

Solutions of Thickening the Sludge from the Wastewater Treatment by a Rotor with Bars

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Abstract : Introduction: The sewage treatment plants, in the second stage, are formed by tanks having as main purpose the formation of the suspensions with high possible solid concentration values. The paper presents a solution to produce a rapid concentration of the slurry and sludge, having as main purpose the minimization as much as possible the size of the tanks. The solution is based on a rotor with bars, tested into two different areas of industrial activity: the remediation of the wastewater from the oil industry and, in the last year, into the mining industry. Basic Methods: It was designed, realized and tested a thickening system with vertical bars that manages to reduce sludge moisture content from 94% to 87%. The design was based on the hypothesis that the streamlines of the vortices detached from the rotor with vertical bars accelerate, under certain conditions, the sludge thickening. It is moved at the lateral sides, and in time, it became sediment. The formed vortices with the vertical axis in the viscous fluid, under the action of the lift, drag, weight, and inertia forces participate at a rapid aggregation of the particles thus accelerating the sludge concentration. Appears an interdependence between the Re number attached to the flow with vortex induced by the vertical bars and the size of the hydraulic compaction phenomenon, resulting from an accelerated process of sedimentation, therefore, a sludge thickening depending on the physic-chemical characteristics of the resulting sludge is projected the rotor's dimensions. Major findings/ Results: Based on the experimental measurements was performed the numerical simulation of the hydraulic rotor, as to assure the necessary vortices. The experimental measurements were performed to determine the optimal height and the density of the bars for the sludge thickening system, to assure the tanks dimensions as small as possible. The time thickening/settling was reduced by 24% compared to the conventional used systems. In the present, the thickeners intend to decrease the intermediate stage of water treatment, using primary and secondary settling; but they assume a quite long time, the order of 10-15 hours. By using this system, there are no intermediary steps; the thickening is done automatically when are created the vortices. Conclusions: The experimental tests were carried out in the wastewater treatment plant of the Refinery of oil from Brazi, near the city Ploiesti. The results prove its efficiency in reducing the time for compacting the sludge and the smaller humidity of the evacuated sediments. The utilization of this equipment is now extended and it is tested the mining industry, with significant results, in Lupeni mine, from the Jiu Valley.

Keywords : experimental tests, hydrodynamic modeling, rotor efficiency, wastewater treatment

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