

Testing of a Novel Lunar Regolith Compaction Device for Site Preparation

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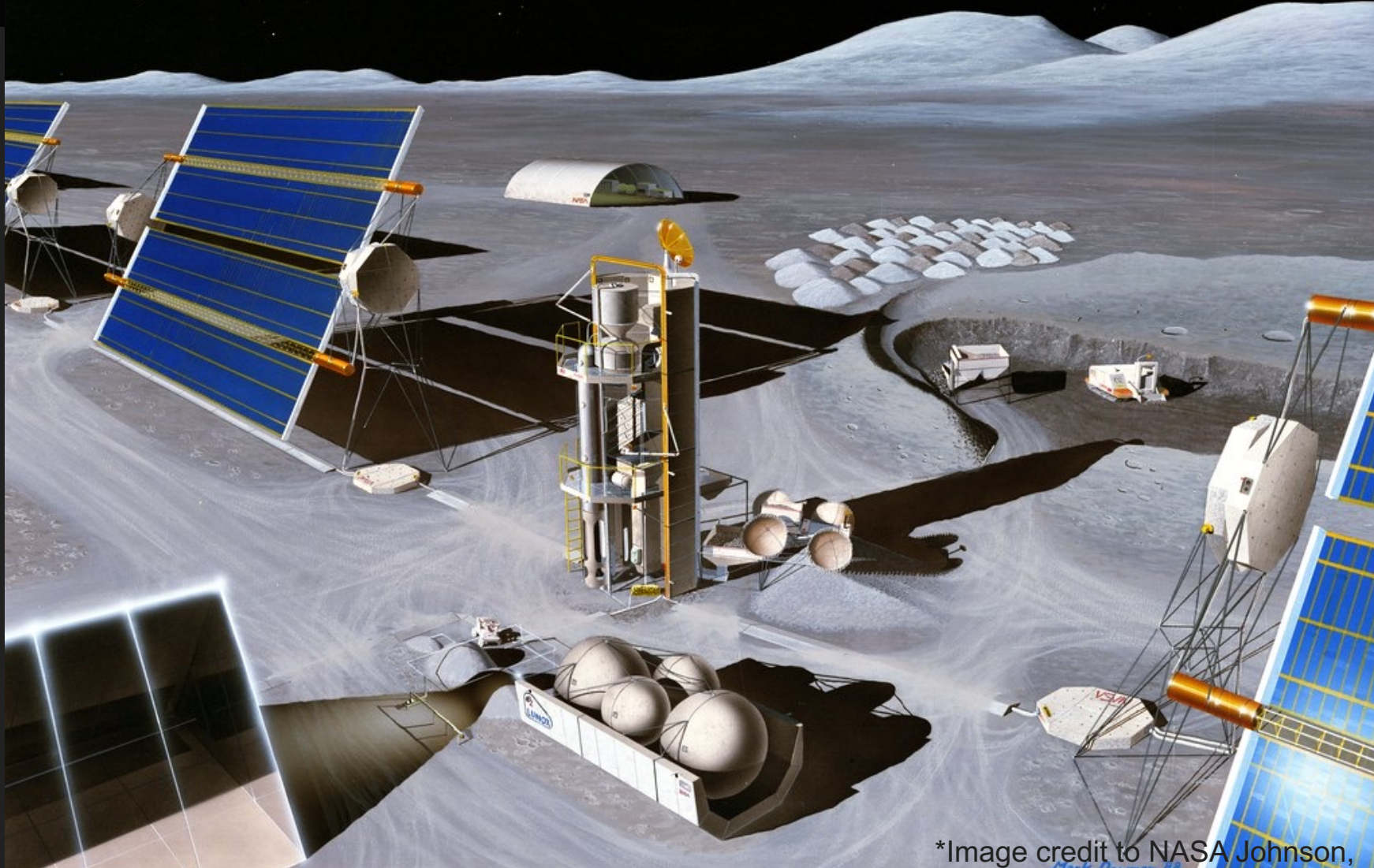
Dr. Paul van Susante

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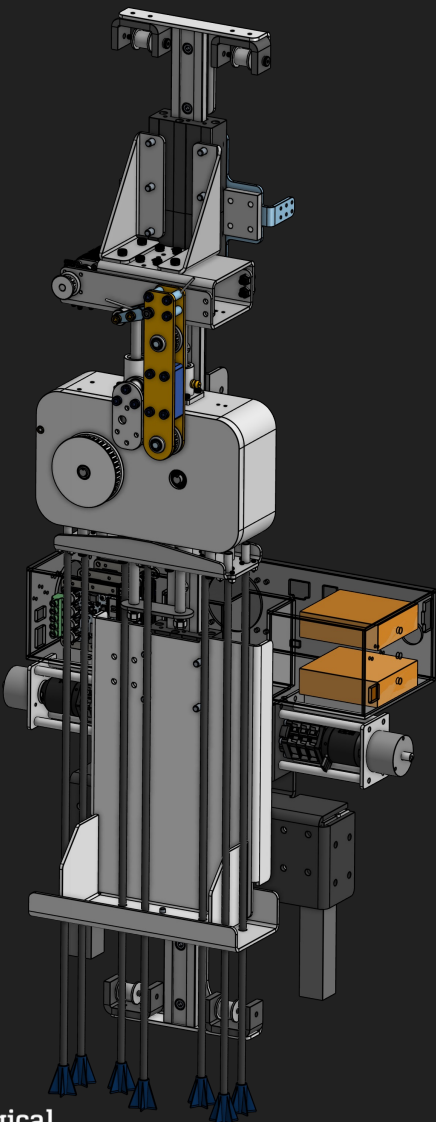
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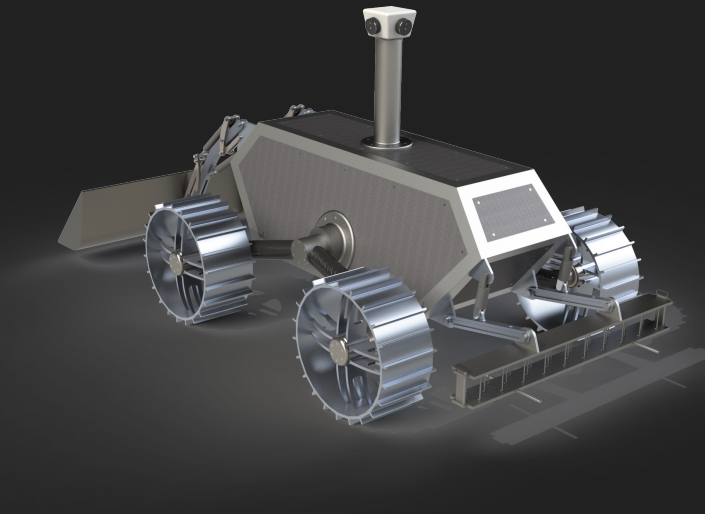


*Image credit to NASA Johnson,

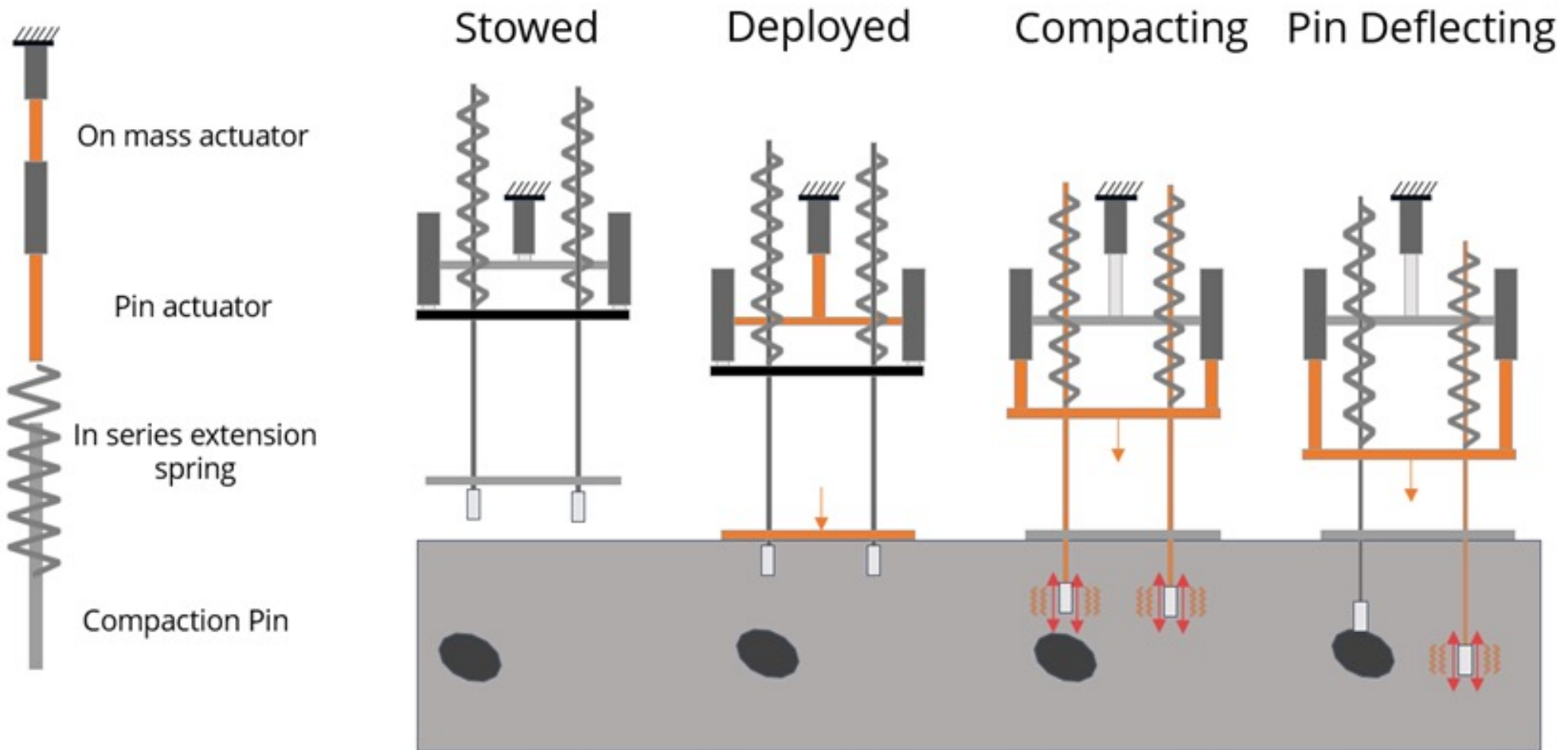
ASPECT Site Preparation Vehicle



Construction Task	Equipment
Obstacle Removal	Bulldozer Blade
Crater filling	Bulldozer Blade
Compaction	Novel Compactor
Site leveling	Bulldozer Blade and compactor



Compactor Requirement	Metric
Compaction Depth	30 cm
Compaction Density	90% (1.81 g/cc)
Platform Area	10 m Diameter
Mass of System	20 kg

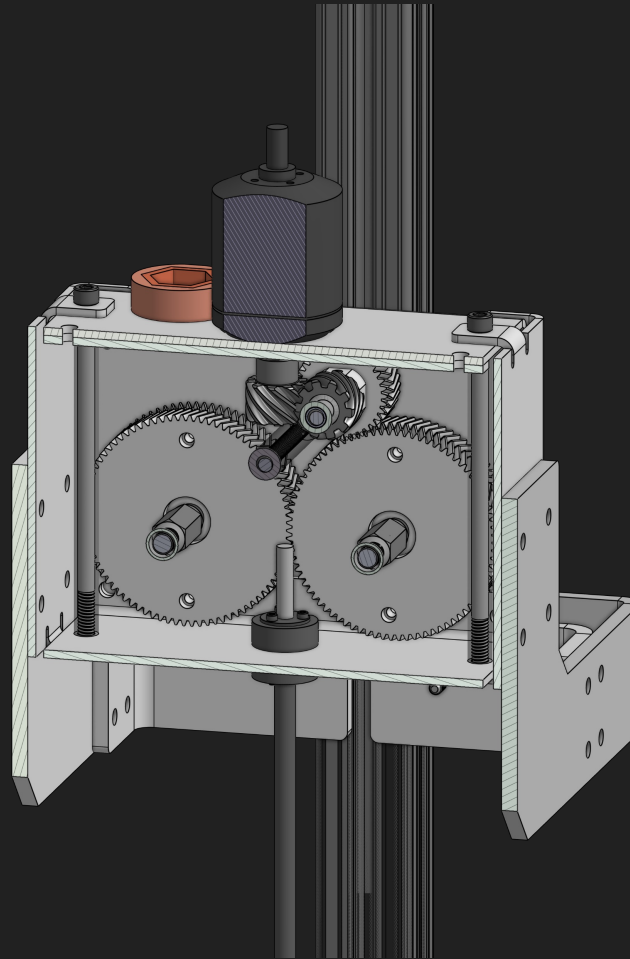


Single Pin Test Setup

Data Collected:

- Acceleration
- Power Usage
- Linear Position
- Control Inputs

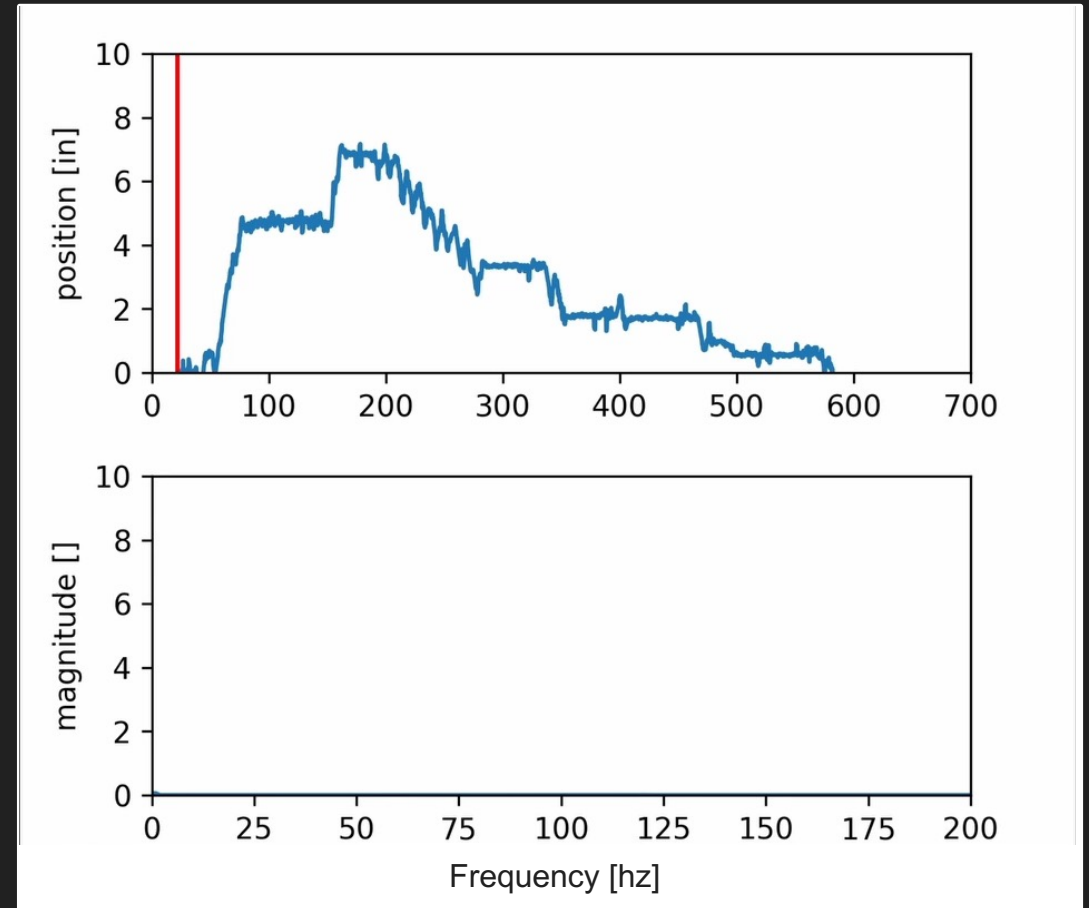
Compaction level
measured on test bin
before and after testing



Test Container Before Test [1.634 g/cc - 59.97%]



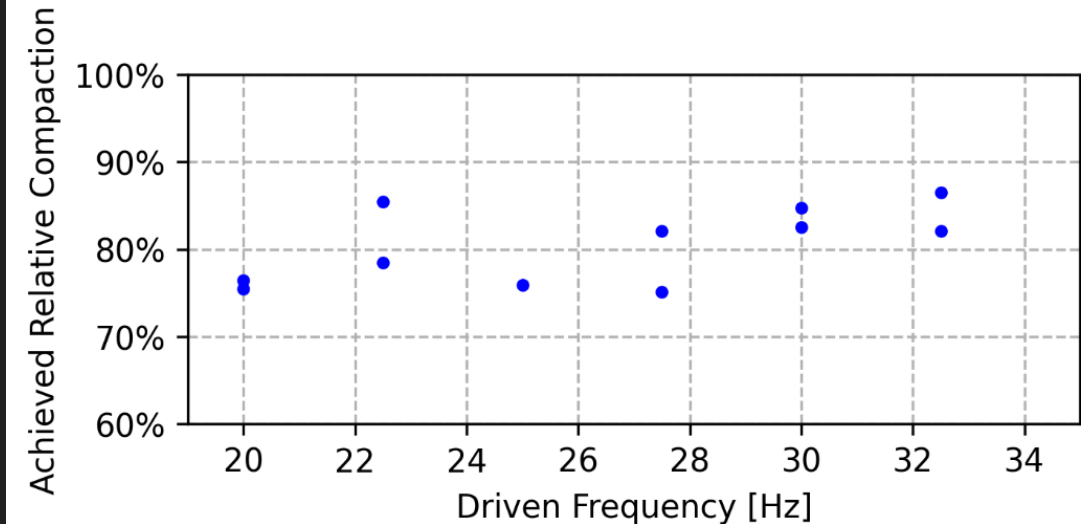
Compaction Cycle



Power Spectra of acceleration data over test



Test Container After Test [1.76 g/cc - 82.10%]



Outputs –
Baseline Effective pin radius
Effective Frequency range

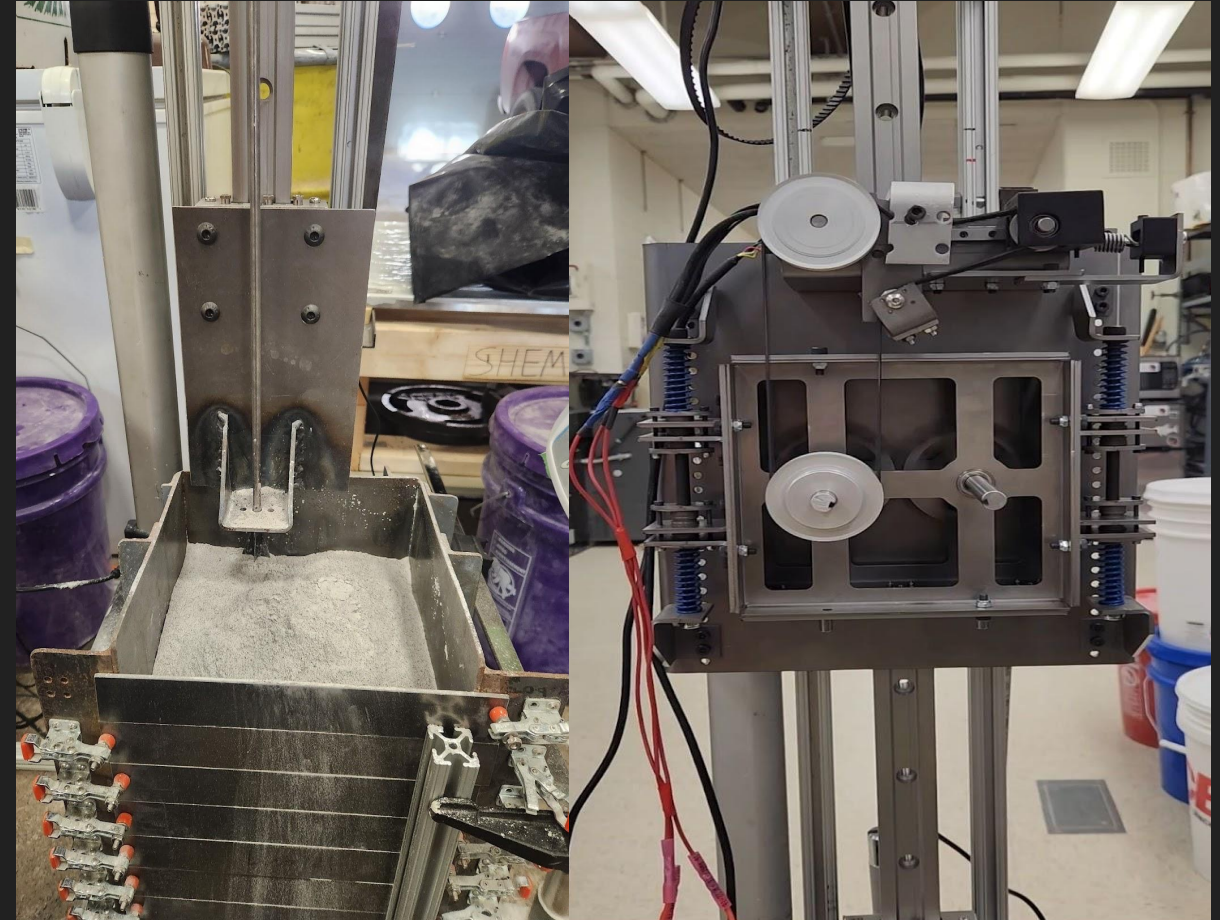
Variable Pin Test Setup

Data Collected:

- Acceleration
- Power Usage
- Linear Position
- Control Inputs

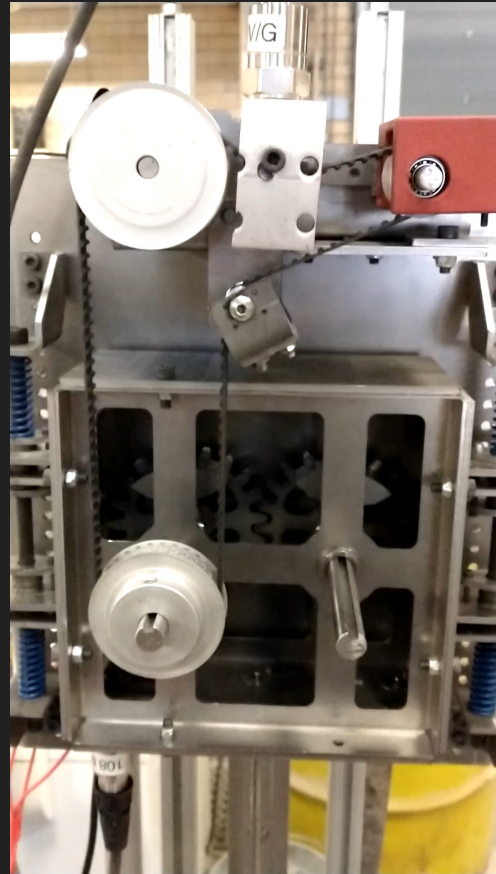
Compaction level measured on test bin before and after testing

Test runs conducted with low and medium starting compaction

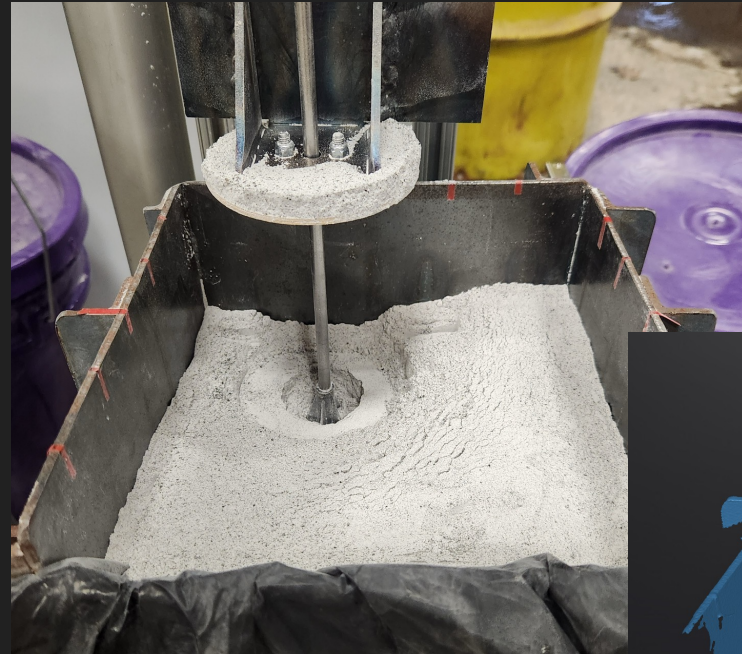




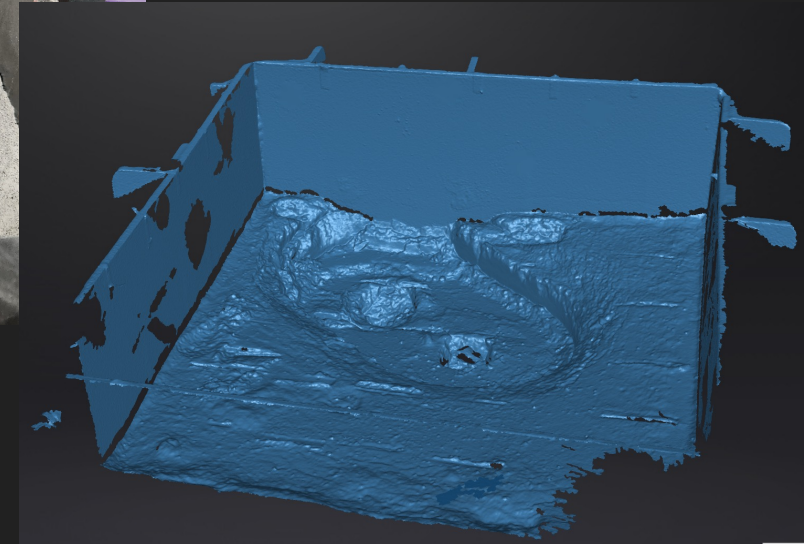
Compaction Cycle



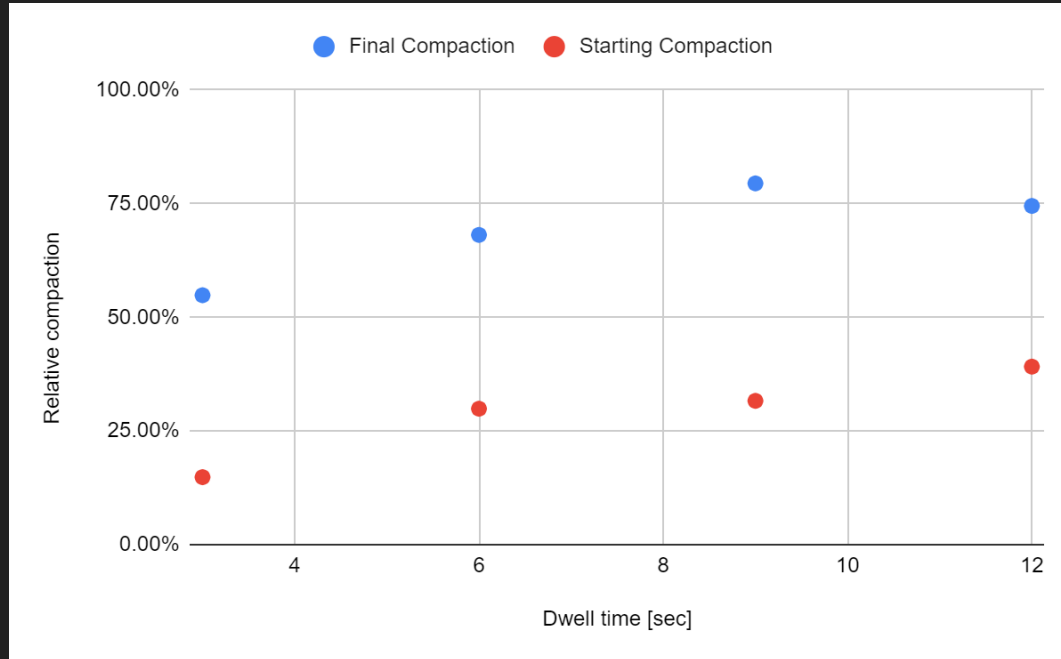
System Vibration



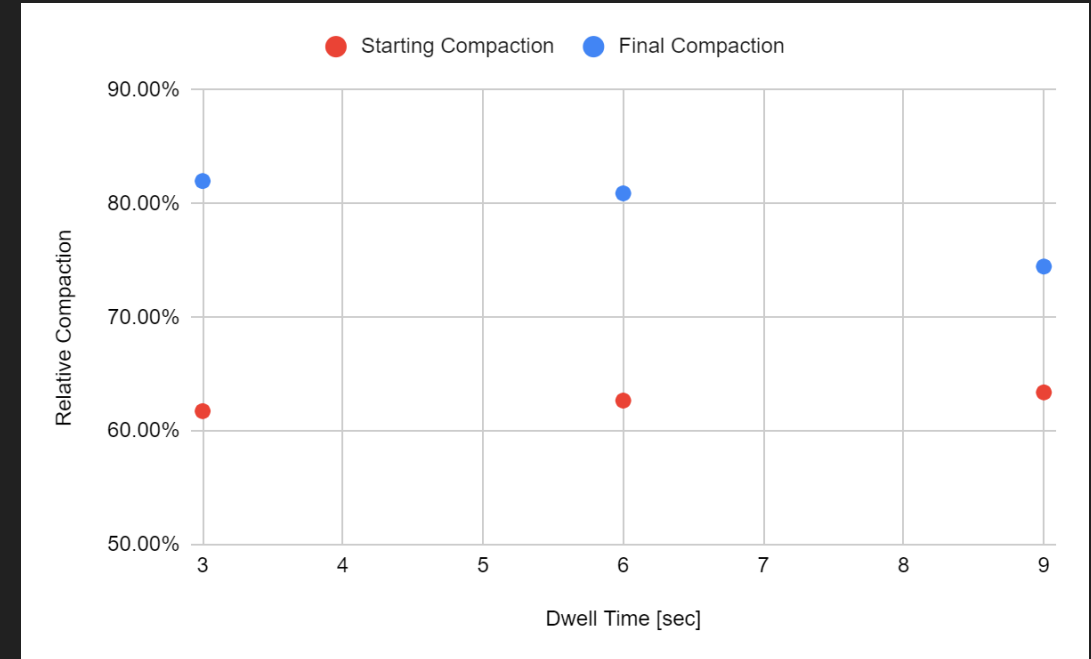
Single Pin Compaction Zone



2 Pin Compaction Zone Scan



Low Starting Compaction

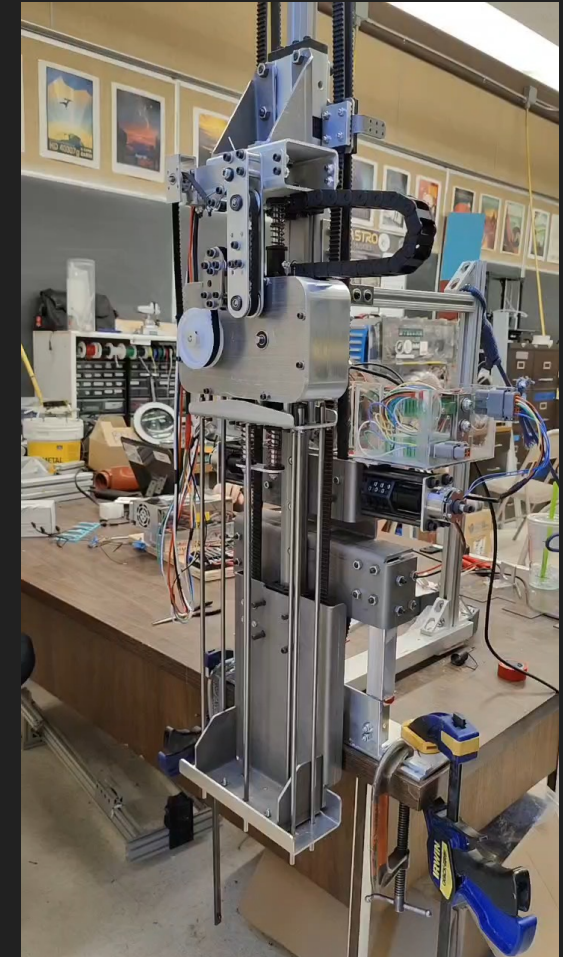
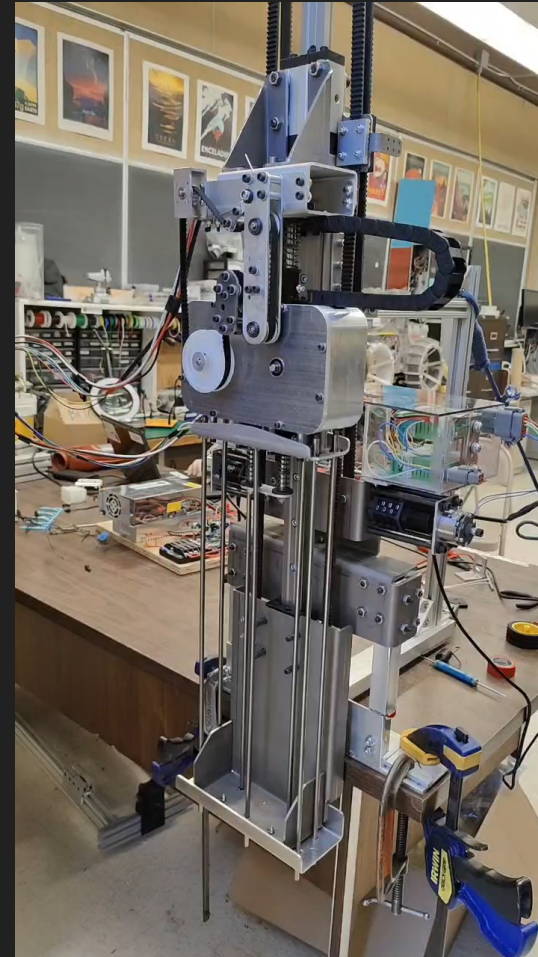


High Starting Compaction

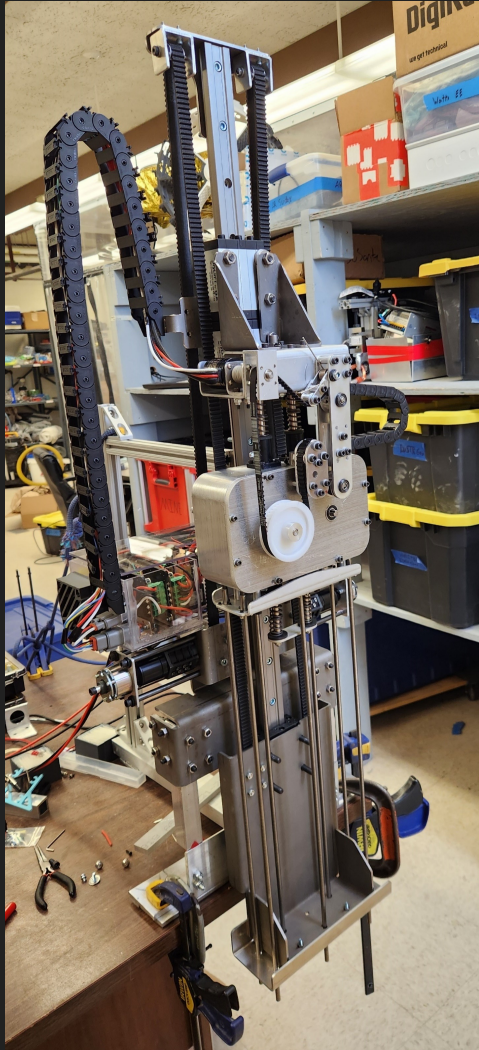
Increased dwell periods compact to a point, then loosen the regolith
Driving constraint for compaction area reaction force

ASPECT Vehicle Compactor

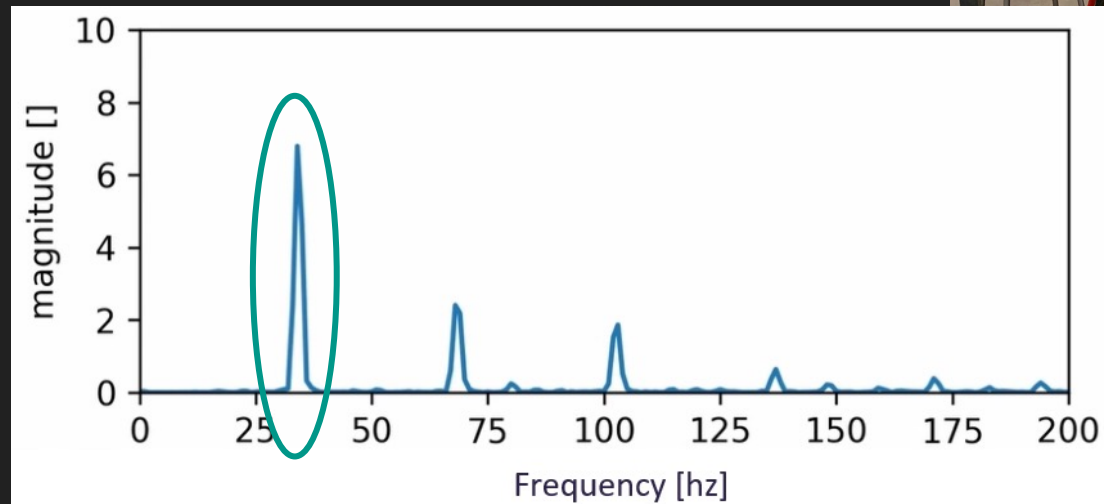
Mass of system: 20 kg
Compaction area: 180 cm²
Estimated Compaction cycle
time: 4.2 min
Time to compact 10 m platform:
305 h



Project Path Ahead



- Vehicle Integration
- System optimization
- Dynamic control
- Vacuum testing



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Questions

