

## How do you check the white ink layer quality on transparent film?

The quality of color graphics printed on clear film is highly dependent upon the white ink background. The white background enhances the Chroma of colors, improves the readability of bar codes or QR codes and helps meet target color specifications. Color ink quality specifications are widely understood and measured with industry-standardized instruments and techniques. White ink specifications require different instruments and techniques in order to obtain accurate and actionable measurements. The quality of the white ink layer can be measured by two criteria:

1. The opacity or hiding-power of the white ink layer
2. The homogeneity or smoothness of the white ink layer

Today a standard densitometer is used to measure the opacity of the white ink. The density of a black reference is compared to the density of the white sample. Because density is a logarithmic value the measurement resolution is quite low on bright samples while it is quite high on dark samples. It is not possible to detect small variations on the white ink layer.

FAG has developed the FAG OPADENS, an easy to use, application-specific measurement device that measures the small variations on bright samples with high resolution.



Fig.1 : FAG OPADENS

The OPADENS measures the opacity in relation to a white reference (100% opacity) and a black reference (100% transparent equal to 0% opacity)

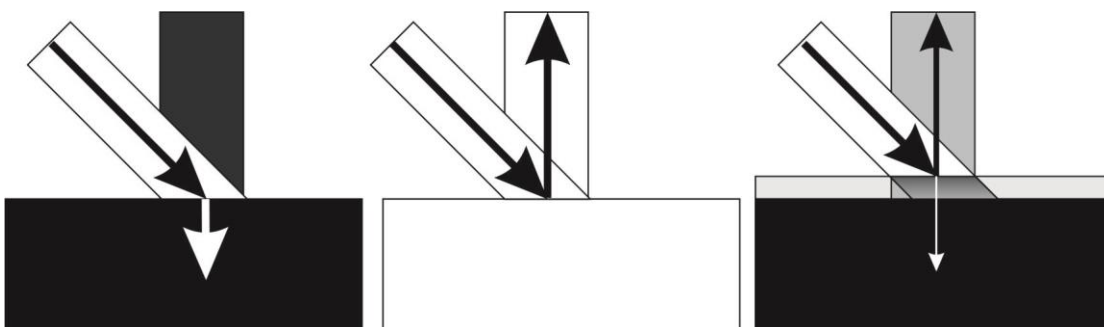


Fig 2: Measurement principle for white ink opacity measurement

A black surface does absorb any light such as no light will be reflected and reach the sensor of the device. The white surface does reflect all light and all light reaches the sensor of the device. Now placing a transparent film sample with white ink onto the black background, some light will go through the film and be absorbed by the black background. Some light will be reflected by the white ink layer and reach the sensor of the device. The amount of reflected light is the opacity of the white ink film.

Use the FAG OPADENS to measure the opacity as follows:

- The black reference is measured with left key depressed
- Next the white reference is measured with the middle key depressed
- Finally, various locations of white ink areas can be measured with the black reference behind the sample
- The device displays the opacity in terms of a number between 0 (transparent) and 100 (opaque).

The usefulness of Opacity measurement is not limited to white ink used as a background for color graphics. Many perishable products must be protected from ambient light in order to preserve their freshness and quality. In this case the graphics also serve as a functional barrier layer. The effectiveness of the ink film can also be measured using the Opacity method. When the opacity of two different colors need to be compared, for example a red color and a gray color, then the white reference is no longer the best choice for the 100% reference.

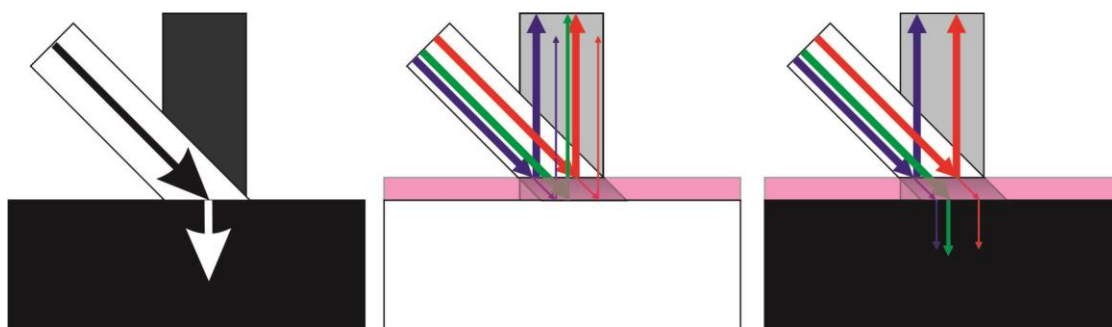


Fig 3: Measurement principle for color ink opacity measurement

The black reference for 100% transparency works for both, white and color samples. The color sample on top of the white reference is used as opaque reference to check the opacity of color samples. Fig. 3 shows that the blue and red spectral bands of the emitted light are reflected by the magenta ink film or the white background such as all blue and red light components will reach the sensor of the device. The green spectral bands will pass the magenta ink film and be reflected by the white background or they will be absorbed by the magenta ink film. Measuring this will store the spectral behavior of the sample into the device.

Comparing the measurement with a measurement with the sample placed on the background will supply the color independent opacity of the sample as the light passing the sample will be totally absorbed by the black background.

Said in easy word: if you cannot see any difference between white and black background while looking through the sample, then your sample is 100% opaque.

Use the FAG OPADENS as follows to measure the opacity of color ink film:

- Measure the black reference with left key depressed
- Place the white reference below the sample with colored area
- Measure the opaque reference on the colored area with white reference below with middle key depressed
- Place the black reference below the colored sample
- Measure the opacity without pressing any key

The measurement value is the opacity of the sample in relation to white light.

The tools and techniques described here give the press operator accurate information about the performance of the printing system beyond the usual density and colorimetric measurements. These parameters are critical in producing high quality ink layers on transparent film. The flexible packaging will be colorful, the products will be properly protected, and bar-codes or QR-codes can be read without problems.

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