Management of Olive Oil Mill Wastewater

Ministry of Environment & Energy

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Environmental permitting

All projects are divided in two categories(A &B)

Category A → (A1) significant environmental impacts → EIA

Category A → (A2) medium environmental impacts → EIA

Category B → Predetermined Environmental Commitments

- <u>A2 category</u>

  (20% total no. olive mills)

  if >200 t/day & more than 90 points or ≤200t/day & >150 points

  Criteria of point system:

  - location of mill in regards to area land uses
  - proximity to “sensitive” recipients, e.g. wetlands, archeological sites etc.
  - distance from town limits

- <u>B category</u> (all the rest) – Predetermined Environmental Commitments

  (80% total no. olive mills)

Wastewater management – Greek legislation

JMD 127402/1487/Φ15/2016

For category B olive oil mills

- Option A: impermeable lagoons for evaporation
- Option B: liquid fertilization

For category A olive oil mills – EIA

- No specific rules for olive oil wastewaters

In both options, the crude olive cake is sent to an olive-pomace oil extractor or is delivered to relevant permitted installations

- Composting
- Biogas production
- Livestock feed

Present situation

More than 2.500 olive mills in total producing about 18% of European olive oil production

Technologies:

- 2 phase decanter → olive oil
  → olive cake (humidity 65-70% (olive cake + waste water)
- 3 phase decanter (vast majority (85%)) → olive oil
  → olive cake (humidity 55%)
  → waste water(4-5 parts ww:1 part oil)

Olive Mill Wastewater (OMWW)

Composition of OMWW

Varies qualitatively and quantitatively according to:

- production site soil and climate conditions
- olive cultivar
- Methods and harvesting means
- ripening state of olives
- composition of olive juices
- olive oil extraction process
- Storage duration

Olive Mill Wastewater (OMWW)

Characteristics of OMWW:

- intensive violet dark-brown up to black colour
- strong offensive smell
- pH between 3 and 6
- high electrical conductivity
- high degree of organic substances
- high content of polyphenols (phytotoxicity)
- high content of solid matter

OMWW constitute a serious threat to the environment & should not be disposed untreated on soil, in sea, rivers, streams or wells

Option A: Evaporation lagoons

Pretreatment of wastewaters in settling water tight tanks (3 hours min residence time) + lime (5 kg/t of olives or 2% of the volume of the wastewaters) to get precipitation. Alternative: any method of equivalent result.

Wastewater is driven through a pipeline to an **evaporation lagoon** (max 1,5 m deep) with the following characteristics:

- impermeable floor
- min 300m from town limits, houses, touristic zones, highways or other areas of “special interest”
- min 100m from secondary roads and seashore limits
- min 200m from potable water sources & min 100m from irrigation water sources & streams
- fence, tree planted perimeter, mud to prevent overflows
- wastewater level max 80% of lagoon depth
- to prevent odours, stirring and, if necessary, addition of hydrogen peroxide (1% per wastewater volume)
- sampling from nearby water abstractions: twice per period (1st at the beginning and 2nd 6 months later)
- At the end of the production period the sediment is removed.

Wastewater evaporation lagoon

Option B: Liquid fertilization

Pretreatment, **liquid fertilization**

- Technical report from geologist or agriculturalist submitted to the decentralized permitting authority (which then informs the relevant Water Directorate and the Directorate of Agricultural Applications & Fertilizers)
- Notification submitted to and the Directorate of Environment & Spatial Planning (wastewater application plan accompanied by results of soil analysis of previous year) min 7 days before fertilization for every oil production period
- Wastewaters are stored either in lagoons (as in option A) or in covered water tight tanks (no more than 10 days before fertilization)
- Storage capacity at least double the daily production capacity, for mills up to 6t/8hours and 4 times the daily capacity, for all other mills
- Max. quantity of fertilization: 80 m^3/he/year for olive and other trees
- Not allowed under rain or snow or when the soil is saturated in water from previous heavy rains
- **Criteria for suitable soil/land**
- **Content of technical report**
- Monitoring of the soil once per year, one month after the application of the liquid fertilization – if some parameters do not change over time → less frequent monitoring

Option B

Criteria for suitable soil/land

- Appropriate distances from potable water sources as per Water Basin Management Plan
- Distance >50 m from populated areas
- Not allowed in water saturated soils
- Aquifer is min 10m below the surface of the ground
- Soils with thickness > 0,5 m
- Land with inclination <15% or in terraces, without surface drainage (hydraulic conductivity <5mm/h)
- Not allowed in sand or similar type soils
- Soil pH > 5,6
- Soils not rich in salts (conductivity < 4 mS/cm)
- Soils that do not contain heavy metals

Option B

Content of technical report

- Information regarding the olive oil mill (technical characteristics/description of the storing facility of wastewaters, technical characteristics and dimensions of pretreatment system, physicochemical and other characteristics of the wastewaters, calculation of the annual quantity of fertilization per he, description of the way the wastewaters are dispersed according to best agricultural practices for irrigation)
- Information regarding the land property to be fertilized
- Information regarding the suitability of the soil: hydrogeological characteristics of the soil that prove that there is no interaction with surface and ground waters, analysis of the soil parameters such as mechanical composition, total N, available P, phenols, K, pH, electric conductivity, organic content – one soil sample per 2,5 he)
- Evaluation/conclusions regarding liquid fertilization
- Soil sampling by certified laboratories or state agencies or the rapporteur – detailed description of soil sampling
- Monitoring

Option B

Benefits:

- Financially sustainable method
- Integrated management
- Substitution of chemical fertilizers

Possible issues:

- Biotoxicity: polyphenols
- Practical issues: irrigation system, weather conditions, storage facilities
- Soil salinity
- Groundwater pollution
- Acidification of the soil

Thank you for your kind attention

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