YOUR NEEDS, OUR CHEMISTRY

Surfactants for Resin Emulsification

Solutions for Waterborne Resins

Indovinya is the global specialty chemical and surfactants division of Indorama Ventures. We are the leading EO producer in the Americas, with operations across 10 countries and 15 manufacturing locations.

Indovinya is rooted in chemistry, powered by people, driven by innovation, and guided by sustainability and community impact.

#1 Non-ionic surfactants producer in the Americas

#1 Supplier of Home Care Ingredients in the Americas

#1 Leading supplier in crop solutions in the Americas

Footprint

AMERICAS
- Brazil
- Mexico
- USA
- Uruguay

APAC
- Australia
- China
- India

EMEA
- Belgium

Industries Units | R&D and Tech Centers

15 Industrial Units

7 Global R&D Centers

Presence in **10** Countries

Approximately **3,000** Employees

Tailored Surfactant Solutions for Resin Emulsification

Resin **emulsification** is a critical step in the development of high-performance waterborne coatings. It enables the transformation of traditionally solvent-based resins—such as alkyds and epoxies—into stable aqueous dispersions, reducing VOC emissions and improving environmental profiles. Surfactants play a central role in this process by facilitating the breakdown of resin phases into fine droplets and stabilizing them against coalescence, sedimentation, and phase separation.

At **Indovinya**, we leverage our deep expertise in surfactant chemistry and coating formulation to develop custom **emulsification** systems that meet the specific needs of our customers. Our portfolio includes anionic, nonionic, and reactive surfactants, designed to work across a wide range of resin types and application conditions. Whether you're working with long-oil alkyds, medium-oil alkyds, epoxies, or other resin systems, we can support you in achieving optimal particle size, stability, solid content, and film performance.

The performance tests presented in this brochure—such as particle size control, drying time, and solid content—are examples of what can be achieved using our surfactants. However, our capabilities go far beyond these results. We offer flexible testing and formulation support, adapting our approach to your specific resin chemistry, application requirements, and desired coating properties.

In addition to **emulsification**, our team can assist with the final paint or enamel formulation, ensuring compatibility, performance, and processability throughout the entire development cycle. From lab-scale evaluation to full-scale production, we are committed to delivering surfactant solutions that enable innovation, sustainability, and performance in modern coatings.

Let us help you unlock the full potential of your resin systems through customized **emulsification** strategies and expert formulation support.

OXIMULSION® 9000

Enable the formulation of stable resin emulsions preserving the polymer backbone and its advantages in the final coating.

Benefits

- **Generate emulsions with small particle size**
- **Low energy demanding emulsification process**
- **High stability**
- **High solids emulsions**
- **Alkyd enamels with low VOC, low odor and reduced environmental risks**

Features

- **Package:** Sample, Drum, Bulk
- APE - free surfactants

Physical Properties	OXIMULSION® 9800	OXIMULSION® 9900	OXIMULSION® 9970
Description	Anionic Surfactant	Non-ionic Surfactant	Non-ionic Surfactant
Appearance @ 25 °C	Brown Liquid	Paste	White Flakes
Actives, wt%	96.0 - 98.0	99.5	100
CMC, g/L	0.40	0.02	3.3*
Surface Tension, 0.1%, mN/m	30	48	42
Melting/Freezing Point, °C	N/A	35	55

* based on literature

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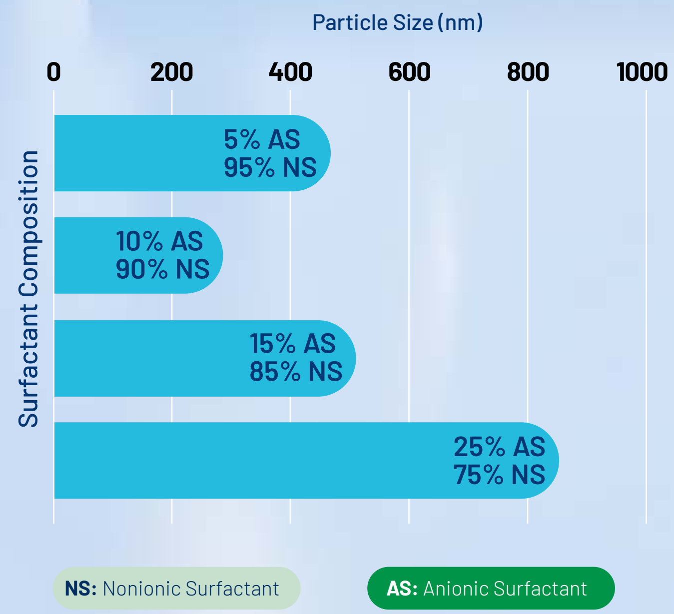
Long in Oil Alkyd Resin

Performance Tests

Particle Size Control

Controlling particle size during resin emulsification is essential for achieving stable emulsions and optimal film properties in waterborne paints. Surfactants facilitate the breakup and stabilization of resin droplets, directly influencing the final particle size distribution. A narrow and uniform particle size ensures better gloss, opacity, and pigment compatibility.

Optimizing the surfactant composition is essential to reduce the interfacial tension between alkyd and water to near zero, enabling to emulsify via phase inversion with low-shear mixing, to control particle size and promote the formation of stable emulsions. Particles smaller than 500 nm tend to enhance colloidal stability, as Brownian motion counteracts gravity and prevents sedimentation.



Instrumental test: Light Scattering.

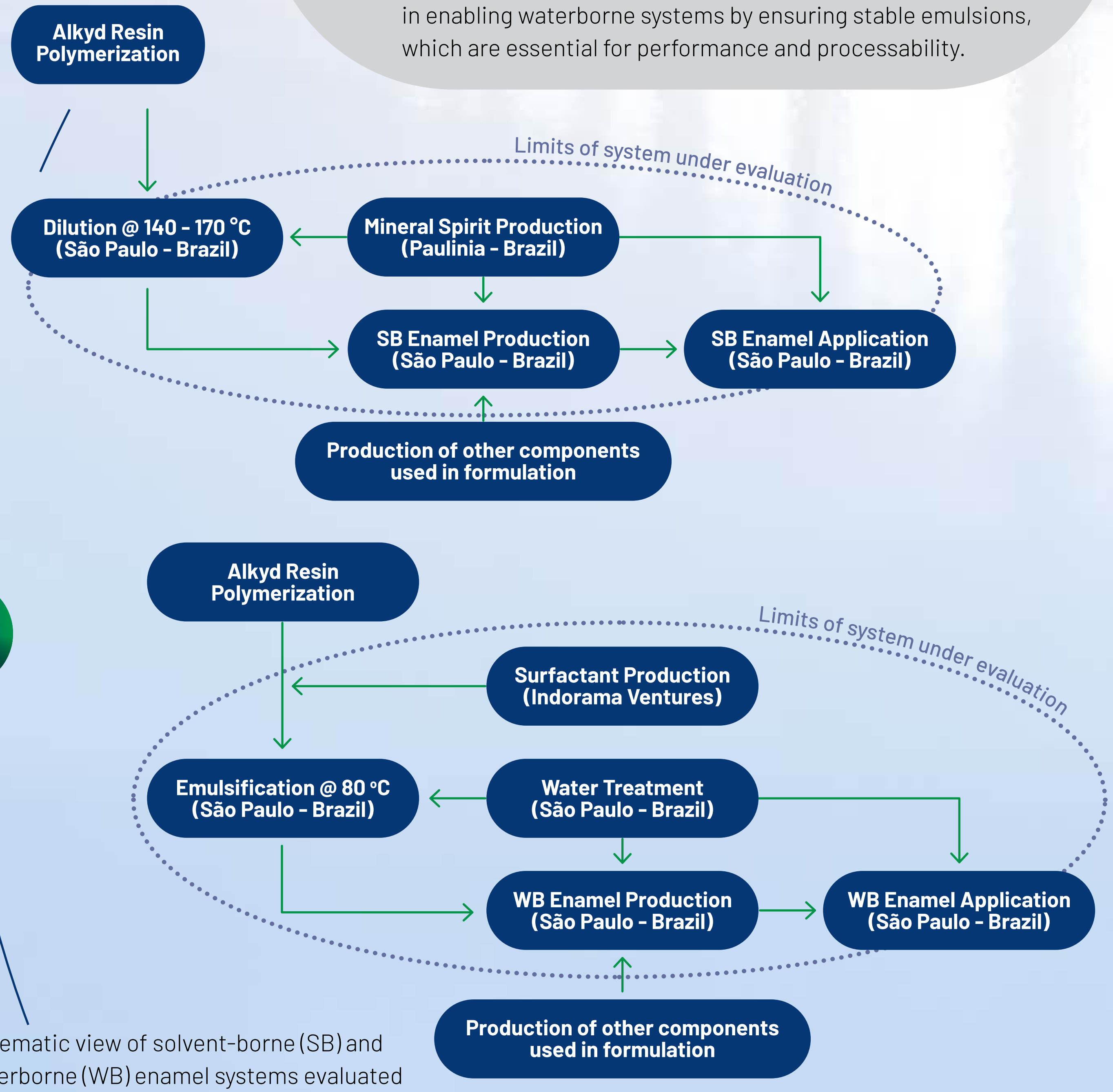
Tested emulsion: Long-in-oil alkyd @ 50 wt% in water with 8 php total surfactant content.

The results above show the importance of **optimizing the surfactant composition** in order to generate emulsion with a particle size lower than 500 nm.

Performance Tests

Life Cycle Assessment

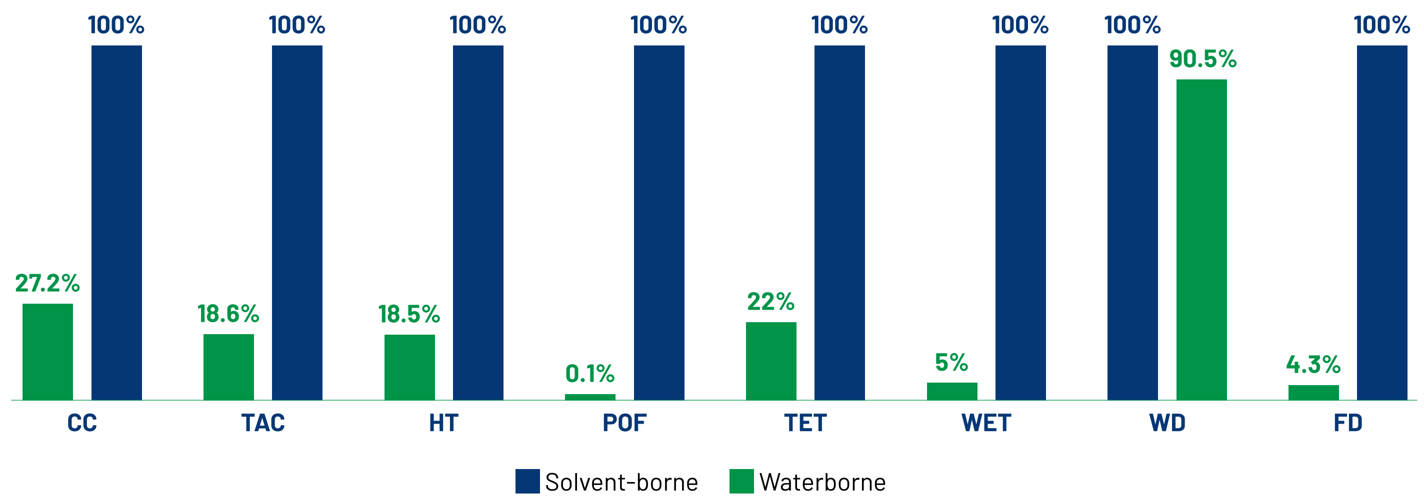
Life Cycle Assessment (LCA) is a methodology used to evaluate the environmental impact of a product throughout its entire life—from raw material extraction, manufacturing, and application, to disposal or recycling. When applied to enamel paint systems, LCA helps compare waterborne and solvent-borne technologies across multiple dimensions, such as energy consumption, emissions, resource use, and end-of-life effects. Surfactants used in resin emulsification play a key role in enabling waterborne systems by ensuring stable emulsions, which are essential for performance and processability.



Schematic view of solvent-borne (SB) and waterborne (WB) enamel systems evaluated through Life Cycle Assessment (LCA).

Performance Tests

Life Cycle Assessment



The Recipe Midpoint (H) was the life cycle assessment method used in this work[1]. The following environmental impact categories were evaluated: Climate Change (CC), Terrestrial Acidification (TAC), Human Toxicity (HT), Photochemical Oxidant Formation (POF), Terrestrial Eco-Toxicity (TET), Water Eco-Toxicity (WET), Water Depletion (WD) and Fossil Fuel Depletion (FD). These environmental impact categories were chosen based on their relevancy for paints and coatings application. For the solvent-borne enamel, the results show that its main environmental impacts are associated with the use of mineral spirits as the solvent.

(1) Popi, M. G. C. B. Effectiveness assessment of alternative processes to improve environmental performance in the production of sodium lauryl ether sulfate. Master's Degree Dissertation. Universidade de São Paulo: s.n, 2015.

Medium Oil Alkyd Resin

Emulsification

Medium in oil alkyd diluted with 5 php* of reactive diluent and 8 php of surfactants is easily emulsified at 80 °C using conventional low shear rate equipment generating stable emulsions with solid content about 49 wt% and particle size lower than 400 nm.

Medium oil alkyd diluted with 5 php of reactive diluent

Total surfactant content: 8 php

Surfactant compositions: 30/70, 20/80 and 10/90 of **OXIMULSION® 9800** to **OXIMULSION® 9900**

Neutralizers: inorganic and organic

Formulation with Surfactant Composition of 20/80

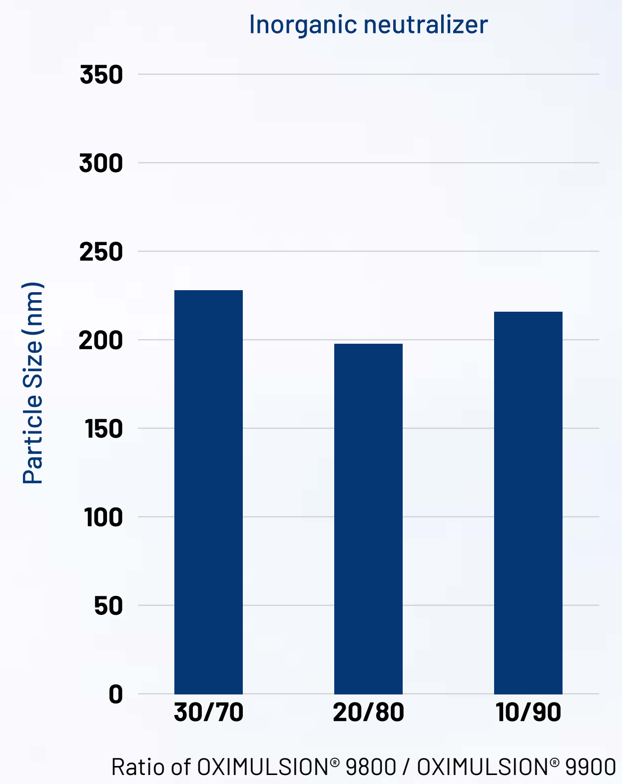
Components	Content (wt%)
Diluted resin	47.6
Neutralizer	0.6
OXIMULSION® 9800	0.8
OXIMULSION® 9900	3.4
Water	47.6
Total	**100.0**

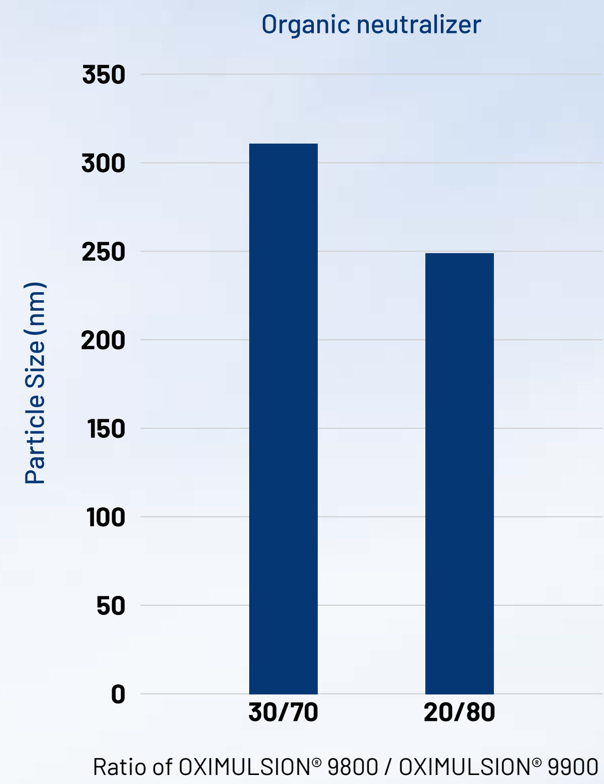
Emulsification was performed at 80 °C
Stirring rate of 230 rpm
php: parts per hundred of polymer

Performance Tests

Effect of emulsifier composition and neutralizer on particle size of alkyd emulsions

We evaluated two neutralizers—one inorganic and one organic—based on prior lab studies showing that neutralizer type significantly affects emulsion drying time.



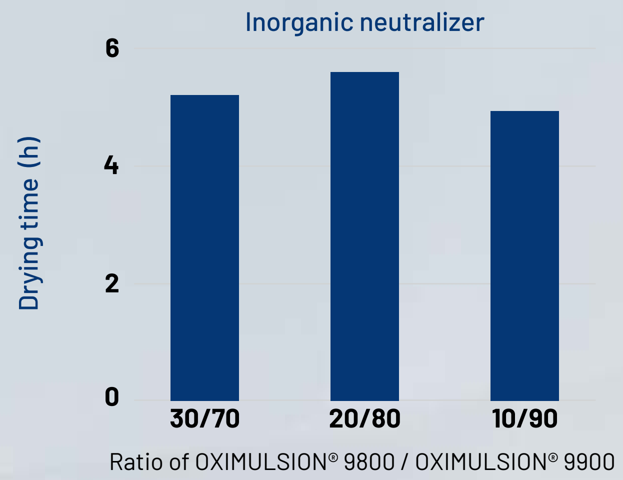


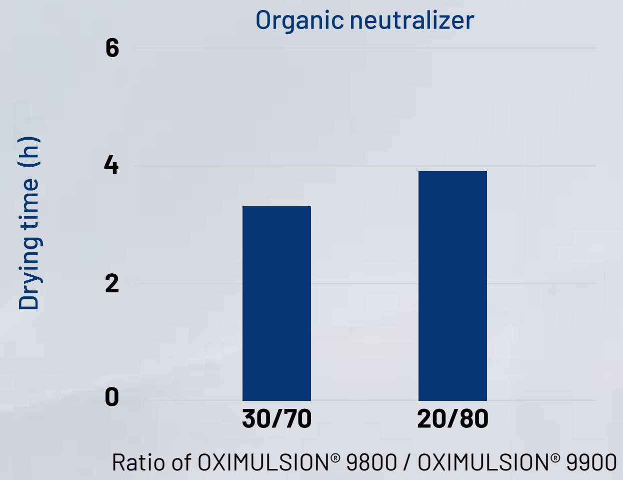
In this plot we can see that all compositions neutralized with the inorganic neutralizer generated stable emulsions with particle size around 200 nm. For the organic neutralizer only the emulsion neutralized with the compositions 30/70 and 20/80 of anionic to non-ionic surfactant generated stable emulsions with particle size in the range of 250 to 350 nm. The composition 10/90 of anionic to non-ionic surfactant generated unstable emulsion.

Performance Tests

Effect of emulsifier composition and neutralizer on drying time of alkyd emulsions

Drying time is a critical performance parameter in alkyd-based paints, directly affecting application efficiency, recoat intervals, and overall productivity. In waterborne alkyd emulsions, the drying process involves water evaporation and packing, deformation, and coalescence of emulsion droplets as well as oxidative cure of the resin. The choice of neutralizer influences the emulsion's stability, pH, and drying time. Understanding these relationships allows formulators to fine-tune drying behavior to meet specific application needs, whether for fast-drying industrial coatings or decorative paints requiring extended open time.





Resin: Medium in oil alkyd diluted with 5 php of prototype of reactive diluent.

Instrumental test: Drying time performed at 25 ± 2 °C and RH of 60 ± 5 % for 24 hours.

Emulsions: Solid content of about 49 wt% with a total emulsifier content of 8 pcp.

This chart shows the effect of surfactant composition and neutralizer on drying time. All stable emulsions neutralized with the inorganic neutralizer presented drying time in the range of 5 to 6 h. While the emulsions neutralized with the organic neutralizer presented drying time in the range of 3 to 4 h.

Epoxy Resin

Emulsification of liquid epoxy through phase inversion

Epoxy Resins

Emulsifying epoxy resins using specialized surfactants via phase inversion to create oil-in-water emulsions—and their corresponding water-based coating formulations—is a key innovation. This approach combines the exceptional performance of epoxy coatings, such as minimal shrinkage, strong adhesion to diverse substrates, and excellent chemical and corrosion resistance, with the practical benefits of water-based systems: lower cost, reduced toxicity, and no unpleasant odors.

Surfactant: OXIMULSION® 9970
Surfactant content: 10 – 30 wt%

Example of formulation with 20 wt% of Surfactant

Components	Content (wt%)
Epoxy resin	41.7
OXIMULSION® 9970	8.4
Water	49.9
Total	**100.0**

Resin: EPON 828.
Emulsification temperature: 25 ºC.

Main properties of epoxy emulsion

pH	6.9
Solid Content (wt%)	49.8
Particle Size (nm)	996
Viscosity, 25C (cP)	226

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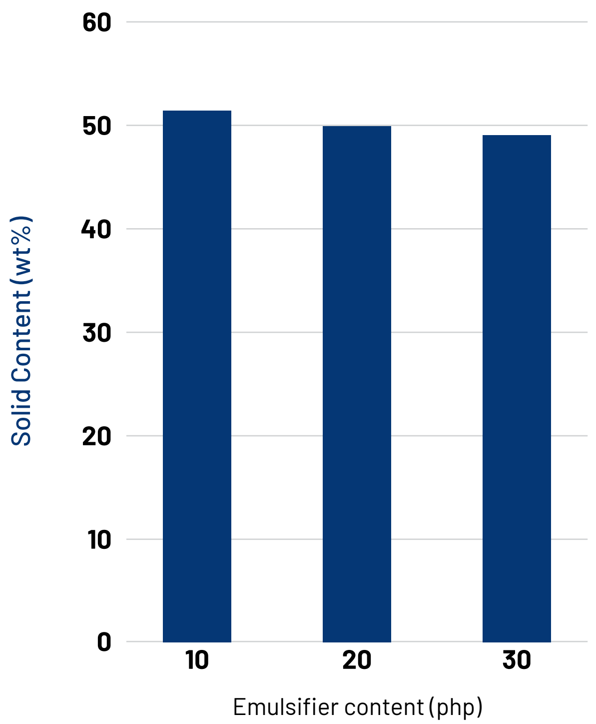
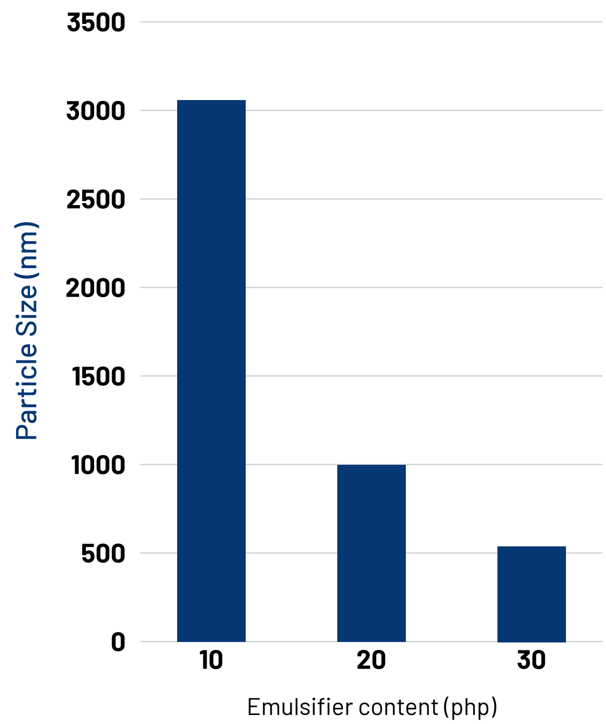
Performance Tests

Effect of emulsifier content on solid content and particle size of liquid epoxy emulsion

The concentration of emulsifier employed during the emulsification process of epoxy resins significantly influences two critical parameters: solid content (wt%) and particle size (nm). An increase in emulsifier content generally leads to a reduction in particle size and tends to elevate system viscosity, which can limit the maximum achievable solid content. Therefore, precise optimization of emulsifier levels is crucial to maintain a balance between fine particle size and high solid content, thereby ensuring optimal film formation and consistent quality in waterborne epoxy coatings.





These emulsions formulated with a suitable coalescent and curing agent for water-based systems resulted in films with excellent MEK resistance.

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If you are looking for a solution
for resin emulsification **OXIMULSION® 9000** Series is what
you need!
Contact us and request a sample.

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