



## K-Flex® Dibenzoate Plasticizers for Vinyl Applications

Plasticizers have been and continue to be a key raw material in plastics applications. Phthalate chemistry, one of the major plasticizer platforms for plastics, has been under increasing scrutiny for safety and health concerns.

There is therefore a need for phthalate alternates. Phthalate alternates such as DOTP, di-isononyl 1,2- cyclohexane dicarboxylate (DIDC), and alternatives based on soy and castor oils are viable, but do not always give the performance desired in vinyl compositions, particularly in plastisols (i.e. poorer compatibility, slow speed, high gel temperatures, less gel strength). As is always the case, performance can often be adjusted by utilizing blends of plasticizers.

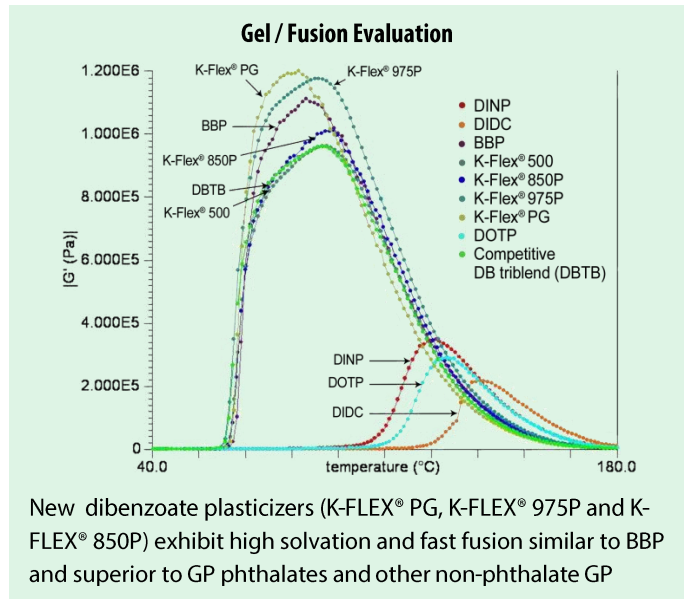
K-FLEX® plasticizers, based on dibenzoate chemistry, can offer an excellent **non-phthalate solution for formulators looking to satisfy both legislative requirements and consumer demand.** Benzoate esters have been well-established and used as specialty plasticizers in certain PVC applications due to their performance and favorable environmentally-friendly profile:

- **Non-phthalate, low-VOC, non-SVHC**
- **Global registrations, REACH compliant**
- **Approval for use in indirect food contact applications**

### Next Generation Products

High solvators are often used in plastisol formulations for their speed and other performance characteristics. However, in addition, the plasticizer must also be economical and have a reasonable freeze point to enable ease of handling and transport. To this effect, two new products have been introduced to the vinyl industry: a new generation dibenzoate triblend, K-FLEX® 975P, has been developed to offer formulators an improved high solvator to complement the performance of general purpose plasticizers. Additionally, an optimized blend of classic dibenzoates, K-FLEX® 850P, has recently been commercialized in response to continued needs in the PVC industry. Our new technology offers an **excellent balance of key performance properties such as stain resistance, extraction resistance, and fusion characteristics** when compared to BBP, competitive dibenzoate triblend (CTDB) and other phthalate alternatives.

As highly solvating plasticizers, K-FLEX® plasticizers offer benefits in manufacturing such as **increased processing speeds and lower processing temperatures.** K-FLEX® plasticizers also offer superior **resistance to extraction by solvents** such as kerosene and cotton seed oil. These



New dibenzoate plasticizers (K-FLEX® PG, K-FLEX® 975P and K-FLEX® 850P) exhibit high solvation and fast fusion similar to BBP and superior to GP phthalates and other non-phthalate GP

properties make K-FLEX® plasticizers an excellent choice for the production of vinyl flooring (wear layer/foam), extrusions, and plastisols – spread coatings, screen ink and more. Blends of K-FLEX® plasticizers with more general purpose plasticizers such as diisononyl phthalate (DINP) or dioctyl terephthalate (DOTP) – or with other specialty plasticizers such as adipates or citrates – are often used to take advantage of K-FLEX plasticizers' exceptional properties.

### Evaluation Methodology

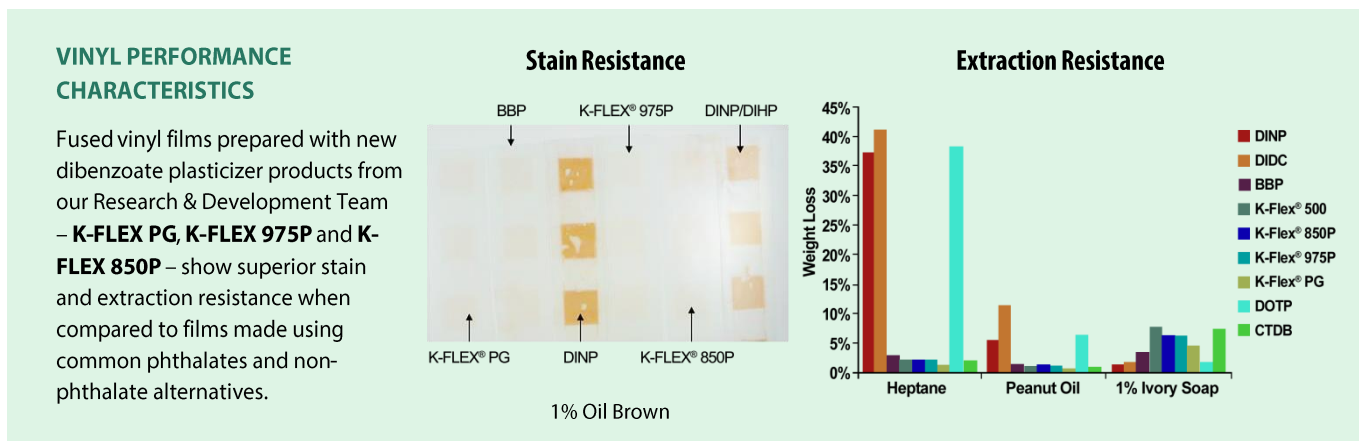
Emerald Kalama Chemical uses analytical instruments such as those depicted above to evaluate performance of plasticizers in a variety of applications, including the preparation of films and the measurement of rheological properties.

## Recommended Products for PVC Applications

**K-FLEX® 975P** – New product from our R&D team. Economical to use and optimized for performance in vinyl compositions, particularly plastisol (paste), with improved handling due to its lower freeze point. Excellent stain resistance & durability.

**K-FLEX® 850P** – New product from our R&D team – economical to use and tailored specifically for vinyl, melt compounding and plastisol applications.

**K-FLEX® PG** – New product from our R&D team. This grade of propylene glycol dibenzoate was specifically designed for vinyl applications and is a very high solvator making it particularly useful in blends of plasticizers to tailor characteristics and end-performance. Optimal stain resistance and durability properties in vinyl applications.



**Emerald Kalama Chemical** is a business group of Emerald Performance Materials, a manufacturer of additives and polymers that make your products last longer, look, taste, smell, or perform better. We are a world-scale producer of toluene oxidation products, shipping 425 million pounds annually to nearly 70 countries across the globe. Products include benzoic acid and various benzoate and dibenzoate ester, alcohol and aldehyde derivatives for food preservatives, flavor and fragrance ingredients, plasticizers and industrial applications. Manufacturing in Kalama, WA (USA) and Rotterdam, The Netherlands – service to our customers globally.

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