Part I: General introduction

In the last decade, lightweight fibre-reinforced composites have allowed the sustainable development of modern society by, for example, enabling more efficient wind turbines and making our vehicles lighter. Unfortunately, these materials are challenging to recycle: most composite parts are still incinerated or landfilled, two very polluting practices.

The FibReLoop project is a Marie Sklodowska-Curie (MSCA) Doctoral Network that aims to promote the industrial implementation of circular economy strategies for composites. Fourteen doctoral candidates will be trained to tackle the recycling of a composite part all the way to the design and production of new recycled components. The topics include the evaluation, enhancement, and development of current and new recycling technologies; the experimental assessment of the behaviour of the recycled materials; the development of material models and design approaches for recycled composites and parts; and the implementation of recycled composites and circular economic practices into real-life industrial cases. FibReLoop involves 18 European universities and companies.

Applications are invited for fourteen PhD positions in the field of recycling of composites, leading to the award of a PhD degree. The recruited researchers will be trained for 3 years to become interdisciplinary and multi-talented experts. They will develop advanced simulation tools to predict optimal microstructures for recycled composites, manufacture these microstructures and then verify them in industrial applications. The researchers will have a unique opportunity to be trained by world-leading experts in cutting-edge technologies, supported by a strong network and extensive industry participation.

Please note that some of the positions are hosted by an industrial partner. In this case, the researcher will also be enrolled in a PhD program at a university.

Part II: Detailed description of individual positions

Title of the position: Industrial recycling of fibre-reinforced composite parts at the end of service

Host organization & PhD awarding (country): Fairmat & Mines Paris – PSL University (Paris/France)

Duration: 3 years

Description

The aim of this PhD project is to contribute to the benchmarking of all the different composite recycling technologies involved in FibReLoop, in particular the one developed by Fairmat. In order to establish a more realistic assessment procedure, the effect of recycling on conditioned and/or fatigued materials will be evaluated to better represent end-of-life parts. The recycling assessment protocol will be validated on the exemplary case of a wind turbine blade.

The work will be performed at Fairmat R&D lab (Paris/France) and at the Materials Centre of Mines Paris – PSL University (Satory/France). You will be supervised by a joint team: Dr. Michael Gaultois at Fairmat and by Dr. Sébastien Joannès and his colleagues at Mines Paris – PSL University.

The work requires a strong background in materials science, composite mechanics and/or solid mechanics and particularly in fracture and damage mechanics as well as a mindset for personal development. This project has a strong mix of experimental and computational activities, . It is therefore essential that applicants are interested in such a combination. Apart from a good working knowledge of the finite element method, proficiency in a programming language such as Matlab or Python is highly desirable.

During the appointment, two secondments are planned:

- 3 months to ENI (Italy) – to assess wind turbines end of life conditions and test recycled material from a turbine blade.
- 4 months to Mines Paris – PSL University (France) – to perform fatigue tests on specimens to be recycled.

Apart from this specific secondment to Mines Paris – PSL University, the PhD student will be required to carry out his/her research between the two laboratories (Fairmat R&D lab and the Materials Centre of Mines Paris – PSL University), depending on the resources available. He/she will also participate in the training courses and events dedicated to PhD students at Mines Paris – PSL University.

During this PhD project, the researcher will:

- Acquire leading-edge knowledge of recycled composites and their behaviour;
- Develop an improved and more realistic assessment procedure to take into account the effect of recycling on conditioned and/or fatigued materials (development and numerical implementation of a fatigue model in a finite element code);
- Validate the method using a wind turbine blade as an example;
- Participate in the dedicated training programme organised by FibReLoop (including technical, communication, career management and business skills) and in six-monthly project meetings;
- Write scientific papers for publication in top-level journals in materials science/mechanics;
- Present his/her research in project meetings, international conferences and outreach events;
- Work in close collaboration with supervisors while being the driving force for his/her own PhD.

Expectations and requirements

A good candidate should be an enthusiastic and self-motivated person with an attitude towards personal development. The candidate should meet the requirements for enrolment in a doctoral programme at Mines Paris – PSL University. This means having at least a B2 level of English and He/she has obtained (or is about to obtain) good grades for a master degree in Materials Science, Mechanical Engineering, Aeronautics, or similar. Eligible applications will be assessed on the applicant's (1) academic qualifications, (2) technical skills, (3) background on modelling, (4) communication skills, and (5) motivation for the project. PSL University has an equal opportunities and diversity policy, and we welcome applications from candidates with diverse backgrounds.

The post is supported by an allowance provided by the European Commission. The EU Researcher Allowances will be used to cover both the employee's as the employer's mandatory charges. The fellows are assigned full-time with a PhD scholarship with full social security.

Candidates must fulfil the eligibility criteria:

1. You do not have a PhD degree yet at the start of your assignment.
2. You must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting beneficiary (France) for more than 12 months in the 36 months immediately before their date of recruitment.

This means that your nationality is not relevant for your eligibility.

Procedure

Applicants should supply the following to recrutement_these@mat.mines-paristech.fr:

- a detailed resume
- a copy of the identity card or passport
- a covering letter explaining the applicant's motivation for the position
- detailed exam results
- two references : the name and contact details of at least two people who could be contacted
- to provide an appreciation of the candidate
- Your notes of M1, M2
- level of English equivalent TOEIC

Please add the label "**[FibReLoop DC1]**" to the subject line of the e-mail you send.

The cover letter should clearly indicate for which FibReLoop position(s) you are applying, as it is possible to apply for multiple. We kindly ask you not to include a photograph in your CV or cover letter. We are committed to equal opportunities, and by removing these details, it helps us to evaluate people on their skills and experience instead of factors that can lead to unconsciously biased decisions.

Applications sent to addresses other than the recruitment address (recrutement_these@mat.mines-paristech.fr) will not be accepted. More details can be found at:

https://www.mat.minesparis.psl.eu/formation/doctorat/propositions-de-sujets-de-these/

Based on the resumé and cover letter, we will invite shortlisted applicants for an interview. This will be held online via Zoom. The interview will consist of three parts and last for about 1.5 hours in total:

1. You will be asked to prepare a small task beforehand and present your approach to the task.
2. You will present a paper relevant to the PhD topic, and assess its strengths and weaknesses.
3. We will ask for clarifications about your background and gauge your motivation and skills.

For further details about this specific position or the procedure, please contact michael.gaultois@fairmat.tech and sebastien.joannes@minesparis.psl.eu. For general information obout Fairmat, please go to https://www.fairmat.tech/. For general information on Mines Paris – PSL University, please go to https://www.minesparis.psl.eu/en/home/ and https://www.minesparis.psl.eu/en/mines-paris-psl/psl-our-university/

Closing date: until filled

Starting date: 1st of October 2024 the earliest and 31st of March 2025 the latest