

Portable Solar-Powered Water Desalination System

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Problem Statement

Access to clean and safe drinking water is a critical challenge in remote and resource-constrained regions. Conventional desalination systems rely on energy-intensive processes and fossil fuels, making them costly, unsustainable, and inaccessible in off-grid areas. There is a need for a portable, eco-friendly desalination solution that provides efficient water purification using renewable energy.

Constraints

Energy production: 200W/h
Water Source Variability
PH: 6.8– 8.5
TDS : 100-150
System dimensions: 80 cm x 60 cm x 60 cm
Environmental impact : Brine <8000 ppm

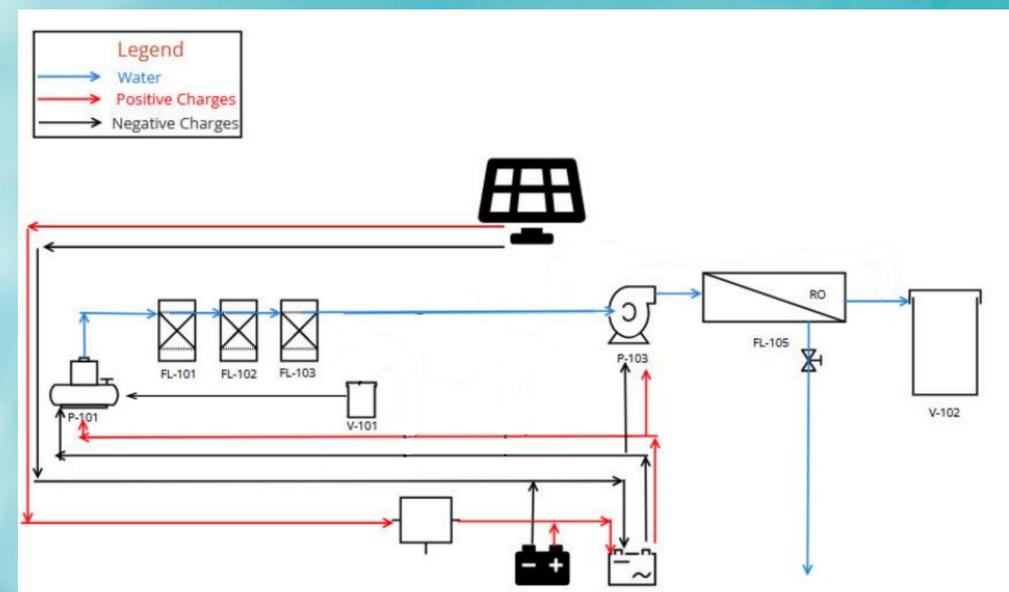
Target Specifications

(TDS): range of 100-150 ppm
System dimensions: 80 cm x 60 cm x 60 cm,
Energy consumption of 2.7 kWh
pH range of: 6.8-8.5

Prototype Design



Process Map



Testing/Validating

1. Achieved at least 2.7 kWh per cubic meter of water desalinated, which matches the energy efficiency target.
2. Stay under the prototype cost target (<6000 SAR), fulfilling the cost constraint by focusing on high-impact components.
3. Ensure the prototype can desalinate water with a TDS range of 100-150 ppm.
4. Use solar energy as the primary power source, significantly reducing the carbon footprint
5. Test the prototype to ensure that it consistently produces water with a TDS below 150 ppm.
6. Use the RO system's capacity to produce at least 10 liters/day for the initial setup.
7. Ensure that solar panels and RO membranes have long warranties and a proven track record for longevity.
8. Optimize the layout to ensure that all components, including solar panels and filtration systems, fit within these dimensions.

Conclusion

The portable desalination system offers a sustainable, efficient solution for clean water access in remote areas. Its compact design and solar-powered operation address environmental challenges and promote water security effectively.