



TECHNICAL C&A INFORMATION

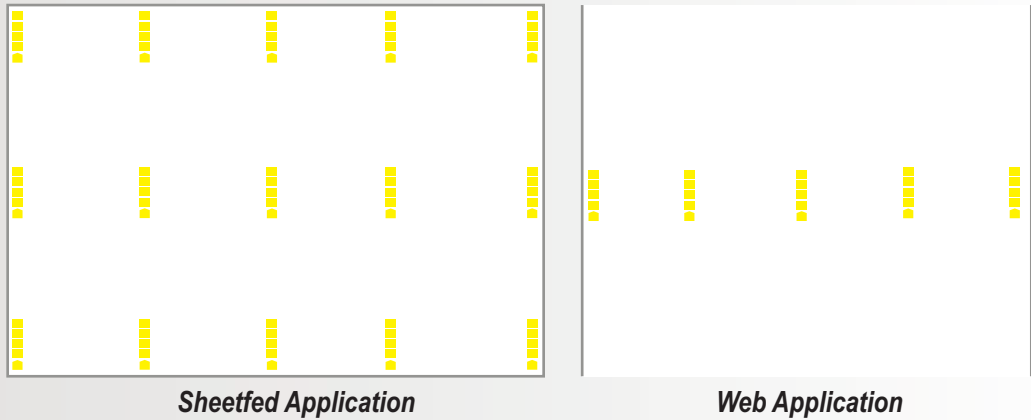
UV Dosage Fastcheck Strips v1.1

Testing Method	
Scope	This test is used to qualitatively and objectively measure the total dosage of UV energy that is being emitted by a UV press curing-system using a color changing test strip. This test can be used as a troubleshooting tool or to benchmark the curing-system based on a pre-determined system condition and machine/curing-system operational parameters.
Test Measurement Instruments	<ul style="list-style-type: none"> - UV Fastcheck Strips, available from UV Process Supply; www.uvprocess.com, part number N010-002 - UV Fastcheck Strip Key Chart; reference chart for color-change of testing strips and relative UV dosage; part number N010-002A
Test Applications	<ul style="list-style-type: none"> - For use when trouble-shooting the UV curing-system when cure-related issues are encountered - For use when bench-marking the UV curing-system when the system is restored to a good working condition by replacing the UV lamp and cleaning/replacing the reflector - For use when evaluating deviations in the UV curing-system and related curing performance across the length of the UV lamp/reflector - For use when testing the UV curing-system for performance or determining equipment failures - For use when comparing condition/performance of the UV curing-system across multiple machines - For use when bench-marking UV curing-system operational settings across multiple machines for comparable results for UV coating film-cure - For use when evaluating UV curing-system performance at graduated operational settings for machine speed and/or UV system output - Total dosage of UV energy is expressed in mJ/cm²; range is 30 mJ/cm² - 1000 mJ/cm² - 5 'patches' located on individual test strip will color-change immediately when exposed to UV energy. The greater the UV total dosage exposure, the more significant the color-change - Adhesive backing of the test strip allows for placement on the substrate for UV curing-system exposure
Storage/Shelf-Life	<ul style="list-style-type: none"> - Shelf-life is rated at 12 months minimum - Store in original packaging and out of direct light and store away from excessive heat/moisture - Store package flat/horizontal, not vertical - Ideal storage location is within a cool and dry location such as an office desk drawer
Test Procedure	<ul style="list-style-type: none"> - Determine areas of the sheet/web to be measured for UV dosage. Typically, it is recommended to evaluate the sheet/web from edge-to-edge to determine any system deficiencies at the ends of the curing-system related to UV lamp degradation and/or reflector contamination. On sheetfed applications, gripper-tail testing can also be conducted to test for 'gripper-shadow' or UV dosage variations related to disruptive sheet turbulence during sheet travel beneath the UV curing-system - Remove UV test strip stickers from backer and attach to the sheet/web in the desired locations with the stickers oriented to machine direction; see diagram on following page. <u>No ink/coating should be applied</u> - Pre-determine machine/curing-system parameters and document on test sheet for reference; ie machine speed, UV power setting/amps/volts, UV lamp hours/condition, UV reflector condition - Expose test sheet to the UV curing-system <u>without ink/coating</u> at the pre-determined machine/curing-system parameters and remove from the press. Observe color-change of the test strips and compare to the key chart - It is recommended to conduct two tests for the initial evaluation to confirm results

Testing Method - *continued*

Test Strip Sheet Layout

Test strips should be positioned on the sheet/web to evaluate the entire sheet/web width from edge-to-edge, with the stickers oriented in machine-direction. For sheetfed applications, evaluating the sheet length is also recommended. The below diagrams depict how to position the test strips in both sheetfed and web applications; when testing the UV curing-system, it is recommended to use maximum sheet dimensions to survey the entire length of the UV lamp/reflector:



UV Fastcheck Strip Key Chart

The un-exposed test strip contains 5 yellow patches that will change color when exposed to UV energy, with the severity of the color-change being reflective of the amount of total UV dosage exposure. The five patches will color-change in graduated 'steps', with all patches not achieving the same color density; the first patch will have the most immediate and significant color-change when exposed to UV energy. The test strip patches will be yellow in color when un-exposed, and will gradually turn green depending on the total dosage of UV energy that the test strip has been exposed to as indicated by the images below:



Using the supplied UV Fastcheck Strip Key Chart, a visual evaluation of the exposed test strips can be conducted to approximate the amount of UV exposure in a value of mJ/cm². The dosage of the test strip and representative color-change is a direct reflection of the UV energy output of the curing system at a given system condition and at specific operational settings for machine speed(dwel) and system power (UV output/wpi). The greater the total UV dosage that the test strip is exposed to, the darker the color-change result. The UV Fastcheck Strip Key Chart has graduated color references ranging from 30 mJ/cm² to 1000 mJ/cm².

Recommended UV Dosage

When using UV coatings from CAC, the recommended starting target dosage of UV energy to ensure proper film cure is 225 mJ/cm². Since the UV Fastcheck Strip Key Chart only references 200 mJ/cm², the color-change result should be slightly darker than this area of the key chart. A total dosage result that is lower than 225 mJ/cm² can result in an under-cured UV coating film and associated problems. A total dosage result that is higher than 225 mJ/cm² can result in an over-cured UV coating film and associated problems. Keep in mind, the UV curing equipment being used can influence the target range for mJ/cm² as different curing-systems and UV lamps can vary in their spectral output profile which will impact the resulting UV coating film cure. Profiling the curing-system for optimum results should take into account the UV coating formulation and associated cure-response as it pertains to optimum film cure. Based on the actual cure-results of the UV coating film achieved using the respective UV curing-system, adjustments to the target UV dosage may be necessary.

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Testing Method - *continued*

Recommended UV Dosage *(continued)*

Use of the KMnO₄ UV Cure Stain Test in conjunction with the UV Fastcheck Strips is the best method to collectively base-line the UV curing-system using two separate measurement methods. Using the KMnO₄ UV Cure Stain Test, optimize machine/curing-system operational settings to achieve optimum measured film-cure of the UV coating product, then use UV Fastcheck Strips to measure and correlate the actual UV dosage to the optimized film-cure results. This creates a base-line result/target for the UV curing-system using the UV Fastcheck Strips for the amount of UV dosage that is required to achieve the desired film-cure results for the UV coating product. Moving forward, this base-line target can be used to spot-check the UV curing-system for performance using the UV Fastcheck Strips.

Other Considerations

- As the exposed UV Fastcheck Test Strips age, the resulting color-change will fade over-time. Due to this, test sheets with exposed test strips cannot be saved for future reference or comparison as the color-change result will be invalid. When using the test strips, evaluation of the color-change of exposed test strips to the UV Fastcheck Strip Key Chart should be done immediately and aged exposed test strips should be disregarded for accuracy.
- Only use a UV Fastcheck Strip Key Chart that is supplied by the manufacturer. Do not use copies of the chart for reference as color deviations of the output device used to create the copied chart can make it inaccurate and invalid.