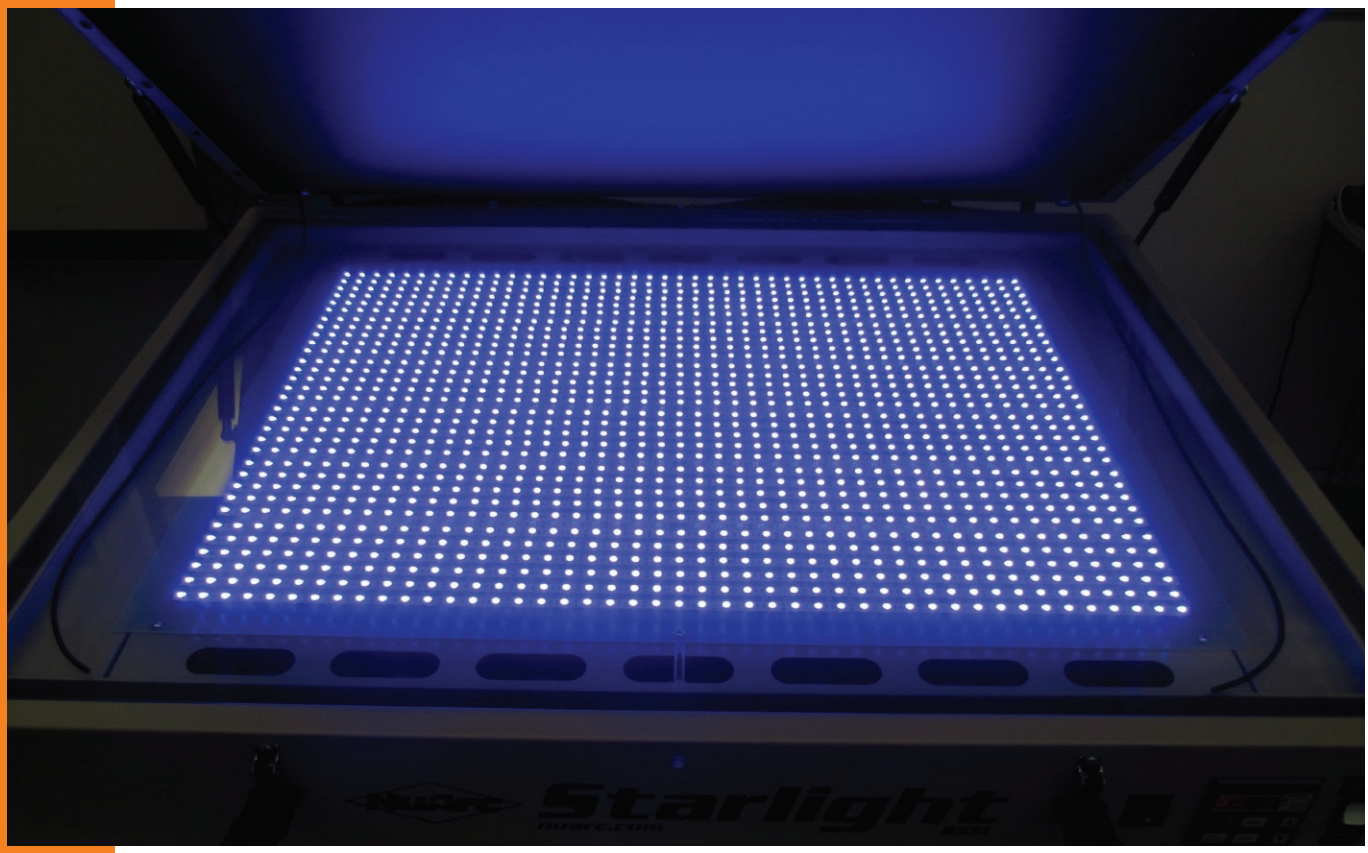
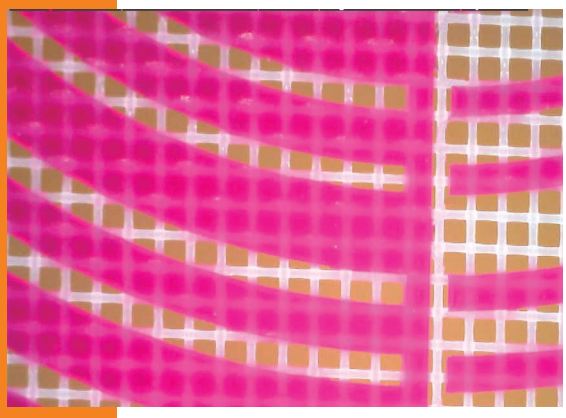
KIWO
ONLINE

The Changing Requirements of Emulsion

by Dave Dennings





products · concepts · solutions

The Changing Requirements of Emulsion

This report discusses how recent changes in ink formulations and further growth in sales of Computer-to-Screen (CTS) and LED exposure equipment affects your emulsion selection process. The report concludes by presenting a new emulsion specially developed to work with any textile ink and LED exposure system.

Plastisol inks have been receiving closer scrutiny over the past several years. As more attention is paid to environmental and social awareness, and in the spirit of sustainability, regulations are being passed to protect our environment and citizens. One of these United States regulations is The Consumer Product Safety Improvement Act (CPSIA), enacted in 2008 and implemented in 2009, which added additional safety regulations which ban children's products — including imprinted sportswear — from containing lead in concentrations greater than 90 ppm and six specified phthalates greater than 0.1%.

More recently, some major athletic and clothing brands are driving change from the commercial side of things. Although there is currently no specific government regulation banning Polyvinyl Chloride (PVC) from plastisol inks, these major brands are tapping into a growing anti-pollution sentiment among the populous. As the by-product of manufacturing PVC (the primary component of plastisol inks) causes pollution and environmental concern, it is likely only a matter of time before government regulators place PVC squarely in their sites.

Additionally, OEKO-TEX® Standard 100 was established to provide common criteria for assessing possible harmful substances in textiles. Each step of the textile manufacturing process from raw materials to finished goods often takes place in different countries, each with their own set of environmental regulations. This is where the basic concept of the OEKO-TEX® Standard 100 applies: The aim of the criteria catalogue is to level out global differences regarding the assessment of possible harmful substances in textiles. [1]

In response, ink manufactures have been introducing phthalate-free (or compliant) and PVC-free plastisol and water-based formulations. You may have noticed new ink systems promoting their environmental compliance like MagnaColors® and Wilflex™ brands illustrated here.

As banned phthalates are replaced by new plasticizers, we are finding some emulsions are not as compatible with the new compliant formulations. The same can be said of the new high-solids acrylic water-based inks because they contain a small percentage of solvent, which many commonly used emulsions today do not resist well. Printers using these emulsions may complain of pre-mature stencil breakdown.

Simultaneously, more screen printers are investing in CTS imaging systems with integrated exposure systems. Since the exposure is integrated, one cannot image the next screen until the first screen is exposed and removed from the machine. This has caused a fundamental shift in demand for faster exposing emulsions. As the textile market changes, the need for an overview of the different styles of emulsions and their compatibility with these new ink, imaging and exposure systems becomes apparent.

With so many different types of imaging and exposing systems in the market now and with ink systems continuing to evolve, it is time to ask ourselves "What emulsion is best for my system?" Just as ink and screen making systems evolve, so too have emulsions.

In general, there are four primary categories of emulsions (**diazo, diazo dual-cure, SBQ, and SBQ dual-cure**) that can be classified by:

- The type of sensitizer (diazo or SBQ)
- The number of light sensitize components (one [single-cure] or two [dual-cure])

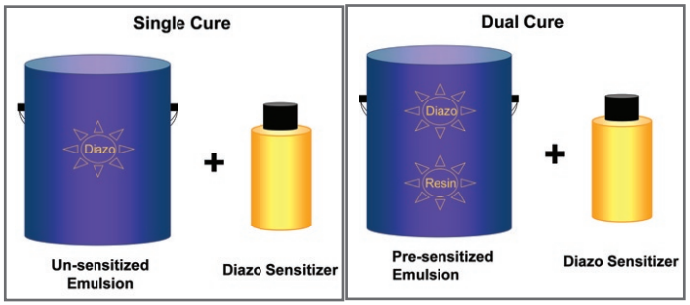
Number of Curable Components ————>		Single Cure	Dual Cure
Type of Sensitizer	Diazo	Diazo	Diazo Dual Cure
	SBQ	SBQ	SBQ Dual Cure

Most know diazo emulsions because they come with a small bottle of powder (sometimes syrup) that is typically dissolved in water and mixed into the emulsion before use. What is not as well known is the difference between single-cure and dual-cure emulsions or that SBQ (also known as pure-photopolymer) emulsions also come in single-cure and dual-cure formulations.

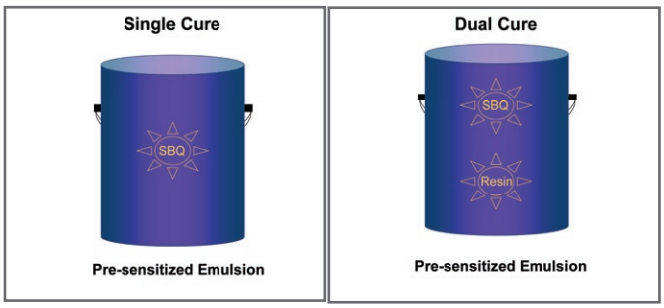
In simplest terms, the primary difference between single-cure and dual-cure emulsions is single-cure emulsions have **one** curable component and dual-cures have **two**. Both diazo and SBQ sensitized emulsions come in single cure or dual-cure formulations.

Dual-cures (both diazo and SBQ) contain UV curable resin, single-cures (both diazo and SBQ) do not. Dual cures are capable of dual resistance (solvent and water), single-cures are not. Single-cures offer good resistance to either solvent or water, but not both. The drawings below use an icon of the sun to represent each curable component (diazo, SBQ, and/or resin) contained within each type of emulsion.

DIAZO SENSITIZED EMULSIONS



SBQ SENSITIZED EMULSIONS



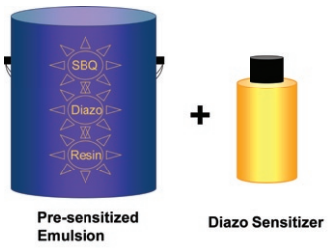
Many T-shirt printers have traditionally used single-cure emulsions but are now using inks that may require both water and solvent resistance, something single cure emulsions do not do well. Co-solvent water-based inks, like many of the new high solids acrylics, require not only water resistance from their stencils but solvent resistance too. Some plasticizers used in new eco-friendly plastisol inks require greater solvent resistance than is currently provided by some single-cure emulsions.

The trend in emulsions is towards dual-cures. However, these are not the diazo-sensitized dual-cure emulsions you typically think of, but SBQ sensitized dual-cures. SBQ sensitized dual-cure emulsions (and SBQs in general) are much faster exposing than diazo dual-cures (and diazo emulsions in general), which makes them better equipped to handle the demand for faster throughput required by busy shops and those investing in the afore-mentioned CTS equipment with integrated exposure. Compared to single-cure SBQs, dual-cure SBQs typically have better copying properties (resolution, mesh bridging and edge definition) and solvent resistance.

Some refer to dual-cure SBQs as SBQ "hybrids." This is confusing for those seeking a clear understanding and differentiation of the four categories of emulsions. If UV curable resin is used as the defining trait of a hybrid emulsion, then diazo dual-cures should also be considered hybrids, which they are not.

HYBRID — TRIPLE CURE?

Hybrid, by definition, more accurately describes what occurs when diazo is added to an SBQ (either type) emulsion. By adding diazo to SBQ emulsion, one is combining two different sensitizing systems (diazo + SBQ) of emulsion together which better fits the hybrid definition.



If one adds diazo to an SBQ dual-cure, does this make it a triple-cure? If one then adds a post exposure step or stencil hardening fluid, does this then become a quadruple-cure? Although we are having fun with this, hopefully these diagrams help you visualize the difference between emulsion categories. The table below offers further clarification along with product examples.

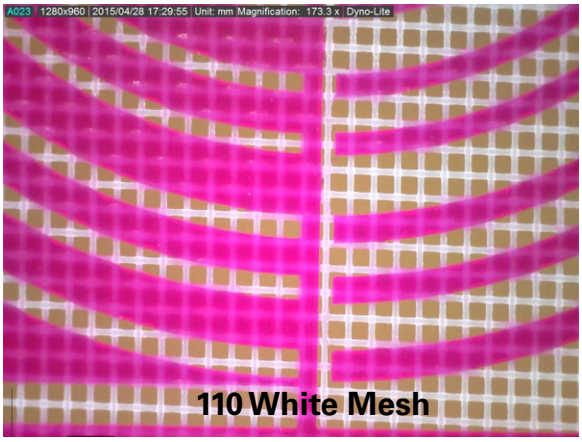
Emulsion Category	Commmon Characteristics	Examples
Diazo	Economical single-cure, either water **OR** solvent resistant, ~4-5 X slower exposing than SBQ systems.	ULANO 925 WR-P, TZ, 569 KIWO 225 WR, 300 WR
Diazo Dual-Cure	Highest resolution, mesh bridging and edge definition of all systems, as well as chemical and mechanical resistance, ~4-8 X slower exposing than SBQ systems.	KIWO POLY-PLUS S, Z, ER, SWR, HWR, SRX ULANO PROCLAIM, DOUBLE DUTY, LX-660, LX-680, RLX, DLX.
SBQ	Economical fast exposing single-cure, no mixing, either water OR solvent resistant.	ULANO QTX, ORANGE KIWO POLYCOL® ONE-COAT, DISCHARGE
SBQ Dual-Cure	Highest resolution and chemical resistant SBQ system, fast exposing, no mixing, often dual resistant.	KIWO POLYCOL® MULTI-TEX, VERSA-TEX ULANO PLATINUM, QLT, QX-5

From the previous table you will see that diazo and SBQ emulsions are capable of providing good water or solvent resistance but are not capable of providing very good resistance to both which, as we have seen, is required when printing with many of the new inks.

While diazo dual-cure and SBQ dual-cure emulsions are capable of providing good water and solvent resistance, this does not suggest that all emulsions in these categories are able to do so. Therefore, one must read the technical data sheet carefully to determine if the emulsion does provide dual resistance properties when needed.

To determine if your water-based ink contains solvent check the Safety Data Sheet to see if the ink has a flashpoint, which is usually located in Section 9 Physical and Chemical Properties. The presence of a flashpoint indicates that the ink does contain solvent.

KIWO recently introduced POLYCOL® MULTI-TEX, an emulsion formulated for the textile market specially designed to address all of the needs discussed in this report.



POLYCOL® MULTI-TEX is a high-solids fast-exposing SBQ dual-cure emulsion offering both water and solvent resistance. It is specially formulated for use with all of the newest textile inks and is optimized for use on the latest CTS imaging & LED exposing systems as well as for all conventional exposure systems. As seen above in the microphotograph of the stencil it has excellent resolution, mesh bridging and edge definition, even on 110 white mesh.

For Plastisol

Resistant to all plastisols including phthalate-free and PVC-free systems.

Saves Time
- Builds quickly
- Exposes quickly
- Develops easily
- Reclaims easily

Less Down Time
- Excellent durability
- Great ink release means fewer screen cleanings

For Water-Based and Discharge

Resistant to all water-based, co-solvent HSAs, and discharge inks.

Saves Time
- No waiting for mixing/ de-gassing
- No time wasted applying, drying, and curring hardeners

Save Labor and Material Costs
- No hardeners required
- No diazo additives needed

[1] https://www.oeko-tex.com/en/manufacturers/concept/concept_start.html

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