

Optimal shim design for non-Newtonian coating liquids in slot coating process

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Slot coating process with many advantages (e.g., high precision and fast processing time) has been regarded as one of the key coating processes in manufacturing IT products. In order to produce uniform films, it is important to evenly distribute coating liquids onto the web by considering rheological properties of coating liquids and controlling die internal configuration. A slot die with specialized chamber and slit structures, which provides the coating uniformity for a selected coating liquid, cannot always guarantee the similar level of uniformity for other rheologically different liquids. It is undesirable to replace very expensive slot dies independently optimized for various non-Newtonian liquids. One idea is that the shim modification without changing the manifold structure of a given slot die can effectively minimize the non-uniformity of coating flow inside the die. Using the three-dimensional computations, it is confirmed that dimensions of hybrid shims for controlling flow features at edge and center regions within slit channel are positively tuned, according to the shear-thinning level of coating liquids.