EPSC Abstracts
Vol. 11, EPSC2017-130-1, 2017
European Planetary Science Congress 2017

The Jet Dust Pump. An Ad Hoc Solution for Pumping Systems on Mars by Using the Martian Dust

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(Dated: August 15, 2017)

Abstract: The basis of an ad hoc pumping technology for Mars exploration called a *Jet Dust Pump* is outlined. In space exploration, in situ resource utilization (ISRU) is defined as "the collection, processing, storing and use of materials encountered in the course of human or robotic space exploration that replace materials that would otherwise be brought from Earth".[1]. However ISRU philosophy not just should be applied on materials but also in suitable technology considering the special Martian environment.

One of the most important aspects to be considered on Mars exploration and settlement is its ubiquitous dust mantle. Here, it will be discussed the possibility to harness the martian dust to develop an ad hoc martian pumping technology. Years ago, in 2004 it was found that almost all dust particles in the Martian atmosphere are magnetic according to the data obtained by NASA-Mars Exploration Rover Spirit. If so, dust particles will respond to an imposed magnetic field, and this feature could be used for accelerating the dust under a magnetic field to produce a dust jet. This dust jet could be used to induce aerodynamic entrainment in devices and then generating suction. This kind of ad hoc technology for Mars could provide an interesting alternative to traditional rod vacuum pumps used on Earth which not just will have a reduced performance on Mars owing to its lower atmospheric pressure but because the dust and sand inflow would be a common problem. Indeed, with a mechanically driven pump, the moving parts will be always at risk of rapid abrasion failure because the dust where plungers, barrels, rods and tubing will be common failure points. Dust could also often plug the system causing the pump to fail.
With a *Jet Dust Pump*, such problems would no longer exist. There are no moving parts. The driving force is the external magnetic field generated by a conical magnetic coil and being the dust the working media generating the aerodynamic entrainment and therefore dust plugging will not occur.

Jet Dust Pumps could be used on rovers to clean up the soil for analysis of the subsoil or cleaning the soil for mining for water.

Acknowledgements

This research was supported by the Spanish Ministry of Economy and Competitiveness under fellowship grant Ramon y Cajal: RYC-2013-13459.

I. REFERENCES

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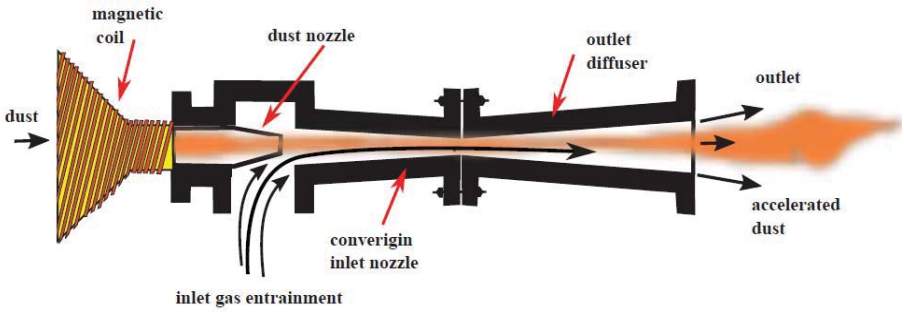

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