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Experimental study on dewatering of ground calcium carbonate by an automatic vertical filter press

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Automatic vertical filter presses are used for dewatering various materials in the chemical and mining industry. Design and sizing of filter presses for new applications always requires tests to be performed. Although these experiments are simple and quick, the amount of tests may become excessive when the influence of a several variables needs to be investigated. The operation cycle of a filter press consists of multiple stages which all influence the cake properties and therefore also the success of the other stages. Theoretical optimization of the whole cycle of a filter press is therefore difficult.

This paper introduces an experimental study performed for determining the influence of five process variables on the performance of the vertical filter press. The tests were performed by a pilot-scale press according to the plans created by following the principles of factorial designs. Capacity of the press and the cake moisture content described the performance of the filter. Results were used for creating regression models for both responses and those were successfully utilized for discovering the most significant variables and for estimating the effects of those on the operation of the filter.

Several designs were created for defining the minimum number of tests required for obtaining satisfactory results. Comparison showed that the amount of tests could be reduced by utilizing the design of experiments and modelling. The number of tests could be reduced from 41 to 8 without losing much of the accuracy for predicting the influence of variables on the operation of the filter.

Bio

Antti Hakkinen , D.Sc.(Tech), is a professor of solid/liquid separation technology in Lappeenranta University of Technology in Finland. He has worked on various issues regarding solid/liquid separation processes and characteristics of filter materials for over ten years. In addition to solid/liquid separation, his research includes batch cooling crystallization, design of experiments and empirical modeling. Antti Häkkinen has authored more than 50 publications in international journals and conferences and he is currently the chairman of the Nordic Filtration Society.