

AD011 – Y Maesydd

Bund Volume Calculations

Calculations detailing the volume of the bunded area and relevant calculations considering the consequences of a spillage.



Version 1

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1 Abstract

This document details the calculations made to assess the volume of the bunded area of the digester plant designed for Haydn Langford. The volumes and internal dimensions of the contained area have been calculated in accordance with CIRIA 736.

The total bunded volume of the site is calculated to be 1,675.45m³.

The digester tank contains 1,200m³.

110% of the largest tank contents is 1,320m³.

25% of the total volume is 300m³.

These numbers show that the bund meets the requirements for the system's containment.

2 Tank Details

The internal volume of the digester tank is $1,200\text{m}^3$. Some of the internal volume is taken up by the rotating arm and the heat exchangers, however, this volume has not been considered in the calculations.

110% of $1,200\text{m}^3$ is $1,320\text{m}^3$.

25% of $1,200\text{m}^3$ is 300m^3 .

Given that 110% of the largest tank is larger than 25% of the total volume of the site, this is the volume that the bund must contain.

3 Bund Details

Please reference drawing HF-GA-01 and HF-GA-08.

The bunded area consists of two levels, a lower spill catchment area and a higher main bunded area.

There is a grit sump within the spill catchment area with a total volume of 7.5m^3 . Under normal operation this will be empty, however, neither have been included in the volume of the bunded area and will contribute excess volume to the stated total bunded volume.

There is a rainwater sump within the main bunded area, the volume of this sump has not been included in the volume of the bunded area.

There is a gas holder that is within the main bunded area that encompasses 117.8m^3 of volume, in the lowest 1,500mm of its shape.

The main bunded area is 40m long and 30m wide, with a total area of $1,200\text{m}^2$, the bund wall height is 1.5m giving a total bunded volume of $1,800\text{m}^3$.

If the tank failed, the area footprint of the tank would still contribute to the containment area and so does not need to be deducted from the calculations.

There are two walls supporting the containers for the control system and the CHP above the bund wall.

- One is 13.5m long and 0.2m thick giving a total volume of 4.05m^3
- One is 4.5m long and 0.4m thick giving a total volume of 2.7m^3

Deducting the volume of the gas holder below the bund wall height and the volume of the walls gives a total usable bunded volume of $1,675.45\text{m}^3$.

4 Drainage

All liquid in the spill catchment area drains into the grit sump, this liquid is then pumped back into the digester tanks.

Under normal operation, any rain that falls into the raised portion of the main bunded area will drain to a rainwater sump.

Under normal operation the rainwater sump will discharge rainwater to the farm rainwater drain.

This would only be done manually and thus poses no risk of discharging liquid during a spill event.

5 Conclusion

Given that the total bunded volume is $1,675.45\text{m}^3$ and the required volume to be contained is $1,320\text{m}^3$, we deem the bunded area to be sufficient.