COMPUTATIONAL FLUID DYNAMICS MODELING APPLIED TO ANAEROBIC DIGESTERS

Introduction

Anaerobic digestion is a mature technology and a serious candidate for the production of renewable energy to support a sustainable development. In waste water treatment plants, the biodegradable sludge is converted to biogas in full-scale digesters that need to be completely mixed. However, up-scaling these systems from lab to full-scale is still a challenge today because we cannot ensure the same optimal conditions as in the lab. As a consequence, safety factors have to be introduced when designing digesters, which increase digester volumes and design and maintenance costs. Instead of traditionally design these systems as 'black boxes', we can try to simulate how the sludge will be moving inside and propose novel digester designs.

Methodology

In order to simulate how the sludge will move inside the digester, you will create a Computational Fluid Dynamic (CFD) model that will represent the geometry of a real digester, as well as the suitable material properties of biodegradable sludge (how viscous it is). In order to convince 'non-believers' that the model work, the model will be compared against (very) detailed data. When the model is validated, you will enter the 'uncharted realm of endless possibilities' where you can test different digester conditions that your colleagues from the lab can only start to imagine.

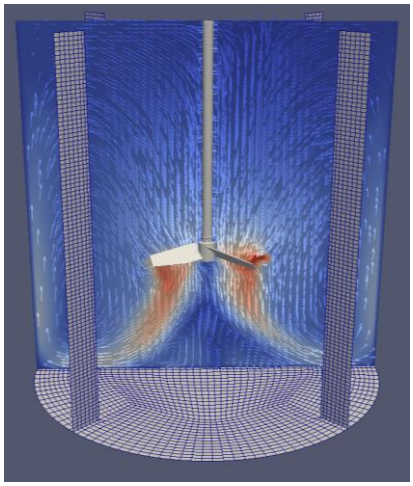

Figure 1 – Example of what your anaerobic digester model will look like.

Objectives of the thesis

This thesis aims to develop a CFD model to study how the sludge moves inside the digester. This will enable the student to learn how to use advance modeling techniques that are highly demanded by industry, and have the proper tools to answer the question: Is the digester well mixed?

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BACKGROUND

L&W, M, C&B

LANGUAGE

English

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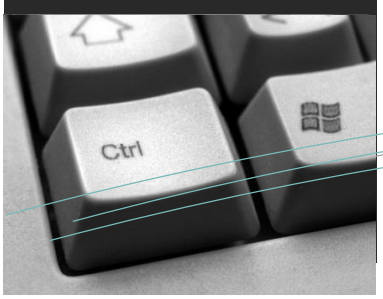

BIOMATH