

## CURRICULUM VITAE

## Federico Reggio

## PROFESSIONAL EXPERIENCE

1<sup>st</sup> December 2020  
Till now

Temporary Research Fellow at the Istituto Nazionale di Fisica Nucleare (INFN)  
In the research field on the application of Tesla turbines for renewable energy production (Miniera project)

December 2018

## Foundation of SIT technologies Srl (University Spin-off)

Participation in the foundation of an innovative start-up for industrial exploitation of research results in the field of energy harvesting and bladeless Tesla turbomachinery technological development.

A Tesla turbine is capable of processing two-phase or "dirty" fluid thanks to the absence of rotor blades which are substituted by disks. This bladeless expander has also a limited performance decay at small scales. For this reason, SIT technologies want exploit Tesla expander turbomachine technology for energy harvesting applications distributed in plants.

<http://www.sit-tesla-technologies.com/>

## EDUCATION AND TRAINING

From 1<sup>st</sup> November 2017  
to 31<sup>th</sup> October 2020

PhD Student at Thermochemical Power Group (TPG): <http://www.tpg.unige.it/TPG/>

Research activity on:

- Innovative energy system with turbomachine diagnostic technics and compressor instability prevention using vibro-acoustic analysis.
- Design of bladeless Tesla turbines for energy harvesting:
  - The first 3kW Tesla expander with air as working fluid and with expander and electric generator housed in a single casing: Experimental tests revealed that this turbine is most efficient air Tesla turbine till now
  - The first two-phase butane Tesla expander to be included in a real industrial Heat-pump

Other studies fields:

- Modal analysis
- Rotor dynamics and balancing
- experimental characterization of Tesla Turbine performances

European research projects:

- PUMP-HEAT  
<https://www.pumpheat.eu/>
- Bio-HyPP  
<http://www.bio-hypp.eu/>

International conference/workshop attended as speaker:

- Low Emission Advanced Power (LEAP-2018)  
<https://netl.doe.gov/>  
exposed topic:
  - "Surge precursors from vibro-acoustical analysis"
- SUstainable PolyEnergy generation and HaRvesting (SUPEHR 2019)  
<https://www.supehr19.unige.it/>

exposed topics:

- Tesla turbomachinery:  
"Two-phase flow expansion: development of an innovative test-rig for flow characterisation and CFD validation"
- Compressor performance in hybrid systems:  
"Surge Precursors from Compressor Vibro-Acoustic Analysis"
- Micro gas turbine technologies:  
"Micro-turbine applied to seismology: toward a power supply safe from lightning"

From 1<sup>st</sup> April 2017  
to 30<sup>th</sup> September 2017

Post-graduate scholarship: "Simulation of Energy system for energy production and storage from renewable source".

20<sup>th</sup> Decemry 2016

**Master Degree in Mechanical Engineering – Design and Production:**

Laurea magistrale in Mechanical Engineering – Design and Production (mechanical engineering) (d.m. 270/2004)

Final grade: 107/110 (One Hundred and Seven out of One Hundred and Ten) and dignity of the press. At the University: Università degli studi di Genova

**Thesis Title:**

“Identification of an incipient surge condition in a radial compressor through acoustic and vibration measurement”

It's an experimental work done at Thermochemical Power Group (TPG) laboratory in Savona (DIME department University of Genoa)

Thesis contents and conclusions were published in an Article for ASME (The American Society of Mechanical Engineers) Turbo Expo 2017 :

“Experimental dynamic analysis on a T100 microturbine connected with different volume sizes”

The article was published in the journal and it has won the recognition as best paper 2017.

**Summary of the work:**

When a turbine is connected to an additional external component located after the compressor, for example when it's placed as part of a hybrid system, volume between the recuperator outlet and the combustor inlet increases.

Large volume size connected with the machine presents critical issues related to the surge prevention, especially during time-dependent operations.

Surge conditions were produced in the test rig developed at the University of Genoa closing progressively a valve in the main air line in order to acquire vibrational and acoustic signals from a T100 micro-turbine compressor during the transitory to the instability.

Analyses of signals acquired from three different volumes plant configurations have revealed some indicators which seem to detect the incipient surge before it begins and so, they seem to be useful in future works to create a control system to prevent the surge.

February 2014:

**Bachelor Degree in Mechanical Engineering:**

Laurea in Mechanical Engineering (Industrial Engineering) (d.m. 509/1999)

At the University: Università degli studi di Genova

**Thesis Title:**

Azimuthal electric engines: merit parameters for innovative cooling systems

from 2003 to 2007

**High school diploma:**

At the school: “Liceo scientifico statale Gian Domenico Cassini”

Mother tongue

Italian

Other language:

UNDERSTANDING		SPEAKING		WRITING
Listening	Reading	Spoken interaction	Spoken production	
B1	B2	B1	B1	B1

English

I've studied English language at high school and to pass English exam at University To pass this exam I've attended a course at Genoa British School and another course to pass PET exam (see results in the table above).

After my master degree, I attended intensive 3 weeks EF English course in Eastbourne (UK) During my Post-graduate scholarship and Ph.D. I worked with many English-speaking colleagues and I attend to some international conferences and courses.

This, combined with the work of writing scientific articles, has greatly improved my English.

Levels: A1/A2: Basic user - B1/B2: Independent user - C1/C2 Proficient user  
Common European Framework of Reference for Languages

**Communication skills** I have good communication skills gained through my experience as scout (11 years, since I was a kid in the Genova40 Agesci's Group) and doing some cultural events with medieval re-enactment and fencing association (La Compagnia degli Alabardieri, La Compagnia del Wargus) Then, I have improved my communication skills during my Ph.D participating and exhibiting my works at international conferences and meetings of European projects I was involved.

**Computer skill** During my study and works I gained experience of these tools:

- PTC CREO
- NI LabVIEW
- ANSYS classic
- ANSYS workbench
- PTC Pro-Engineer
- LMS Test.Lab
- MATLAB
- LMS Virtual Lab (CATIA based 3D CAD)
- MicroStation
- Mastercam
- Microsoft Office™ tools
- C++

**Driving licence** Driving licence category:

- B

**Publications:**

Ferrari, M.L., Silvestri, P., Pascenti, M., Reggio, F., Massardo, A.F. "Experimental dynamic analysis on a T100 microturbine connected with different volume sizes" 2018 Journal of Engineering for Gas Turbines and Power 140(2),021701

Ferrari, M.L., Silvestri, P., Reggio, F., Massardo, A.F. "Surge prevention for gas turbines connected with large volume size: Experimental demonstration with a microturbine" 2018 Applied Energy 230, pp. 1057-1064

Silvestri P., Traverso A., Reggio F., Efstathiadis T., "Theoretical and experimental investigation on rotor dynamic behavior of bladeless turbine for innovative cycles" Proceedings of ASME Turbo Expo 2019, June 17-21, 2019, Phoenix, Arizona, USA

Reggio F., Ferrari M.L., Silvestri P., Massardo A.F. "Vibrational analysis for surge precursor definition in gas turbines", Meccanica 2019 Springer Nature B.V. 09 July 2019

Federico R., Ferrari M.L., Silvestri P., Massardo A.F. "Surge Precursors from Compressor Vibro-Acoustic Analysis" 2019 E3S Web of Conferences

Traverso, A., Reggio F., Silvestri P., Engelbrecht G., Chasoglou A. "Two-phase flow expansion: Development of an innovative test-rig for flow characterisation and CFD validation" 2019 E3S Web of Conferences

Renuke A., Reggio F., Silvestri P., Traverso, A., Pascenti, M., "Experimental investigation on a 3 kW air tesla expander with high speed Generator" Proceedings of ASME Turbo Expo 2020, June 22-26, 2020, London, England

Reggio F., Ferrari M.L., Silvestri P., Massardo A.F. "Operation extension in gas turbine-based advanced cycles with a surge prevention tool" under submission Energy

**AWARD  
2017**

The article "Experimental dynamic analysis on a T100 microturbine connected with different volume sizes" won the recognition:

- **"2017 ASME Turbo Expo Committee Best Paper Award"**

<http://www.tpg.unige.it/TPG/awards/>