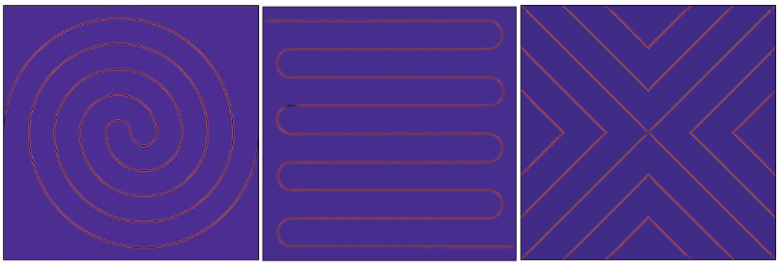
Title of the project: Heat transfer optimization in adsorbent bed



Context

Within the EPFL Carbon Team, we've developed a distinctive approach to capture CO_2, employing two technologies. The first involves directing air through adsorbent pellets, materials with the ability to selectively trap CO_2 molecules on their surface. Releasing the captured CO_2 from the pellets requires the application of heat, raising the adsorbents' temperature from 20 to a range of 80 to 120 degrees Celsius. This heating process can be energy-intensive, prompting the need for efficiency considerations.

Description

As part of this project, you will be required to design an adsorption bed with an integrated heat exchanger to minimize energy consumption. You will be comparing different ways to provide heat to the adsorbents inside the bed and choosing an optimal solution. To validate the optimal solution, you are required to simulate the heat exchanger system and to build the bed to experimentally test it. You will be collaborating with the aerodynamics project to build one prototype that optimizes both aerodynamics and heat transfer.

Requirements

- Knowledge in heat transfer.
- Knowledge in fluid mechanics and especially in compressible fluid mechanics.
- Knowledge regarding how to use a CAD software.

Bonus: experience in a lab or with other projects.

Tasks

- Simulate the heat transfer through the adsorbents for different geometries of adsorbent bed.
- Build the most optimal heat exchanger and test the results of your simulations (i.e. measure the energy needed to heat 4kg of adsorbents stacked in the adsorbent bed).

Contact

Supervising lab: LFIM, Prof. Wendy Queen.
Student supervisor: Louis Saix (louis.saix@epfl.ch).

Remarks

Project location: Lausanne.
The project can accommodate a maximum of 5 students.