

Ionomer-membrane Water Processor System Design and EDU Demonstration

Paragon Space Development Corporation

Technical Abstract

a. Paragon Space Development Corporation (Paragon) proposes to continue our investigation into the use of microporous-ionomer membrane technology to improve the robustness and effectiveness and simplify water recovery processes for space applications. Improved robustness and effectiveness will be evident through (1) reduced loading on the downstream post processor due to the ionomer's unique property of selective permeability, (2) near complete removal of water from wastewater, and (3) inclusion of a backup barrier between the retentate and permeate. The technology offers simplification over existing technology through (1) a lower dependency on moving parts, and (2) integrated capture of wastewater solutes for disposal. Phase 1 testing showed that 99% of the contaminants in concentrated pretreated urine ersatz were removed by the proposed technology and virtually complete dewatering of the brine was achieved in a configuration that would appear to be insensitive to gravity and orientation. As the technology is fully developed, it can be inserted into existing and/or developing water recovery system architectures to increase water recovery rates beyond that currently available to date. The application of this technology for spacecraft water reclamation will be referenced as IWP (Ionomer-membrane Water Processor).

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Ontological Models to Support Planning Operations

TRAC Labs, Inc.

Technical Abstract

Automation and autonomy technologies, such as automated planning software, are key elements in realizing the vision for space exploration. However, the major stumbling block to realizing the widespread use of automation tools for operations is capturing and maintaining the domain models -- the object types and subtypes, relationships among them and operational constraints -- needed to support such techniques. Our success in Phase 1 showed that it is possible for subject matter experts (SMEs) to author ISS model information to produce a consistent model useful for planning, scheduling and procedure execution. In this Phase 2 proposal we aim to fully develop the authoring and data integration portions of our design and to integrate the resulting models with our interactive planning aid for flight controllers. The benefits for NASA operations are that the resulting modeling framework will 1) make available a consistent domain model that need not be reproduced for each automation project, unify the often disparate sources of EVA and Core Systems information, provide for rapid update of ISS configuration information, thus allowing automation applications to provide results based on the most recent data, provide a consistent view of the domain so as to minimize error in authoring procedural data.

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