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# Optimisation of clarifier-thickeners processing stable suspensions for turn-up/turn-down

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## Abstract

Solid-liquid separation equipment operating on wastewater duties seldom functions at steady state and may be expected to perform over a wide range of feed loads.

Satisfactory control of the solids residence time in these clarifiers and thickeners is critical to their successful operation. High solids residence times can lead to hydrolysis and rising sludge. This paper addresses the design of clarifiers and thickeners with minimum solids residence times. A one-dimensional force balance theory of sedimentation is used as the basis for the optimal design. Turn-up and turn-down are considered directly within the optimisation. A robust algorithm is presented for the repeated solution of the design equations and the constrained optimisation of the solids residence time. Three types controlling phenomena are identified and illustrated with design cases. The designs are found to be taller with smaller plan areas than their point

optimised equivalents.



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## Keywords

Clarifier; Thickener; Design; Optimisation; Turn-up; Turn-down

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