

Experiment 1 — Structured R&D ELN Record

Focus: Fragrance Stability / Solubilizer Optimization

Project: CLEARSCALP Sulfate-Free Shampoo Initiative

Experiment ID: CS-221-A07

Date: 14-Feb-2026

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Objective: Evaluate whether increasing PEG-40 Hydrogenated Castor Oil improves fragrance incorporation stability in the eucalyptus fragrance variant.

Formula Summary

Ingredient	Function	Target %	Actual Mass	Supplier	Lot #
DI Water	Carrier	q.s.	612.33 g	Internal Utility	W-778
Sodium Lauroyl Sarcosinate	Primary Surfactant	14.0	140.02 g	Innospec	SAR-25-X1
Cocamidopropyl Betaine	Secondary Surfactant	7.0	70.11 g	Evonik	CAPB-44B
PEG-40 Hydrogenated Castor Oil	Solubilizer	3.0	30.04 g	Croda	PEG40-19
Eucalyptus Oil Blend	Fragrance	0.8	8.01 g	Bell Fragrances	EUC-88
Hydroxyethylcellulose	Rheology Modifier	0.7	7.00 g	Ashland	HEC-220
Citric Acid (20%)	pH Adjuster	variable	2.3 g used	Lab Stock	CA-11

Equipment

Equipment	ID
Silverson L5M-A Homogenizer	MIX-04

Equipment	ID
Overhead Stirrer	STR-11
Brookfield DV2T	VIS-08
Mettler Toledo pH Meter	PH-03

Procedure

Phase 1 — Water / Polymer Hydration

08:10 — Charged DI water into 2 L vessel. Started overhead mixing at 250 rpm.

08:18 — Added Hydroxyethylcellulose slowly to vortex. Minor agglomeration observed initially; resolved after ~12 min hydration.

08:35 — Increased temperature to 68°C.

Phase 2 — Surfactant Addition

09:02 — Added Sodium Lauroyl Sarcosinate gradually.

Observation:

- substantial foam generation
- vortex instability at >300 rpm

Corrective action:

- reduced mixing speed to 180 rpm

09:25 — Added Cocamidopropyl Betaine.

Result:

- batch became translucent
 - no visible precipitation
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Phase 3 — Fragrance Premix

Prepared separate premix:

Component	Mass
PEG-40 HCO	30.04 g

Eucalyptus Fragrance 8.01 g

Premix initially slightly hazy.

Homogenized using Silverson at 4000 rpm for 90 sec.

Result:

- transparent liquid obtained

Phase 4 — Main Incorporation

10:12 — Added fragrance premix slowly into primary vessel at 52°C.

Initial observation:

- temporary clouding
- light swirling

Applied high shear:

- 3500 rpm for 4 min

10:20 — solution cleared completely.

Phase 5 — Cooldown / Final Adjustment

11:05 — Batch cooled to 34°C.

Measured pH = 7.84

Added citric acid incrementally.

Final pH = 5.48

Results

Parameter	Result
Appearance	Clear
Odor	acceptable

Parameter	Result
Viscosity	5,850 cP
Foam During Processing	high
Stability @ 40°C	no separation after 24 hr

Conclusion

Increasing PEG-40 HCO to 3% successfully eliminated fragrance haze observed in CS-221-A05.

High-shear incorporation appears critical for transparency recovery.

Residual issue:

- excessive foam during surfactant charging.

Next study:

- evaluate low-foam addition sequence.