission on Agricultural Tractors: Feasible architectures to reduce dissipation and fuel consumption-Part 1
Gaiola, A.; Zardin, B.; Casoli, P.; Borghi, M.; Mazzali, F.; Pintore, F.; Fiorati, S.

2019 - DESIGN AND MODELLING OF A CARTRIDGE PRESSURE AMPLIFIER
Zardin, Barbara; Cillo, Giovanni; Zavadinka, Peter; Hanusovsky, Juraj; Borghi, Massimo

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2019 - Evaluation of the hydro - Mechanical efficiency of external gear pumps Zardin, B.; Natali, Emiliano; Borghi, M.

2019 - Modelling of hydrostatic bearings for servo-cylinders
Zardin, B.; Natali, E.; Cillo, G.; Borghi, M.

According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV.

Modena, Italy 15/05/2024