

Thermotechnical comparison of conventional heating and microwave radiation method for dewatering of sewage sludge

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ABSTRACT

In this study, variations on the dewatering of filter cake sludge following microwave irradiation and conventional drying processes were investigated. The rates of dewatering and operating costs were calculated. One hundred percent dewatering of the sludge was accomplished using 800 W microwave power for 15 min. Conversely, filter sludge was dewatered to only 45% by heating to 200°C for 60 min. To examine the cost analysis for the same conditions, a 45% dewatering rate was chosen. While energy consumption for conventional drying was 1.2 kWh/100 g sludge, energy consumption for the microwave radiation process was 0.126 kWh/100 g sludge. According to the Turkish legislation, sewage sludge must have a minimum 35% solid content to be stored in landfill areas. To ensure this, approximately 0.053 kWh/100 g sludge and 0.6 kWh/100 g sludge energy consumption was obtained for microwave radiation and conventional drying processes, respectively. According to the regulation, waste sludge can be used in soil with 90% solid matter content. In this context, energy consumptions of 0.173 kWh/100 g sludge and 1730 kWh/ton sludge, approximately, were calculated for microwave radiation process. Study results have shown that the microwave radiation process was 10 times faster, more effective, and 15 times more economical than conventional drying for sludge dewatering.

Keywords: Microwave irradiation; Sludge dewatering; Conventional drying; Cost analysis

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