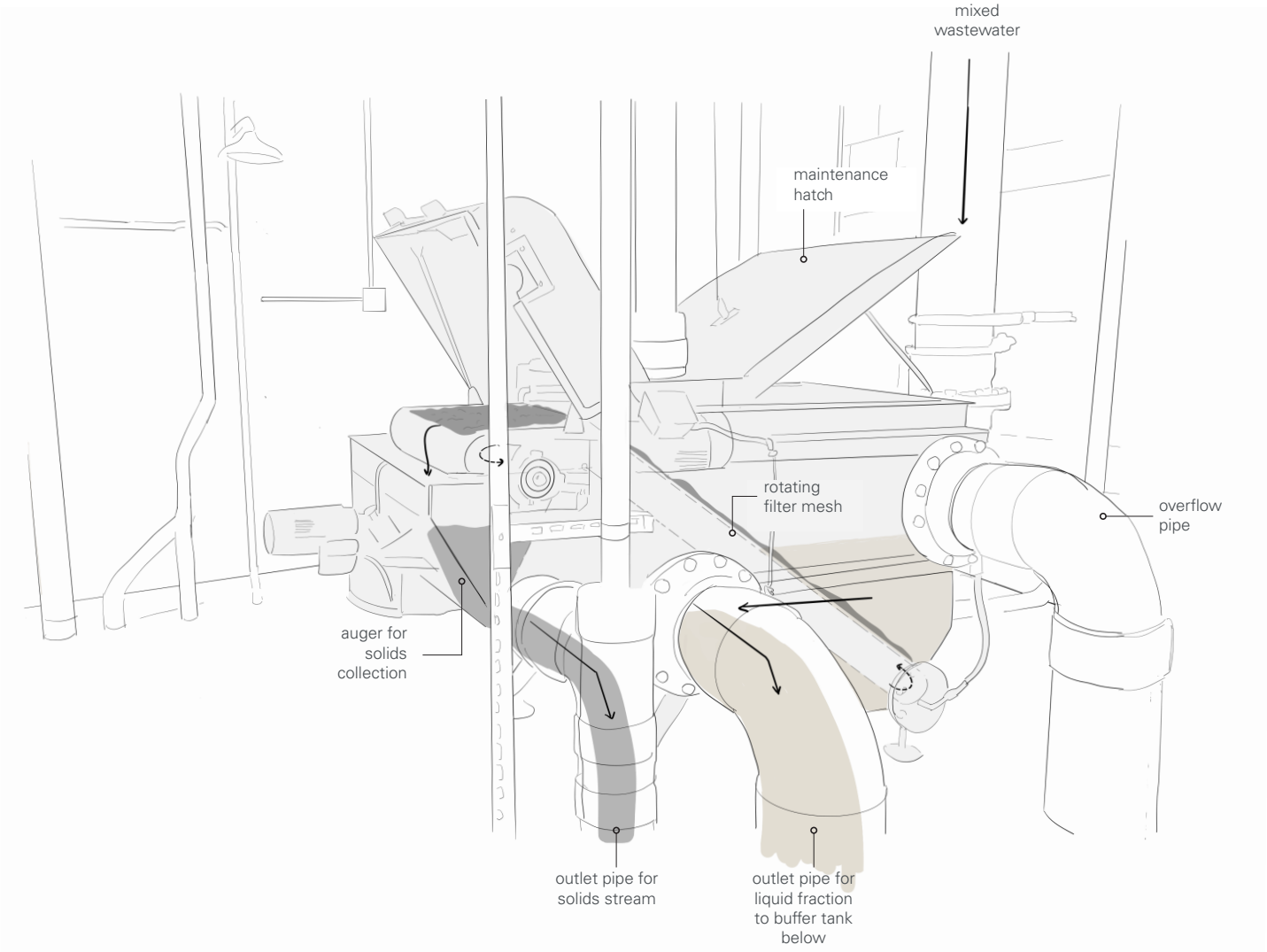
T.42 SETTLING TANKS | SCREENS

TECHNOLOGY



Settling tanks and screens are used for the separation of large solids and suspended matter from wastewater streams. These technologies are generally implemented as a primary treatment step to protect and/or to simplify subsequent biological or advanced treatment steps in water treatment and reuse. Additionally, the separation of solids, allows for their valorization as a source of organics and nutrients. Settling tanks retain water at a low flow, allowing heavier suspended particles (i.e., grit, sand, organic particles) to settle by gravity. The settled sludge must be periodically pumped out of the tank (desludging). Settling tanks are sometimes called sedimentation tanks, clarifiers or septic/Imhoff tanks. Screens are physical (static or mechnical) separation devices that retain suspended solids on one side of the barrier, while allowing water to flow through to the other side. Screens are typically at the beginning of the treatment train, but can also be used between biological treatment and filtration or disinfection steps. Different screen configurations exsist made out of wires, plates, discs, or mesh. Coarse screens (e.g., bar screens) remove large debris, while fine screens (e.g., drum and disc filters) target small suspended particles.

INPUT STREAMS

- MW Mixed wastewater
- BW Blackwater
- GW Greywater

TARGET OUTPUT(S)

- Liquid fraction
- Solid fraction

MW — T.42 BELT FILTER — SCREW PRESS — STORAGE — CHEMICAL OXIDATION

T.47 MBR — T.48 REVERSE OSMOSIS — T.50 UV DISINFECTION — CALCITE FILTER — T.50 CHLORINE DISINFECTION — T.41 STORAGE TANK

SALESFORCE TOWER + NEMA pilot

San Francisco, CA, USA | 2019

Solids recovery and valorization from mixed wastewater

Mixed wastewater is screened by a rotating belt filter with a 350 micron mesh. The solids stream (thickened to 3-8% dry matter) is currently sent to sewer, but a pilot in a similar building in San Francisco (NEMA) showed that the solids (including food waste from kitchen grinders) could be further dewatered to 20-30% dry matter onsite with a screw press, then stored and transported to a treatment hub to be treated by chemical oxidation and used as a soil amendment.

SPECIFICATIONS

INFRASTRUCTURE

Settling tanks are relatively large and typically placed in the basement or undergroud. Settling tanks are often built in reinforced concrete, steel, fiberglass or durable plastic. Periodic desludging can be manual or automated, using pumps or scrapers. Sludge is often pumped to the sewer (when available), or transported away by trucks. Alternatively the solids can be treated and valorized on-site. Screens have much smaller footprints, and are usually placed in a mechanical room of a building, or outdoors. For efficient separation, wastewater should enter a settling tank or screen with a controlled flow without excessive turbulence.

OPERATION & MAINTENANCE

Settling tanks require little maintenance. For optimal performance, maintenance of settling tanks includes regular inspection of leaks, monitoring effluent clarity, monitoring of sludge accumulation, and periodic desludging. The frequency of desludging depends on the tank design, incoming solids, and retention time. Screen operation can be fully automated, however, since there are many moving parts, they require regular maintenance and inspection by skilled personel for wear or damage. Accumulated debris in a screen need to be cleaned periodically either manually or automatically.

Due to their low maintenance and desludging requirements, septic or Imhoff tanks are widespread in rural/off-grid settings. Sludge is regularly transported by vacuum truck to a treatment facility.

TARGET OUTPUTS

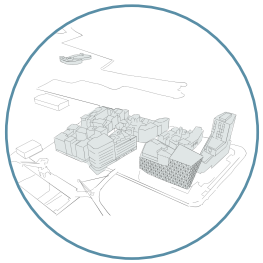
Settling tanks and screens separate wastewater into a liquid fraction and a solid fraction. The removal of solids, organics and nutrients, from the liquid fraction increases the treatment performance of subsequent treatment steps to produce water for reuse. Meanwhile, the separation of a solid fraction from the liquid fraction facilitates the recovery of organics and nutrients. However, the solids recovered from screens or settling tanks are still relatively diluted (less than 8% dry matter), and need thickening and dewatering before further treatment (i.e., sanitization and stabilization).

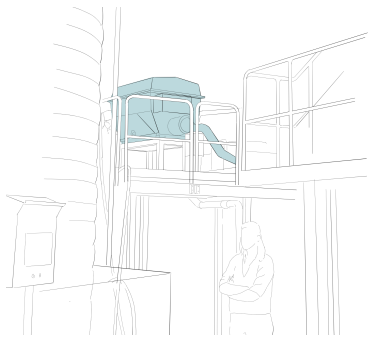
Settling tanks and screens enable the recovery of the organically-bound nutrients and undissolved organics (feces, toilet paper) present in a diluted mixed wastewater or blackwater stream. Once separated, these can be valorized.

SELECTED CASE STUDIES

OCEANHAMNEN

Helsingborg, Sweden | 2021





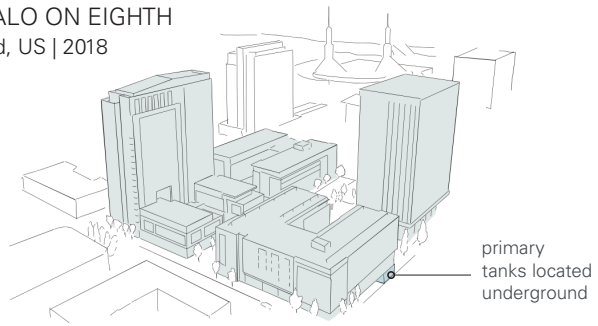
Drum filter before nutrient recovery technologies

Oceanhamnen is a waterfront development that has a "three-pipes out" collection of greywater, vacuum-collected blackwater and kitchen waste scaled for 2100 p.e., treated at the Recolab building. After anaerobic treatment of the blackater in a UASB, the effluent goes through a drum filter to remove suspended solids, organics and metals that can negatively impact the subsequent nutrient recovery steps (struvite precipitation and ammonia stripping). The drum filter, with a 40 um cloth mesh, achieves ~ approximately 74% removal of total suspended solids.

BW — COLLECTION TANK — T.23 UASB — biogas — T.42 DRUM FILTER — T.4 STRUVITE PRECIPITATION — struvite — T.5 AMMONIA STRIPPING — ammonia salt

HASSALO ON EIGHTH

Portland, US | 2018



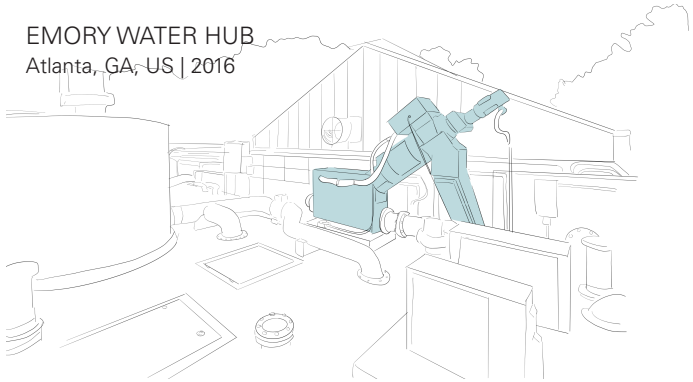
Sludge from settling tanks treated at municipal WWTP

The wastewater treatment system of this LEED Platinum neighbourhood treats an estimated 230 m³ of wastewater per day from three large residential buildings. The treated water is reused for toilet flushing, cooling systems, and landscape irrigation. The system includes four primary settling tanks, each with an emergency overflow to the sewer. The sludge is removed and transported to the centralized Durham Wastewater Treatment Facility four times per year, where it is treated anaerobically (producing biogas). The dewatered sludge is used in agriculture as a soil amendment.

MW — T.42 SETTLING TANKS — ANOXIC TANK — T.45 TRICKLING FILTERS — T.44 CONSTRUCTED WETLANDS — T.42 DISC FILTER — T.50 UV DISINFECTION — T.41 STORAGE TANK

EMORY WATER HUB

Atlanta, GA, US | 2016



Solids screened out, compacted and transported away

A rotary drum fine screen (with 6mm spacing) is used for primary screening of mixed wastewater before biological treatment. The screen is placed outside in the mechanical area on top of the concrete MBBR tanks and contains a screw that transports and compacts the screenings. Solids are not recovered; they are sent down a chute to a bin and transported to a facility for further treatment.

MW — T.42 ROTARY DRUM FINE SCREEN — T.46 MBBR & FBBR — T.42 DISC FILTER — T.50 UV DISINFECTION