Effect of Blade-Tip Shape on the Doctoring Step in Gravure Printing Processes

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Gravure printing is a viable way to produce large-area, low-cost electronics on flexible substrates due to its high throughput and high resolution. One key step toward higher resolution lies in the use of a doctor blade for wiping excess liquid from the non-print area of the gravure roll, ideally leading to zero residual film thickness. Unfortunately, minimizing residue increases the likelihood of solid–solid contact between the blade and roll, resulting in blade wear and possibly damage to the roll. Therefore, an optimal doctoring process requires a balance between minimizing residual film thicknesses and minimizing solid–solid contact.

We have developed a multiphysics model used to study the doctoring step. The model couples the lubrication flow of the liquid film and the motion and deformation of the doctor blade [1]. In this presentation, we will present the use of that model to predict the effect of blade tip shape on residual film thickness and the likelihood of blade-roll contact, as a function of printing speed, configurations, i.e. forward and reverse doctoring, and loading force [2]. The effect of doctoring on a well-known print defect called “drag-out” will also be examined.

References:

1. Hariprasad, DS, Grau, G, Schunk, PR, Tjiptowidjojo, K, ‘‘A computational model for doctoring fluid films in gravure printing.’’ J. Appl. Phys., 119 135303 (2016)

2. Tjiptowidjojo, K., Hariprasad, DH, and Schunk, P.R. ‘‘Effect of blade-tip shape on the doctoring step in gravure printing processes.’’ J. Coat. Technol. Res. DOI: 10.1007/s11998-017-0029-0 (2018)

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