CONSIDERATIONS REGARDING THE USE OF SLUDGE IN AGRICULTURE

Authors: Cornel SAVA[1], Elena Maria PICĂ, Marius-Daniel ROMAN[2]
[1] Technical University of Cluj-Napoca, Building Services Engineering Department, Blvd. December 21, no. 128-130, 400604, Cluj-Napoca, România
[2]Technical University of Cluj-Napoca, Building Services Engineering Department, Blvd. December 21, no. 128-130, 400604, Cluj-Napoca, România
Corresponding author: sava.cornel47@yahoo.com

Abstract. *Water is undoubtedly a source of life, but almost equally it is an essential source for comfort. The use of water for activities that provide the comfort of a civilized life, implies a marked degradation of the natural qualities of the water can occur due to the introduction of pollutants into water, transforming it into wastewater. Wastewater is collected through complex sewage systems and transported to areas outside human settlements. For a long time this huge source of pollution was dumped into the flowing waters, into lakes and artificial ponds created for this purpose. The numerical increase of the human settlements has highlighted the high pollution capacity of the wastewater. People have realized that wastewater needs to be treated. The cost of treating wastewater is about twice the cost of drinking water. The expansion and modernization of wastewater treatment plants is the only way to reduce pollution and avoid infestation of surface water with wastewater. The current treatment technology involves obtaining significant quantities of sludge. The sludge collected from wastewater treatment is an important source of pollution. This may result in additional processing and storage costs. The present paper proposes a method of responsible management of the sludge can be obtained. Following dehydration, the sludge remains with a significant amount of water, about 70%, which makes it difficult to use. For the preparation of the sludge for use, the proposed method involves the use of a machine that will continue drying the sludge after the mechanical dehydration operation, until it is brought to 50% solid substance (SS). Dry sludge becomes much more attractive for use. If the treatment plant is well sized, it manages to eliminate those substances contained in the wastewater, which are harmful when their concentration is high. The use of dehydrated and dry sludge as fertilizer in agriculture can only be carried out with careful supervision of the process of collecting and purifying wastewater and drying properly. Those interested should be properly informed about the qualities of dehydrated sludge. The sludge contains nitrogen and phosphorus, chemical elements that recommend its use on agricultural land as fertilizer. The sludge resulting from the treatment of wastewater contains organic matter and nutrients, which can contribute to increasing soil fertility. The paper will present pictures of dried sludge to highlight the advantages of dry sludge. Laboratory determinations will show that, by drying, the substances contained in dehydrated sludge do not destroy. Also will be presented modern methods used in the European Union to illustrate how dry sludge can be disposal in agriculture.*

Key words*: sludge, dry sludge, agricultural, land, fertilizer.*

INTRODUCTION

Water is undoubtedly a source of life, but almost equally it is an essential source for comfort. The use of water for activities that provide the comfort of a civilized life, implies a marked degradation of the natural qualities of the water by introducing polluting substances into water, transforming it into waste water.

Waste water is collected through complex sewerage systems and transported to areas outside human settlements. For a long time this huge source of pollution was dumped into the flowing waters, into lakes and artificial ponds created for this purpose. The numerical increase of the human settlements has shown the high pollution capacity of the waste water. People have realized that waste water needs to be treated. The cost of treating waste water is about

twice the cost of drinking water. The expansion and modernization of wastewater treatment plants is the only way to reduce pollution and avoid infestation of surface water with waste water.

The current treatment technology involves obtaining significant quantities of sludge.

The sludge collected from wastewater treatment is an important source of pollution, in cases where its management is not properly executed.

The people responsible for the waste water treatment must request the specialists clear solutions for managing the resulting sludge quantities.

The sewage treatment plant is a complex of machines that operate continuously, so that the resulting sludge increases with each hour.

Sludge storage inside the treatment plant can be a short-term solution (max. 2-3 days). The storage in warehouses located outside the treatment plants implies the carrying out of complex works that allow the storage of the sludge without infestation of the groundwater.

It is obvious that these deposits also have a limited capacity, not representing a long-term solution.

The present paper proposes a method of responsible management of the sludge that allows their preparation, so that they can be used avoiding the need for storage.

Following dehydration, the sludge remains with a significant amount of water, about 70%, which makes it difficult to use.

For the preparation of the sludge for use, the proposed method involves the use of a machine that will continue drying the sludge after the mechanical dehydration operation, until it is brought to 50% solid substance (SS).

Dry mud becomes much more attractive for use.

If the treatment plant is well sized, it manages to eliminate those substances contained in the wastewater, which are harmful when their concentration is high.

Dehydrated and dried sludge in a machine designed and manufactured for this purpose may be used as long as it does not contain dangerous substances.

MATERIAL AND METHODS

The proposed machine for drying the sludge is a drying tunnel shown in figure 1.

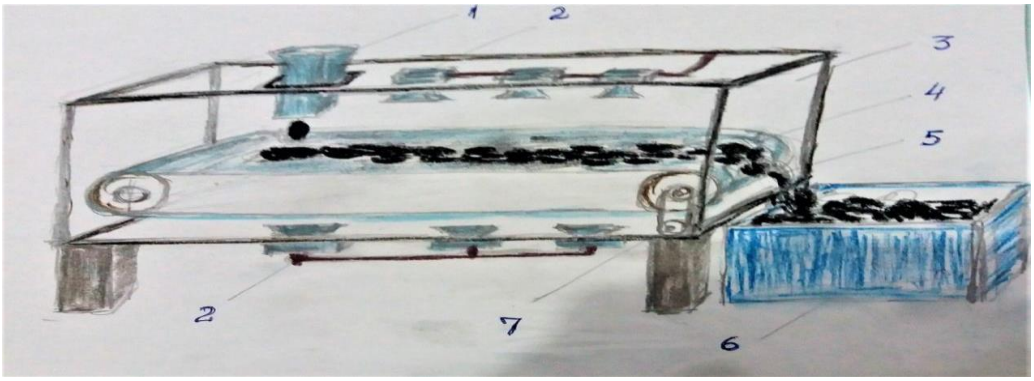

Figure 1 Drying tunnel

1. Feed funnel; 2. Hot air ventilation system; 3. Transparent housing; 4. Conveyor belt; 5. Dry mud; 6. Dry sludge collection container; 7. Conveyor belt drive system

According to Figure 1, the dehydrated sludge is introduced into the enclosed space (3) through the feed funnel (1). The ventilation system (2) will be adjusted so as to ensure a good ventilation of the workspace and a temperature of 50 ° C.

The conveyor belt drive system (7) must provide a travel speed so that the dehydrated sludge travels the distance to the container (6) in 30 minutes.

The sludge thus obtained becomes much easier to use. It can be a filling material in constructions, in the restoration of degraded lands.

The sludge contains nitrogen and phosphorus, chemical elements that recommend its use on agricultural land as fertilizer.

The sludge resulting from wastewater treatment contains organic matter and nutrients, which can contribute to the increase of soil fertility.

The use of dehydrated and dry sludge as fertilizer in agriculture can only be carried out with careful supervision of the process of collecting and purifying waste water and an appropriate drying, resulting in a light and pollutant-free sludge.

Figure 2 shows the dehydrated sludge that is still soaked with water, which makes it difficult to use

Figure 2 Dehydrated sludge before drying

Figure 3 shows the dried and dried sludge. It is observed that it becomes much more accessible for use.For agricultural land the dry sludge can be spread with the equipment used for spreading chemical fertilizers.

Figure 3 dry sludge after dehydration

RESULTS AND DISCUSSION

The efficiency of the drying method was evidenced by laboratory experiments from which we present the results obtained by drying a sample in a ventilated space at a temperature of 100 ° C, during imposed periods of time respectively, 30, 60 and 90 min.

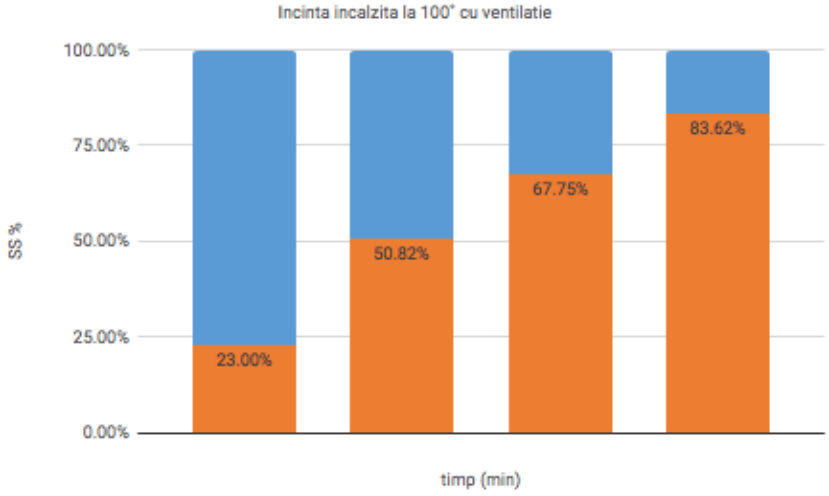

Figure 4 Heating results at 100 ° C with ventilation

Figure 4 shows how the amount of dry matter increases with increasing heating time, starting from 23% (dehydrated sample) to 83.62% after 90 min.

Following the chemical analyzes carried out both on the dehydrated sludge and after drying it, it was found that by drying the substances contained in the dehydrated sludge, they do not destroy.

CONCLUSIONS

The studies and researches regarding the drying of the sludge resulting from the treatment of waste water in the treatment plants had as main objective the discovery of a technology that could continue the process of water removal and after the dehydration operation.

The sludge resulting from the drying process carried out in the drying tunnel is much easier and more accessible for use for other purposes.

The content in organic substance, nitrogen and phosphorus recommends its use for soil fertilization in agriculture.

Figure 5 Sludge spreading on agricultural land

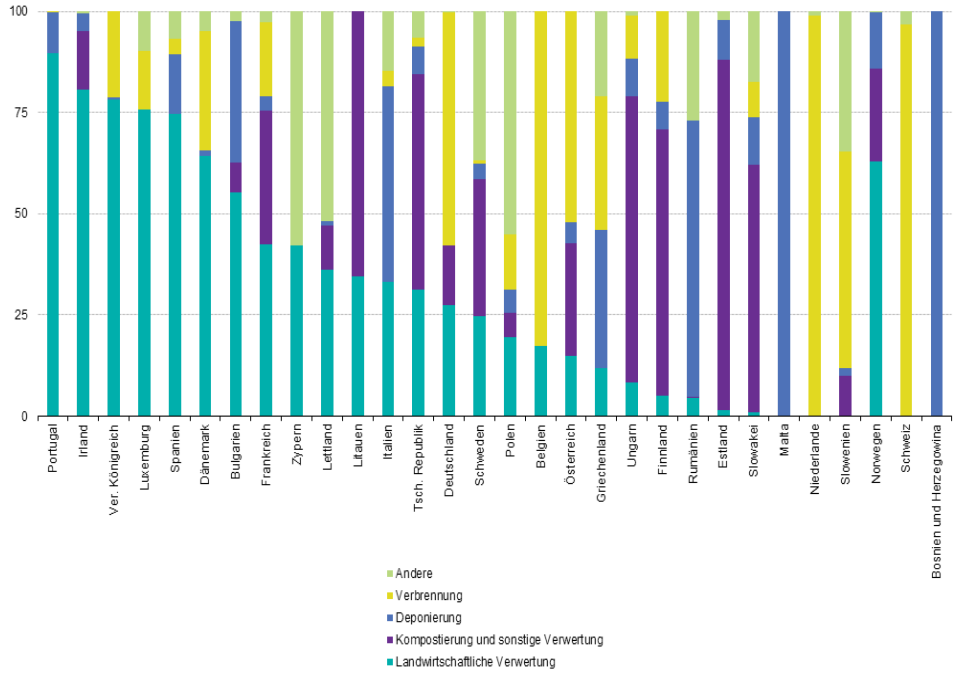

Figure 6 Sludge processing in European Union states
(Schurig and Wasser, 2018)

Figure 6 shows in graphical form the way in which the states of the European Union manage the resulting sludge in the treatment plants.

It is noted that while countries such as Portugal, Ireland and Spain use in agriculture 75% of the sludge resulted in treatment plants, in Romania its use is about 5%.

The present paper proposes to increase the percentage of dry sludge used in agriculture by properly informing those interested and presenting samples of dry sludge that convince about the qualities of fertilizer.

Reducing the amount of sludge stored is an activity with significant benefits in protecting the environment.

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