Time to Bust the Mars Dust

Havel, Abbey

Martian dust has an electrostatic charge which causes it to easily attract to moving objects, has the ability to invade machinery, and is hazardous to humans. With space exploration heading towards Mars, future Martian habitats will need to be protected from dust. The dust is iron oxide with magnetic properties. An innovative model of a Martian Dust Collection Chamber was built using neodymium and electromagnets. Very little research has been done on using magnets on Mars except in small-scale, limited applications. A cart with dust was transported via robot into the chamber. The dust collected per magnet and dust left on the cart were measured. The strength of the magnetic fields from fixed points for all tests was measured using a magnetic sensor. In the first test, two neodymium magnets were tested to see if repelling or attracting magnets collect dust better. In the second test, two magnets were set up at three distances from each other, and the dust collection was compared. In the third test magnets were set at, 45°, 90°, and 135° angles to see which set-up performed better. In the fourth test, an electromagnet and neodymium magnet were used to collect dust. The dust simulant used was black iron oxide. Final results showed attracting magnets, smaller distances, and a 90° angle performed the best. The iron core electromagnet/neodymium magnet did not perform as well, but the electromagnet can be made stronger. ANOVAs performed on the results showed that distance and angle differences were significant.

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