# Purpose

The purpose of this document is to provide supporting research for the mechanical design. Specifically, it looks to cover:

* Questions surrounding the digestate, like:
  + How biohazardous is it? What safety precautions are required for this?
    - Heavy influence on design
  + Appropriate disposal
  + Can it be cleaned out? How easy/difficult would it be to do so?
  + Does the digestate need to be kept in an environment with no/little oxygen?
  + Does the digestate have a certain pressure that it should be maintained at?
* Questions surrounding how to get the fluid into the container?
  + I’m personally a big fan of attaching the unit to the tap output.
  + Could also secure some sort of lead, but then this introduces more hazards.
  + Can assume, with some good reason, that we’d be able to place it onto a table
    - Flaws with this idea
* Questions surrounding how we will dispose of the fluid
  + Single use containers? Even then, how will the handler get these out safely?
    - Costs?
    - How would this affect how the heating elements are placed into the mixture?
  + Is there some sort of liquid solution that we could use to clean it out with?
    - What are the hazards of this? Costs?
* How we will configure the instrument for best analysis
  + This will be supported by some of the findings of ours
  + For example, does rotating get better foaming analysis accuracy?
    - Would we install rotation/stirring then, or just get multiple cameras?
    - How does the digestate actually foam?

# The digestate

<https://www.epa.gov/agstar/how-does-anaerobic-digestion-work>

## How biohazardous is it? What safety precautions are required for this?

Digestate can contain pathogens found in the inputs. These pathogens, if in contact with humans, can be extremely dangerous. As such, it should be ensured that no contact is made with the digestate.

Further, the digestate can contain:

* Ammonium (NH4)

And the biogas can include:

* Methane (CH4) - colourless, odourless, can cause asphyxiation
* C02 - colourless, odourless, can cause asphyxiation
* Hydrogen sulfide (H2S) - Rotten egg smell, colourless, but sensitivity to smell decreases rapidly with increasing concentrations. Attacks the central nervous system causing loss of consciousness and/or death.
* Ammonia (NH3) - Colourless gas with a strong pungent odour. Can cause lung damage and death in cases of high exposure to high concentrations..
* Carbon Monoxide (CO) - Binds with red blood cells, does not let oxygen bond to cells. Causes death through suffocation.

These gases are unlikely to come through in large quantities, but it’s best not to let them through.

Another interesting thing is that the digestate can be in the form of:

* A liquid
* A slurry
* Less commonly a stackable material that looks like compost

## Cleaning out the digestate

### Impacts on design

## Appropriate disposal

## Can it be cleaned out? How easy/difficult would it be to do so?

## Does the digestate need to be kept in an environment with no/little oxygen?

## Does the digestate have a certain pressure that it should be maintained at?