The most commonly used monitoring methodology is that of gas capture with floating hoods connected to a continuous N_2O and CH_4 analyser. The hoods are connected through an air tube to a gas flow meter and the outlet of this is passed through the sample conditioning system to remove possible particles and condense moisture and then passes through the gas analyzer, obtaining a continuous reading of the gas concentration. Therefore, the three most important elements for a correct monitoring are the collection of the gases emitted by floating bells, measurement of the concentration of the gases with the gas analyzer in continuous and determination of the gas flow out of the reactor where it is being measured.

When emissions monitoring is conducted in anoxic compartments or tanks, the methodology has to be adapted to the fact that the emitted gas flow is so low that it cannot be accurately measured with a flow meter connected to the hood. In these cases, air with a known oxygen concentration can be introduced into the hood and the oxygen concentration of the gas leaving the hood can be measured. With this protocol, the flow of gas out of the reactor can be calculated because, having an oxygen concentration equal to zero, it causes a decrease in the oxygen concentration leaving the hood. Next figure shows a measurement scheme for aerobic and anoxic zones.

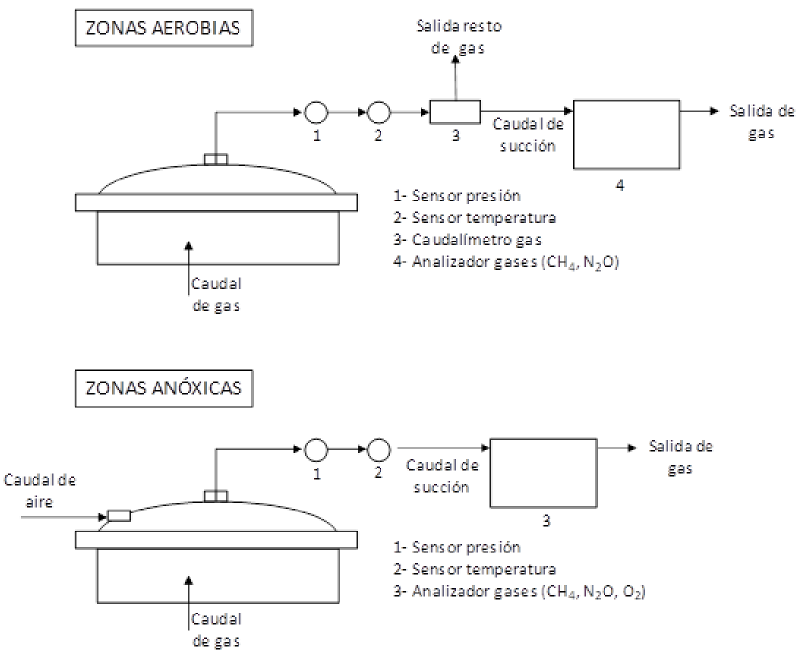

Diagram of the gas flows in and out of the hood used in aerobic and anoxic zones.

EQUATIONS

For the calculation of N2O emissions we can use equation 1:

$$N_2O\ emitted\ = \sum_i^n \left(\sum \left(C_{N-N_2O} \cdot \check{L}_{gas} \cdot \Delta t \right)_{hood\ i} \right) \cdot \frac{A_{zone\ i}}{A_{hood\ i}} \qquad \text{(Eq. 1)}$$

where

$$C_{N-N_2O} \left({}^{g\ N-N_2O}/_{L} \right) = C_{N-N_2O}\ (\mathrm{ppmv}) \cdot \mathrm{N_2O\ molar\ volume\ (0.0402\ a\ 1atm\ and\ 25^{o}C)} \cdot 10^{-6} \cdot 28 \qquad \text{(Eq. 2)}$$

$\check{L}_{gas}$ is the gas flux that exits the reactor (L/s). This is quantified differently depending on whether it is an aerobic or an anoxic zone. For the aerobic zones, it is quantified by means of a gas flow meter on the vent port. For the anoxic zones equation 3 applies.

$$\check{L}_{gas}\ (anoxic\ zones) = \check{L}_{hood\ suction} - \check{L}_{incoming\ air\ into\ the\ hood} \qquad \text{(Eq. 3)}$$

$$\check{L}_{incoming\ air\ into\ the\ hood} = ((\check{L}_{hood\ suction} \cdot x_{oxygen\ exiting\ the\ hood}) - (\check{L}_{reactor\ gas} \cdot x_{oxygen\ exiting\ reactor}))/(x_{oxygen})$$

(Eq. 4)

$x_{oxygen\ exiting\ reactor}$ equals zero for anoxic zones.

$x_{oxygen\ exiting\ hood}$ equals teh concentration of oxygen measured by the analyzer.

Δt is the time interval in which the N2O concentration is measured (s).

$A_{zone\ i}$ is the area of the reactor zone where the Hood is placed.

$A_{hood\ i}$ is the area of the hood.