

22nd January 2019

### Personal details

**name** Costante Mario Invernizzi

**year of birth** December, 8th 1956

**nationality** Italian

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### Education and degrees completed

- PhD in Energy obtained in 1987 (Politecnico di Milano)
- Degree in Nuclear Engineering obtained in 1981 (Politecnico di Milano)

### Current position

- Full professor of “Fluid Machinery and Energy Conversion Systems”

### Previous work, experience and awards

- Associate professor 2002 - 2018. University of Brescia
- Researcher (assistant professor) 1986 - 2002. University of Brescia
- ★ Harold Disney Prize 2008 (with G Angelino e P Iora) of the Institution of Mechanical Engineers. For the paper *Closed versus open cycle energy recovery from solid oxide fuel cells*, Proceedings of the Institution of Mechanical Engineers - Part A - Journal of Power and Energy, Vol. 222, 2008, pp. 371-379
- ★ Winner, in 1985, of the Prize “Giovanni Francia” reserved to studies and researches on the “Alternative Energies”

## Scientific activity, personal research funding and grants

The scientific activity, until now, is mainly dedicated to the study of energy conversion systems and to innovative thermodynamic engines. Some example of main topics are:

- **heat engines and inverse cycles.** Heat engines, heat pump and refrigerating cycles with non conventional working fluids (pure fluids or mixtures);
- **thermodynamics and technology of Rankine cycles with organic working fluids.** (For heat recovery, external combustion – with biomass too, solar thermodynamics, geothermal energy). **Closed Brayton cycles** for power generation. **Stirling engines.** Thermodynamics and technological aspects of **binary cycles** (with liquid metals, steam and organic fluids) for high temperature applications;
- **thermochemical stability of working fluids for Rankine and Brayton cycles.** The thermal stability of working fluids (pure fluids or mixtures) is investigated by means of a suitable experimental apparatus that, for pure fluids, also allows the measurement of the vapour pressure.

Key numbers (from SCOPUS on November 2nd, 2017)

- Number of published refereed papers: 56
- Hirsch-index:  $H = 15$
- m-index =  $H/(\# \text{ of years after PhD}) = 0.6$
- Citations in 2017: 170
- Total citations: 993
- Average citations/article: 17.73
- Number of co-authors: 41
- Number of finished PhD theses supervised: 5

## **Research projects, Agreements and Contracts, Collaborations with public organisations and private corporations**

- 2002** FIMAC Spa Fabbrica Italiana Macchine Aria Compressa, via Piemonte, 19. 200030 Senago (Milano). Choice of the working fluid for a refrigeration system of aircraft's components
- 2003** ASM Spa (Brescia). A evaluation program for the economic analysis of cogeneration systems in civil and tertiary sectors
- 2005** Principal Investigator of the Research Unit of Brescia University in the project PRIN 2005: Numerical simulation of SOFC and MCFC fuel cells integrated in coal gassification systems
- 2005** Frigosystem Srl, Caronno Pertusella (Varese). Study and preliminary design of a refrigeration machine with air as working fluid
- 2006-2009** Linea Energia Spa, Rovato (Brescia). A research PhD grant in "Technology and Energy Systems for Industry"
- 2006** Linea Energia Spa, Rovato (Brescia). A techno-economical analysis of some cogeneration systems
- 2006** Politecnico di Milano (Milano). Development of a computational program for the simulation of tubular and planar SOFC
- 2007** Frigosystem Srl, Caronno Pertusella (Varese). Thermodynamic analysis of some mixtures of fluids for cryogenic applications
- 2008:** Bravo Spa, Montecchio Maggiore (Vicenza). Study of a carbon dioxide refrigerator
- 2008** Politecnico di Milano (Milano). Numerical simulation of hybrid systems with MCFC in design and off-design conditions
- 2008** Turboden Srl, Brescia. A theoretical and experimental comparative study of the effectiveness of pipe joints
- 2008** Turboden Srl, Brescia. Characterisation of working fluids by their thermal stability and by their material compatibility
- 2009** Turboden Srl, Brescia. A numerical dynamic model for controlling the speed of a synchronous generator by means of the turbine valve and a break

- 2010** Torri Solare Srl. Estimation of the producibility of photovoltaic modules
- 2010** Metalwork Spa, Concesio (Brescia). A study of the performances of a hydraulic micro-turbine
- dal 2010 al 2012: Agreement with the Lombardy region**, Politecnico di Milano and University of Brescia. Technology optimisation of Organic Rankine Cycles for the exploitation of geothermal sources
- 2012** Nooter/Eriksen, Legnano (Milano). Thermal stability measurements on some working fluids
- 2013** ENEA - Politecnico di Milano. Evaluation of innovative thermodynamic cycles for biomass boilers using liquid salts as intermediate heat transfer medium
- 2015 - 2018** Turboden Srl, Brescia. Thermal stability analysis of new working fluids for Rankine cycles -
- 2016 - 2018 University Project** “Brescia 20-20-20”. Principal Investigator of the Working Package: “Study of innovative systems to assure the right vacuum degree in the condenser of closed thermodynamic Rankine cycles”
- 2018** Consorzio L.E.A.P. (Laboratorio Energia e Ambiente Piacenza). Thermal stability of some working fluids
- 2018 - 2020 Research Department Project.** TEC (Tesla Expander Chiller) - High efficiency air conditioning systems
- 2019 - 2023 Horizon H2020 SCARABEUS - 814985.** Call H2020-LC-SC3-2018-2019-2010-RES-TwoStages - Building a Low-Carbon, Climate Resilient Future: Secure, Clean and Efficient Energy. **S**upercritical **C**ARbon dioxide/**A**lternative fluids **B**lends for **E**fficiency **U**ppgrade of **S**olar power plant.
- 2019** Turboden Srl, Brescia. Development of a data-base of working fluids for Rankine cycles

### Teaching experience

Teacher of the following courses at the University of Brescia:

- Renewable Energy Technologies (Mechanical Engineering course - Energy curriculum)
- Energy Conversion Systems (Mechanical Engineering course - Energy curriculum)
- Fundamentals of Fluid Machines and Conversion Energy Systems (Mechanical Engineering course)
- Renewable Energies (Civil and Environmental Engineering)

**from 1986 since today** Supervisor or co-supervisor of many degree thesis:  
Master thesis, PhD thesis.