Asociación Argentina
de Mecánica Computacional

Mecánica Computacional Vol XXXV, págs. 311-311 (resumen)
Martín I. Idiart, Ana E. Scarabino y Mario A. Storti (Eds.)
La Plata, 7-10 Noviembre 2017

PREDICTION OF WEAR VIA DEM AND PHENOMENOLOGICAL MODELS

Franco Perazzo[a] and Rainald Löhner[b]

[a]*Aula DIMEC-CIMNE, Dept. of Mechanical Engineering, Universidad Técnica Federico Santa María, Av. España 1680, Valparaíso, Chile, franco.perazzo@usm.cl, http://www.mecanica.usm.cl*

[b]*Center for Computational Fluid Dynamics, George Mason University, M.S. 6A2, Fairfax, VA 22030-4444, USA, rlohner@gmu.edu, https://cfd.gmu.edu/~rlohner*

Keywords: Archard Wear Model, Discrete Element Methods, SAG Mill.

Abstract. The Discrete Element Method (DEM) is a computational method used to describe the movement of a large number of particle of different sized and shapes, which interact through a contact model. Among other applications, in the field of mining DEM have been used extensively for predicting the trajectory of material inside Semi-Autogenous Grinding (SAG) mills and in the chutes of minerals transfer. However, no calculations that predict the wear of the enclosing walls have been performed to date. After an extensive review of the literature, a methodology to predict wear via DEM and phenomenological wear models has been developed. The decision was taken to use Archard's model (one of the simplest yet most accurate models proposed to date) in the context of DEM. Given that the wear occurs in a matter of weeks or months, and that a DEM run of even a minute can consume copious amounts of computer resources, a separation of timescales was implemented. For each stage of the overall cycle, the present configuration is run for a relatively small amount of physical time (from T0 to T1) in order to get the statistics of wear. For a mill, this could be a few rotations. For all the faces on the boundaries, the wear is updated every time step. At the end of the DEM run, the total change in volume is used to compute a `recession speed' for each face. The recession speed is then used to extrapolate the recession distance (i.e. the wear) from T0 to a much larger time T2. Once the surface is moved via the recession distance, the run is restarted and the cycle repeats. The result obtained to date show that the methodology is able to compute realistic wear patterns with CPU requirements that are acceptable in an engineering design environment.