

Sustainable Resource Recovery From Brine In Water Purification



INTRODUCTION

In the desalination industry, we transform waste into useful resource. Our innovative process recovers valuable minerals and salts from leftover brine, enhancing freshwater production, boosting profits, and safeguarding marine ecosystems. We offer a reliable, eco-friendly solution that turns environmental challenges into profitable opportunities.

PROBLEM STATEMENT

The project aims to enhance sustainable resource recovery from brine by optimizing the extraction of valuable minerals and addressing environmental concerns and water scarcity through innovative treatment methods.

CONSTRAINTS

- Flow Rate (Q): 0.5 - 5.0 m³/h.
- Safety Compliance: 100% OSHA adherence
- Operational Pressure: 1 - 10 bar.
- Temperature Range (T): 22.5 - 260°C.
- Extraction Focus: Limited to Mg, NaCl, SO₄ (Red Sea composition).
- Simulation Limitation

TARGET SPECIFICATIONS

- ≥65% mineral recovery.
- ≥60% salt recovery.
- ≥ 80% Water recovery rate.
- 10,000 to 1,000,000 L/day.
- >90% purity level.

PROTOTYPE DESIGN

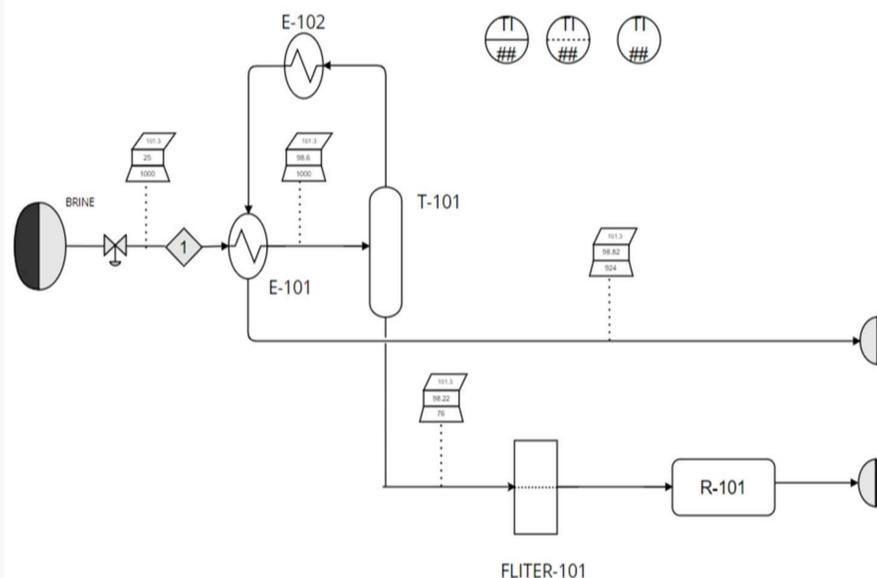


Figure 1: Bin model

PROJECT IMPACT

Economic: Converts brine into economic gains, enhancing technology and job prospects.

Societal: Addresses water scarcity, promotes sustainability, and improves public health.

Environmental: Transforms waste into resources, fostering sustainability and reducing pollution.

TESTING

Separator:

By using mass balance:

- Output Liquid Flow Rate: 82 kg/h
- Output Vapor Flow Rate: 918 kg/h
- ≥ 80% Water recovery rate

Compound	Mass Fraction	Compound	Mass Fraction
Water (H ₂ O)	0.1707	Sodium Chloride (NaCl)	0.5720
Sodium Sulfate (Na ₂ SO ₄)	0.0952	Magnesium Chloride (MgCl ₂)	0.0952
Potassium Chloride (KCl)	0.0024	Chlorine (Cl ₂)	0.0633

Filter Details:

• Using a simple sieve filter to manage salt particles formed due to NaCl and Na₂SO₄ exceeding maximum solubility.

Mass Balance:

- **Salts Entering Filter:** 62.72 kg/h
- **Solids Formed:** 42.71 kg/h
- **Recovery Rate:** 68.10%
- ≥65% mineral recovery.
- ≥60% salt recovery

CONCLUSION

- **Proven Success:** Demonstrated effective resource recovery from brine, reducing environmental impacts and boosting economic gains.
- **Innovative Technology:** Pioneered sustainable desalination techniques with potential for wider industry application..
- **Long-term Sustainability:** Aim to assess and ensure ongoing environmental sustainability