

Co-composting of sewage sludge with plant residues: The case study of Rethymno WWTP

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Co-composting of sewage sludge with plant residues is one the most useful, efficient, reliable and economical method of sludge stabilization. Co-composting of urban wastewater treated sludge with plant residues, instead of its disposal at landfills, is an essential issue which solves a major environmental problem.

The main purpose of this study is to present the modern solar drying and co- composting of sewage sludge with plant residues unit of Municipal Water and Sewerage Utility of Rethymno. Also, another purpose of this study is to present the quality evaluation of the produced compost. The produced compost has a great fertilizer value and contributes to sustainable agriculture, in the circular economy and in the halting of climate deterioration.

The solar drying and composting unit at Rethymno, Crete

The owner of the projects of the Solar Drying and Co- Composting Unit and the managing body of these projects is the Municipal Enterprise of Water Supply and Sewerage of Rethymno (DEYA of Rethymno). It was built at the Wastewater Treatment Plant (WWTP) of Rethymno on period 2015 2020 and is in operation from in January 2021. Groundbreaking in its kind by Greek standards consists of:

- Unit of fragmentation of branches- wood and plant residues (shredder unit).
- Two solar dryers (2×1000 m²) with agitation systems, air circulation, meteorological station, all automated to maximize water evaporation (Picture 01).
- Zeolite addition unit to the mixture.
- Composting reactor in a closed building of 1,500 m² with three fermentation channels (Picture 02), mechanical stirring and promotion of the mixture, automatic water addition equipment, air blowing aerators into the fermented mixture to maintain aerobic conditions and temperature control automations.
- Sifting unit of the finished product and removal of impurities.
- Unit of maturation of the compost, storage and final disposal.



Picture 01: Solar drying unit



Picture 02: Fermentation channels of Composting reactor

Compost of Rethymno

Compost of Rethymno is the commercial product of the produced compost from the Solar Drying and Co-Composting of sewage sludge with plant residues Unit of Deya of Rethymno (DEYAR). It is the compost of DEYAR, which is an organic, soil improver and compost produced by tree prunings, vegetable garden residues, biological sludge, natural zeolite and seaweed.

The great fertilizer value of the produced compost (Picture 03) is presented in the Tables 01- 03 (Values are expressed in terms of dry weight).



Picture 03: Compost of Rethymno

Table 01. Physico-chemical compost characteristics.

Parameter	Unit
Organic Matter	55- 57%
pH	7.4- 7.8
Humidity	30- 35%
Conductivity	4000- 5000 $\mu\text{S}/\text{cm}$
Specific gravity	0.60- 0.65 kg/L

Table 02. Compost Macronutrients.

Parameter	Unit
Total Nitrogen (TN)	2.4- 3.0 %
Phosphorus (P_2O_5)	2.4- 3.0 %
Potassium (K_2O)	1.0- 1.2%
Calcium (CaO)	5%
Magnesium (MgO)	1.3 %
Sulfur (SO_3)	2.0 %

Table 03. Compost Micronutrients trace elements

Parameter	Unit
Iron (Fe)	5000 mg/kg
Zinc (Zn)	450 mg/kg
Copper (Cu)	200 mg/kg
Manganese (Mn)	100 mg/kg
Boron (B)	70 mg/kg

The produced compost is free from contaminants and especially have been observed that there is:

- An absence of pathogenic micro-organisms (Escherichia Coli 0157, Salmonella spp)
- Very low concentrations in heavy metals, 3-15 times smaller than maximum concentration of legislation.
- Almost zero values in organic micropollutants (PCB, PAH, PCDD).
- Absence of Hexavalent Chromium and Arsenic.
- Low cadmium content compared to phosphorous chemicals fertilizers.
- Low Cl content compared to chemical potassium fertilizers.
- Freedom from weed seeds and phytopathogenics.

The produced compost has been certificated of its agriculture suitability by the Greek Ministry of Rural Development and Food and especially by the Hellenic Agricultural Organization “Dimitra”, the Department of Agriculture of Hellenic Mediterranean University and the School of Chemical Engineering of National Technical University of Athens.

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