Re-use of Winery Wastewater

Minimising the Environmental Impact

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What are the environmental impacts of Waste Water Treatment & Re-use?

- Potential for Odour nuisance
- Energy required for treatment
- Noise associated with treatment plant operations
- Land application of treated water
  - Soil degradation
  - Infiltration to ground water
  - Potential for runoff

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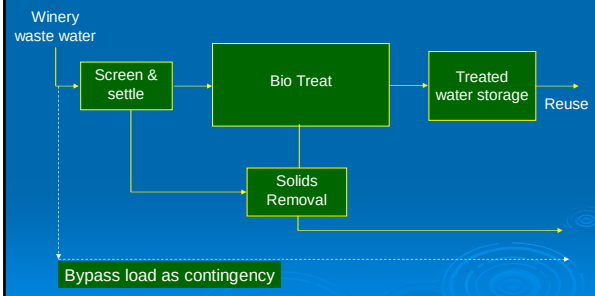
What are the options for reducing these impacts?

Simple Process Model



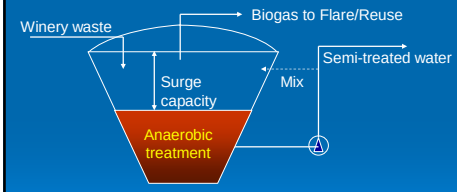
Bio Treat

- Can be:
  - Anaerobic/Aerobic
  - Aerobic
- > 80% of WWTP energy in aeration
- Energy requirement is dependent on configuration

Vessel	Air System
Lagoon	Submerged
Tank	Surface

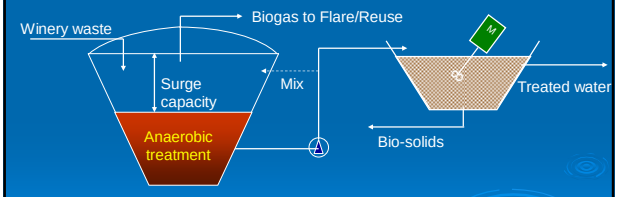
- Need to compare power consumption/load treated

Covered Anaerobic Lagoon/Aerated Lagoon



Organic Carbon > Biogas (CH_4 + CO_2) + Biomass

Covered Anaerobic Lagoon/Aerated Lagoon

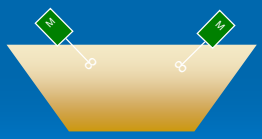


Organic Carbon > Biogas (CH_4 + CO_2) + Biomass

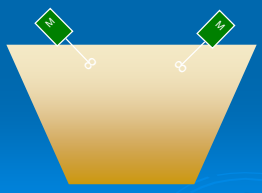
Organic Carbon + O_2 > CO_2 + Biomass

Covered Anaerobic Lagoon

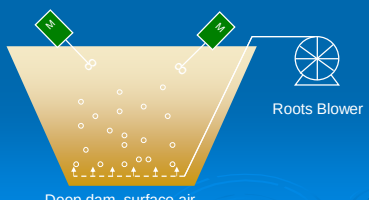
Aerated Lagoons



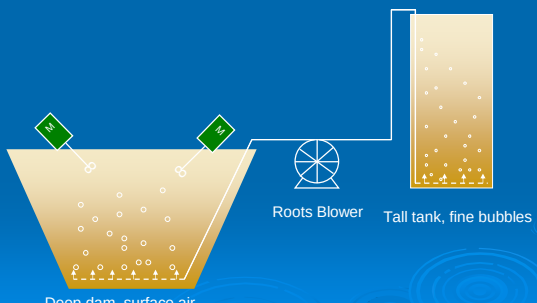
Aerated Lagoons



Aerated Lagoons

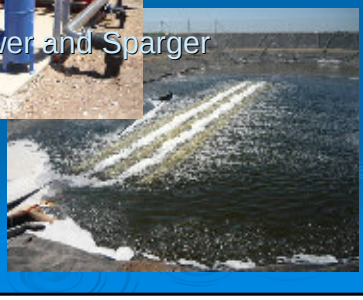


Aerated Lagoons/Tanks

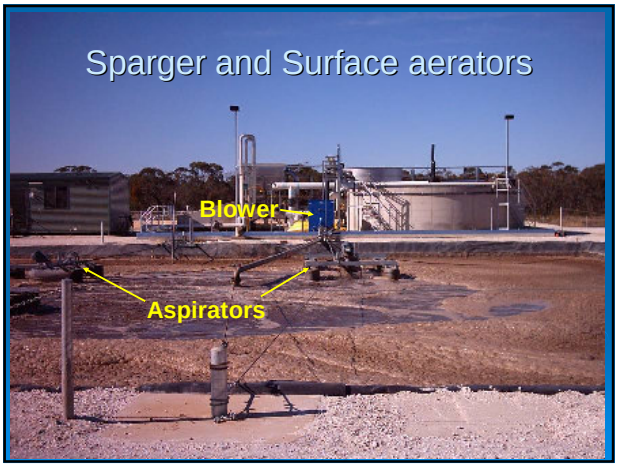


Surface Aerators

Blower and Sparger

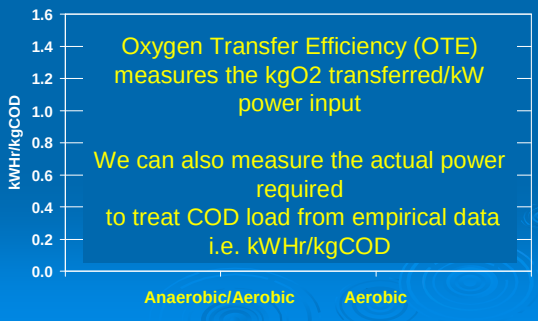


Sparger and Surface aerators

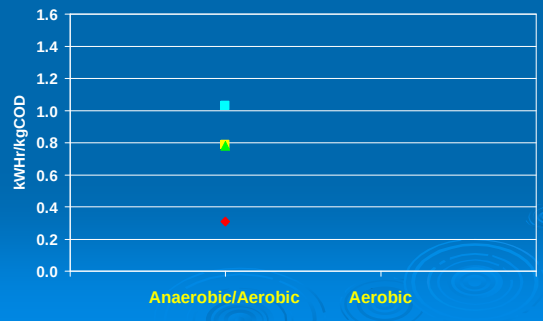


Tall tank with fine bubble diffusers

Bio-Reactor Energy Efficiency



Bio-Reactor Energy Efficiency (Peak conditions)



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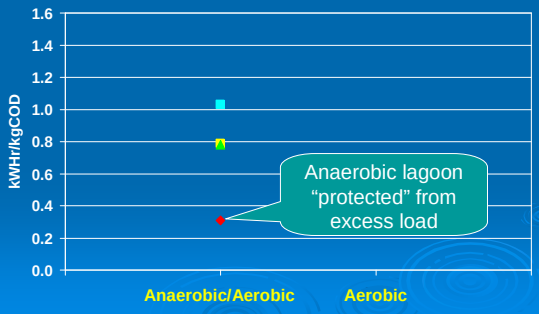

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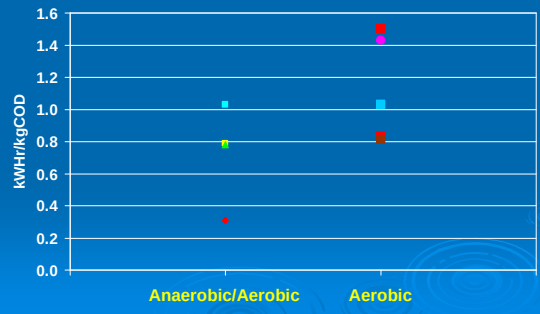

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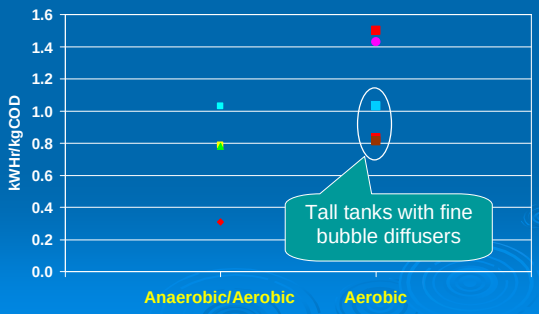

Reducing carbon footprint of waste water treatment:

- Anaerobic front end can provide 30 – 90% COD removal, dependent on:
  - Management of load to protect pH
  - Temperature
  - Mixing
- Aerobic treatment efficiency dependent on:
  - Bubble size and residence time
  - Temperature
  - Power turndown – allow low air when not required
  - Process control – know when low air is acceptable

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What are the options for reducing these impacts?

Reuse requires the application to land

Pros:

- Can displace irrigation water from other sources (MDB)
- Biosolids add to soil carbon content

Risks:

- Application needs to be based on crop need, not water supply to avoid saturation, run-off etc. – need storage
- Winery processing adds ~ 1,000mg/L dissolved Salts (Na^+, K^+, HCO_3^-) to treated water – need to balance with Ca^{++} (Gypsum)

Take aways:

- Develop a systematic approach to irrigation
- Spread thin over a large area to minimise impact

Questions?