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THESIS FOR THE DEGREE OF
LICENCIATE OF ENGINEERING

PREDICTION OF CONE CRUSHER PERFORMANCE

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ABSTRACT

Prediction of the output from crushers in the aggregate producing industry has been focused on as the demands for higher quality and lower costs increase.

In this thesis a method for prediction of cone crusher performance is presented. The method is used to predict product size distributions and total capacity. By combining these results a *crusher performance map* is achieved. The crusher performance map can be used for optimization and choice of machine parameters for individual crushers.

The proposed calculation method utilizes a new process model to describe compressing crusher machines. The model includes the two basic mechanisms: *selection* and *breakage*. Selection corresponds to the probability of a particle being broken when an aggregate of particles is compressed. Breakage represents the way a single particle is broken into smaller fragments. An important property of the process model is that it must be closely physically defined. This is guaranteed by modelling crushing in a cone crusher as a repetitive process.

It is suggested that characterization of the fragmentation behaviour for rock materials is done by compression crushing tests. The test method developed is based on form conditioned crushing, with bed thickness and stroke of the same order that occur in a real crusher.

Determination of the material transport through the crushing chamber is done by utilizing a known flow model. Some development of the flow model has been done to fit the process model.

The calculation method suggested comprises the three parts described above: process model, characterization of rock material fragmentation behaviour and flow model. Thereby, the method takes fragmentation behaviour of the rock and feed size distribution into consideration. Moreover, chamber and machine geometry together with machine parameters such as closed side setting, stroke and eccentric speed are accounted for.

The final result achieved using the calculation method is a crusher performance map. The map can be multi-dimensional, showing how the final product depends on variations in machine parameters for a given crushing chamber. By analysing an assumed cone crusher it is shown that the eccentric speed has a great influence on the final product, such as size distribution and net capacities of different product gradings.

Keywords: ballast, fragmentation, crushing, modelling, simulation.

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