Water Innovations and Lessons Learned From Water Recycling in Space

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Objective:

Keep Astronaut alive

Provide habitable environment

Reduce Cost
Historical Approach: Open Loop
International Space Station

MIR

ISS
Mars
Commercial Space
**Inputs**
- Water
- Oxygen
- Waste Collection
- Temperature Control
- Pressurized Environment
- Energy

**Outputs**
- Waste
- Water
- Carbon Dioxide
- Volatile Organics
- Solid Wastes
- Heat
Space Station Regenerative ECLSS
Flow Diagram (Baseline and Scarring)
Open-loop life support system re-supply mass

- Water 89%
- Oxygen 2.5%
- Food (dry) 2.2%
- Crew Supplies 2.1%
- Gases lost to space 2.1%
- Systems Maintenance 2.1%
ISS US Water Processing Assembly

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- Wastewater is recycled using distillation, adsorption, and oxidation.
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Concept to Practice

It is one thing to talk about what could be done but entirely another to make it work.
Lessons Learned From 3 Years Operation of ISS WPA

- Formation of calcium scale determines maximum recovery ratio.
- Trace contaminants build up.
- Maintenance requirements are high.
- Reliability matters. Especially for future long duration missions.