University of Huddersfield Repository

Elrawemi, Mohamed, Blunt, Liam, Muhamedsalih, Hussam, Fleming, Leigh and Gao, Feng

Verification of an in Process Optical System based on High Resolution Interferometry for Detecting Flexible PV Barrier Films Defects

Original Citation


This version is available at http://eprints.hud.ac.uk/21292/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/
Verification of an in Process Optical System based on High Resolution Interferometry for Detecting Flexible PV Barrier Films Defects

*M. Elrawemi¹, L. Blunt¹, H. Muhamedsalih¹, L. Fleming¹ and F. Gao¹

*EPSRC Centre for Innovative Manufacturing in Advanced Metrology, University of Huddersfield, HD1 3DH, UK. Tel: [01484] 473536 E-mail: U0950234@hud.ac.uk.

Abstract

The relationship between surface morphology, defects density and water vapor permeability of aluminium oxide (Al₂O₃) barrier coating on polyethylene naphthalate (PEN) films, used particularly to prevent water vapor and/or oxygen ingress into flexible photovoltaic (PV) modules has to date been studied in the laboratory. However; detecting defects off-line for flexible PVs is difficult and time consuming, and as such devices are manufactured by R2R methods this procedure can often result in large quantities of barrier films being manufactured before defects are detected. In addition, the quality requirements and line speed are continuously increasing and off-line methods are not efficient to operate within these requirements. Hence, it is desirable to make use of non-contact optical based in-line inspection systems during PV manufacturing processes. Nevertheless, implementing highly accurate in-line (optical) measurement system in the PV production environment can be challenging, as the requirements on positioning and stability are demanding. This research paper reports on the deployment of new in-line interferometric optical technique based on wavelength scanning interferometry (WSI), for detecting PV barriers defects. The instrument has built-in environmental vibration compensation, providing areal measurement at high speed of less than a second per field of view. The technique is being deployed on a demonstrator system at a Roll2Roll production facility as shown in Figure 1. The results show the capability of the WSI to be used as a quality assurance tool in PV production lines, where the results compare favourably with off-line metrology techniques.

Figure 1: WSI deployed in R2R facility