



The Oxygen and Volatile Extraction Node (OVEN) Subsystem for Resource Prospector

PROJECT MANAGEMENT Aaron Paz – aaron.paz-1@nasa.gov Johnson Space Center

OVERVIEW

The OVEN (Oxygen and Volatile Extraction Node) Subsystem is part of the RESOLVE (Regolith and Environment Science & Oxygen and Lunar Volatile Extraction) Payload, whose main objective is to verify the presence of water and other volatiles on the lunar surface. The RESOLVE payload is scheduled to fly to the moon as part of the Resource Prospector (RP) in 2019.

The OVEN Subsystem accepts regolith (soil) and evolves the volatiles contained in the sample by heating the segment to a temperature of at least 150°C for volatile analysis and as high as 900°C for hydrogen reduction. In general, a regolith segment is deposited into a crucible; the crucible is heated and evolved gases flow to a gas analyzer.

INNOVATION

The OVEN is unique compared to similar systems in the respect that it can process larger regolith samples, including core segments and loose cuttings, and the crucible can be used more than once. The state-of-the-art sample analyzers have typically processed samples between 38 and 789 mm³, where the OVEN processes samples up to 16,000 mm³.

PIONEERING SPACE & LIFE ON EARTH

The OVEN is one important subsystem, in a suite of instruments, designed to quantify water and other resources on the Moon. It demonstrates small-scale In-Situ Resource Utilization (ISRU) prior to long-duration human mission. The results from such a precursor mission will help engineers and scientists target the right locations and resources to design and build large processing plants for propellant manufacturing and life support.

PARTNERSHIPS/HIGHLIGHTS

OVEN, under the RP Program umbrella, has partnered with Honeybee Robotics to provide the Sample Acquisition & Transfer System (SATS). RP Program is also a multi-center collaborative effort between Ames Research Center (ARC), Kennedy Space Center (KSC), Glenn Research Center (GRC) and Johnson Space Center (JSC).

PROJECT DEVELOPMENT FLOW

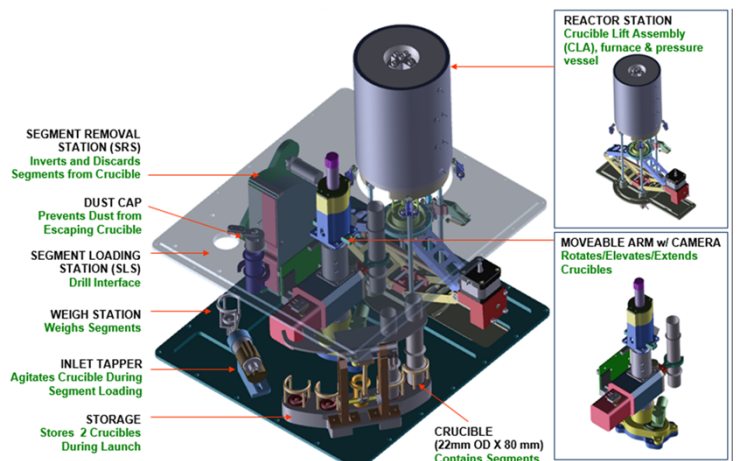
OVEN Development – Past, Present & Future

- 2006: Laboratory Testing of Various Reactors for Volatiles Characterization & Regolith Oxygen Extraction
- 2008: Analog Field Demonstration of Auger-Mixed, Automatic Regolith Feed Reactor
- 2012: Analog Field Demonstration of 1st OVEN Prototype
- 2013-2015: Analog Field Demonstration, Vibration Testing & Thermal-Vacuum Testing of 2nd OVEN Prototype
- >2015: Flight Unit Development

INFUSION

The OVEN technology may be deployed on any precursor ISRU planetary mission, particularly Mars, with the need to collect, heat and remove multiple samples of the local regolith to understand the resources present.

OVEN (OXYGEN AND VOLATILE EXTRACTION NODE) SUBSYSTEM



NASA TECHNOLOGY AREA ROADMAP

TA 7.1.1 Destination Reconnaissance, Prospecting, & Mapping

NASA TECHNOLOGY READINESS LEVEL: 6