

INCLINED PLATE SETTLERS WITH NOVEL RECEIVER SECTION AS A UNIT OPERATION FOR COMPLEX CONTINUOUS SOLID-LIQUID SEPARATION PROBLEMS

Hannah Engelmaier, Austrian Centre of Industrial Biotechnology
Hannah.engelmaier@acib.at

Nikolaus Hammerschmidt, Austrian Centre of Industrial Biotechnology
Christoph Dattenboeck, Baxalta Innovations GmbH part of Takeda

Alois Jungbauer, Austrian Centre of Industrial Biotechnology and University of Natural Resources and Life Sciences, Vienna

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Solid-liquid separation has been identified as a bottle-neck in continuous processing, especially regarding precipitate collection¹. Previously, tangential flow filtration has been proposed as a means of solid-liquid separation that retains precipitate flock structure². We have developed a novel receiver section concept for inclined plate settlers. Inclined plate settlers have been described for cell retention in perfusion processes in the 1990s³. Conventional plate settlers suffer from non-ideal flow distribution between the individual plates⁴⁵, mixing effects in the receiver section and significant losses of solubilized product during withdrawal of the concentrated suspension. Consequently, conventional plate settlers are not suitable for applications outside of perfusion. We devised a novel receiver section concept employing a system of flow distributors, which overcomes the deficiencies in flow distribution and separation between inflowing suspension and sedimented solids. Furthermore, the novel concept enables wash of the collected solids and thus significantly reduces fluid carry-over into the (intermittent) discharge stream. Thereby, the application range of inclined plate settlers is expanded from cell-retention to solid-liquid separation in general. Both streams, clarified fluid as well as concentrated and washed solids, can leave the system. The separated solids can, but do not have to be returned to the process. Proof-of-concept was provided using a single plate inclined settler. Operation conditions of the inclined plate settler system were optimized for precipitated product harvest. Scale-up is demonstrated from one to multiple plates for cell removal. We demonstrated continuous operation for ~90h and once in steady-state, turbidity was reduced by 95 % at consistently high product yields.

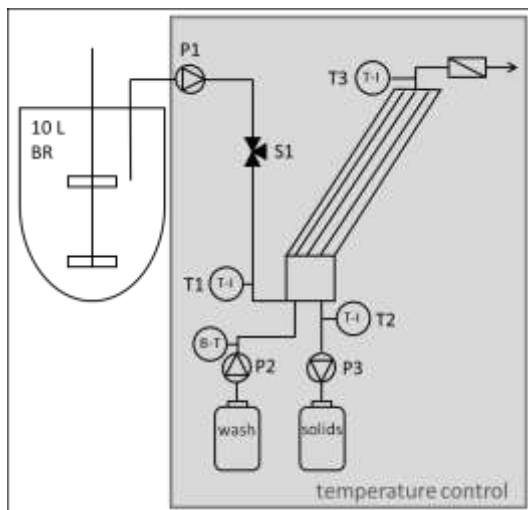


Figure 1 – Continuous cell removal in a cell-culture process with wash of the solids using the inclined plate settler with the novel receiver section concept.

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