

# Use of virtual sensors for the analysis of forces exerted by the load inside a rotating mill

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This work studies in detail the forces exerted by the load on the drum of a rotating mill. For this purpose, virtual sensors are included in a numerical model based on Discrete Element Method (DEM) of a rotating mill. The sensors allow to obtain independently the time pulses of the load forces on each face of the lifter and adjacent liner during mill rotation (Fig. 1a). Signal processing is further used to develop a methodology to obtain representative forces acting on each lifter face and liner. In parallel, a rotating mill test bench is constructed (Fig. 1b), including instrumented lifters to measure the forces acting on the front and rear faces. Experiments are carried out to compare results from simulations and real measurements, showing good agreement (Fig. 1c and Fig. 1d).

The proposed methodology is used (i) to provide physical explanation to the behaviour of power consumption in relation to operating conditions; and (ii) to propose an objective definition of the localization of the toe of the load inside the mill.

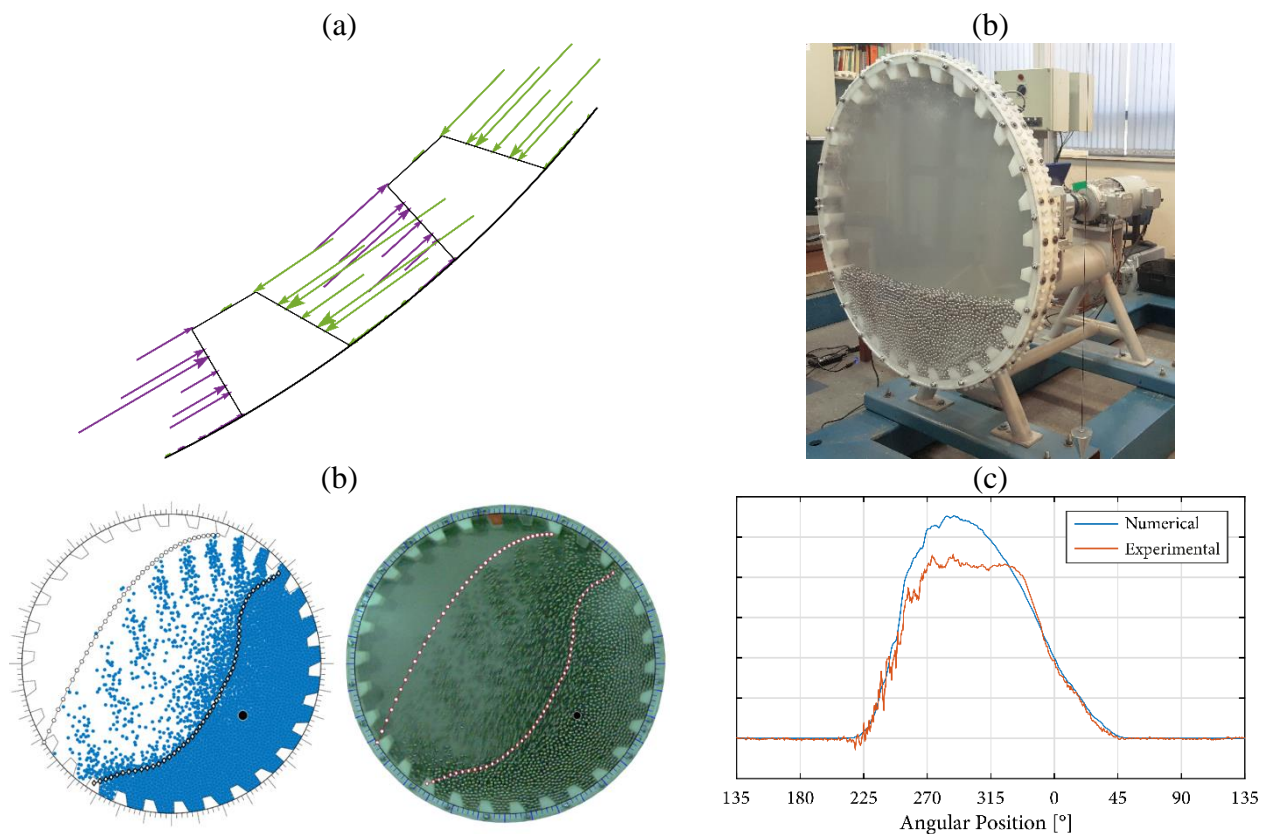


Figure 1: (a) Forces acting on the virtual sensor. (b) General view of the test bench. (c) Comparison of DEM simulation and real movement of the load. (c) Comparison of load measurements between virtual sensor (blue) and instrumented lifter (red).