



**VALORSABIO.COM**

Engineering Innovation

**UASB-PRO<sup>®</sup>**

**Upflow Anaerobic Sludge Blanket**

**Advanced Bioreactors**

**Pulse Reversed Operation**



# UASB-PRO<sup>©</sup> range of applications

- **Sludge Digestion.**

Domestic excess sludge anaerobic digestion.

- **Leachate COD abatement.**

High load ( COD > 5000mg/L) leachate pretreatment.

- **Food Industry High COD reduction.**

Distilleries, Dairy, meat and vegetable processing industries, cheese factories, wineries.

- **Industrial wastewater pretreatment.**

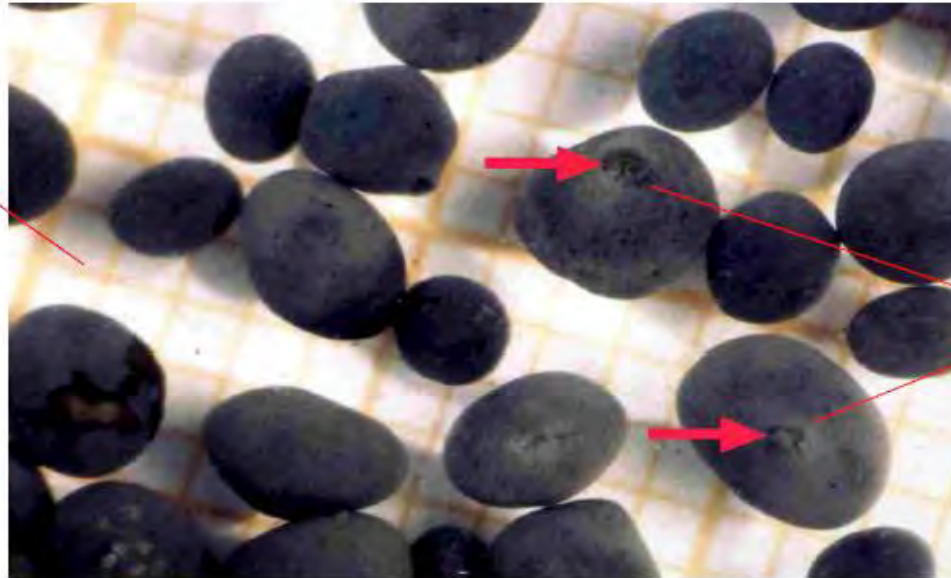
Leather Industries, Pharmaceutical industries, Fine chemicals industries, Biofuels industries.

# UASB-PRO<sup>©</sup> capacities and specifications

- **COD specific load** and Biogas conversion  
5-35 kg COD /m<sup>3</sup>.day ; Biogas = 0.4 Nm<sup>3</sup> / kg COD
- **HRT:**  
5-96 H hydraulic Retention Time.
- **COD removal efficiency:**  
80-95 %
- **Upflow velocity:**  
0.2-1.5 m/h
- **Biomass concentration:**  
15-40 g/L

# UASB-PRO<sup>©</sup> Biomass Granulation

Millimeter paper indicating the size of the granules.



Gas vents in the granules, where biogas is released

## Advantages of granulation:

- Very high Biomass concentration: Up to 40000 mg/L
- Good settling properties for biomass: 30-70 cm/min
- Unique chain-process/symbiotic process between different biomass strains.

# UASB-PRO<sup>©</sup> Unique features

- **Pulse feed:**

The UASB-PRO included an innovative dynamic feeding process, that prevents the usual preferential flow path and avoids the dead zones in the whole reactor volume. The feed is kept at constant rate but injected in different and alternated levels, to generate a water continuous pulsation.

The biomass is thus better mixed with the feed and the COD loaded is homogeneously distributed in the bioreactor bottom layers.

- **Reverse return wastewater:**

The returned flow is reversed in synchronization with the pulse feed by the use of an innovative design that prevents any possible clogging in the distributing piping inside the bioreactor

- **External Anaerobic Lamella clarifier for total Biomass recovery:**

The Biomass recovery is done externally to the Bioreactor in a specially designed lamella Clarifier. This improvement can prevent any biomass washout, very common in conventional UASB units.

- **Partial Biogas recirculation:**

The return wastewater flow pumped across a special ejector is the driving energy to pump back biogas and mix it with the return flow, thus improving the quality of the operation in bioreactor and reducing the recirculation energy consumption in more than 30%.

# UASB-PRO<sup>©</sup> Application cases



UASB Hybrid – Distillery,  
Portugal

UASB – Olive Industry  
Portugal



UASB Hybrid – Cheese  
factory, Portugal

# UASB-PRO<sup>©</sup> Application cases



UASB – Poultry  
wastewater , Israel



UASB – Sludge  
digestion, UK



UASB-PRO –  
Pharmaceutical  
Industry, China

# UASB-PRO<sup>©</sup> Economic advantages

- **CAPEX ( Capital Cost ) :**

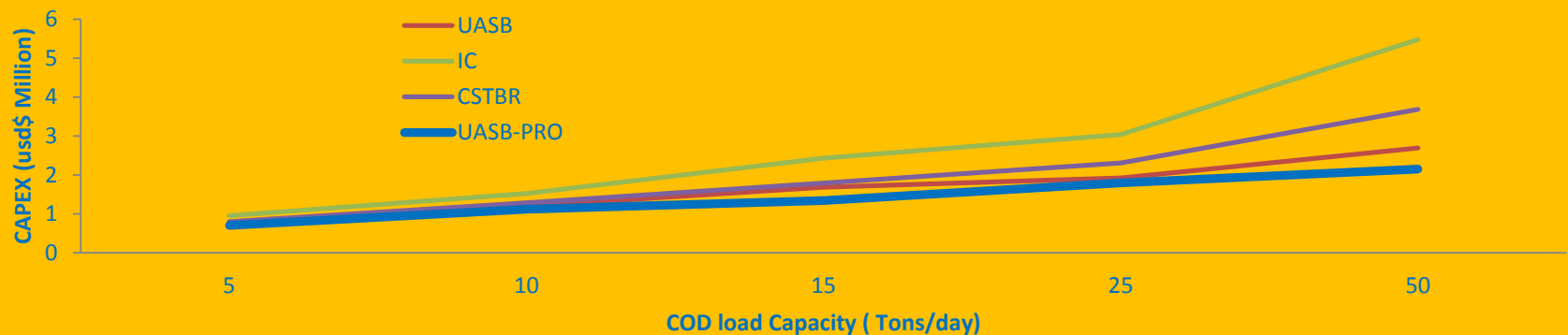
The UASB-PRO tanks are projected for bolted steel plates covered with several layers of Glass Fused on the metal. The cover is built with a double layer of flexible technical plastic membrane.

All internal piping is SS AISI 316 as also the external support tanks, heat exchangers, valves and line accessories.

The UASB-PRO advanced know-how and technology allow for lower installed volumes and higher conversions and efficiencies, that combined with the competitive design allow for a cost effectiveness of the UASB-PRO, when compared with conventional UASB systems and others, such as IC( Internal Circulation) and CSTBR ( Continuous Stirring Tank BioReactor).

Investment costs can change according to different particularities requirements from clients specific needs and also depending on local suppliers for main equipment.

## Anaerobic reactors CAPEX





# UASB-PRO<sup>©</sup> Economic advantages

- OPEX ( Operation Cost ) :**

The UASB-PRO uses a more efficient feed/recirculation wastewater process combined with partial biogas reinjection on the bottom of the reactor for better mixing between raw influents and Biomass. The Pulse Reverse Operation ( PRO) can save energy up to 45-55% in the pumping process for recirculation, thus providing a total OPEX much lower than most existing processes.

Operation costs can change according to different electrical local tariffs and special process operation requirements for some particular needs .

## Anaerobic Reactors OPEX - Heating cost not included

