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PhD Thesis

MODELING OF SEWAGE SLUDGE FILTRATION BY CHANGING THE
PROCESS PARAMETERS

ABSTRACT

The study undertook to verify the impact of changes in the conditioning factors of sewage sludge and the parameters of the filtration process on the increase of the dewatering effects and improvement of the modeling of the filtration process. The subject of the experiment was municipal sewage sludge in the form of preliminary, mixed and digested sludge from WARTA S.A. Municipal Sewage Treatment Plant in Częstochowa. The research included the measurement of hydraulic resistance at the filter baffle, measurement of the velocity of the breakthrough of the sludge cake by the liquid fraction, measurement of the content of total organic carbon, final sludge hydration, compressibility coefficient, and filtration process efficiency. The pressure filtration process itself was conducted at an operating pressure of 0.2 – 0.5 MPa. The study showed that conditioning of sludge with flocculent polyelectrolyte C-494 and fine-grained loose mineral additives resulted in an increase of pressure filtration efficiency for pre-flocculated sludge from 2.09 to 11.65 kg/m²h; for mixed sludge from 1.61 to 10.54 kg/m²h; and for digested sludge from 1,89 to 11,20 kg/m²h. The addition of mineral substances and conditioning with polyelectrolyte C-494 resulted in a significant reduction in the final hydration of pretreated sludge from 81.4% to 74.6%; mixed sludge from 85.3% to 77.2%, and of digested sludge from 83.2% to 75.4%. The proposed methods for conditioning municipal sewage sludge can be successfully used in sewage treatment plants.