

Title of the project: Air flow 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 which are stacked in an adsorbent bed. These materials have the ability to selectively trap CO_2 molecules on their surface. Knowing that the weight concentration of CO_2 in the air is only 0.06%, we need to move 10'000 kg of air to capture 6kg of CO_2 . You can directly see the problem when scaling up, especially if we have considerable pressure drop.

Description

Your role is to design an aerodynamic housing for the adsorbent bed that minimize the pressure drop the most, with the fan system that will push air through it. To validate the optimal solution, you are required to simulate the air movement through the bed and build it to experimentally test it. You will be collaborating with the heat transfer project to build one prototype that optimizes both aerodynamics and heat transfer.

Requirements

- Knowledge in fluid mechanics and especially in compressible fluid mechanics.

- Knowledge regarding how to use a CAD software.
- Knowledge in fluid mechanics in porous medium.

Bonus: experience in a lab or with other projects.

Tasks

- Simulate the air flow through a porous medium for different geometries of adsorbent bed.
- Build the most optimal adsorbent bed according to the results of your simulations and experimentally verify these results.

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.