New concept for energy self-sustainable wastewater treatment process and biosolids management

LIFE B2E4SustWWTP — LIFE16 ENV/GR/000298

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PROJECT OUTLINE

- Wastewater treatment is an energy intensive process
- Energy required for secondary wastewater treatment = 0.3-0.6 kWh/m^3
- Energy available in wastewater ≈ 1.8kWh/m^3
- LIFEB2E4SustWWTP proposes to exploit the energy content of wastewater for its treatment *(Figure 1)*:

1. *Microsieving*→ removal of biosolids upstream of the aeration tank using a rotating belt filter
2. *Drying*→ moisture removal
3. *Gasification*→ syngas production
4. *Syngas combustion*→ energy production

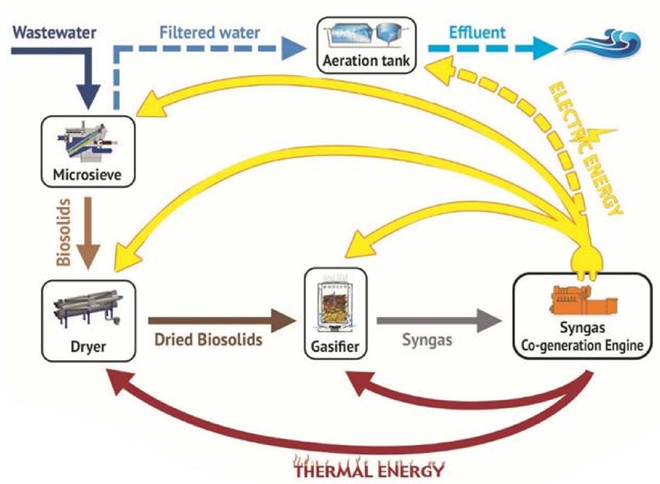


Figure 1. Mass and energy flows of the process.

PRELIMINARY TESTS

Microsieve performance (*Figure 2*):

- ~ 30% reduction of TSS
- ~ 15% reduction of BOD_5
- ~ 17% reduction of COD
- Selective removal of the larger particles→ increase of biodegradability of wastewater

- Higher performance is expected, if a cloth filter with smaller pore size will be used
- Coagulants will be used to enhance solids removal

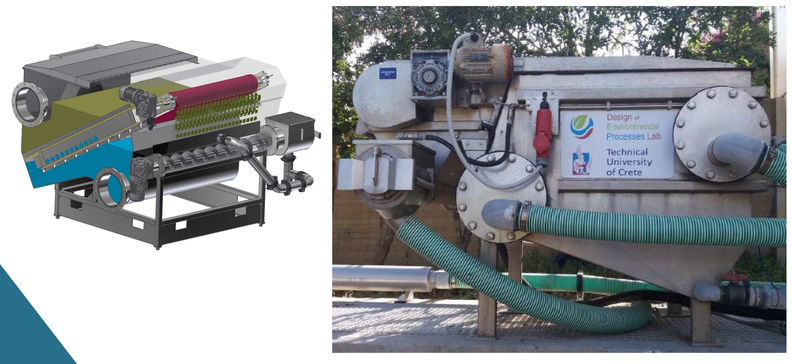


Figure 2. 3D illustration (left) and picture (right) of the microsieve.

Primary Sieved Solids (PSS) Characteristics	
Solids content	~ 40%
Volatile solids (dry basis)	~ 84%
Higher Heating Value (HHV)	~ 23 MJ/kg

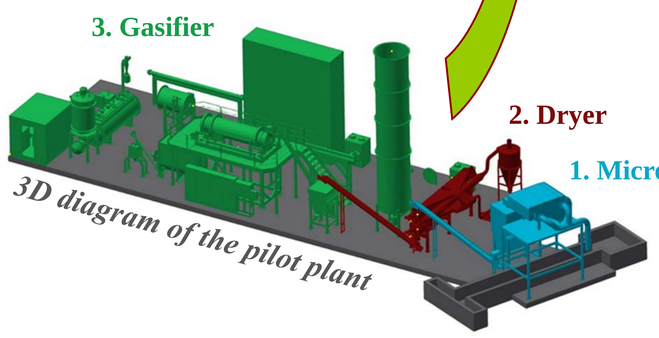
APPLICATION SITE

A real scale integrated system has is currently under installation at the WasteWater Treatment Plant (WWTP) of Rethymno, Crete, Greece.

- ✓ Environmental Impact Assessment
- ✓ Environmental and Operation Permits

Mediterranean sea

WWTP Rethymno, Crete, Greece



3D diagram of the pilot plant

PILOT PLANT DESIGN

The demonstration plant is designed with:

- Hydraulic capacity = 5,000 m^3/d
- PSS production = 1/2 ton/d (dry basis)
- Syngas production = 1,800-2,400 Nm^3/d

Thermal energy→ Utilization in the dryer for moisture removal from the PSS.
Electric energy→ Partial coverage of the electrical needs of the WWTP & export to the electrical grid.

Positive effects:

- Energy production
- Management of biosolids
- Solids & BOD loading reduction→ enhancement of WWTP's performance

KEY PERFORMANCE INDICATORS (KPI)

Improved environmental & climate performance:

- Reduction of Greenhouse Gas Emissions (GHG)
  104 tonsCO_2/year (45% reduction)
- Waste reduction
  306 tons/year (93% reduction)
- Improved WWTP effluent
  1,825 Mm^3/year

Better use of natural resources:

- Energy from renewable energy sources
  250 MWh/year
- Reduced energy consumption in aeration tank
  250 MWh/year (35% reduction)

LIFEB2E4SustWWTP INFORMATION	
TOTAL BUDGET	1,936,680 €
EC CO-FUNDING	60% (1,162,004 €)
START DATE	01/09/2017
COORDINATING BENEFICIARY	TECHNICAL UNIVERSITY OF CRETE (GR)
ASSOCIATED BENEFICIARIES	CETENMA (ES) DEVISE (GR) DEYAR (GR) ENGINNOV (UK)

PROJECT PARTNERS

Coordinator

Technical University of Crete

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