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Performance comparison of the microwave oven and conventional Electrical Furnace in the volume reduction and final stabilization of the South Esfahan wastewater treatment plant's sludge

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The Biological Solids produced during Wastewater Treatment processes are referred to as Sludge. Because the Sludge contains constituents such as pathogens, organic and inorganic substances and have adverse effects on humans and environment, they should be treated and processed entirely prior to disposal and then disposed of with respect to environmental regulations. One of the sludge treatment methods is thermal treatment. Among these, Microwave method could have an important role in sludge treatment. Thus in this Study, Microwave performance in sludge volume reduction and final stabilization of primary and Biological solids produced in South Esfahan WWTP in comparison with conventional laboratory Electrical Furnace have been surveyed. A batch system was set up to compare the Microwave Oven and Electrical Furnace in converting the South Esfahan WWTP's primary and biological sludges (as a sample alone and with adsorber addition) to a stabilized matter. The effects of relevant parameters such as, contact times between 1 to 10 min for Microwave Oven and 240 & 300 min for the Electrical Furnace heating and the adsorber dosage in the range of 5 to 30(w/w%) affecting the Sludge mass temperature production, weight percent reduction and total and volatile percent reduction, Coliform and HPC decrease also were tested. The study relieved that, by increasing radiation time, the Microwave oven performance increase sludge sample characteristics. In the samples with different percent of Adsorber addition, the mass temperature increased to 600°c in Microwave oven, however, in the samples treated in electrical furnace or with no Adsorber addition(in the Microwave Oven) did not have any significant effect on the temperature. The results in the microbiological characteristics also showed that in sludge samples containing different percent of Adsorber addition, The removal efficiency of Coliforms and HPC increased up to 100 percent but in the samples with no Adsorber addition the Microwave oven was able to 4.5 and 5 log reduction, respectively. Totally, data achieved from this study revealed that, if the sludge samples without Adsorber Additives were exposed to Microwave Radiation in different contact times, they were dried only and lose their humidity, but with different Adsorber addition dosage, in addition to drying, due to excessive temperature increasing in sample mass, Pyrolysis process occurred possibly and then the sludge samples during digestion are stabilized.

Key Words: Microwave, Sewage Sludge, Thermal treatment, Electrical furnace, Sludge stabilization

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