Company: ChemEverse

CEO: Anshika Agrawal

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Chemical Formula: CH2=C(R)-COO-(CH2CH2O)nR'

[R = H or CH_3 (from acrylic or methacrylic acid backbone)]

[R' = End group, often an alkyl or ether group]

Chemical Name: Polycarboxylate ether

Use case:

Uses:

- Polycarboxylates are used as builders in detergents. Their high chelating power, even at low concentrations, reduces deposits on the laundry and inhibits the crystal growth of calcite
- Polycarboxylate ethers (PCE) are used as superplasticizers in concrete production.

Alternatives:

- Naphthalene Sulfonate Formaldehyde (SNF)
- Melamine-Based Superplasticizers (SMF)
- Lignosulfonates (LS)
- Polyacrylic Acid (PAA) & Polyvinyl Alcohol (PVA)-Based Superplasticizers

Advantage over alternatives:

- PCE has higher water reduction capacity , leading to higher strength and durability.
- PCE keeps concrete **flowable for 2-3 hours**, perfect for **ready-mix concrete (RMC) and self-compacting concrete (SCC).**
- PCE uses **steric hindrance and electrostatic repulsion** to **disperse cement particles evenly**, reducing **clumping & air bubbles.**
- **PCE** works effectively at **0.1-0.3% by weight of cement hence cost effective for longer runs.**

Magnitude of imports in India

- Polycarboxylate Ether worth $26,587,962 has been imported.

- Average import price for polycarboxylate ether was $1.47.
- Polycarboxylate Ether was imported from 5 countries.
- China was the largest exporter of polycarboxylate ether accounting for 71.82% of the total imports of polycarboxylate ether.
- South Korea was the second largest exporter of polycarboxylate ether accounting for 19.60% of the total imports of polycarboxylate ether.
- The month of Apr 2016 accounted for the highest number of import shipments.

Economic feasibility:

Input Raw Materials:

a. Dodecyl alcohol/Lauryl alcohol **($C_{12}H_{26}O$)** or fatty alcohol ethoxylate **($C_{12}H_{25}(OCH_2CH_2)$□OH)**
b. Ethylene oxide **(C_2H_4O)**
c. Sulfur trioxide **(SO_3)** or Chlorosulfonic acid **(HSO_3Cl)**
d. Sodium hydroxide solution **(NaOH, ~50 wt%)**

Raw material cost distribution:

To Produce 1 kg of product we require

1. Acrylic acid - 350 g at 100 rupees per kg costs 35 rupees
2. Methoxy Poly Ethylene Glycol - 350 g at 110 rupees per kg costs 38.5 rupees
3. Potassium Carbonate - 15 g at 90 rupees per kg costs 1.35 rupees
4. Ethanol - 85 rupees per litre => 108 rupees per kg (density = 789 kg/m3) => 30g costs 3.24 rupees
5. Azobisisobutyronitrile(AIBN) - 2 g at 950 rupees per kg costs 1.9 rupees
6. 3-Chloro-2-methyl-1-propene (CMP) - 30 g at 100 rupees per kg costs 3 rupees
7. Methacrylic Acid - 80 g at 130 rupees per kg costs 10.4 rupees
8. Sodium Hydroxide - 15 g at 36 rupees per kg costs 0.54 rupees
9. Deionized water - (5 rupees per litre => 5 rupees per kg) 128 g at 5 rupees per kg costs 0.64 rupees

Adding up we obtain the input cost to be 94.57 rupees per kg.

Product selling price is 560 Rupees per kg.

Selling Price = 560 Rupees/kg

ıls Cost Price = 94.57 Rupees/kg

Profit = 465.43 Rupees / kg

References:

- https://en.wikipedia.org/wiki/Polycarboxylates
- https://www.zauba.com/import-polycarboxylate-ether-hs-code.html
- https://www.nacchemical.com/3-chloro-2-methyl-1-propene-3560909.html
- https://buyer.indiamart.com/

List the contributions of each author:

- Krish Agarwal carried out the market research for chemical trade data.
- Kshitij Srivastava prepared the use case.
- Krish Agarwal looked at economic feasibility.

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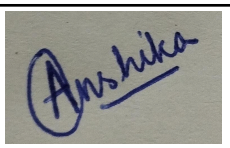
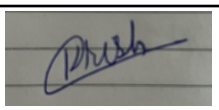
Anshika Agrawal	230160	
Krish Agarwal	230570	
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