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The designation of sewage sludge stabilized using alkaline lime and fly ash additives – Potential odor nuisance

Background

The N-Viro facility of Dan-Viro at the Shafdan Wastewater Treatment Plant was planned from the outset for a process based on sewage sludge stabilized with alkaline lime and fly ash additives remaining in concrete silos for 24 hours, in order to obtain the required threshold conditions for Type A sludge, as well as to meet the VAR (Vector Attraction Reduction) criterion to reduce odor emission and insect attraction. After it was realized that the storage in the silos harms the friable texture of the sludge stabilized with alkaline lime and fly ash needed so that the additives can be evenly distributed in the field, the Ministry of Environmental Protection authorized an alternative - N-Viro HT procedure. This procedure required that the stabilized sewage sludge will be left in a container for two hours at a temperature of 70°. Reaching that temperature necessitated doubling the proportion of lime in the product and thus harming its agricultural quality.

The most significant volatile, odoriferous component of the sewage sludge stabilized with alkaline lime and fly ash is ammonia, which is formed from the ammonium found in the sludge, when exposed to the high pH level caused by the alkaline additives, especially lime. The potential for emission of the ammonia exists mainly in the early stages of the treatment of the sludge, due to the suppression of the microbial activity when the microorganisms are exposed to the high pH level and the pasteurization temperature (over 52°), created as a result of the reaction of the lime with water.

Numerous tests carried out on the sludge produced according to the original (lower lime content) procedure found that it meets the requirements of Type A sludge immediately after leaving the blender in the Dan-Viro facility, which shows that the alternative, N-Viro HT process in fact only serves to accelerate the stabilization of the sludge.

Tests for odor emission from the sewage sludge stabilized with alkaline lime and fly ash addition

In order to make it possible to obtain a higher quality product from the agricultural point of view as originally planned, the professional-scientific team of the Coal Ash Board, in coordination with the Ministry of Environmental Protection, conducted a



test to measure the odor emissions from the sludge treated by the original N-viro procedure when kept in a container, instead of a silo, for 24 hours in order to see if it meets the VAR criterion.

In accordance with the program authorized by the Ministry of Environmental Protection, the Coal Ash Board plans to place a container filled with sewage sludge stabilized with alkaline lime and fly ash in the area of the Dan-Viro facility and to measure odor emissions during the process of sludge treatment, its loading into the container and the time it is held in the container. The measurements will be carried out by experts from the Neveh Yaar Research Center of the ARO. Based on the findings of the tests, the experts of the Arava Institute will conduct an assessment of the distribution of odor emanating from the treated sludge in the vicinity of the Shafdan sewage treatment plant, using a designated distribution model.

The findings of the measurements and the odor distribution assessment will be presented to the Ministry of Environmental Protection in order to obtain its authorization for the production of stabilized sludge using lime and coal ash, based on the original treatment procedure, but using the current production setup, in which the sludge is not kept in silos but in containers instead.

Comment

As noted above, significant ammonia production is not expected at the later stages of the treatment of the sludge, since the high pH level prevents microbial development that can generate materials that give off noxious odors, including ammonia. It follows that the release of ammonia during the process of stabilization of the sludge up until it is loaded onto the container in the Shafdan facility, reduces the amount of ammonia to below the level reached upon the exposure to ammonium in the sludge to the high pH level of the lime. Consequently, it is reasonable to assume that the emission of odors at an interim storage site or during distribution in the field, will be rather low (this on condition that the handling of the stored stabilized sludge, e.g. ventilation of sludge piles, will prevent renewed anaerobic microbial activity). On the other hand, leaving the stabilized sludge for an extended period in a pile after the pH has decreased without ventilation, could create conditions that encourage the renewal of the anaerobic microbial population that forms organic compounds that contain sulfur (e.g., dimethyl and trimethyl sulfide), which give off a characteristic odor.

If it should emerge that the odor nuisance at the interim storage or afterwards exceeds the anticipated level, odor emission tests will be carried out at later stages of the handling of the stabilized sludge.