

Short abstract proposal: X-ray based characterization of paper and board non-uniformity

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All fiber based products have an inherent non-uniformity in their mass distribution due to the unavoidable entanglement of fibers during the wet laid (conventional) or air-laid (non-woven) forming processes. Most applications require that this uniformity be minimized since the inevitable distributed void areas lead to low strength and subsequent failures in product applications requiring compression or tensile endurance. The most common popularized method for qualitatively assessing non-uniformity called the formation of a sheet, is simply made by examining the variation of transmitted light through the sheet material. Despite its convenience and popularity, this measurement is misleadingly influenced by the presence of coatings, fillers, dyes and the density of the sheet. Analysis of transmitted x-ray images however, avoids all of the optical effects since the attenuation of x-rays through matter are unaffected by optical properties but are dependent on atomic number. Recent availability of portable solid state low energy x-ray imaging systems allows this technology to be implemented for paperboard applications. What is required and proposed here is the development of a post processing analysis method of transmitted soft x-ray images to correlate intensity variation with mass variation using a calibration technique and look-up table. The result will be a readily available and established technique using commercially available equipment to unambiguously quantify the mass non-uniformity (formation) of any paper or paperboard product regardless of its basis weight, color, density, filler or coating content or composition.