Water Capture from Soil

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Previous ISRU Water Capture Systems

2005-2008
- PILOT – Lockheed Martin
- ROxygen Freezer – JSC

2008-2010
- Carbothermal Reduction System-Orbital Technologies Inc.
- ROxygen 2 Condenser – JSC

2010-2015
- HESTIA Soil Processing Module - JSC
Assumptions for 2016 EMC study

Freezer 1

Freezer 2

Q_v = Heat load from incoming vapor
Q_H = Power required to thaw ice.
Q_{outv} = Heat rejected from radiator = Q_v

EMC Freezer Concept

EMC Study Heat Rejection Results
Forward Considerations

- The rate of condensation/deposition will determine the rate vaporization within the soil processing module if it is a passive system.
- The temperature of the condenser/freeze cold surface will drive the rate of condensation/deposition.
- Requirements need to capture the thermal management architecture. For example:
  - “heat shall be removed from ISRU components using mechanically pumped _____ refrigerant with a temperature range of -___ to + ___C and a flow rate of ____ lpm”
  - Or
  - “ISRU components shall include a means to reject heat directly to the Martian atmosphere”
What about sorbants?
- Unless we electrolyze vapor, sorbants still require a condenser at some point.
