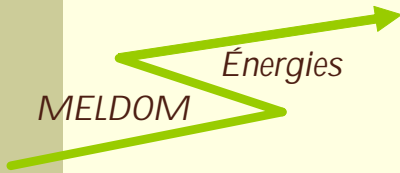


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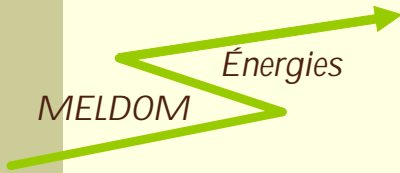
ANAEROBIC WASTEWATER TREATMENT

Technology comparison



Anaerobic treatment basics

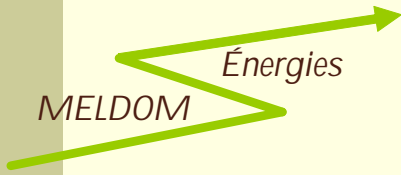
- Organic material is mineralised by specific bacteria in the absence of oxygen
- Production of biogas: mainly $\text{CO}_2 + \text{CH}_4$
- Reduction of COD by 85%
- Reduction of BOD by 90%



Anaerobic treatment

■ Advantages

- Reduction of **high organic load** including substrates normally difficult to treat
- Very **little production of sludge** or mineral salts (150g dry mass per kg of CODs)
- **Energetic balance positive**
- **Biogas** usable in situ in factory or for production of **electricity** and **hot water**
- **No offensive smell**
- **Easy automation**



Anaerobic treatment

■ Limitations

- **Slow start** once in the life of the digester
- Not well adapted for **discontinuous activity**

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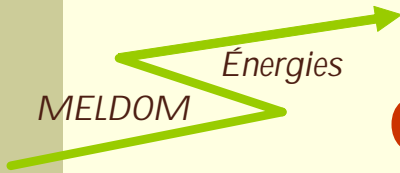
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Best Principles for the design of an Anaerobic plant

- Simple design and reliable operation
 - **Easy to maintain** without stoppage
 - **Cheap** to build, **Cheap** to operate
 - **No need to empty** the digester at any time
- Best conditions for the work of the bacteria
 - **Control** of temperature and pH
 - **Maximum contact** with organic components
- Monitoring of the plant
 - **No expert needed** on the spot, only simple tasks
 - Fully operated from the distance through **Internet**

Main families of digesters

- Stirred (STR & CSTR)
 - **Basic original** technology
- Permanent Internal Support For Bacteria
 - Uses internal **supports for bacteria** growth (tubes, rings)
- UASB (Up flow Anaerobic Sludge Blanket Digestion)
 - The **sludge creates a bio-filter** at the bottom of the tank
- Fluidized-Bed & SMAR (Submerged Media Anaerobic Reactor)
 - Bacteria are supported by **small synthetic particles** at the bottom of the tank
- Others **Batch, lagoons**



Our views on the current solutions and what to do to improve the result

- Each one of them responds to some aspect of the job to be done, **not to the global issue**
- We have to combine the advantages without having **to cope with the inconvenient** explained below
- We are to be prepared to receive semi liquid waste with **high COD concentration** without having to dilute them



Fundamental advantages of a P.Lemaire's anaerobic plant (1)

- A combination of “Constantly Stirred” and “Contact” in one tank = **adapted to work in semi liquid products**
- All mechanical moving elements outside the digester and duplicated = **no stoppage for any maintenance**
- No solid particles added in the digester = **no need to control the quantity of particles escaping in the evacuated sludge**

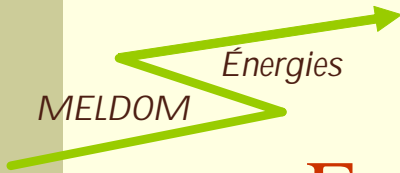


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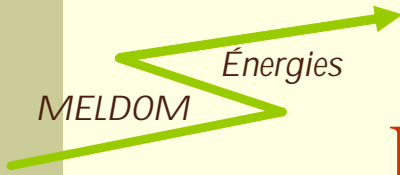
Fundamental advantages of a P.Lemaire's anaerobic plant (2)

- No permanent support for bacteria inside the tank = **no risk of clogging after sometime**
- Easy control of Organic Suspended Solids = **a simple task**
- Monitoring of operation in relation with analytical results from the distance = **one person can monitor semi automatically several digesters through remote control**
- Digesters not stopped in more than 10 years



Fundamental advantages of a P.Lemaire's anaerobic plant (3)

- Simplicity of operation = no need to control the formation of “balls”, easy control of the Suspended Solids
- Long SRT (solid retention time) = for the best action of bacteria in the contact area
- Short HRT (hydraulic retention time) = for the size of the digester
- Energetic balance positive = more energy produced than required



Problems avoided with the P.Lemaire's technology

- High **investment** and **operating costs** through simplicity
- **Dilution** of the waste water because of too high COD concentration (UASB)
- **Clogging** of the permanent supports inside the reactor
- **Stoppage** of the reactor and **emptying** of the tank to maintain mechanical internal elements
- **Loss of the supports** of the bacteria when sludge has to be evacuated and recycling of the support particles (SMAR system)

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Tequila Sauza MEXICO: anaerobic plant august 2002)





The main reasons to use P.Lemaire's technology

- Heavy COD loads are a difficult problem to solve in **semi liquid waste**
- The Waste Water Treatment Plant must not be a burden but a **natural part of the solution**
- For rustic environment like waste treatment **simplicity is a great advantage**
- **Production of green energy** is a additional benefit for any organisation



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THANK YOU