

## **EFFECTIVE SOLUTION FOR MUNICIPAL WASTE WATERS STATION SLUDGE**

Mircea GRIGORIU<sup>1\*</sup>, Gheorghe CIOBANU<sup>2</sup>, Anton BEIOGLU<sup>3</sup>

*The paper presents the possibilities of utilization for waste waters plants sludge for a medium sized city. The main applications considerate are: reuse of reforestation, sanitary landfills, composting, and incineration. There are identified the local opportunities for each situation, taking into account the geographical, demographical, industrial and regional development trends.*

**Keywords:** Three to six keywords are required, written in lowercase letters.

### **1. Introduction**

The agricultural reuse of sludge is proposed as the preferred path of sludge disposal for the future. The transformation in the practice depends mainly from the qualities of the produced sludge, the qualities of the soils and the willingness of the farmers to use the sludge, respectively. Beyond other alternatives as proposed should be exanimate very careful in order to find ecological and economical solutions for the future [1]. The proposed alternatives are:

- reuse of sludge for reforestation,
- sanitary landfills (in common with solid waste),
- composting,
- incineration.

The example considered is a region centred by the city of Constanta and which boundaries are: Razelm Lake, Danube River, Black See and the South tourist station Mangalia. The paper analyses the medium situation, do not taking into consideration yearly the fluctuation in volume and quality of the sludge.

### **2. Critical aspects- risk analyze for sludge USING in agriculture**

The use of sewage sludge as fertilizer in agriculture is highly disputed. Benefits and risks have to be weighed against each other. The fertilization work of the agricultural fields with the sludge from the wastewater treatment plants,

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<sup>1</sup> Conf., Depart. Power Engineering, University "Politehnica" Bucharest, România (\*Corresponding author)

<sup>2</sup> Drd., Depart. Power Engineering., Universitatea "Politehnica" din București, România

<sup>3</sup> Drd., Depart. Power Engineering., Universitatea "Politehnica" din București, România

including the industrial waters too, is used for the first time in Constanta County, this vital problem for the largest cities being approached for the first time by RAJAC (County Water Company). By applying the sludge in agriculture, the dangerous substances included in the sludge can lead to risks for the human health, the soils and the environment in a direct way [3].

The risks can be multiplied by the combination of the agricultural reuse of sludge and the agricultural practice. The main risks are coming from: Heavy metal concentration and nutrient concentration, especially nitrate and phosphorus.

#### *Heavy metals*

The issues regarding heavy metals concentration in sewage sludge can be summarized as: persistence and metal balances, extractability or bioavailability changes with time, crop uptake and microbial impacts [2].

A multi-annual and overdosed fertilization of sewage sludge may lead to a surface, ground and drinking water pollution. Since pollutants accumulate in the soils, there is a long-term risk of affecting the soil fertility, plant yield and quality, animal and human health and accumulation or contamination with pollutants in the food chain.

Sewage sludge application leads to an accumulation of heavy metals in the soil. An elevated soil content of heavy metals leads to a diminished activity of soil organisms, to a diminished plant yield and to an enhanced accumulation of heavy metals in plants. Nevertheless, the risk to animal and human health by heavy metal intake today is considered as low; the heavy metal concentrations of sewage sludge had never been as low as today.

Even if sewage sludge is no longer admitted as a fertilizer in agriculture, hazardous substances, agents and organisms will continue to be dispersed into ecosystems and to be accumulated in the food chain.

#### *Pollution by nitrate and phosphorus*

Nitrogen (N) component in the sludge is probably the most interesting from either an environmental or an agronomic point of view and this is the reason for using N content as the basis for calculating the application rates [2].

Phosphorus (P) is an essential plant nutrient, but the low concentration and solubility in soils makes it a critical nutrient limiting plant growth.

## **2. Reuse of sludge for reforestation**

Less than 5 % of Constanta County area is covered by forests. The most important forests within the project area are Hagieni (330 ha) located close to Albesti village and Comorova, a little area north of Mangalia (4 ha). Both forests

are natural protected areas. This means that an application of sludge is forbidden by the Romanian regulations. Another connected forestry area is located close to Valu lui Traian and Basarabi covering less than 100 ha. More connected forests are located in the outermost western part of the County, around 80 up to 100 km away from Constanta.

Discussions with the County Forestry Inspector (Ministry of Agriculture) revealed that the application of sludge can only be accepted in nurseries.

Due to the restricted availability of forest areas only small amounts of sludge can be used in forestry. Moreover, after renewing of the current Sludge Directive the application of sludge in forests will be most probably forbidden. Under all considerations a reuse of sludge in forestry can not be recommended.

#### *Sanitary landfills (in common with solid waste)*

According to the Romanian Regulations No. 78/2000 and 426/2001 the dumping of sewage sludge in common with solid waste has a legal basis.

Currently waste and soil are layered in the landfill. Therefore the local Department of Water and Environment accepts sludge in landfills only if no other alternative is available.

If the dumping of sludge in solid waste dumpsites should come into practice, additional tests of the sludge (content of dangerous substances) would be necessary. The offered price is about 20 \$/t DS delivered sludge.

#### *Composting*

In general, composting of sludge is considered to be a good fertilizer for horticulture and gardening. It is possible to compost sludge together with the organic portion of municipal solid waste or to compost the sludge separately in order to obtain a uniform quality of compost.

But it must be stated that the nutrients concentration, especially nitrogen and phosphorus is very low, in contrast to the costs for the production process, which are high.

Only the content of potassium in the compost is higher than in sludge. This is justified in the intensive transformation process.

As the nutrients concentration in the compost is very low, it is understandable that in Germany only 4 % of the total amount of sludge (2.7 Mio t total DS in the year 1999) has been composted [4].

Therefore it can be expected that if composting will be introduced in the project area, this process will allow the solving of a minor part of the sludge management problem. Moreover, it must be stated that the discussions with the local authorities revealed the fact that at the moment no capacities for compost production exist in the project area.

### *Incineration*

In the Master Plan incineration of sludge is ruled out to be an impracticable solution for the future, due to the following reasons:

- No existing capacities for incineration (located inside the WWTPs, in common with municipal solid waste)
- Incineration is a complex process and special trained operators are needed
- Possible air pollution (particles, oxides of nitrogen acid gases, specific constituents such as hydrocarbons and heavy metals)
- The process is very costly and requires a lot of electrical and thermal energy

In contrast, an interested company has been identified in the Lafarge Romcim Cement Company (LAFARGE-Group) located in Medgidia. This company is permanently looking for substitutes in the combustion process (bituminous coal) in their factory. In a first meeting they testified their interest and offered burning capacity depending on sludge water content (DS content, humidity) and the content of heavy metals. The total amount for substitution has been announced to be up to 125,000 t/y.

Despite of this fact, the total amount of the sludge production has been indicated to be around 50,000 t/y (2006, 25 % DS). In a first estimation a price of 30-35 \$/t DS (transport by RAJA own tucks) has been offered, but the price is subject of negotiation.

It has been agreed upon to inform the representative of Romcim after receiving the results of the sludge samples (Constanta South, Mangalia WWTPs) sent for analyses to ICPA laboratory Bucharest.

## REFERENCES

- [1]. *Hall, J.E., Havelaar, A.H., L'Hermite, P.* "Treatment and use of sewage sludge and liquid in agricultural wastes", in Review of COST 68/681 Programme, 1972-1990, EUR 14330 EN, 1992.
- [2]. *Ingrid. Walter*, "Availability of nitrogen and heavy metals from sawage aludge amended soil by different crops", Bangkok, Thailand, 2002.
- [3]. *L'Hermite, P., Otto, H.* "Processing and use of sewage sludge", D.Reidel Publishing Company, London, 1983.
- [4]. *Assianty, a., Khalel, M.A.*, "Effects of dry sludge application on soil microarthropod communities in a reclaimed desert ecosystem", *Pedobiologia* no.44, p.567-578, Bucharest, Romania, 2000.