Electrostatic Assist Using a Patterned Backing Roller for Slide Hopper Coating

Mark C. Zaretsky, Robert R. Quiel
Eastman Kodak Company
Rochester, NY
email: mark.zaretsky@kodak.com

***Abstract*— Traditionally, groove patterns have been used on rollers to provide traction over a wide range of speeds (from 100 to 3500 fpm) when conveying and coating webs. However, there are several classes of specialty rollers where typical groove patterns and depths cannot be used because of the nonuniformity that the pattern introduces into the coating. In particular, when using an electrified backing roller in a slide hopper coating process, the nonuniform electric field arising from a grooved pattern can create a coating nonuniformity. Increasing the groove spatial frequency from a typical 24 groove-per-inch (gpi) to frequencies of 80 to 100 gpi, while reducing the groove depth, is a practical solution to this problem. The electric field nonuniformity is significantly reduced, while maintaining good traction for web conveyance. Increasing the groove frequency exploits the Laplacian solution to the electrostatic problem for these patterned rollers, whereby the electric field decays exponentially away from the roller surface, with a characteristic length that is inversely proportional to the groove frequency. The higher the groove frequency, the lower the field nonuniformity with distance from the roller surface. Experimental results will be presented that document the benefits of this approach for a 100 gpi slide hopper backing roller when using electrostatic assist. Coating nonuniformity reductions of 100X or more are realized for various coating structures.**