Proceedings of the Annual General Donald R. Keith Memorial Conference
West Point, New York, USA
May 4, 2017
A Regional Conference of the Society for Industrial and Systems Engineering

Roll-to-Roll Processing and Inspection: An Analysis of Optical Defect Inspection of Aluminum Depositions on Flexible Substrates

Ryan McGinn[1], Nicholas Pascale[1], Daniel Hart[2], Daniel Muller[2], Garrett Sklar[3], Dr. Mark Poliks[1] and Dr. Gang Sun[4]

[1]Systems Science and Industrial Engineering Department, Binghamton University, Binghamton, NY 13902

[2]Electrical and Computer Engineering Department, Binghamton University, Binghamton, NY 13902

[3]Mechanical Engineering Department, Binghamton University, Binghamton, NY 13902

[4]SunOptical Systems, LLC

Corresponding author's Email: npascal1@binghamton.edu

Author Note: An interdisciplinary team of senior engineering students from Binghamton University completed this project over the course of the academic year with a faculty advisor. We would like to thank the senior and graduate research assistants at the Center for Advanced Microelectronics Manufacturing, Robert Malay, Christian Bezama, and Joseph Steiner for their assistance and support. Additionally, we would like to thank Gang Sun of SunOptical for providing the sensors and technical support. Lastly, we would like to thank Dr. Mark Poliks for allowing us to conduct our senior project within the facility.

Abstract: Thin film manufacturing is integral to the packaging of integrated circuits onto flexible substrates. In Roll-to-Roll (R2R) manufacturing it is important to possess the capability to continuously inspect deposited materials and to acquire defects data for each sample. The team designed a mounting bracket to fit into a Roll Conveyance Tool for the installation of a non-contact optical sensor. Image processing algorithms were developed to locate and record defects, based on images captured from the sensor. The completed R2R Inspection System examined deposition quality via a 13 mm width line scan of aluminum depositions on polyethylene terephthalate (PET). After verification experiments, it was determined that this system is comparable to using a human operator, with additional benefits: defect categorization, location tracking, and reduced variability in results.

Keywords: Roll-to-Roll, Thin Film, Thin Film Inspection, Optical Inspection, Aluminum Deposition, Raspberry Pi