EVONIK SUSTAINABILITY CHALLENGE 2025

Recycling of PET Waste to High-Purity BHET via Glycolysis

Two-Page Interim Report

By Team Name : ChemiEvolve

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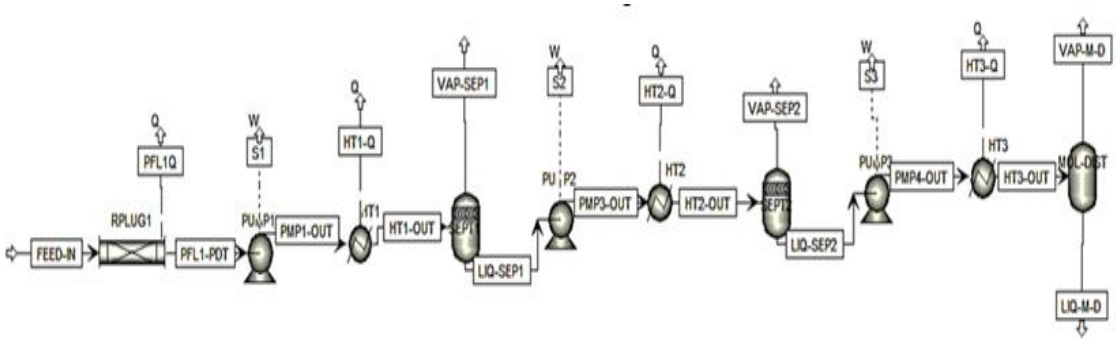
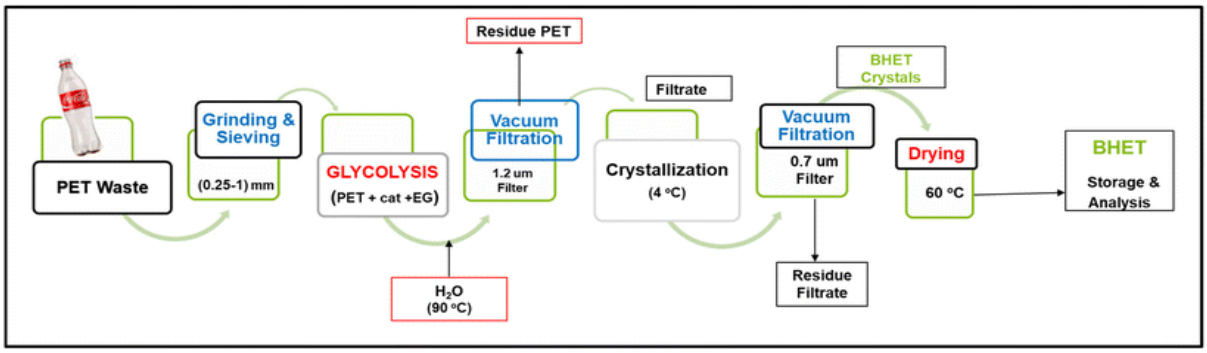
1. Block Diagram of the Proposed Process :





2. Preliminary Process Description :

1. **Feed Composition & Pre-Treatment :**
   - **Input**: PET waste (80–85% PET) with impurities.
   - **Pre-treatment**: Washing and drying to remove water and contaminants.
2. **Depolymerization via Glycolysis :**
   - **Process:** Glycolysis of PET using **sodium alkoxide** as a catalyst.

- **Reaction:** PET + Ethylene Glycol → Bis(2-hydroxyethyl) terephthalate (BHET).
- **Temperature & Pressure**: Optimized for efficient breakdown.

3. **Separation & Purification**
   - Filtration of unreacted solids.
   - Crystallization of BHET to achieve **high purity**.
4. **Product Output**
   - Target: **30,000 tons per annum (30 kta) of high-purity BHET**.

3. Plan of Activities (Until 7th March 2025) :

Date	Activity
5th - 10th Feb	Refine process flow, reaction conditions, and catalyst selection. Begin in-depth literature research for optimizing glycolysis conditions.
11th - 17th Feb	Develop and set up detailed **Aspen/Hysys simulations** to model the PET depolymerization process and identify bottlenecks.
18th - 24th Feb	Analyze simulation results, optimize separation techniques, and validate process efficiency in terms of energy consumption and product purity.
25th Feb - 2nd Mar	Conduct a **detailed economic feasibility study**, including cost estimation for raw materials, energy consumption, and operational expenses.
3rd - 5th Mar	Compare alternative process routes and evaluate equipment options to enhance efficiency and reduce costs.
6th - 7th Mar	Finalize and submit the **10-page interim report**, including process diagrams, economic insights, and key findings.

4. Economic Viability & Considerations :

- **Cost Benchmarking**: BHET production cost must be ≤ **70-80% of PET sales price** to be economically viable for repolymerization.
- **Plant Location**: **India**, selected based on raw material availability, labor costs, and logistics advantages.
- **Key Cost Factors**: Raw material procurement, catalyst consumption, energy usage, and efficiency of the purification steps.