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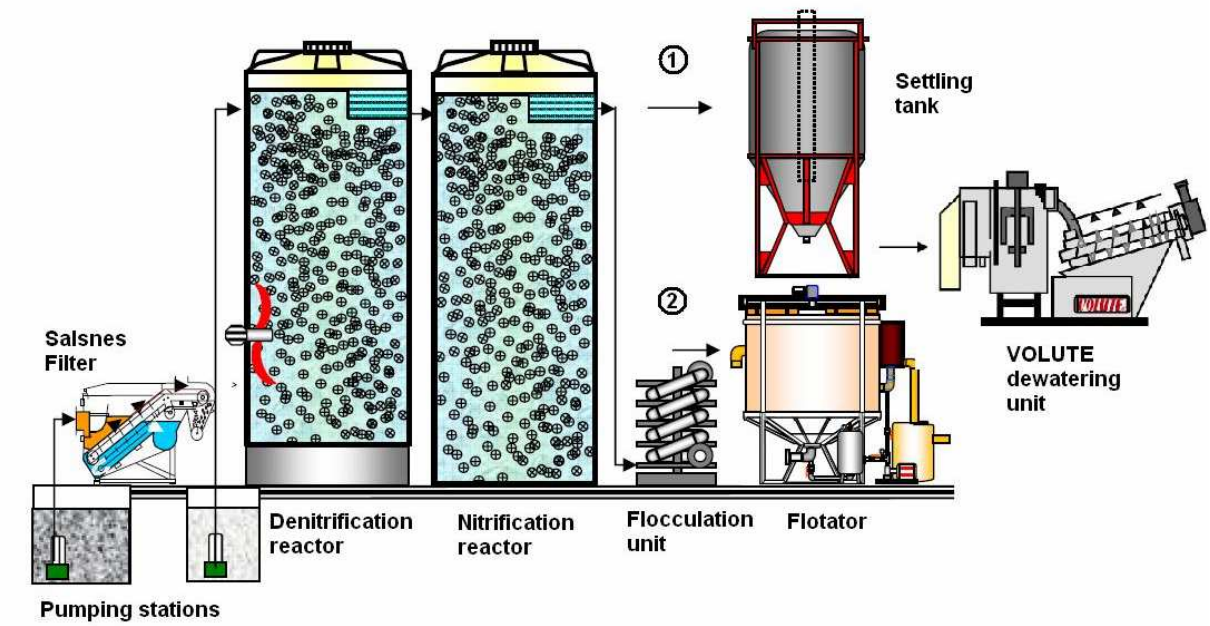
MECHANICAL – BIOLOGICAL – CHEMICAL WASTEWATER TREATMENT PLANTS
(industry: fruit&vegetable processing industry, slaughterhouse and meat processing industry, meat rendering plants, poultry processing plants, fish processing plants; municipal wastewaters)

MODULAR WASTEWATER TREATMENT PLANTS "CIS"

CIS (Compact Inwatec System) is mechanical-biological-chemical technology for wastewater treatment. The technology based on removal of suspended solids by Salsnes Filter, biological wastewater treatment on moving bed bioreactor carriers and sludge dewatering on Volute Press.
CIS is high efficient technology which can be erected on small, compact area.
Modular treatment plants were designed basing on modern solutions for wastewater treatment developed by Salsnes Filter and Inwatec designing experiences.

CIS WWTP scheme



Design of CIS

Mechanical stage

- wastewater equalization tank with submersible pump
- Salnes Filter for removal of suspended solids with dewatering of primary sludge

Biological stage

- denitrification tank (made from PEHD) with MBBR carriers and slow-rotating stirrer
- nitrification tank (made from PEHD) with MBBR carriers and air dispersing system

Mechanical-chemical stage, excess sludge dewatering

- Excess sludge separation can be made in:

1) settling tank (tubular) with conical bottom – for small plants
2) flotation unit – for bigger plants

- Volute dewatering press – for thickening and dewatering of excess biological sludge

Other equipment: air blowers, chemical dosing stations of coagulants and polymers (for flotation unit), control panel.

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Modular wastewater treatment plant parameters

- CIS plants have small footprint in comparison with traditional WWTPs (with primary and final settling tanks) and SBR plants,
- High concentration of biomass, in biological reactors (on bio-carriers), allows to remove pollutants in reactors with lower capacity than in activated sludge method,
- Salsnes Filter instead of primary clarifier and flotator instead of final settling tank, require lower footprint and in many cases have higher removal capacity,
- Inlet wastewater is mechanically treated by Salnes Filter what cause 60-80% TSS removal. Sludge is dewatered in Salsnes unit. Reduction of TSS at the same time reduce BOD factor up to 35% (lower demand of air in biological)
- High biomass concentration allows to treat wastewater with high variability of loadings without threat of appropriate operation of WWTP
- MBBR technology produce less excess sludge compare to traditional activated sludge WWTP
- MBBR biomass is resistant on under- and overloading, temperature and pH variability,
- Excess biological sludge is dewatered in low energy and water consuming Volute Press

Description of the equipment

- **Salsnes Filter**

Salsnes Filter is applied for mechanical treatment of inlet wastewater. It has patented air cleaning system for removal of the sludge from the mesh cloth. As Salsnes is made in closure body it does not generate any odours outside. It removes suspended solids and afterwards dewater them.
Reduction on Salsnes Filter:
COD 45-60%; BOD 35-50%; TSS 65-95%; FOG 40-70%. Salsnes filter is able to remove from wastewater solids with size around 50µm.

- **Denitrification and nitrification reactors**

Tanks are formed by rotational moulding system from high density polyethylene. Tanks are cylindrical, have flat bottom. Tanks are fulfilled by biocarriers. Biological treatment with usage of bio-carriers is high-efficient technology. It allows to conduct the process in smaller reactors and to receive higher loadings of COD, BOD comparing to traditional activated sludge method. Depending on Nitrogen concentration in inlet wastewater denitrification stage is mandatory or not.

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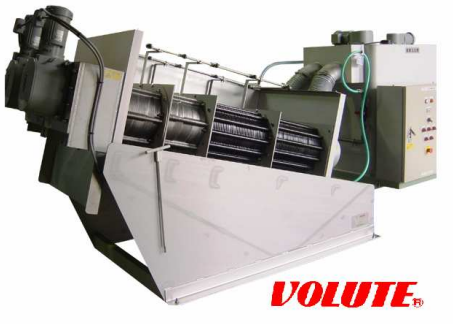
- **Flocculator and flotation unit**

DAF-NIKUNI flotation is wastewater treatment technology which use nano- and micro-bubbles (MNB – size 20-30 µm) of air for removal of suspended solids and colloids. This method has lower energy demand (~50%) and treats wastewater more efficient in smaller flotation unit (compare to traditional flotation units). The key part of the unit is Japanese NIKUNI pump, which replace complex flotation systems with air compressor, additional pumps, pressure tanks and expanded control system.

- **Final settling tank**

Settling tanks made from PEHD are suitable for small WWTPs. Tank is formed by rotational moulding system. It has conical bottom (45-60º) which makes easier settling of SS and discharge of sludge from the tank.

- **Volute dewatering press**



VOLUTE dewatering press is an easy maintenance, fully automatic (maintenance 1h/week) and simple construction equipment, which dewaters sludge to higher dry mass content comparing to conventional solutions: belt presses, centrifugators, chamber presses etc.
Sludge is discharged to the tank, where is mixed with coagulant and flocculant (or only flocculant). This process helps forming bigger flocs of the sludge. Dewatering process is based on slow movement of the sludge in dewatering chamber (moving and non-moving rings) by screw. Volute dewatering press is low energy and water demand equipment.