

Rover to extract water from Martian Soil

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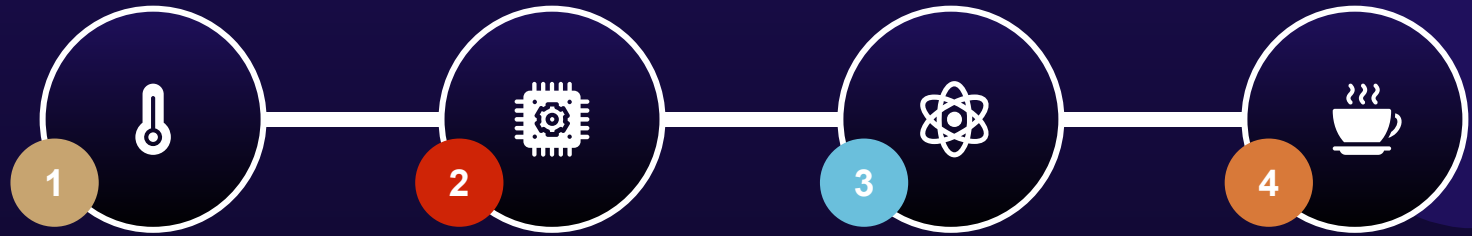


Problem to Tackle



Lack of easily available resources on Mars, such as **Water**. We propose a combination of systems to provide water to the crewmembers over a long period of time.

The Extraction Process



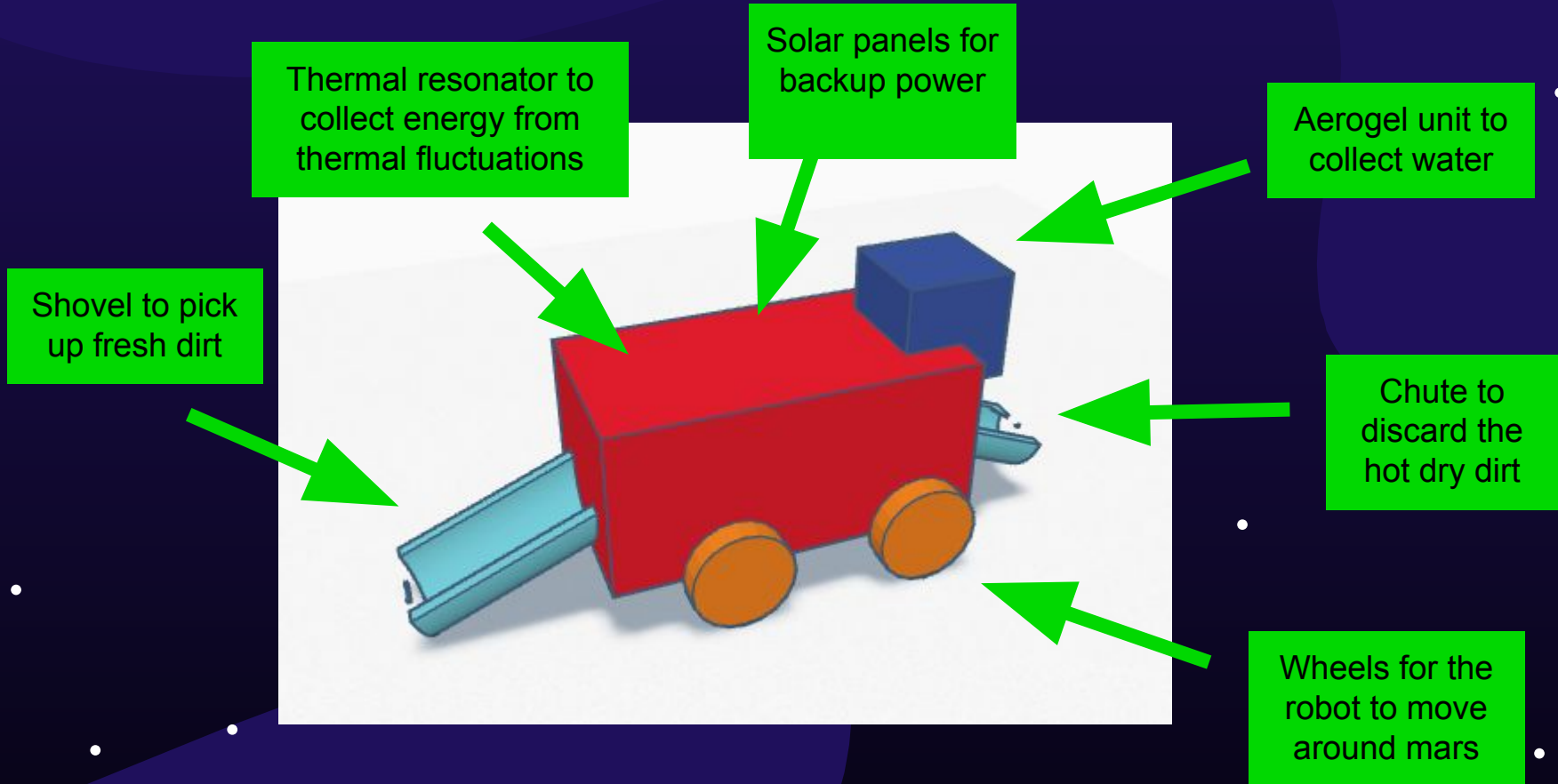
1
Drawing Energy
from Thermal
Fluctuations of Mars

2
Using Rovers to travel
and scoop Martian
Soil

3
Using energy
generated to heat up
the dirt

4
Using Aerogel to obtain
water vapor from dirt
collected into H₂O

Model (not to scale)



Harnessing Energy from **Thermal Fluctuations**

- Researchers from the **Massachusetts Institute of Technology (MIT)** created a device called a **Thermal Resonator**
- Harnesses energy from the changes of Martian temperature
 - Ex. changes in temperature from day to night
 - Temperature on Mars can change from 27 degrees celsius in the day, and -133 degrees celsius at night
- It could generate electricity to power LED lights, small computers and batteries
- Could be placed on our own Robot Model or Biodomes



Harnessing Energy from Thermal Fluctuations

Application to our robot

- Due to the drastic fluctuations in temperature on the surface of Mars, we believe that using such a system to capture energy would be effective alternative to solar panels in the case of a dust storm where the sun is obstructed by the dust particles
- Additionally we could add solar panels as an auxiliary power source for the robot.
- The energy is then used to move the robot and heat up the dirt using microwaves to release the water trapped inside

NUS Aerogel

- Researchers at the National University of Singapore (NUS) created a substance that extracts water from air
- It contains chemical structures that switch between attracting and repelling water
- The aerogel gathers water molecules from the air, condenses and releases water when there is greater sunshine
- Water quality was approved by the WHO
- Water source for astronauts, and other activities



NUS Aerogel

Application to our robot

- After heating up the dirt to extract the water trapped within it, the Aerogel can then be used to quickly collect the water vapour produced to increase the efficiency of the robot in collecting water
- It is also useful as it does not require power to function

Other components

❖ Low Gravity

- As the robot does not use a gravity based filtration system it is unaffected by the decreased gravity on mars

❖ Harsh Weather

- Housing and equipment can be damaged by harsh dust storms on Mars. We propose that our robot be connected to a weather monitoring satellite to provide an early warning system to recall the autonomous robot to the base when a large dust storm approaches

Resources

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2. NUS news. 2021. NUS engineers create 'smart' aerogel that turns air into drinking water. [online] Available at: <<https://news.nus.edu.sg/nus-engineers-create-smart-aerogel-that-turns-air-into-drinking-water/>> [Accessed 29 July 2021].
3. Voosen, P., 2021. Martian dust storms parch the planet by driving water into space. [online] Science | AAAS. Available at: <<https://www.sciencemag.org/news/2020/11/martian-dust-storms-parch-planet-driving-water-space#:~:text=Martian%20dust%20storms%20are%20common,its%20solar%20panels%20in%20dust.>> [Accessed 29 July 2021].
4. Boyle, A., 2021. How to get water on Mars? UW researchers are working on a way to cook it out of soil. [online] GeekWire. Available at: <<https://www.geekwire.com/2016/water-on-mars-microwave-soil/>> [Accessed 29 July 2021].