The negative impact of uneven calendering on web properties and strength

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Extended Abstract

Research was conducted at FPInnovations to evaluate the impact of out-of-round calender rolls on paper and board properties and to try to understand the relationship between properties variations and web breaks at pressroom and converting plant. Out-of-round calender rolls can be expressed as roll surface out-of-roundness (oval shape or presence of residual barring) and roll eccentricity (roll is round but its center is not concentric to its surface). Uneven calendering due to calender rolls out-of-round will lead to web properties variations in machine direction which in turn will deteriorate the web quality and the web runnability on printing presses and converting equipment. In this presentation, we will first quantify the effects that non-uniform calendering may negatively have on web properties such as caliper, gloss and web strength.

Uneven thickness variations in machine direction can affect reeling and winding, causing equipment vibrations and roll defects. Uneven gloss variations will be visually seen as a quality problem by customers due to uneven print pattern and non-uniformity of the final product. But more importantly, uneven calendering will cause tensile and stretch variations in machine direction, decreasing the uniformity and exhibiting more weakness in the web. Research has shown that strength non-uniformity significantly increases the risk of web breaks, especially when tension variations are present on press and on converting equipments. Older machinery and lack of maintenance will also be more demanding on the web and contribute to increase the risk of web breaks related to strength non-uniformity.

Grinding rolls is an easy solution to correct calender rolls out-of-roundness; however if the rolls are not perfectly round or exempt of residual variations after grinding, the replacement rolls might cause similar issues after only a few days or weeks of operation. Out-of-round specifications of calender rolls for high speed machine may be very small (down to 0.2 thousandths of an inch). On the other hand, surface variations due to residual barring for example may require very severe grinding tolerances (down to 0.05 thousandths of an inch). As most grinders are not equipped to accurately grind rolls with an acceptable level of out-of-roundness and eccentricity, they cannot effectively reach the tolerances required. Adequate grinding techniques, in parallel with good stack configuration, can help mills to improve calendering operations and increase web quality, strength and runnability.