

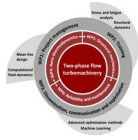


POLITECNICO
MILANO 1863

Host	Politecnico di Milano – POLIMI	Country: Italy
Industrial Partner	Danfoss A/S – Danfoss	Country: Denmark
DC5	Supervisor: Prof. Giacomo Persico Co-supervisor: Dr. Ekaterini Kriezi	WP No: 4
Title: Modelling and design of novel two-phase ejectors and expanders for transcritical heat-pumps		
Context: <p>The green transition of energy systems requires the implementation of novel emerging energy conversion technologies based on turbomachinery with two-phase flow. However, the current level of knowledge and understanding of two-phase flow in turbomachinery is low, urgently calling for the need of educating scientists that can support the development of such technologies. In this context, we offer the best possible training for young scientists, providing excellent career opportunities both in academia and industry, as part of a recently started MSCA-DN (Marie Skłodowska-Curie Actions, Doctoral Network) project on two-phase flow in turbomachinery, entitled Training42Phase. The aim of Training42Phase is to educate the future leading scientists within turbomachinery with two-phase flow, thereby providing the scientific and technological basis required for the development of the next generation of turbomachinery. You may read more about the Training42Phase project at https://training42phase.dtu.dk/.</p> <p>In the frame of this project, the Department of Energy of Politecnico di Milano has one open PhD position with focus on two-phase flows in ejectors and expanders in transcritical heat pumps, with an industrial secondment hosted by the company Danfoss.</p> Research Objectives: <p>(1) Select the proper physical models for the high-fidelity prediction of equilibrium and non-equilibrium flashing flows; (2) Construct specific two-phase flow models for multiple refrigerant fluids, including carbon dioxide, for implementation in one existing and validated CFD software and validate the approach against experiments in flashing flows of CO₂ and refrigerants; (3) Perform shape-optimization of ejectors for heat pumps, by implementing the two-phase CFD tool within the in-house Politecnico di Milano evolutionary optimization tool FORMA, and considering reliability aspects; (4) Conceive a novel two-phase turbo-expander tailored for application in heat pumps and quantify the potential performance increase, considering a combined system and expander optimization.</p>		

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101120366





Applicant - specifications: in addition to the general specifications (eligibility criteria) listed above, the applicant must feature the following requirements:

• **Earned degree:**

- MSc in Energy, Mechanical or Aerospace Engineering (or related area), as well as Physics and Mathematics, with a focus on Applied Computational Physics.
- MSc with a final score no lower than 95/110 or 86/100
- MSc with a minimum average score in exams indicated here

COUNTRY	MINIMUM GPA
BANGLADESH	3,3/4
CHINA	70/100
COLOMBIA	3,5/5
European Countries (ECTS grading system)	C+
EGYPT	65/100
ETHIOPIA	3/4
GHANA	65/100
INDIA	70/100
INDONESIA	2,8/4
IRAN	14,5/20
NIGERIA	3/5
PAKISTAN	3,3/4,0
SERBIA	7,5/10
TURKEY	3/4
VIETNAM	7/10

(for the Countries not included in this list, the evaluation will be carried out directly by the Selection Committee).

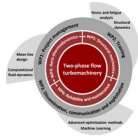
• **Background (mandatory):**

- Thermodynamics
- Thermo-fluid-dynamics
- Fluid-Machine design and analysis
- Power plant engineering
- Matlab/Python programming
- Fundamentals of CFD

• **Additional background that will be valued in the selection process:**

- Advanced thermodynamics
- Advanced computational fluid dynamics





POLITECNICO
MILANO 1863

- **English language:**

- A certification of the level of English is required. Below is a list of the certifications accepted by the Politecnico di Milano and the corresponding levels.

TEST	MINIMUM LEVEL REQUIRED
CAMBRIDGE	≥ FCE grade B
CAMBRIDGE IELTS (International English Language Testing System) (Academic)	≥ 6
ETS - TOEFL (Test of English as a Foreign Language)	paper based (total score): ≥ 547
ETS - TOEFL (Test of English as a Foreign Language)	computer based (total score): ≥ 210
ETS - TOEFL (Test of English as a Foreign Language)	internet based (total score): ≥ 78
ETS - TOEIC (Test of English for International Communication - Listening and Reading Test)	≥ 720
TRINITY COLLEGE LONDON	≥ ISE II

- **Eligibility criteria:**

According to the MSCA-DN mobility clause; **the applicant must not have resided or carried out his/her main activity (work, studies, etc.) in Italy for more than 12 months in the 36 months immediately before the date of recruitment.** Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention¹ are not taken into account.

Scheme:

- M1-M24, M31-M36: the applicant is hired and hosted by Politecnico di Milano (Department of Energy, Building BL25, Via Lambruschini 4, 20156 Milano, Italy)
- M25-M30: the applicant is seconded at Danfoss (Dr Ekaterini Kriezi, Nordborgvej 81, 6430 Nordborg, Denmark) and trained in the industrial aspects of heat pumps, including performance targets, off-design operation, and transients.

How to apply: submit application package (see below) to Prof. Giacomo Persico via the form at the following link <https://forms.office.com/e/qgiwE532GJ> before 21 January 2024, 17:00 h CET.

The Application Package is comprised of:

- CV
- Letter of motivation
- A short essay (maximum length is 3 pages, including references) on the topic of the *Performance improvement devices for trans-critical heat pumps: opportunities and challenges*
- The application package must not exceed 15 Mb

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No. 101120366





POLITECNICO
MILANO 1863

Contract:

- Start date (estimate): May 2024
- Type: full-time exclusive
- Gross salary (yearly): 38.052,72 €
- An additional (family) allowance is available for candidates who have family obligations (applied from and until this condition applies)

Equal Opportunity Employers:

Politecnico di Milano is an Equal Opportunity Employer. We believe that no one should be discriminated against because of their differences, such as age, disability, ethnicity, gender, gender identity and expression, religion or sexual orientation. All employment decisions shall be made without regard to age, race, creed, color, religion, sex, national origin, ancestry, disability status, sexual orientation, gender identity or expression, genetic information, marital status, citizenship status or any other basis as protected by European and Italian laws. For details, view a copy of the Gender Equality Plan of Politecnico di Milano.

