

Post-Doctoral position in particles technology – 18-month fixed-term contract

CENTRE SPIN

JOB ENVIRONMENT:

Institut Mines-Télécom is the leading public group of engineering and management *Grandes Écoles* in France. Consisting of eight public graduate *Grandes Écoles* and two subsidiary graduate schools, *Institut Mines-Télécom* leads and develops a rich ecosystem of partner schools, economic, academic and institutional partners, key players in education, research and economic development.

Mines Saint-Étienne, a graduate school of the *Institut Mines-Télécom*, is responsible for education, research, innovation, industrial transfer and scientific culture dissemination. With 2,500 students, 500 staff and a budget of €50m, it has 3 campuses dedicated to the industry of the future, health and well-being, and digital sovereignty and microelectronics. It is ranked in the top 15 graduate engineering schools in France and the top 500 universities worldwide.

The 2023-2027 strategy of Mines Saint-Etienne is in line with that of *Institut Mines Telecom*. It aims to:

- Support the ecological, digital and generational transitions and educate the people involved
- Support national and European sovereignty in microelectronics and digital technolog

To support this strategy, it is recruiting a **postdoctoral**.

JOB DESCRIPTION:

HYGEN is a ADEME funded project spearheaded by FIVES CRYO, a leading company in the manufacturing of cryogenic heat exchangers. It aims at developing and improving the process of hydrogen liquefaction which is a key step towards its storage and handling on an industrial scale. Indeed, the target is a 100-fold increase of the liquefaction capacities.

In this context, SPIN, which is the chemical engineering research center of Mines Saint-Etienne is in charge of improving the filling process of the heat exchanger with granular catalyst particles.

The present job offer is a 18 month post-doctoral contract which will take place in the laboratory of Mines Saint-Etienne.

The main barrier of this project is the very confined space between the exchanger plates which prevents an easy and homogeneous filling. The study will be focused on the use of vibrations to improve the filling procedure.

In this context, the project aim at (i) contribute to the understanding of particles flow in confined space (ii) evaluate the capability of vibrations to improve the flowability and analyse the mechanism involved and (iii) improve the vibrations cycle.

The successful candidate will be expected to build two experimental setups in order to study the filling process of particles under vibrations. Both of them will be simplified - quasi 2D - models of the heat exchanger.

- 1) The first one is about ~10 cm of height and width and will be used to visualize the particle packing by means of 3D - X rays micro-tomography. The analysis of tomography images should allow us to evaluate different parameters related to the particle packing and its homogeneity.
- 2) The second one is also ~10cm width but higher (~70cm). It will be used to evaluate the

residence time distribution of gas. To do so, a neutral gaseous will be injected (Argon) until the setup is filled and then a short inflow of Nitrogen will be sent. Finally, the concentration of nitrogen in the outflow will be measured. This measurement should allow us to identify flow paths.

Then, for each experimental setup, parametric study will be led to analyse the effect of vibrations on the particles flow in this very confined geometry. The variable parameters might concern both process and powders:

- Acceleration and amplitude of the vibrations
- Geometry of the heat exchanger's Fins
- Particle size distribution and powder morphology

The description of the tasks above may evolve slightly with respect to the candidate background and aspirations. For example, a short numerical study (DEM simulation) might also be implemented. Also, tasks may change depending on the needs of the department and Mines Saint-Etienne.

The position is based on the Saint-Étienne campus and Hygen partners collaborations (CEA, Flves Cryo) are encouraged.

PROFIL SOUGHT:

You are in one of the following situations*:

- A doctoral degree no more than 3 years old, in which case you will be employed as a post-doctoral researcher
- If your doctorate is more than 3 years old, you will be employed as a research and development engineer

**In accordance with the law on programming and research.*

And ideally:

Holder of PhD in a relevant field (Granular media, powder technology,,,...).

You have the following skills, knowledge and experience:

- Strong background in particle flow, experimental or modelling
- Experimental set up design in particule technology
- DEM simulation
- Basic knowledge of French would be of great asset for communications with the technicians

You recognise yourself in the following abilities and skills:

- Demonstrated research aptitude
- Excellent communication skills

WHY JOIN US:

Institut Mines-Telecom is characterised by:

<https://www.youtube.com/watch?v=m39m6hdNC48>

- A scientific environment of excellence
- A group with entities throughout France

Mines Saint-Etienne is distinguished by:

- A privileged working environment with a high student supervision rate and a high environment rate (support and back-up functions)
- First-rate experimental and digital resources
- Significant contract research activity (€11m/year in Research and Innovation contracts), mainly with industrial partners
- 25% international students, Member of the T.I.M.E. network and the EULIST European University
- A centre for scientific, technical and industrial culture - *La Rotonde* - which is unique in France, and which has a major impact on society (> 50,000 visitors per year)
- Pleasant workplace, easily accessible by public transport and close to motorways
- Public transport costs reimbursed up to 75% (subject to conditions)
- Sustainable mobility package
- Staff committee that subsidises sports, leisure, cultural and social events and activities
- The possibility of partial remote working
- 49 days annual leave

ADDITIONAL INFORMATION:

Recruitment conditions:

- Fixed-term contract for a period of 18 months
- Desired start date: 01/07/2024
- Remuneration will be set according to the candidate's profile, based on the rules defined by the *Institut Mines Télécom's* management framework
- Full time
- Position based in Saint-Étienne
- For internal use :
 - Category II - Job P - *Post doctorant* according to the Management Framework

The position is open to all, with accommodation available on request for candidates with disabilities.
The job is open to civil servants and/or the general public.
All applications may be subject to an administrative enquiry.

How to apply:

Applications (CV, covering letter, letter of recommendation if applicable) must be submitted on the RECRUITEE platform **no later than 28/06/2024**:

<https://institutminestelecom.recruitee.com/o/post-doctoral-position-in-particles-technology-18-month-fixed-term-contract-2>

As part of its Equality, Diversity and Inclusion policy, École des Mines de Saint Etienne is an employer that is committed to fair treatment of all applicants.

For further information:

For further information about the position, please contact:
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For all administrative information, please contact:
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Useful links:

<https://www.mines-stetienne.fr/>

<https://www.imt.fr/>

<https://www.youtube.com/watch?v=QUeuC5iQiN0>

Protecting your data:

<https://www.mines-stetienne.fr/wp-content/uploads/2018/12/Informations-des-candidats-sur-les-traitements-de-donn%C3%A9es-personnelles.pdf>