

SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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THE MARK IV: A SCALABLE LUNAR MINER PROTOTYPE

Abstract

The Mark IV (M-4) project will address how current and emerging In-Situ Resource Utilization systems can be integrated into a scalable lunar miner prototype. The design of the M-4 miner will use the Mark-III (M-3) design from the Fusion Technology Institute at the University of Wisconsin-Madison as reference. The M-3 was designed to extract solar wind volatiles (H₂, 4He, 3He, CO₂, CH₄, N₂, H₂O) to support the yearly N₂, H₂O, CO₂ and O₂ needs of 47 lunar inhabitants. The major subsystems of the M-3 consist of a bucket wheel excavator, regolith separation and movement systems, a heater system, a locomotion system, solar and fuel cell power systems and a volatile storage system. The M-4 design drivers will be based on a number of criteria including, but not limited to, the available payload mass of lunar landing systems, requirements for larger and/or more effective regolith heating systems, available systems to compress or cool volatiles for storage, and the best method to demonstrate system scalability. Following the M-4 design, the plan is to build and test prototype regolith processing and heating systems. The results from this project will directly impact the design of future mining systems at NASA or private industry.