Coalescers in Alkaline Degreasing Baths: What They Are and How They Help

A **coalescer** is a chemical or mechanical system that helps merge small oil droplets into larger ones, making it easier to remove them from the degreasing bath. Coalescers are useful in alkaline degreasing when oil tends to **float** on the bath surface, causing contamination in subsequent baths.

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1. How Coalescers Work in Alkaline Degreasing

- **Breaks stable oil emulsions**: Some oils remain in fine dispersed droplets, making separation difficult. Coalescers cause these small droplets to merge into larger ones.
- **Enhances oil skimming**: Larger oil droplets rise to the surface faster, where they can be removed by an oil skimmer.
- **Reduces bath contamination**: Prevents redeposition of oil onto the cleaned parts.
- **Extends bath life**: By continuously removing oil, the bath lasts longer before needing replacement.

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2. Types of Coalescers for Alkaline Degreasing

A. Chemical Coalescers (Additives)

These are special chemicals added to the degreasing bath to improve oil separation.

✅ **Nonionic Surfactants with Low HLB Value (Hydrophilic-Lipophilic Balance)**

- Examples: **Sorbitan Esters (Span 80, Span 85)** or **Fatty Acid Esters**
- Helps destabilize emulsified oil, making it easier to separate.
- Usage: **0.1 – 1%** concentration in the bath.

✅ **Silicone-Based Defoamers with Coalescing Properties**

- Example: **Polydimethylsiloxane (PDMS) emulsions**
- Helps separate oil while also controlling foam formation.
- Usage: **Few ppm levels (50–200 ppm)**.

✅ **Polymer-Based Coalescers**

- Example: **Polyacrylates or Polyether-based coalescers**
- Helps destabilize oil emulsions.
- Usage: **0.2 – 1%** concentration.

✅ **Electrolyte Additives (Salts to Enhance Coalescence)**

- Example: **Calcium Chloride ($CaCl_2$) or Magnesium Sulfate ($MgSO_4$)**
- These neutralize charged oil droplets, making them easier to coalesce.
- Usage: **0.05 – 0.5%** concentration.

B. Mechanical Coalescers (Filtration Systems)

These are physical devices that help remove oil from the bath.

✅ **Oil Skimmers**

- Removes floating oil using a rotating belt or disk.
- Works well with chemical coalescers to separate oil before skimming.

✅ **Coalescing Media Filters**

- Uses a fine-pored structure to collect and merge oil droplets.
- Installed in the bath circulation system.

✅ **Inclined Plate Separators (IPS)**

- Uses gravity to allow oil to rise and separate.

✅ **Centrifugal Oil Separators**

- Uses spinning force to separate oil from the bath.

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3. Recommended Approach for Your Problem (Winter Oil Removal)

Since oil removal is slow in winter, combine **chemical and mechanical** solutions:

🔹 **Modify the degreaser formula:**

- Add **0.5% Span 80 or PDMS-based defoamer** to enhance coalescence.
- Use **low-foaming nonionic surfactants** to keep oil dispersed.

🔹 **Install an oil skimmer or coalescer filter:**

- A **belt skimmer** will help remove the floating oil.
- A **coalescing filter** in the bath circulation loop will enhance oil removal.