

Waterless Concrete Landing Pad to Prevent Fine-Dust in the Moon.

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Background: According to NASA and other space exploration roadmaps, they are planning manned lunar exploration and building infrastructures in the Moon. This requires multiple landing of rockets that causes fine dust in the Moon which has harmful effect on human and infrastructures. Therefore, there is a need of lunar landing pad developed by ISRU. In addition as long term human existence and working on the lunar environment is dangerous automation system applied on rover needs to be developed.

Introduction: To construct structures on the moon, one has to select proper materials considering safety, cost and procurement. Lunar concrete concept is quoted ISRU (In-Situ Resource Utilization). It only needs pressure and heat on lunar soil mixed with 'polymer' which is binder. Moreover, the process of production is simple and short. This idea has born as terrestrial concrete request water, cement, and reinforces steel which has limit to manufacture in the Moon or to bring the massive resource from Earth because of the high cost.

Terrestrial Concrete: Concrete needs long time (28 day) for curing to reach enough strength in construction site. Also, it needs various materials. Thus, most of the construction sites in Extreme Environment select to deliver the prefabricated concrete modules.



Figure 1 Prototype of Lunar Concrete

Waterless Lunar Concrete and Landing Pad: The Lunar Concrete has simple to make experimental process that was used pressing and heating pad based on ISRU. Component of concrete is lunar simulant

'KOHLS-1(Korea-Hanyang Lunar Simulant)' and additional materials 'polymer' that should be delivered from the earth mixed then, the formwork give to heat and pressure. After product lunar concrete, it tested the strength for compression. The result of the test is successful for appropriateness in the Moon.



Figure 2 Lunar Landing Pad Prototype

This Study introduces the lunar landing pad manufactured by the new type waterless concrete for lunar construction and presents automation system prototype for lunar landing pad construction.

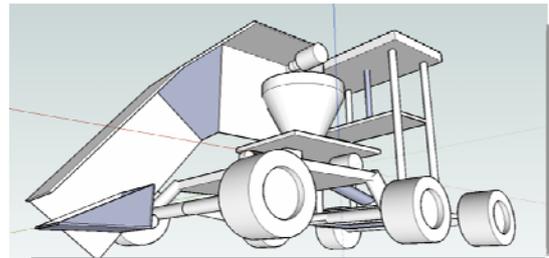


Figure 3 Landing Pad Rover Concept Design

References: : [1] Sung Won Koh, Jaemin Yoo, Leonhard E. Bernold, and Tai Sik Lee(2010) " Experimental Study of Waterless Concrete for Lunar Construction ", Earth and Space 2010: Engineering, Science, Construction, and Operations in Challenging Environments © 2010 ASCE