

# Winter Alkaline Degreaser Solutions

Alkaline degreasers based on caustic soda (NaOH) face several issues in winter, particularly with oil removal:

## Challenges of Caustic-Based Alkaline Degreasers in Winter:

### 1. Poor Oil Emulsification in Cold Conditions:

- In low temperatures, oils and greases become more viscous and harder to remove.
- Caustic-based degreasers rely on saponification (reaction with fats to form soap) and emulsification, which slow down in cold temperatures.

### 2. Oil Floating on Subsequent Baths:

- When oil is not effectively emulsified, it remains floating in degreasing and rinsing baths.
- This leads to contamination of subsequent processes like phosphating or electrocoating.

### 3. Incomplete Cleaning on High-Oil Loads:

- In cases where the material has excessive oil, the degreaser struggles to break it down, leading to redeposition and poor bath life.

## Possible Remedies and Reformulation Approaches

To improve performance in winter and prevent floating oil issues, we can adjust the formulation and process:

### 1. Improve Oil Emulsification

#### ✓ Add Nonionic Surfactants:

- Nonionic surfactants help emulsify oil better at low temperatures.
- Examples:
  - Alkylphenol ethoxylates (e.g., NP-9, NP-10)
  - Fatty alcohol ethoxylates (C12-C14 ethoxylates)
  - EO/PO block copolymers

#### ✓ Use Solvent Boosters:

- Glycol ethers (e.g., Butyl Cellosolve) can improve oil solubility.
- Helps prevent oil from floating by better dispersing it in the bath.

### 2. Optimize Alkalinity Source

#### ✓ Reduce Excess Caustic Soda (NaOH):

- High NaOH can lead to excessive saponification, forming floating soap scum.
- Instead, balance with Sodium Metasilicate ( $\text{Na}_2\text{SiO}_3$ ) or Borates for improved emulsification.

#### ✓ Use Sodium Carbonate or Sodium Metasilicate Instead of Pure NaOH:

- Sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) maintains alkalinity but is milder.
- Metasilicate improves wetting and prevents redeposition.

### 3. Add a Sequestrant to Improve Stability

#### ✔ Use Chelating Agents Like EDTA or Phosphonates:

- These prevent soap scum formation and improve bath stability.
- Helps in water hardness control.

### 4. Use a Surfactant Blend for Cold Conditions

#### ✔ Cold Degreasing Formulation:

- **NaOH:** 2–5% (Reduced to prevent floating soap)
- **Sodium Metasilicate:** 3–6% (Improves wetting)
- **Nonionic Surfactants (NP-9, C12-C14 EO/PO):** 1–3%
- **Glycol Ether Solvent:** 2–4% (Enhances oil removal)
- **Sequestering Agent (EDTA, NTA, Phosphonates):** 0.5–2%

### 5. Mechanical and Process Modifications

#### ✔ Increase Bath Agitation:

- Use air sparging or mechanical circulation to keep oil dispersed.

#### ✔ Pre-Wash with Warm Water or Light Solvent Spray:

- A warm pre-rinse (40–50°C) can reduce oil viscosity before alkaline degreasing.

#### ✔ Use Oil Skimmers or Coalescers in the Bath:

- Helps remove floating oil and extends bath life.

### Conclusion

For winter operation, **modify the degreaser by adding surfactants, reducing NaOH, and introducing solvents or chelating agents.** If floating oil remains a problem, install an **oil skimmer** and improve bath circulation. '