

Formación y liberación de compuestos odorantes producción porcina Principios e influencia operacional



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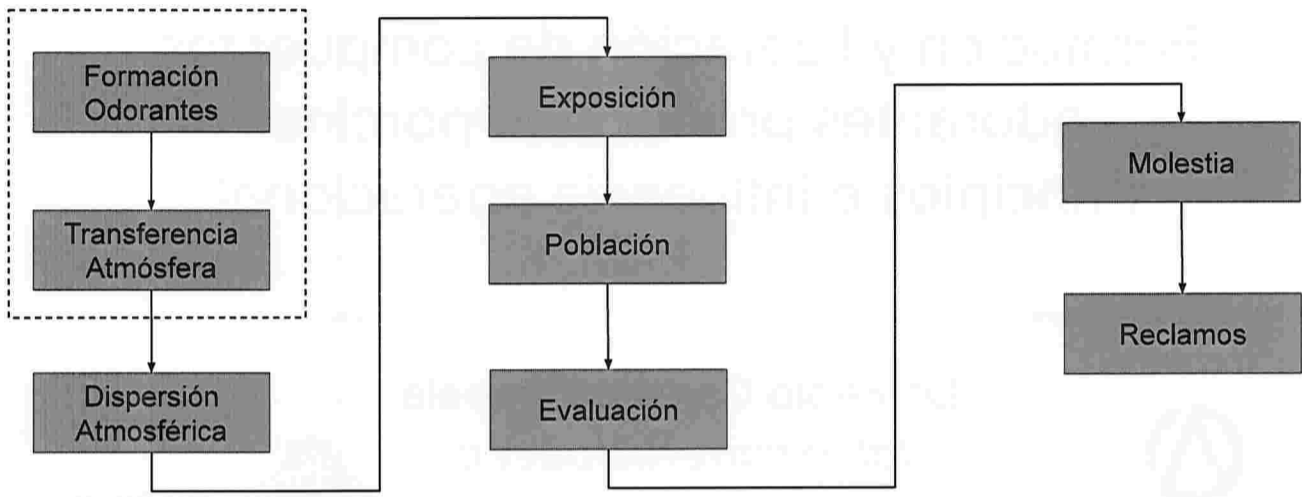
PONTIFICIA
UNIVERSIDAD
CATÓLICA DE
VALPARAÍSO

Contenido

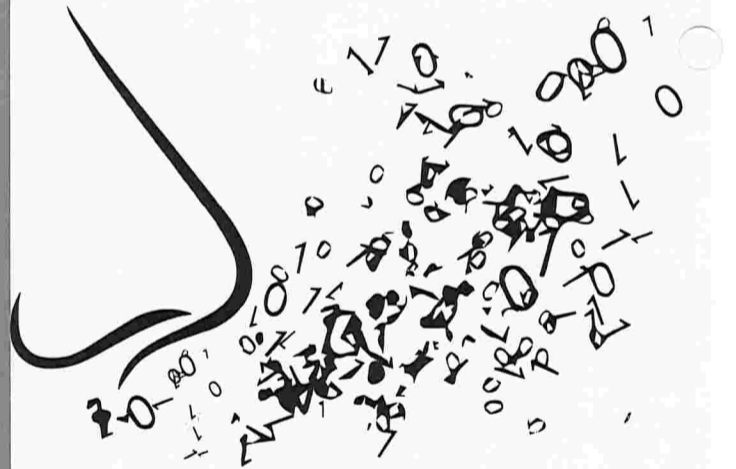
- Composición química emisiones atmosférica olor:
 - Principales compuestos odorantes
 - Formación y liberación
- Influencia operacional emisiones:
 - Almacenamiento
 - Tratamiento



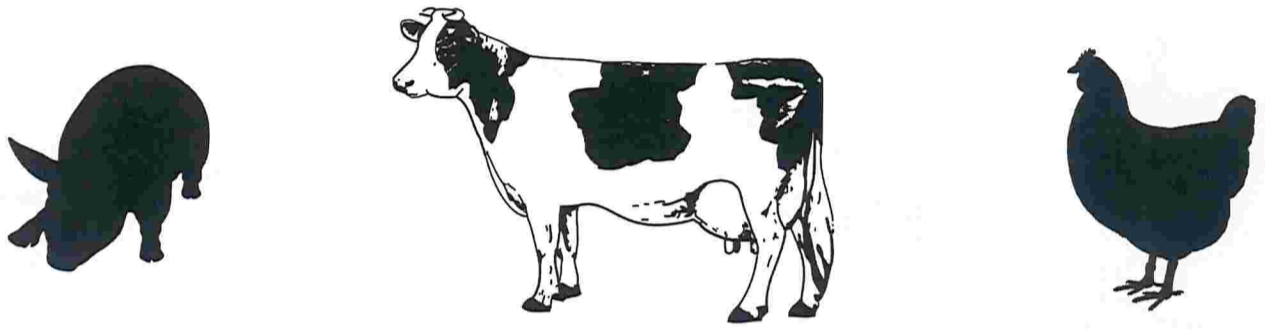
Impacto por olor



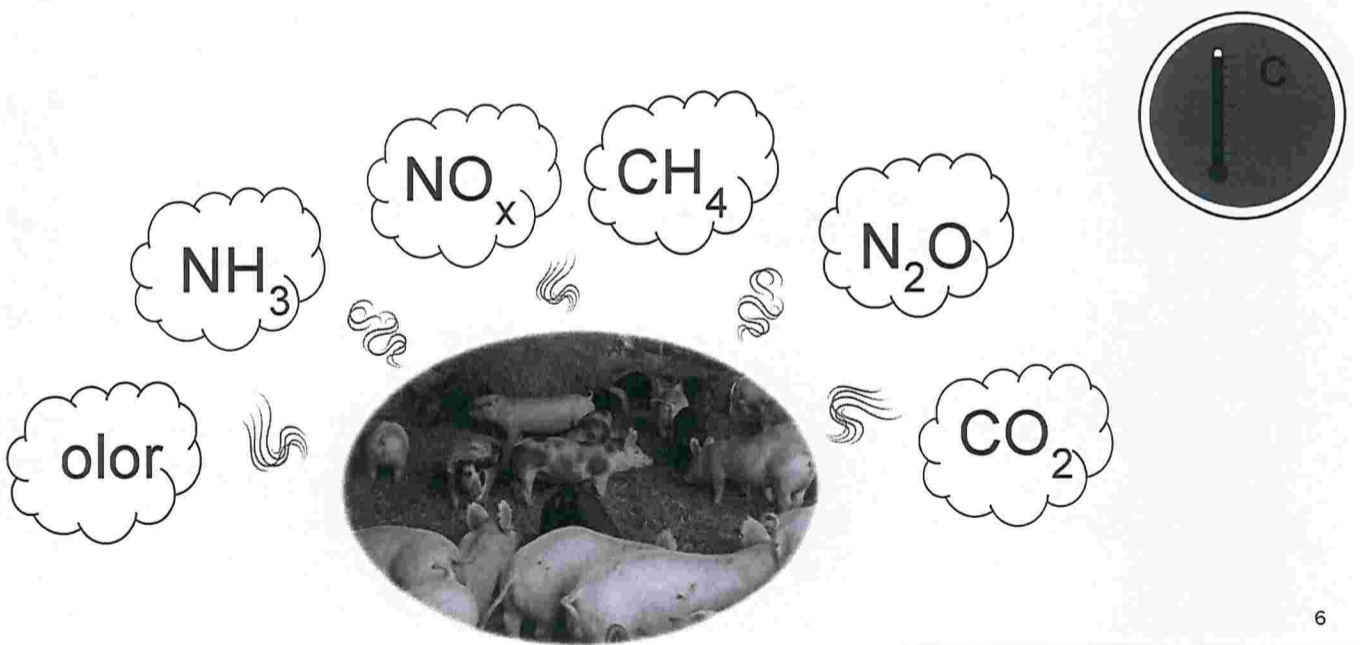
¿Qué es el olor?



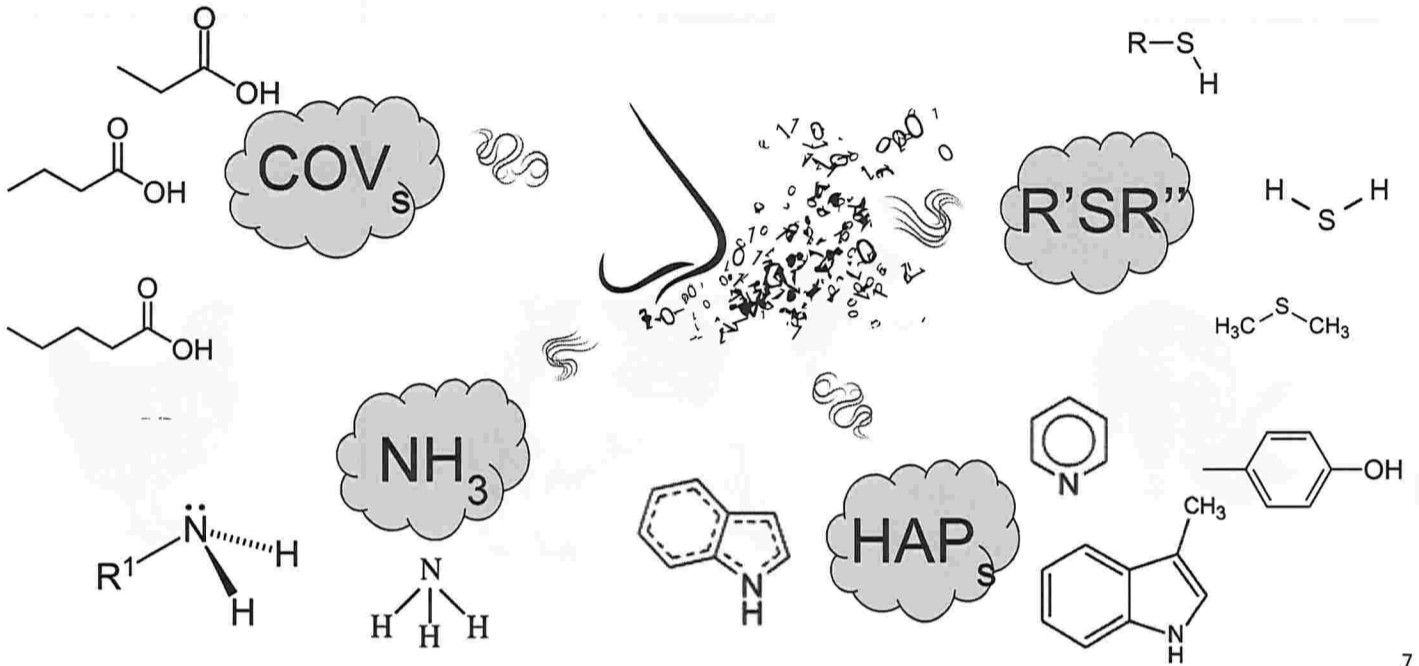
Agroganadería



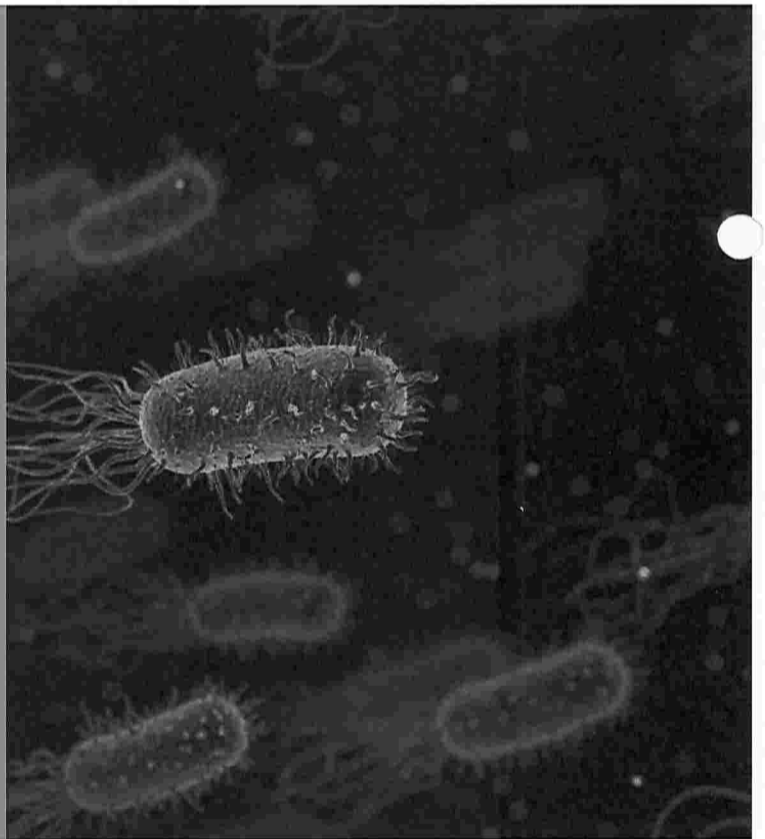
Emisiones Atmosféricas



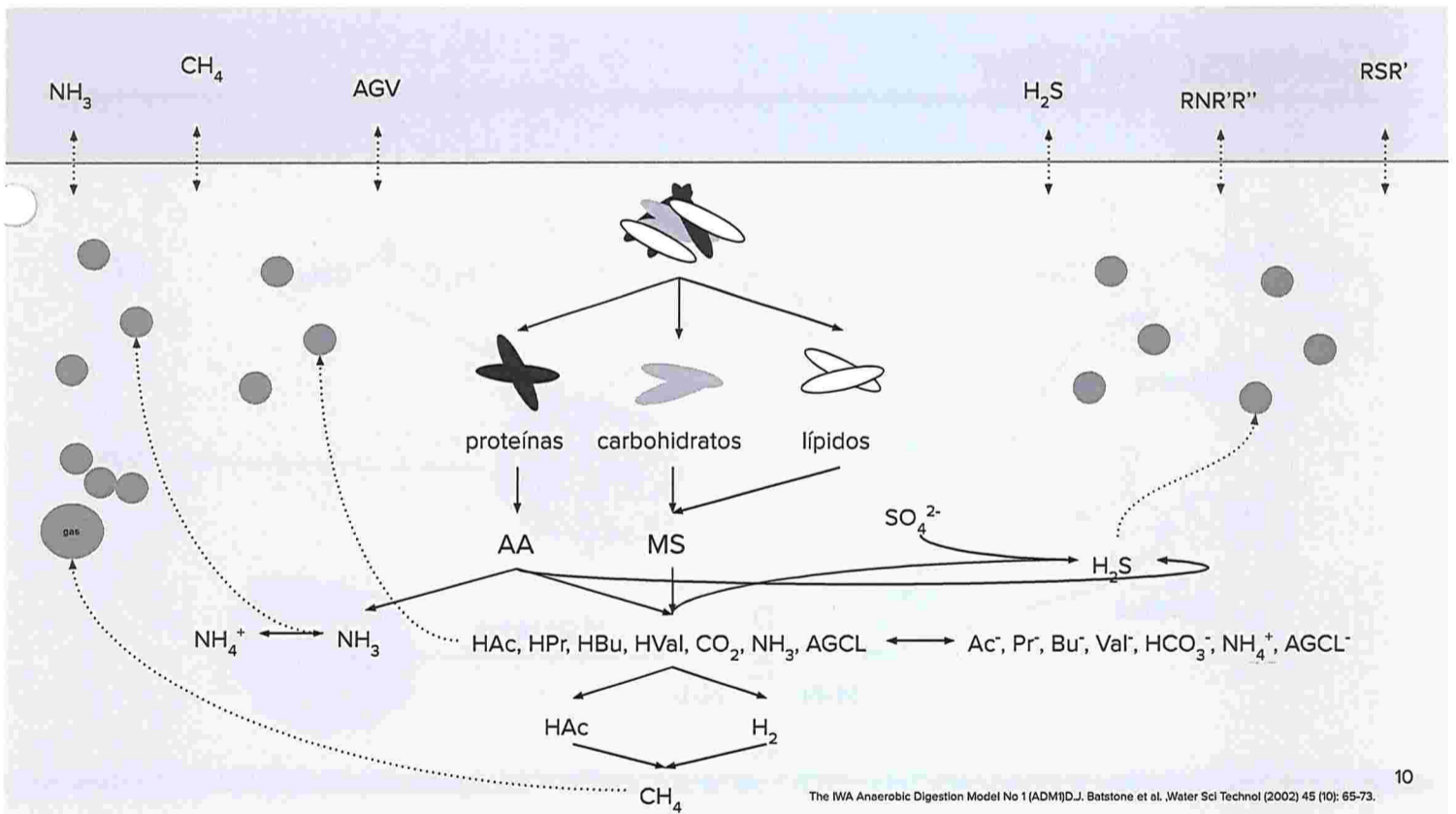
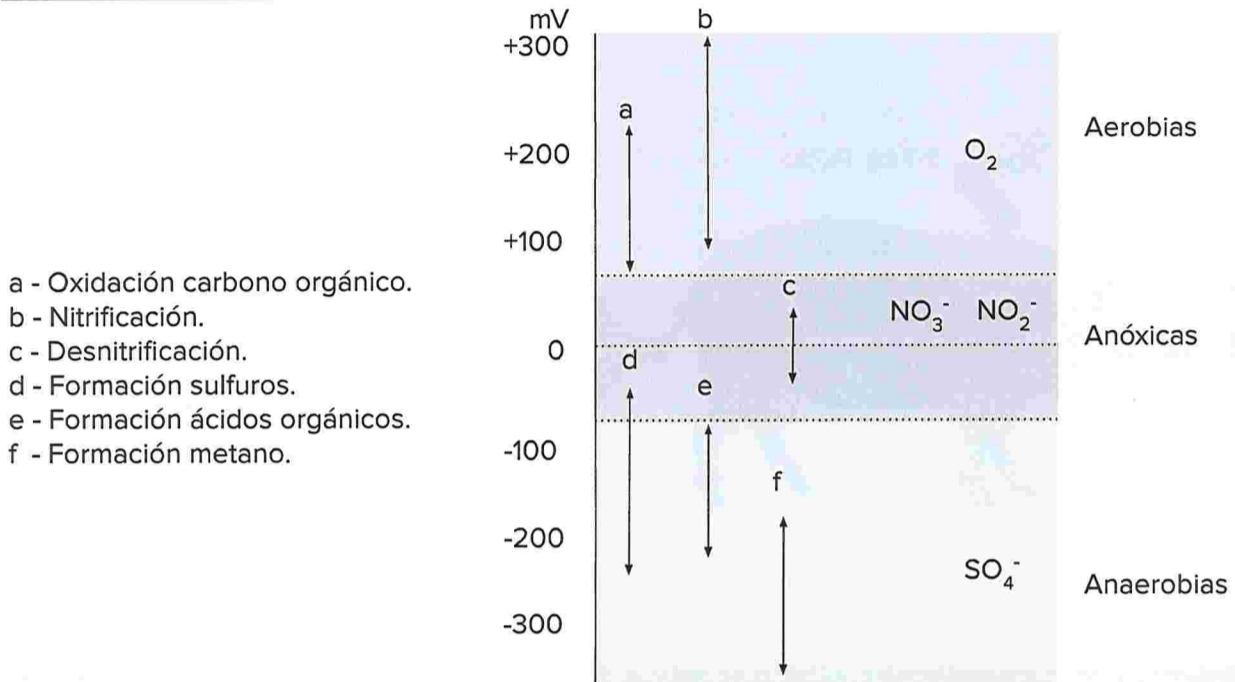
Composición Química



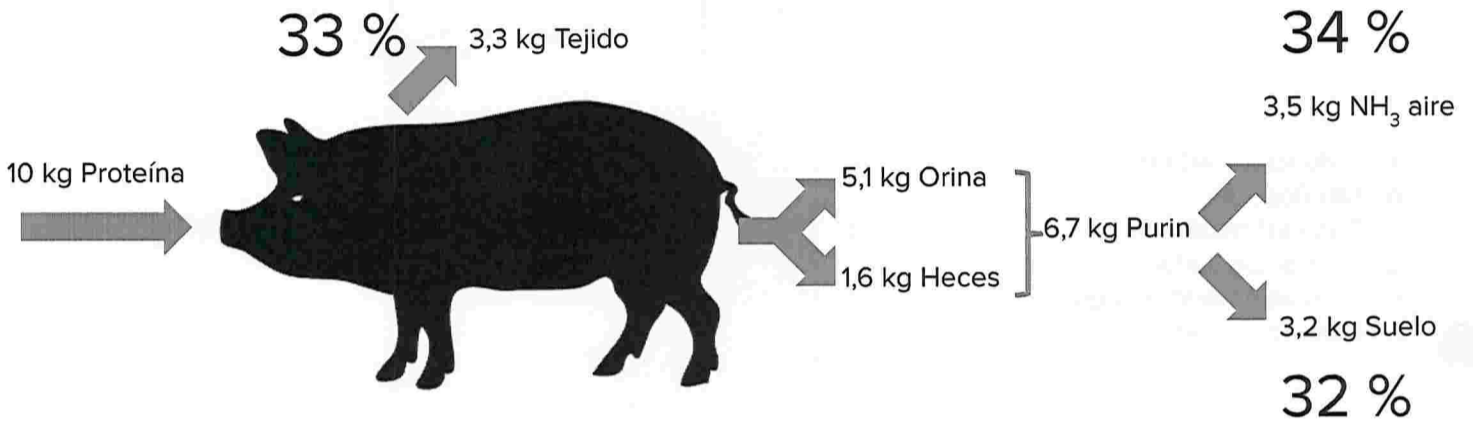
Formación



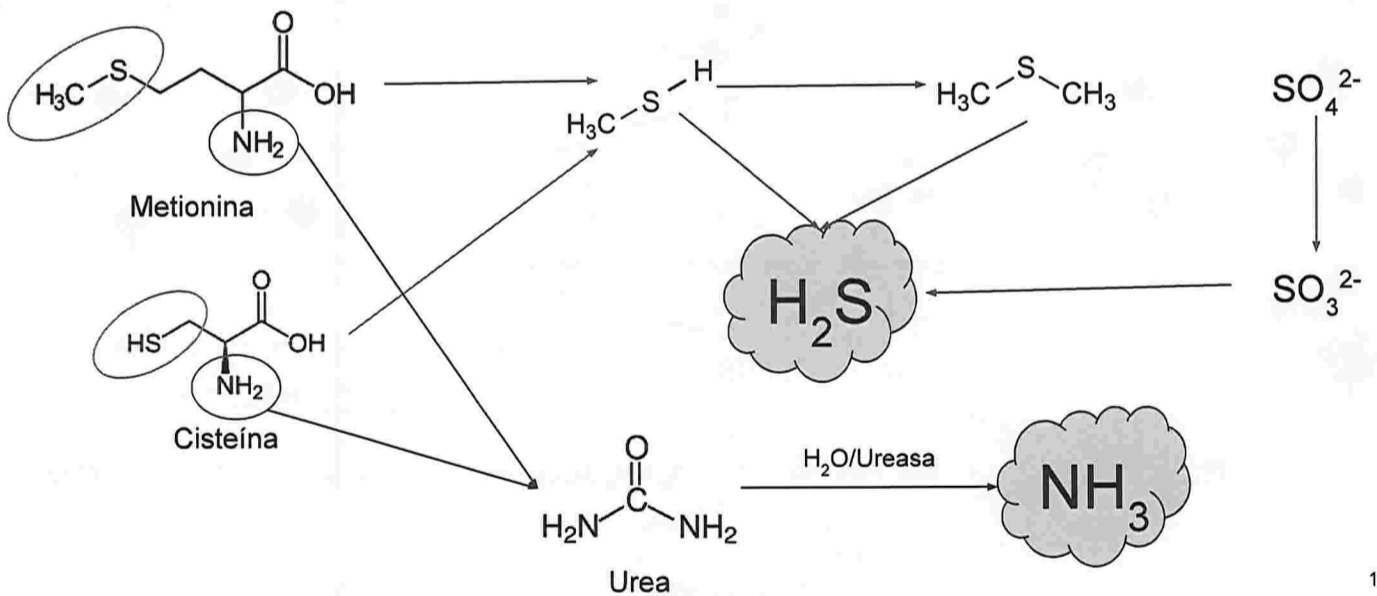
Reacciones biológicas potencial redox



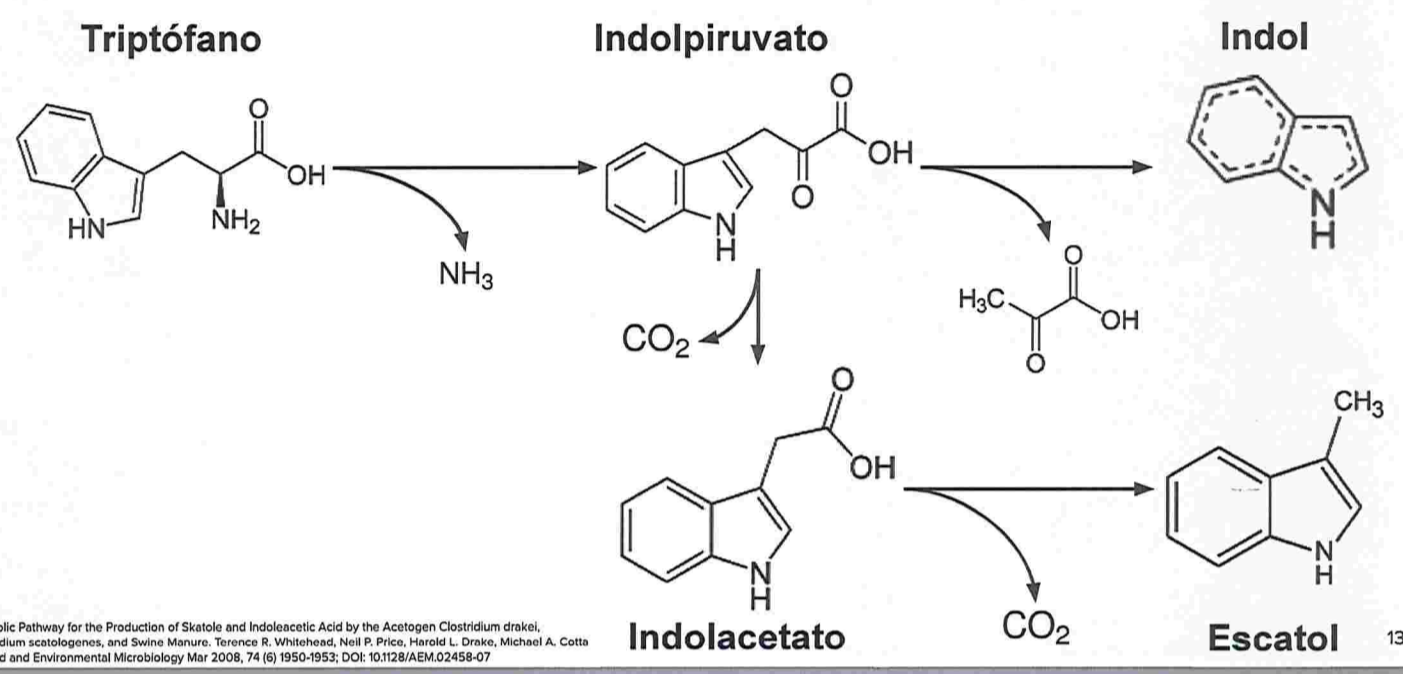
Generación Olor



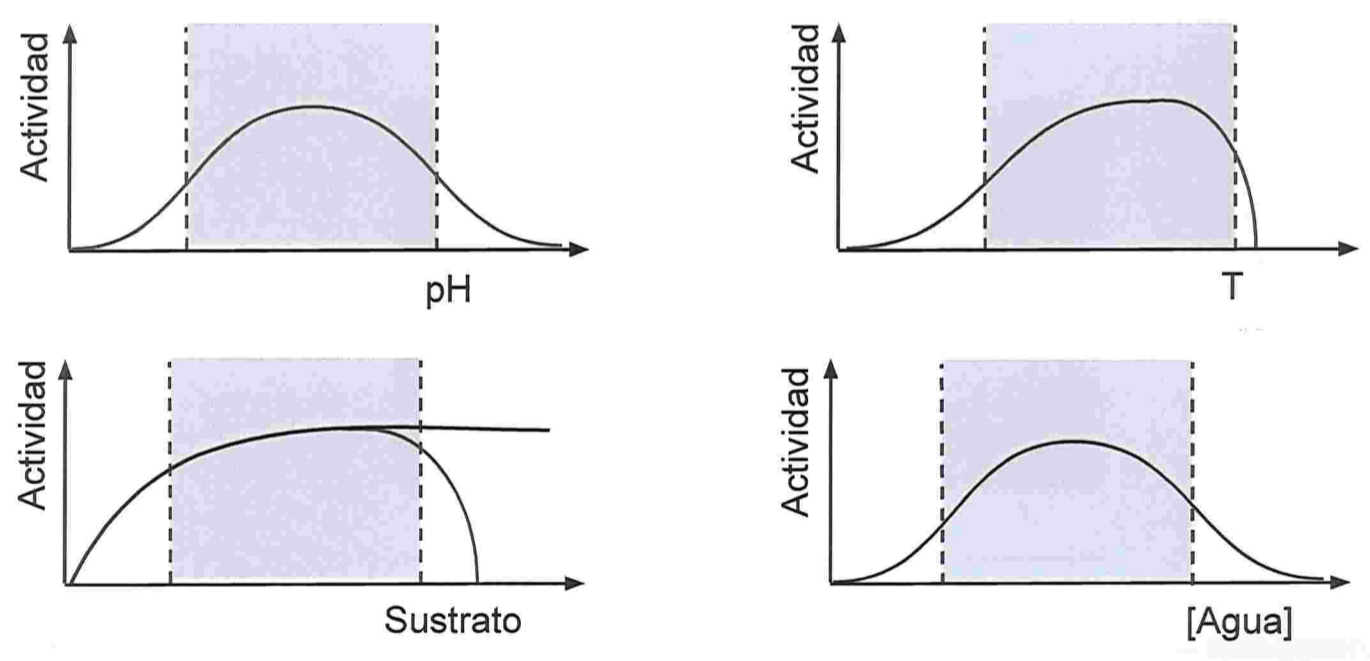
Generación Olor



Generación Olor



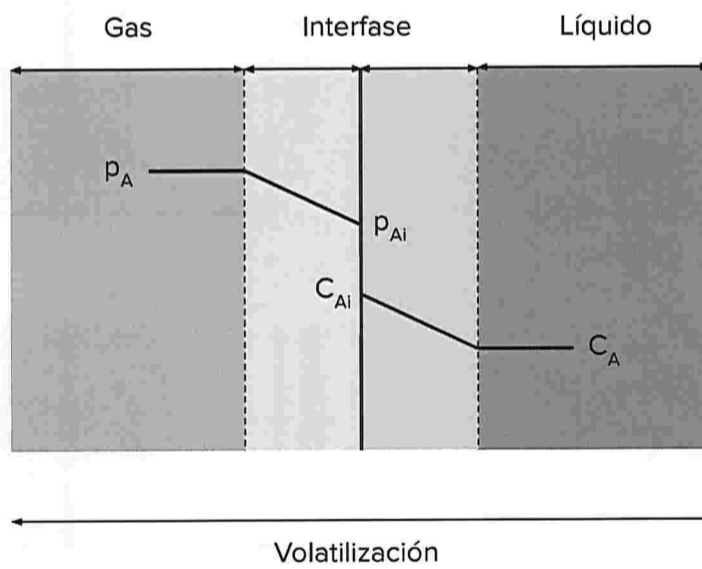
Generación Olor



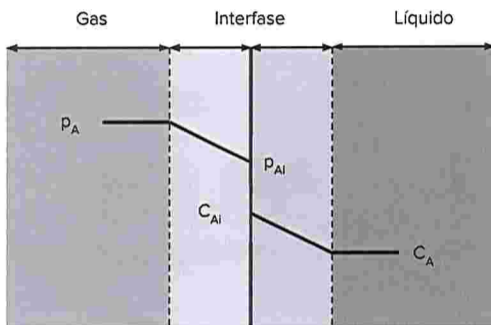
Liberación



Transferencia Materia Líquido-Gas



Transferencia Materia Líquido-Gas



$$J_g = -D \frac{\partial p_i}{\partial x} \approx -D \frac{p_A - p_{Ai}}{\delta_n} = \frac{D}{\delta_n} (p_{Ai} - p_A) = k_g (p_{Ai} - p_A)$$

$$J_l = -D \frac{\partial C}{\partial x} \approx -D \frac{C_{Ai} - C_A}{\delta_n} = \frac{D}{\delta_n} (C_A - C_{Ai}) = k_l (C_A - C_{Ai})$$

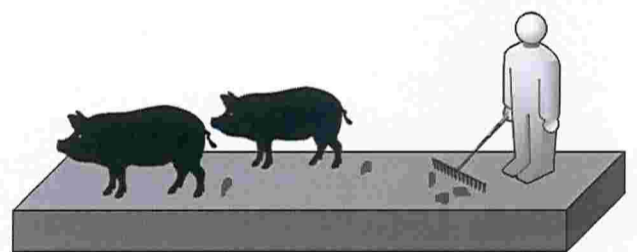
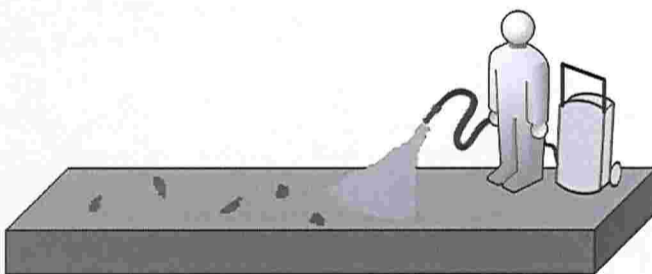
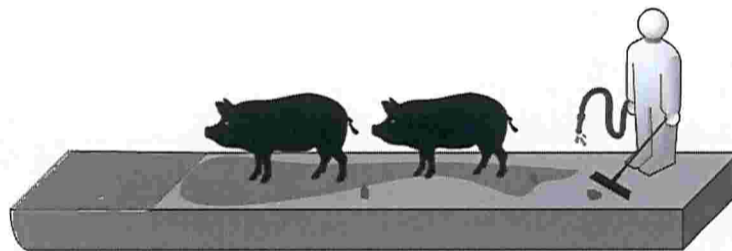
$$J = K_l ((C_A - C_{Ai}) + (C_{Ai} - C_{Ai}^*)) = K_l (C_A - C_{Ai}^*)$$

$$J = K_g ((p_{Ai} - p_A) + (p_{Ai}^* - p_{Ai})) = K_g (p_{Ai}^* - p_A)$$

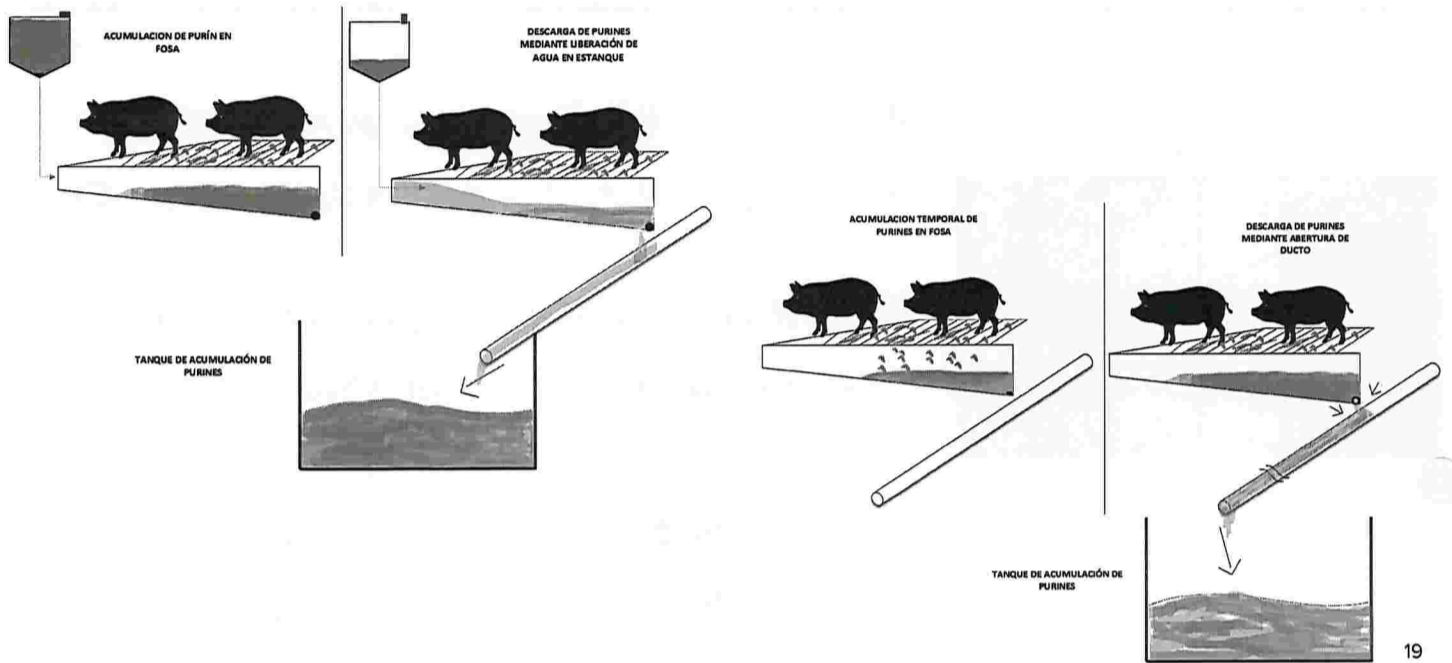
$$J = K_l \left(\frac{J}{k_l} + \frac{J}{k_g H} \right) \longrightarrow \frac{1}{K_l} = \frac{1}{k_l} + \frac{1}{k_g H}$$

$$J = K_g \left(\frac{J}{k_g} + \frac{JH}{k_l} \right) \longrightarrow \frac{1}{K_g} = \frac{1}{k_g} + \frac{H}{k_l}$$

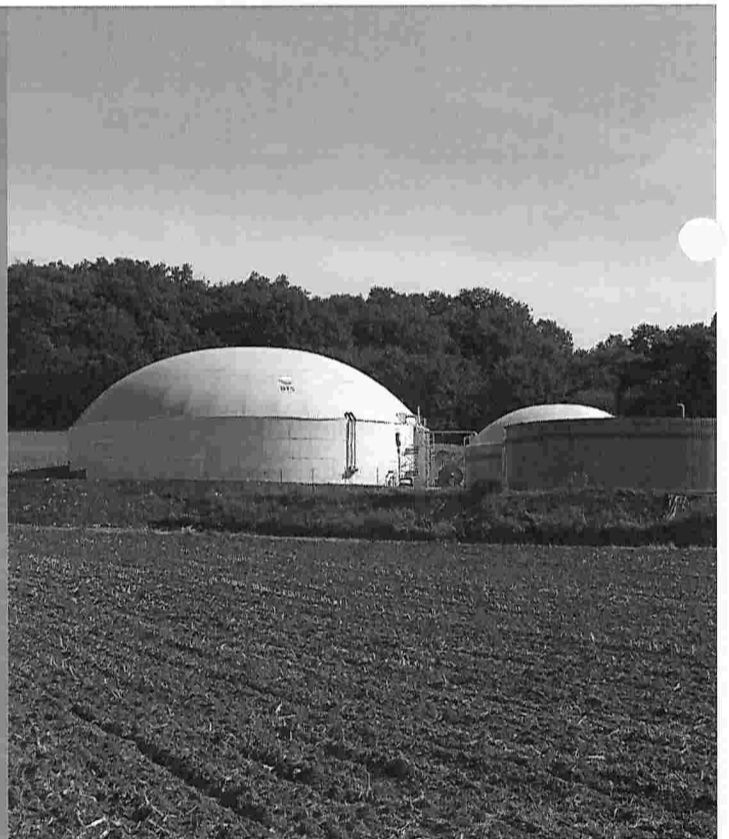
Sistemas de Limpieza



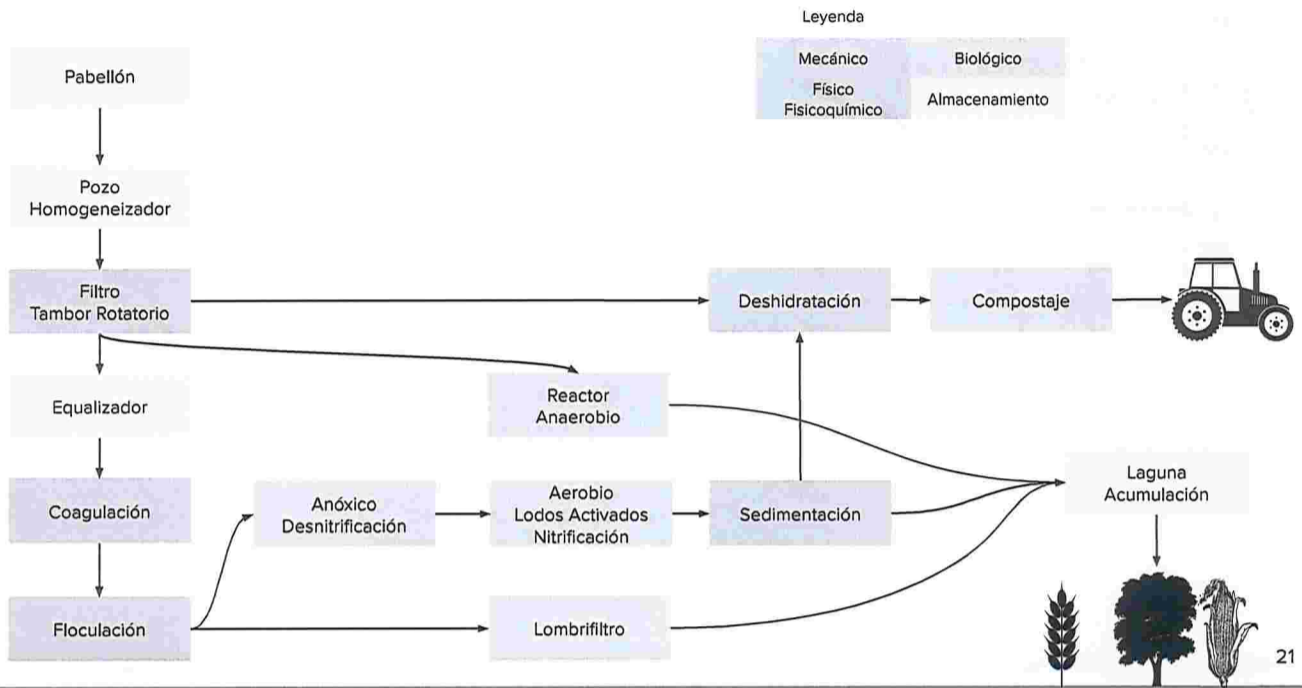
Sistemas de Limpieza



Tratamiento

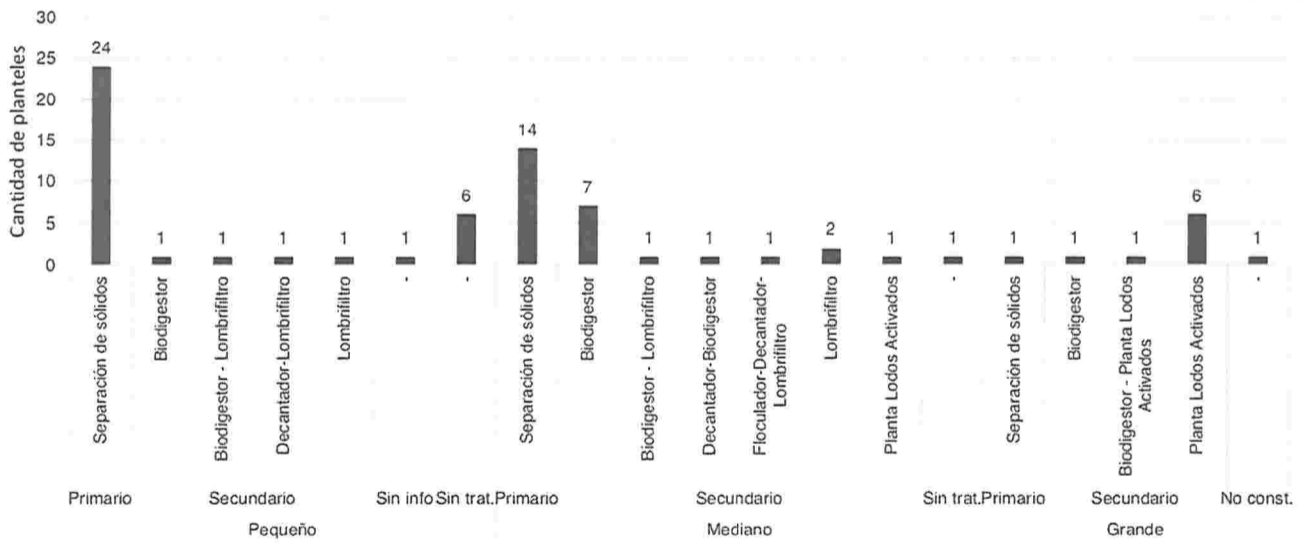


Tratamiento Purín



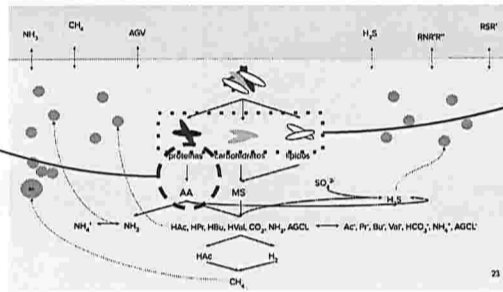
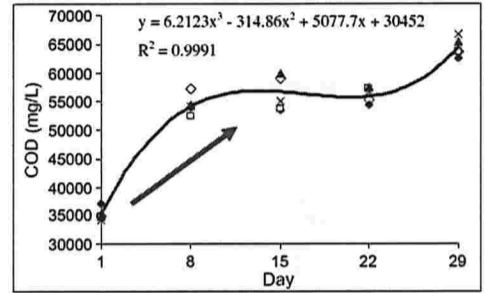
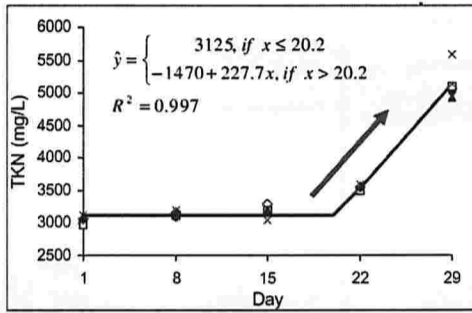
Envirometrika, 2018.

Tratamiento Purín

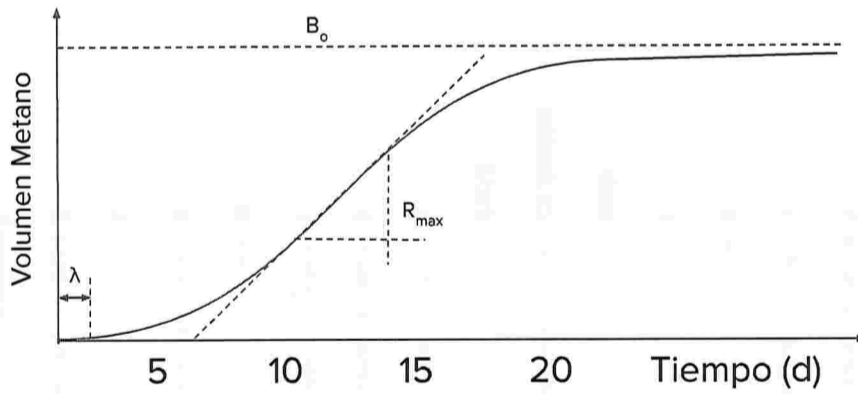


Fuente: Envirometrika, 2018.

Almacenamiento: Pabellones



Almacenamiento: Lagunas



$$B(t) = B_0 e^{-e \left(\frac{R_{max} \cdot e \cdot (\lambda - t)}{B_0} + 1 \right)}$$

Recomendaciones

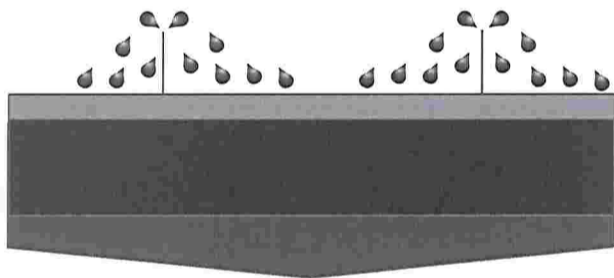
↓ Tiempo almacenamiento

↑ Inspección

🧠 Confinamiento

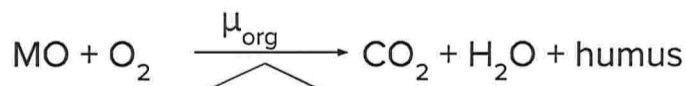


Tratamiento Aerobio: Lombrifiltro



Coliformes fecales ≥ 99%
 ST ≥ 95%
 N-tot: 60 - 80%
 Aceite y Grasas ≥ 80%

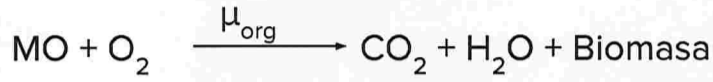
DBO₅ ≥ 95%
 SSV ≥ 93%
 P-tot: 60 - 70%
 50 L d⁻¹ m⁻²



Bacterias

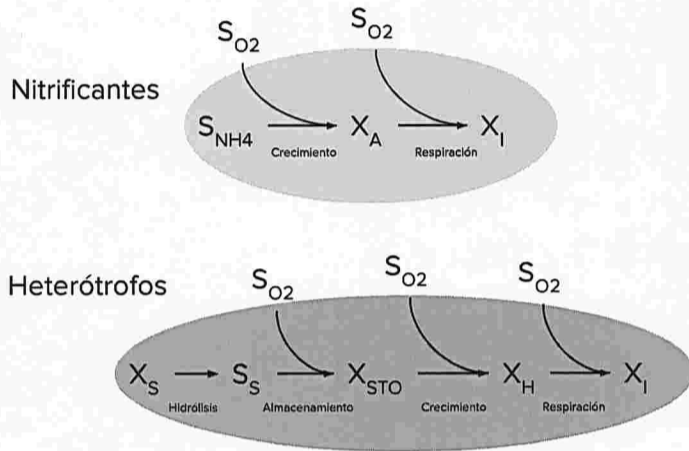
Lombrices

Tratamiento Aerobio: Lodos Activos

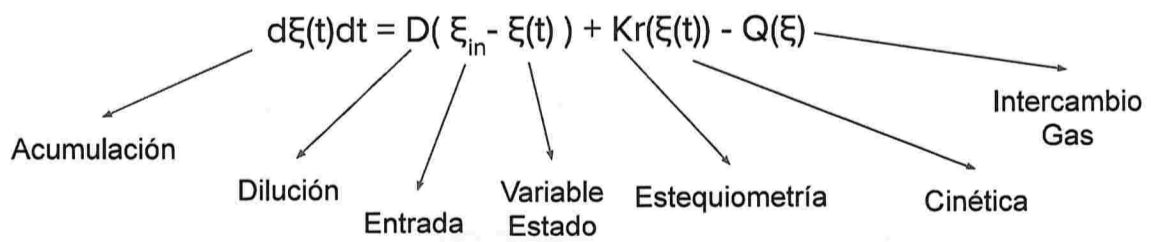
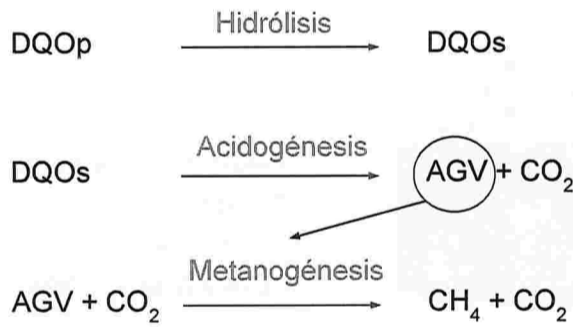


□ Convencional:
F/M: 0.25-0.45
STR: 4-6 d

□ Aireación Extendida:
F/M: 0.05-0.15
STR: 15-25 d



Tratamiento Anaerobio



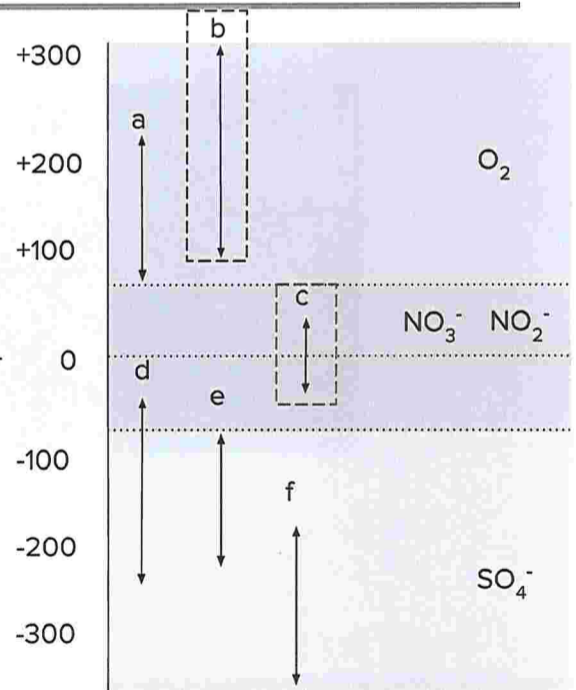
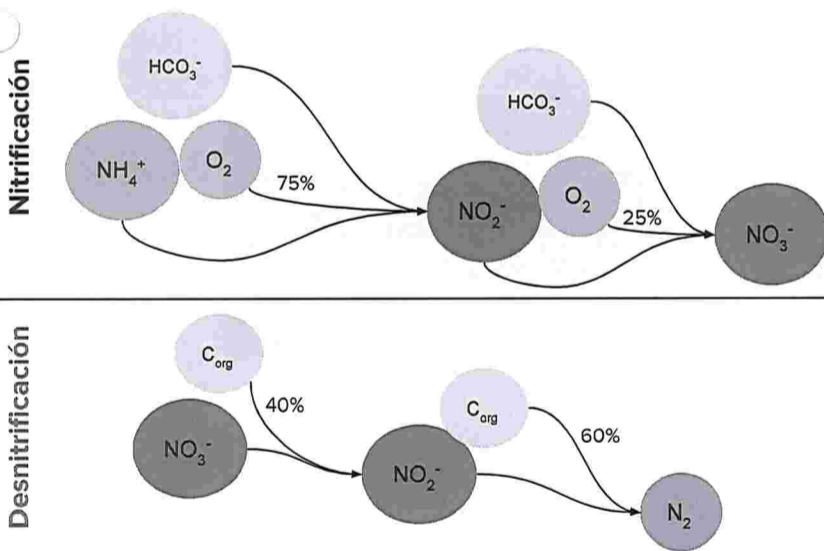
Tratamiento Anaerobio



| Operation Parameters | Standard Methods Index | Typical Range | | Extreme Range | |
|---------------------------|------------------------|--|-------------------------|--|-------------------------|
| | | Mesophilic | Thermophilic | Mesophilic | Thermophilic |
| Temperature | 2550(A) | 32-37 ¹⁷ °C | 50-60 ¹⁷ °C | 20-42 ¹⁷ °C | 45-65 ¹⁷ °C |
| Organic Loading Rate | NL | 0.8-2.0 ¹⁷ g | 1.5-5.0 ¹⁷ g | 0.4-6.4 ¹⁷ g | 1.0-7.5 ¹⁷ g |
| Hydraulic Retention Time | NL | 15 - 35 Days | | < 15 ; > 35 Days | |
| Carbon: Nitrogen Ratio | NL | 25:1 ¹⁷ | | > 25:1 | |
| Monitoring Parameters | Standard Methods Index | Optimum Range | | Suboptimum Range | |
| pH | 4500-H+(B) | 6.5 - 8.2 ¹⁰ | | < 6.5 ; > 8.2 | |
| Alkalinity | 2320(B) | 1300 - 3000 ¹⁷ | | < 1300 | |
| Volatle Acids | 5560(C) | mg CaCO ₂ -L ⁻¹ < 200 ¹⁰ | | mg CaCO ₂ -L ⁻¹ > 200 ¹⁰ | |
| Solids Removal Efficiency | 2540(B,E) | mg Ac-L ⁻¹ > 50 % | | mg Ac-L ⁻¹ < 50 % | |
| Biogas Content | 2720(C) | 55-70 CH ₄ ; 30-45 CO ₂ % | | < 55 CH ₄ ; > 45 CO ₂ % | |

Amani, T., Nosrati, M., Sreekrishnan, T.R. Anaerobic digestion from the viewpoint of microbiological, chemical, and operational aspects: a review. Environmental Reviews 18, 255-278 (2010).

Eliminación nitrógeno: NDN



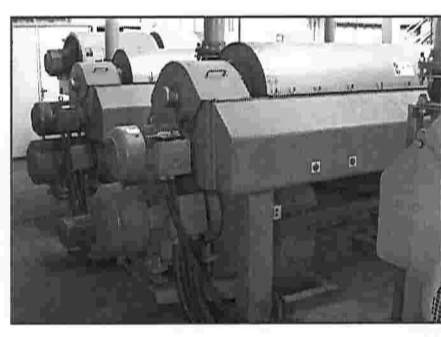
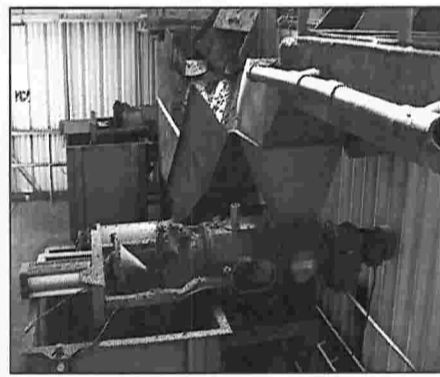
Recomendaciones

↑ Monitoreo

🧠 Modelación



Tratamiento Mecánico



Tratamiento Físico-Físicoquímico



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Eliminación materia orgánica: Sistemas aerobios



Acopio, compostaje de guano y camas calientes

Procedimientos: C/N = 20

45-55% en contenido de agua (bh)

43-60°C de temperatura





$\text{pH}_{\text{bacteria}} = 6-7.5$ $\text{pH}_{\text{hongos}} = 5.5-8$

$\varnothing_p = 5-15 \text{ cm}$



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Conclusiones

-  Sistemas cerrados.
-  Rutinas de verificación operacional.
-  Capacitación.
-  Plan de contingencia.



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