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Popular Article

Solid waste management - Biosolids as source of fertilizer

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Introduction

Waste minimization and recycling/reuse policies have been implemented in recent years to lessen the quantity of trash produced, and alternative waste management techniques are being used to lessen the effects of waste management on the environment. The production of sewage sludge, also known as biosolids, is rising quickly due to global industrial development, urban planning, and population growth. Sludge must be properly handled and managed ecologically in order to minimize the harmful effects of application or disposal. Significant amounts of biosolids are produced by the treatment plants. Wastewater from cities, sewage effluent, and effluent treatment facilities all produce biosolids. In many nations, biosolids or sewage sludge are regularly used for a variety of uses, including the manufacture of biogas, landfill, organic fertilizer, soil amendment, and increasing crop yields. As a result, sewage sludge, also known as biosolids, is being considered as a resource globally. In addition to this increased concentration of various heavy metals, microbes provide significant obstacles to the use of biosolids, or sewage sludge, in a variety of industries. Sewage sludge (also known as biosolids) is defined as the residual, semi-solid substance that is produced as a by-product during the sewage treatment of industrial or municipal wastewater (Kumar and Chopra, 2016). More precisely, sewage sludge is created as a byproduct of the several phases of treatment used to purify wastewater from homes, occasionally containing commercial and industrial effluents as well. The present popular article deals with the different applications of sewage sludge for sustainable agriculture.

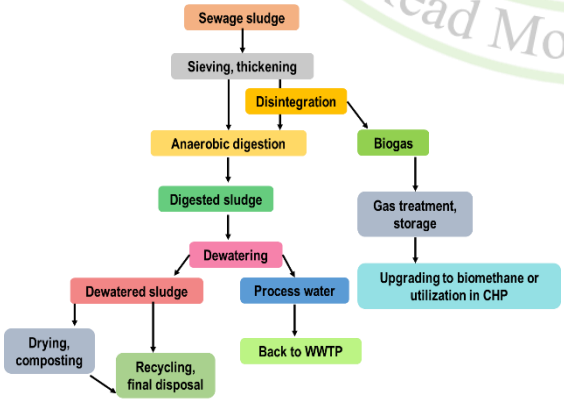
Characteristics of biosolids

The specific gravity of sewage sludge is 1.0, which is equal to water. Solids concentration, which measures the proportion of solids to water in the volume index for sludge and slurry (SVI). The physico-chemical properties of biosolods, typically consist of 20% fat, 50% carbohydrates (sugar, starch, and fibre), 30% to 40% organic matter, 3% total nitrogen, 1.5% total phosphorus, 0.7% total potassium content, 10% to 20% C/N ratio, and high concentrations of heavy metal ions, such as Cu and Zn. The dry sludge has a heat value (Ho) of roughly 12.000 kJ/kg. According to Xu (2014), the usual

pH range for sewage sludge is 6.5–7.0. Sewage sludge that has been properly processed and treated turns into biosolids, which are organic materials rich in nutrients that are produced by wastewater treatment facilities (Kumar and Chopra, 2013). Biosolids generally varied in characteristics and contain organic and inorganic chemicals, toxic metals and pathogens. Furthermore, biosolids can be recycled and used as fertilizer to enhance and preserve fertile soils and promote plant development. The management techniques for sewage sludge improve the material's usability as biosolids and lessen its hazardous content to stop it from being dumped into aquatic resources including lakes, rivers, and streams.

Sewage sludge as resource

Recently, a number of nations have realized that it is possible to recycle the components of sewage sludge as part of a "productification" strategy, which aims to turn sludge into products intended for market sale. Products made from sludge can be recycled for land application and utilized again for energy through matter recovery. The "Productification" concept states that these products can be sold on the open market in addition to being used on-site, as has been done for many years at treatment plants.



Diagrammatic sketch of sewage sludge production and possible resource recovery

Sewage sludge in soil amendment:

Different processing techniques can be used to reduce the number of pathogens in the sewage sludge. The key techniques are composting, air drying, anaerobic digestion, aerobic digestion, and lime stabilization of the sewage sludge. Furthermore, sewage sludge dried by air drying is left on sand beds or in paved basins of sludge dryness for several months at a time. Therefore, while using the composting method, the sewage sludge is kept either in a windrow composting method or a static aerated vessel, while when using the lime stabilization method, the sewage sludge is mixed with lime to raise its pH. The incorporation of biosolids enhances the biomass of soil microorganisms and certain soil enzymes, including urease, alkaline phosphatase, and β-glucosidase, which are associated with the C, N, P, and S soil cycles. Because organic amendments may contain both external and intracellular enzymes, as well as potentially boost microbial activity in the soil, they can also increase dehydrogenase activity in the soil. Walker and Bernal (2008) discovered that remediating saline soil with compost or sewage sludge worked well.

Use of sewage sludge in agriculture:

It has been discovered that applying sewage sludge significantly increases the production of agricultural crops. Franz (2008) states that 90% of the phosphorus needed to produce a sufficient phosphate fertilizer may be extracted from sewage sludge ash (SSA), which has a high phosphorus concentration of between 4% and 9% from sewage sludge incineration. The actual application of sewage sludge to agricultural land accounts for about 37% of its total production; land reclamation and

restoration (12%) and incineration (11%) are the other principal routes.

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