

CONTROL STRATEGIES FOR CLARIFIER-THICKENERS UNITS

FERNANDO BETANCOURT C., ALONSO PEREIRA F., DANIEL SBÁRBARO H.,
AND FERNANDO CONCHA A.

ABSTRACT. The rational use of water has become an important issue in the mineral industry, especially in countries where it is located in desert areas with low water reserves. The need to increase the capacity of many copper concentrators requires efforts to recover the maximum amount of water in solid-liquid separation processes. The thickeners work continuously to produce a underflow concentrated, while the supernatant water overflows without particles. The thickening process is highly non-linear and practice has shown that standard feedback control has not been effective in providing consistent operation. In many plants, the thickeners work with deficient standards, with high doses of flocculants and a highly variable flow concentration. This work presents new control strategies and compares them with the strategies found in the industry and in the literature with a calibrated simulator based on a one-dimensional model clarifier-thickeners fed by suspensions with time-dependent properties. The analysis of the results indicates the characteristics of each of the control strategies and provides suggestions on how to improve their performance using the knowledge provided by the phenomenological model.

Keywords: Solid-liquid separation; Mathematical modeling; Simulation; Control strategies .

REFERENCES

- [1] Betancourt, F., Concha, F., & Sbárbaro, D. (2013). Simple mass balance controllers for continuous sedimentation. *Computers & Chemical Engineering*, 54, 34-43.
- [2] Betancourt, F., Bürger, R., Diehl, S., & Faràs, S. (2014). Modeling and controlling clarifierthickeners fed by suspensions with time-dependent properties. *Minerals Engineering*, 62, 91-101.
- [3] Betancourt, F., Bürger, R., Chalons, C., Diehl, S., & Faràs, S. (2018). A random sampling method for a family of Temple-class systems of conservation laws. *Numerische Mathematik*, 138(1), 37-73.

CI²MA AND DEPARTAMENTO DE INGENIERÍA METALÚRGICA, UNIVERSIDAD DE CONCEPCIÓN, CHILE
E-mail address: `fbetancourt@udec.cl`

DEPARTAMENTO DE INGENIERÍA METALÚRGICA, UNIVERSIDAD DE CONCEPCIÓN, CHILE
E-mail address: `alpereira@udec.cl`

DEPARTAMENTO DE INGENIERÍA ELÉCTRICA, UNIVERSIDAD DE CONCEPCIÓN, CHILE
E-mail address: `dsbarbar@udec.cl`

CRHIAM AND DEPARTAMENTO DE INGENIERÍA METALÚRGICA, UNIVERSIDAD DE CONCEPCIÓN, CHILE
E-mail address: `fbetancourt@udec.cl`