Energy-Efficient Power Supply

Regarding energy efficency in wastewater treatment, not exclusively the plant equipment's energy consumption should be optimzed.

The following power supply components should also be taken into consideration:

Idle Power

Idle Power Compensation

- Changing electro-magnetic fields in motors generate idle power. The higher their ratio of idle to real power, the smaller is their cos φ power factor.
- Transmission of idle power burdens power grids and increases their losses; it may be charged by utilities.
- Idle power compensators can keep cos φ above 0.9 so that over 90 % of apparent power is real power.
- Power distribution loss and cable heating are reduced, e.g. by 40 % if cos φ is reduced from 0.7 to 0.9.

Transformers

- Plants are usually supplied with medium-voltage power (10 kV) that is transformed down to low-voltage power (400 V) within the plant.
- Transformers are sized to maximum simultaneous apparent power consumption. By load management their size and loss can be reduced.
- Total transformer loss is the sum of no-load loss and short-circuit loss.
- No-load loss is usually 0.1 – 0.2 % of a transformer’s nominal power Pnom.

- Short-circuit loss rises proportional to the square of the utilization factor n and is around 1 % • n^2 • Pnom.
- Transformers with reduced no-load losses are usually economical.
- Over-sized transformers are often economical because they have higher no-load loss, but considerably lower short-circuit loss.

Supply Contracts

Power Supply Contracts

- Usage price usually differs between high- and low-tariff periods.
- Demand price depends on peak power supply within a period; maximum demand must often be declared in advance and if exceeded, a penalty applies.
- Idle power is often charged if a certain minimum cos φ (e.g. 0.9) is not maintained.
- Continuous usage rebates may apply for high ratios of average to peak supply.
- Consumers in deregulated power markets can negotiate with various suppliers and choose the best offer.
- In some countries, power utilities have to pay statutory minimum prices for power fed into their net.

Load and Energy Management

- Shifts power demand from high to low tariff periods,
- Equalizes power consumption and reduces peak demand,
- Generates power by co-generation, e.g. from digester or natural gas,
- Uses emergency power generators to cut peak power demand,
- Anticipates short and medium term power demand and takes corrective actions.