Target Mottle Variation in paper and board

Traditional measurements of paper with regard to surface variability have focused on “roughness” as a predictor of print quality involving the paper under test. Various air leak tests have been applied to yield a roughness value that could represent good performance versus bad performance in conventional print techniques that involve subjecting the substrate to pressure in the print process.

Another property of substrate variability, especially in communication-grade white paper, is the property of Formation. A formation value is established by passing light through a substrate and assigning a value to the variability in light/dark appearance of the paper.

The above-mentioned techniques, however, have been superseded by changes in the paper and print industry. First, many of the print techniques involving nip pressure during the press roller contact on the paper have been replaced by non-contact printing involving electrostatic or ink jet technology. Secondly, as the demand for packaging-grade paper has grown and the demand for communication-grade paper has diminished, devices designed to pass light through white paper have difficulty doing the same with heavier and denser packaging materials. However, there is still concern for producing papers that are less-variable in visual appearance.

The Verity IA Software Target Mottle Variation technique for describing variable sheet appearance does not depend on putting the test specimen under pressure nor does it require light transmission through a test specimen. Instead, light is reflected off the surface of the test specimen and received by a scanner camera where the luminance value of every pixel is recorded and the variation in luminosity values across the sheet is analyzed and described as “Mottle”. The lower the value of Mottle, the more even is the sheet appearance.

Formation has been the go-to sheet variability descriptor in communication-grade paper. It was convenient because light from scanners could easily pass through the specimen sheet, just like holding up a sheet of copier paper to the light and observing the mottle “clouds”. However, the density or thickness of board grades precludes most transmitted light from passing through the specimen. Therefore the reliability of assessing the formation “clouds” is difficult to attain.

The mottled appearance of a sheet of, say, liner board can be treated as a surface phenomenon. A pixel analysis of the sheet surface should yield a data description that agrees with visible assessment. Verity IA Software has developed just such a description, using a flatbed scanner to generate the detailed image. The scanner accepts standard 12” x 12” specimens resulting in a scan area of a large enough size to characterize visual Mottle phenomena over a large area at 600 ppi. The Verity IA system can scan the 12x12 sheet, assign a luminosity value for every pixel and return a numeric result in less than a minute. Results data are stored in Excel files and can be uploaded to a data collection system.