

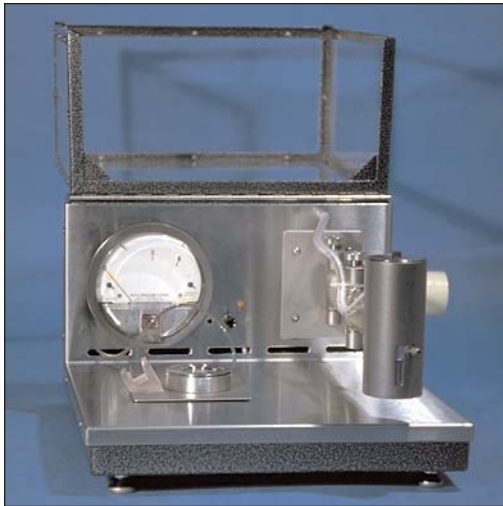
Ink Cure Analyzer™

Laboratory and portable testing instruments verify degree of polymerization for UV curable inks and coatings on a variety of substrates



IDENTIFYING TYPICAL CURE PROBLEMS

- Ink or coating does not adhere to substrate (flaking).
- Curing to manufacturer's specifications does not account for equipment or environmental parameters.
- Ink or coating is excessively brittle, fails to fold, score or die-cut.
- Lack of inner-coat adhesion when applying overlying ink layer.
- It worked in the lab, but not in production.
- Ink or coating is just not curing.
- What determines actual cure?
- What determines overcure?
- How do you determine the presence of uncured monomers?
- How do you determine whether the product is safe for shipping?
- How can you eliminate the smell from cured inks and coatings?
- Are your UV curing lamps degrading or is your system performing properly?
- How do you determine when to change lamps?
- How do you assure that your customers receive completely cured product?

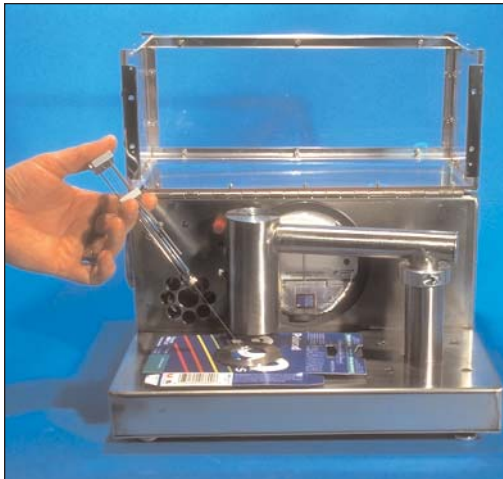


THE SOLUTION

Test cured inks and coatings by evaluating the degree of cure using the **CON-TROL-CURE® Ink Cure Analyzer™**.

WHEN TO USE

The Ink-Cure-Analyzer™ helps establish what makes a good cure and finished product. Previously, this ability, which allows you to create repeatable cure parameters, has been available only through very expensive and highly technical equipment. With its ease of use and the affordability, the Ink Cure Analyzer™ can be stationed on the production floor for checking cure periodically throughout every production run.



ADJUST CURING VALUES

With the Ink Cure Analyzer™, a numerical value can be established which directly relates to the crosslink density of the cured product. This determination is relative to the product's physical properties and performance. With this measurement, the operator can define optimum production rates for maintaining the required curing properties. Once the samples are approved, cure data can be used to target numerical cure values for reference and to define specific production variables.

CREATE GOALS IN THE LAB

The Ink-Cure-Analyzer™ can be used to establish all process variables on the production floor or in the Quality Control lab. This data will serve as the target production goal to help deliver repeatable, acceptable results.

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TEST DURING PRODUCTION TO CHECK GOALS

Once production goals are established in the lab, the Ink Cure Analyzer™ can be readily used as an off-line production testing tool to further ensure that production is operating within specifications.

EVALUATE LOT-TO-LOT CONSISTENCY OF INKS, COATINGS AND ADHESIVES

The Ink Cure Analyzer™ can be used for quality control of inks, coatings and adhesives as they are received into inventory. By checking and verifying new inventory against known samples, you can they will cure within the same parameters as previous lots. If any differences are revealed, the ICA's numerical data can help indicate what remedies could produce similar cure properties, or indicate that the inks or coatings should be returned rather than used.

DETERMINE HOW HEAT AFFECTS CURING PROPERTIES

In many applications, heat increases the cure rate. This fact can be used to produce specific parameters. Most UV curing equipment produces large amounts of heat, which is then removed through air or water cooling. Different cure properties result if the cooling systems are operating differently (warm water in summer vs. cold water in winter in the cooling system). The Ink Cure Analyzer™ can show the minute changes in cure associated with subtle heat changes.

QUICKLY DETERMINE PROPERTIES WHICH MAY DEVELOP LATER

Some UV inks and coatings have post-cure properties; i.e. they continue to cure after they exit the UV curing chamber. Development of desired properties, hours or days later, makes it very difficult to test while the product is being produced.

The Ink Cure Analyzer™ will produce a numerical value for cure associated with crosslink density. Minor changes in this state will be evident, and can be directly related to final properties. Changes in the cure rate can then be made to yield the desired results.

DOCUMENT FINAL CURE RESULTS FOR YOUR CUSTOMER

Since the Ink Cure Analyzer™ produces numerical data as to the degree of polymerization, it offers excellent documentation of cure results and repeatability factors. For example, some applications require the amount of residual monomers be documented or other cure-related variables defined. The Ink Cure Analyzer™ can quickly and economically provide exact data as to how the product was processed.

CONCEPT OF THE TEST METHOD

A sample of the "cured" product is tested in the Ink Cure Analyzer™ utilizing an extremely pure Test Solution. This liquid consists of one or more solvents and a trace quantity of Carbon-14 suited to the specific chemical constituency of the ink or coating. These solutions are highly sensitive to the changes in the film structure of the "cured" ink or coating.

A metered amount of Test Solution is deposited on the cured substrate. The permeation of the Test Solution through the polymer matrix, and the subsequent reading of the Carbon-14, is monitored and relayed to a PC. The supplied ICA™ Software interprets the data as a peak value, or as a profile along a numerical curve. Information derived in this manner then becomes the standard for determining proper cure.

FEATURES:

- Operates with PC-compatible computer (486 or higher)
- Measures crosslink density of cured product
- Can be used to evaluate specific print areas
- Offers sensitive reading and measurement
- Will show differences of cure, even variances of a clear coating printed over white, and clear coating over black
- Fast measurement requires approximately three minutes per test
- Measurement technique: MICRO SOLVENT SWELL
- Microcomputer analysis
- Reads degree of cure in UV and other cross linking processes
- Low-cost test instrument and solutions
- Supplied software provides peak value or numerical curve for developing standards

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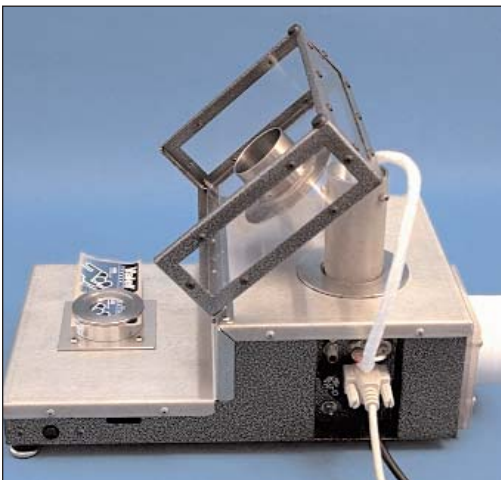
Laboratory and portable testing instruments verify degree of polymerization for UV curable inks and coatings on a variety of substrates



ICA's SOFTWARE AND HARDWARE BASED SYSTEM

- Easy-to-use software runs all aspects of the test, records curing history, retrieves samples on demand
- Reports a single numerical value of degree of cure
- Capable of displaying graph/chart of cure for performance analysis of single or multiple cure records for a visual comparison
- System card plugs into an available 16 bit slot on any IBM-PC (AT) or 100% PC-compatible computer system
- Safe, fast, reproducible, quantitative results in a 3 minute test

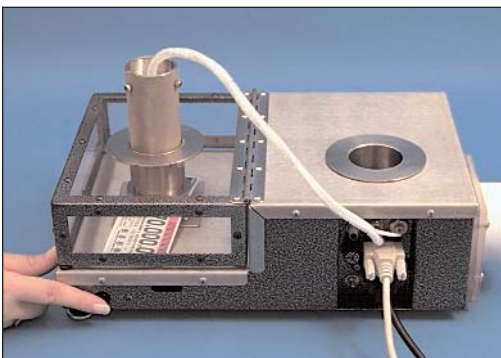
Item No.	Description
M002-011	Ink Cure Analyzer™ w/o Computer
M002-012	Ink Cure Analyzer™ w/ Computer



Introducing the New PORTABLE INK CURE ANALYZER™

Offering the identical testing capabilities as the standard laboratory ICA™, the **Portable Ink Cure Analyzer™** features an RS-232 serial connection for true portability and universal compatibility. Compact and lightweight, this system, when used with a laptop computer, can be easily packed within a standard catalog or sample case (13.5 x 8 x 18") for use by sales and technical service representatives when demonstrating new products in the field.

Item No.	Description
M002-004	Portable Ink Cure Analyzer™ w/o Computer
M002-013	Portable Ink Cure Analyzer™ w/ Computer



INK CURE ANALYZER TEST SOLUTIONS

Item No.	Description	Item No.	Description
M002-008	MMS Red Test Sol./35 test pk	M002-049	MSS AK Test Sol./30 test pk
M002-009	MMS Red Test Sol./85 test pk	M002-025	MSS BH Test Sol./85 test pk
002-015	MSS BV20H Test Sol./85 test pk	M002-046	MSS BH Test Sol./30 test pk
M002-016	MSS BK10P Test Sol./85 test pk	M002-026	MSS BK Test Sol./85 test pk
M002-044	MSS BK10P Test Sol./30 test pk	M002-047	MSS BK Test Sol./30 test pk
M002-017	MSS BW10H Test Sol./85 test pk	M002-027	MSS BV Test Sol./85 test pk
M002-043	MSS BW10H Test Sol./30 test pk	M002-048	MSS BV Test Sol./30 test pk
M002-020	MSS BK20P Test Sol./85 test pk	M002-050	MSS BW Test Sol./85 test pk
M002-045	MSS BK20P Test Sol./30 test pk	M002-051	MSS BW Test Sol./30 test pk
M002-024	MSS AK Test Sol./85 test pk		

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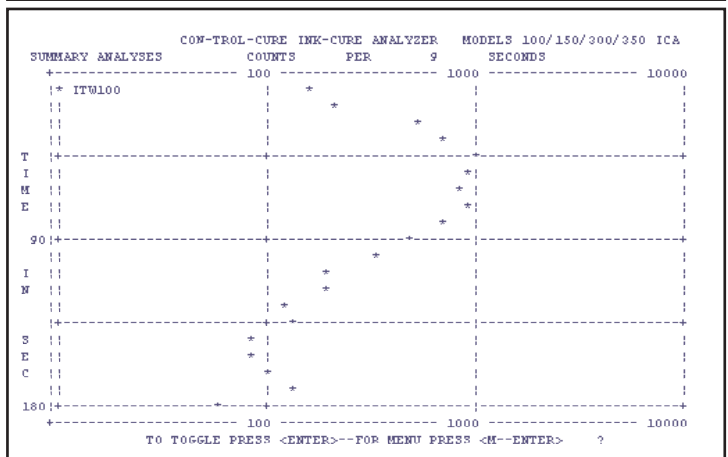
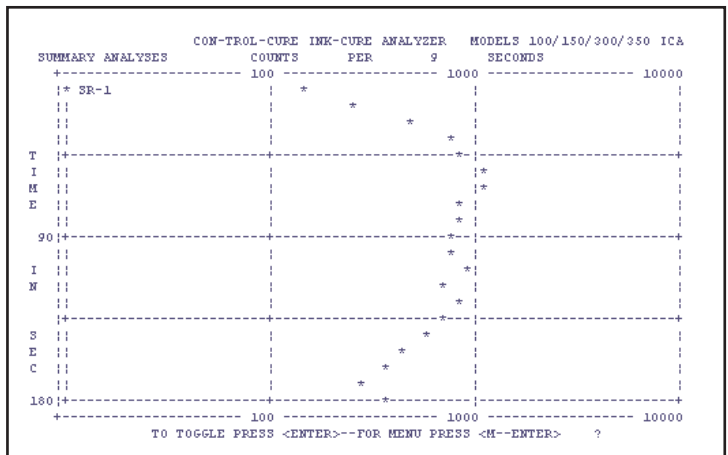
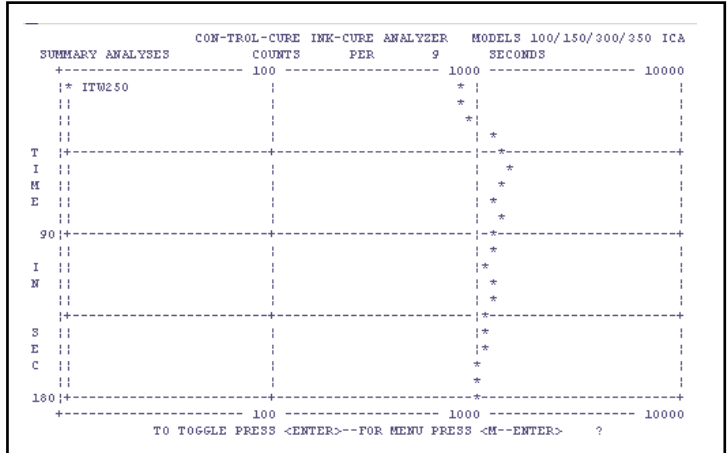
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Low Cure Graph: Indicates high solvent absorption within the coating layer as high evaporation rate is recorded over an extended time. This indicates the solvent has penetrated deep within the coating layer and is retained by the polymer.

Mid Cure Graph: Moderate evaporation rate is indicated by high initial reading with gradual falloff. With rate moderating between 100 and 1000, this indicates solvent has penetrated the coating, yet solvent retention is less than low cure.

High Cure Graph: Initial high evaporation rate with dramatic dropoff to the 100 level indicates solvent penetration and retention is extremely low.



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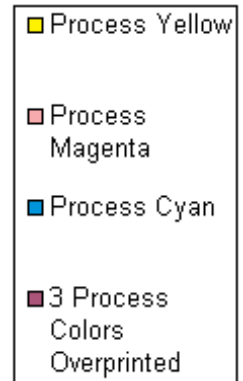
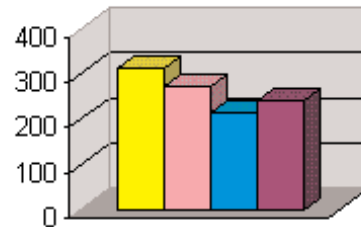
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Gallus Incorporated

- This series of tests correlates the degree of cure of printing UV curable process colors on a polyolefin material using a web rotary letterpress.
- The colors were tested using the same press sheet.
- The printing sequence for each test was Y, M, C, B.
- The MSS Index values correlate with the amount of energy received by the color tested.
- It is evident that the Ink Cure Analyzer™ is able to distinguish the degree of cure among colors of the same press sheet.

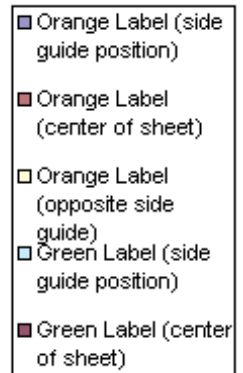
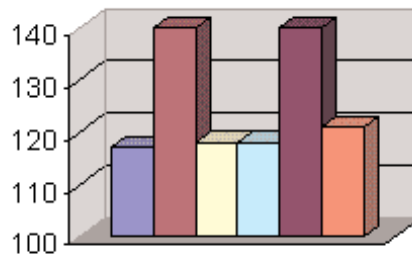
MSS Index Value



Package Products Specialty

- This test compared degree of cure in relation to position of printing ink on screen printed press sheet.
- Samples tested were from press sheets 5 labels across.
- Testing areas were from the left, middle, and right side of two sheets (green and orange).
- Orange label sheet exhibited acceptable adhesion upon cure but failed in areas encompassing outer positions a month after production. Middle labels were acceptable.
- The green sheet was tested one day after printing.
- Both press sheets were produced on the same line using the same pressman and ink line.
- It is evident that adhesion failure is related to production conditions and the ICA was able to show those distinctions.

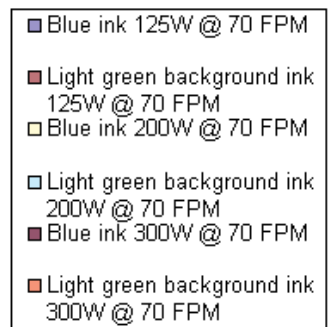
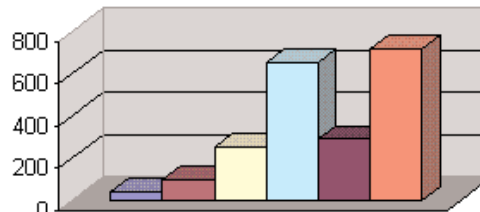
MSS Index Value



Tubed Products, Inc.

- This battery of tests correlate the degree of cure of printing ink with the energy dose received by the ink.
- All samples were 1 oz. Vaseline Petroleum Jelly tubes from the same production line cured at the same speed.
- It is evident from the data that the MSS Index Value correlates directly with energy dose given each sample.
- The cure ratio between both colors tested is a near constant despite energy dose increases. The cure ratio is the numerical relationship of cure between 2 coatings or ink colors and is derived by dividing the higher MSS Index by the lower.

MSS Value Index



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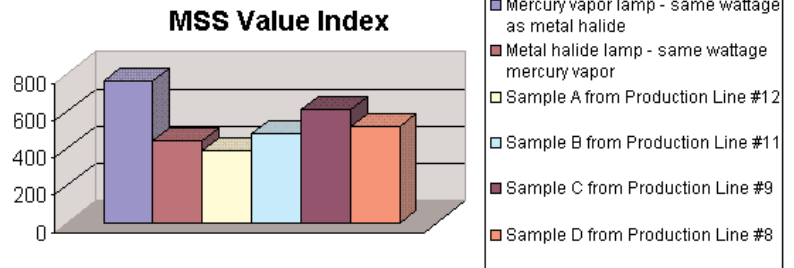
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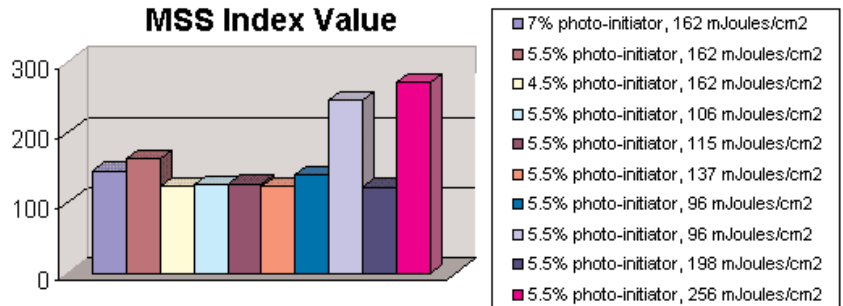
Digital Audio Disc Corporation

- This series of tests shows the variation of cure of a clear protective varnish on compact discs.
- Each disc was coated with the same formulation and spin coated and cured through different production lines.
- Each production line is of an older style that spin coats the discs "one at a time."
- The first two samples were cured on the same piece of equipment. Only the type of light source was changed.
- The higher the MSS index, the greater the molecular crosslinking.
- Of the two light sources, the mercury vapor lamp is clearly the most efficient light source for curing this formulation.
- The CON-TROL-CURE® Ink Cure Analyzer™ distinguishes the degree of cure related to variations in the process of coating and curing a spin coated UV varnish.



Casco Nobel Industrial Coatings

- This series correlates percentage of photo-initiator to degree of cure.
- Each sample tested was created by carding, in 2 perpendicular passes, a clear UV-curable coating on wood paneling.
- Samples H, K and F were each cured at 162 mJoules/cm². As noted in the above table, each sample has a different percentage of photo-initiator.
- As indicated by the MSS index, the best cure was achieved with 5.5% photo-initiator (standard recommendation).
- The ICA clearly distinguishes the degree of cure related to variations in formulations.



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