

## **Versatile Sputter Roll Coater for Production of Optical Multi-Layers on Flexible Substrates**

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Applications for displays increasingly require optical coatings on PET films for anti-reflective (AR), anti-static (AS) and transparent conductive applications.

ARAS multi-layers combine all these features in one multilayer stack. Such films deposited on PET or other appropriate plastic film materials are usually laminated on flat display screens or CRT monitors but most recently are also applied to flexible displays as well for enhanced color contrast and suppression of undesired reflection. ITO based TCO coatings are commonly used on flexible substrates for touch panels and as low ohm layer in actively addressed display matrixes.

The selection of appropriate pre-treatment technologies and reactive Dual Magnetron Sputtering process offers the best precondition to combine both high production yield and excellent film uniformity cross and down web direction.

The presentation focuses on various design issues for single and double drum sputter roll coaters designed for achieving excellent coatings on flexible substrates with film thicknesses from 25  $\mu\text{m}$  to 200  $\mu\text{m}$  and on the variety of applicable technologies within the coating machine. The considered coating width typically amounts to 1.3 m. The equipment concept precisely separates the pay-out and take-up function, smart gas separation between different sub-chambers, precise winding system, plasma pre-treatment, individual controlled reactive sputter deposition processes to deposit optical films with lowest absorption. Finally, the measurement equipment for *in-situ* monitoring allows performing transmittance, reflectance and resistance measurement on the coated films ensuring excellent film quality inspection dedicated to mass-production lab-coating as well.

The paper highlights relevant layer stacks applied versus the related target configurations of the magnetrons. The coater is equipped with up to ten large area dual magnetrons to be operated in bipolar AC mode. For such large area reactive sputter processes the results of the dynamic deposition rates are discussed with respect to oxides film coatings like SiO<sub>2</sub>, TiO<sub>2</sub>, Nb<sub>2</sub>O<sub>5</sub> ZAO and ITO. A comparison of productivity issues is provided for both different production coater configurations and related layer stacks considering the achievable total web speed.