

SAWTP FLARING MODEL

1. Biogas bubble volume: 340 m³.
2. Biogas typical composition: 65% CH₄ and 35% CO₂.
3. Typical Scenario:

Flare kicks in when gas bubble level reaches 85% and switches off when gas bubble level reaches 65%. For biogas level to go down by 20%, flare is switched on for around 22 minutes.

This means that the flare burnt 20% of gas bubble volume, equivalent to:
 $0.20 \times 340 \text{ m}^3$ of biogas = 68 m³ of biogas burnt in 22 minutes.

Before flaring, 68 m³ of biogas is composed of around 44.2 m³ of CH₄ and 23.8 m³ of CO₂.

Assuming a flare efficiency of 98%;

After flaring, 98% of the CH₄ is converted to CO₂ and water, and 2% is non-combusted and escapes to the atmosphere:

Methane gas weighs 0.554 kg/m³
Carbon Dioxide weighs 1.836 kg/m³
98% of 44.2 m³ CH₄ = 43.316 m³ equivalent to 24 kgs of CH₄

According to the chemical formula $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$, when 24 kgs of CH₄ are combusted they produce 66 kgs of CO₂

4. Emissions

When the flare is switched on for 22 mins, the following emissions occur:

- 1) 2% of 44.2 m³ of CH₄ = 0.884 m³ of CH₄ escapes to the atmosphere, equivalent to 0.49 kgs of CH₄ ;
- 2) 23.8 m³ of CO₂ present in the unburnt biogas equivalent to 43.7 kgs, plus 66 kgs of CO₂ from the combusted methane.