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Energy-Efficient Pumping and Lifting



Large and power-consuming pumped flows at wastewater treatment plants are:

- Lifting of arriving raw sewage, e.g. with screw pumps,
- Sludge return in activated sludge processes, e.g. with centrifugal pumps;
- Internal recirculation for nitrification/ denitrification, e.g. with propeller pumps;
- Wastewater feeding of trickling filters, e.g. with centrifugal pumps;
- Feeding and backwashing of sand filters;
- Raw sludge pumping, e.g. with positive displacement pumps;
- Sludge recirculation at digester heating and mixing, e.g. with centrifugal pumps or draft tubes;

Net energy consumption is 2.7 Wh per m³ and m head. Gross power consumption ranges between 3.5 and 11 Wh/(m³•m), depending on pump efficiency that depends e.g. on pump and drive type, flow, head, free passage.

Power consumption can be minimized by:

- Flow reduction, e.g. by raising return sludge concentration, or by use of variable speed pumps;
- Head reduction, e.g. by optimized hydraulic plant profile (needs to be balanced with excessive excavation and construction costs);
- Head loss reduction, e.g. by flow reduction, optimized pipeline or channel sizing and lay-out;
- Correct pump sizing in respect to both head and flow (remember: life of mechanical equipment is smaller than a plant's design horizon);

- Pump selection in respect to energy-efficiency of pump and drive, under special consideration of efficiency at duty point(s);
- Screening before pumping to permit use of energy-efficient pumps (See e.g. [HUBER RakeMax® Multi-Rake Bar Screen](#) or [ROTAMAT® Pumping Stations Screen RoK 4](#));
- No grinding because it needs more power and because coarse solids should be removed;
- Pump control optimization, e.g. by selection of parallel pumps of different capacity, or with variable frequency drive.

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