

IAF SPACE POWER SYMPOSIUM (C3)
Space Power Systems for Ambitious Missions (4)

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BIOVOLT: USE OF HUMAN WASTE THROUGH PYROLYSIS IN FUTURE EXTRATERRESTRIAL
SETTLEMENTS, PROVIDING SUSTAINABILITY AND ENERGY AUTONOMY IN SPACE

Abstract

Biovolt emerges at the Space Generation Workshop held in Costa Rica 2023, with students from Costa Rica and Guatemala from different universities.

The BioVolt project represents an innovative approach towards sustainability and energy autonomy in future human settlements outside the Earth. In a context where space exploration and the eventual colonization of other planets are seen as a reality, the need arises to develop technologies that allow efficient management of resources and reduction of dependence on terrestrial supplies. In this sense, BioVolt proposes a unique solution by addressing the treatment of human waste through pyrolysis for energy generation.

Pyrolysis is a thermochemical process that decomposes organic matter in the absence of oxygen, generating byproducts such as combustible gases and liquids, as well as biochar, a solid carbonaceous byproduct with various applications. In the space context, where resources are limited and waste management is a critical challenge, the ability to convert human waste into useful energy and material resources is of utmost importance.

The pyrolysis process would take place in specially designed units within the extraterrestrial human settlement, using biological waste as raw material. This waste could include organic waste generated by human activity, such as excrement, food scraps, and plant biomass. By subjecting this waste to pyrolysis, combustible gases and liquids would be produced that could be used to generate thermal and electrical energy, thus satisfying part of the settlement's energy needs.

In addition to energy generation, the pyrolysis process also produces biochar, a material with beneficial properties for agriculture and nutrient retention in soils. This biochar could be used to improve the quality of soils in greenhouses or growing areas within the settlement, thus contributing to food production in extraterrestrial environments.

BioVolt represents a significant advance in the search for sustainable and autonomous solutions for future human settlements in space. By harnessing pyrolysis to convert human waste into useful energy and

material resources, the project not only addresses the challenge of waste management in extraterrestrial environments, but also promotes the self-sufficiency and resilience of space communities in the face of adverse environmental conditions.