General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

Produced by the NASA Center for Aerospace Information (CASI)
Addition of Electrostatic Forces to EDEM with Applications to Triboelectrically Charged Particles

Michael D. Hogue, Ph.D.
NASA, Kennedy Space Center

Abstract

Tribocharging of particles is common in many processes including fine powder handling and mixing, printer toner transport and dust extraction. In a lunar environment with its high vacuum and lack of water, electrostatic forces are an important factor to consider when designing and operating equipment. Dust mitigation and management is critical to safe and predictable performance of people and equipment. The extreme nature of lunar conditions makes it difficult and costly to carry out experiments on earth which are necessary to better understand how particles gather and transfer charge between each other and with equipment surfaces. DEM (Discrete Element Modeling) provides an excellent virtual laboratory for studying tribocharging of particles as well as for design of devices for dust mitigation and for other purposes related to handling and processing of lunar regolith. Theoretical and experimental work has been performed pursuant to incorporating screened Coulombic electrostatic forces into EDEM™, a commercial DEM software package. The DEM software is used to model the trajectories of large numbers of particles for industrial particulate handling and processing applications and can be coupled with other solvers and numerical models to calculate particle interaction with surrounding media and force fields. In this paper we will present overview of the theoretical calculations and experimental data and their comparison to the results of the DEM simulations. We will also discuss current plans to revise the DEM software with advanced electrodynamic and mechanical algorithms.