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Energy-Efficient Mechanical Treatment



Power consumption of primary clarifiers is low. Scrapers and primary sludge pumps have a power consumption in the order of 0.1 kWh/(PE·a).

However, dimensioning of primary clarifiers has a big impact on the energy balance of entire treatment plants.

- Where no primary clarifiers are provided, the entire organic freight enters the biological stage and is mostly oxidized, with high power consumption, to water and CO₂.
- For energy reasons, simultaneous aerobic sludge stabilization or extended aeration should be limited to small plants below < 10,000 TP.
- Where primary clarifiers with a dry weather detention time of 0.5 – 1.0 h are provided, only around 20 % of the BOD is removed.
- Short detention time provides sufficient BOD for denitrification, but supply of easily degradable carbon from other sources, e.g. hydrolyzed substrate from primary thickeners, is far more energy-efficient and can be controlled.
- Primary clarifiers with a detention time of 2.0 h remove at least 30 % BOD. Less organic substance is oxidized, power consumption of biological treatment is reduced, and more digester gas is produced from primary sludge; power and heat cogeneration is thus increased.
- Long primary clarifier detention time, in combination with anaerobic sludge digestion, reduces energy consumption of treatment plants by over 50 %. This is the single most important decision concerning a plant's energy-efficiency.
- Plants without nitrification can be energy-self-sufficient. As much power and heat is co-generated from digester gas as required for its entire operation.

- Primary clarifiers should be designed such that their detention time can be varied in a wide range, e.g. by provision of several parallel tanks. This permits operators to optimize the plant's energy efficiency depending on actual wastewater characteristics.

See also [Biological Wastewater Treatment](#) and [Sludge Stabilization](#).

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