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The role of copper in a printing ink

Scope

The purpose of this Technical Information Paper is to provide a basic understanding concerning the role that copper plays in a printing ink. Copper is a concern to many box makers since copper levels are often regulated in plant effluents by local sewage authorities. The intent is to provide the box maker with some fundamental technical information concerning copper, its use and control.

Safety precautions

There are no safety precautions associated with this TIP.

Content

The presence of copper in the ink is a result of pigment choice during the design of the printing ink. Copper containing pigments are routinely used when formulating inks. Specifically, copper pigments are used to impart blue and green hues to a printing ink. Many of the GCMI blue/green inks are formulated with copper containing pigments (ex: GCMI 31 blue, GCMI 20 green). Other GCMI colors (reds, yellows, browns) are usually not formulated with copper pigments. Several copper containing pigments are available with copper phthalocyanine blue pigment, which is the most popular for flexographic ink. Copper phthalocyanine provides excellent color stability, heat/light resistance, and color matching flexibility at a reasonable cost. In fact, it is the most widely used blue pigment throughout the printing industry regardless of the type of printing.

The copper phthalocyanine pigment contains 11% copper by weight which can result in up to 0.5% copper in final ink products depending on the color and formulation pattern. In the copper phthalocyanine pigment, the copper is tightly bound (water insoluble) within the pigment structure. However, a small amount of free copper (water soluble) is present. Discharge of this water-soluble copper may cause a problem for a local sewage treatment plant by destroying the living bacterial filter bed. The water-insoluble copper phthalocyanine itself is not known to have any appreciable aquatic toxicity. In fact, the EPA delisted copper phthalocyanine (C. I. Pigment Blue 15, C. I. Pigment Green 7 and C. I. Pigment Green 36) from the Hazardous Substance list for reporting under SARA 312 and 313 in 1992. However, regulatory testing for copper in wastewater will measure both forms of copper. Therefore, it is the total copper level that becomes an issue for the box maker.

For this situation, reduction of copper in the blue and green GCMI colors is desirable and possible by substituting copper-free blue pigments. Several are available for use in flexographic inks (Milor Blue, Alkali Blue, copper-free phthalocyanine, etc.). However, the use of only copper-free pigments for flexographic ink becomes a trade-off with respect to cost, flexibility in color matching and ink performance. Those copper-free blue pigments are considerably more expensive than copper phthalocyanine and not as effective in meeting GCMI shade requirements. A compromise approach is recommended to reduce the copper level in incoming inks. The approach of using copper free pigments in combination with copper phthalocyanine pigment affects the balance between cost, color match and ink performance. It is strongly recommended for a specific application that you consult your ink supplier for

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assistance. The ink supplier can provide more detailed information concerning the design and composition of their ink products and what alternatives are available for your specific application.

Other suggestions to reduce the level of copper discharge include: recycling of press wash water to starch make-up; reduction of discharge water load via improved housekeeping and installation of commercial filtration and/or wastewater treatment systems.

Further information on some of these approaches is available in other TIPs.

Recommendation

For the most up to date information on the role of copper in a printing ink and its impact on the environment, consult your local ink supplier and environmental manager.

Keywords

Copper, Ink, Printing, Corrugated boards

Additional information

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