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1 *Roll-to-roll inspection system*

ROLL-TO-ROLL INSPECTION SYSTEM

Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP

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For thin film applications a roll-to-roll optical inspection system is needed which fulfills the defect resolution requirement down to 1 µm region.

Fraunhofer FEP has developed a winding/rewinding system with integrated optical inspection system installed in an ISO class 6 clean area.

The system can operate with the following inspection modes:

- 100% web inspection with CCD linescan cameras with a pixel resolution down to 14 µm,
- automatic image recording with xy moveable microscope with high resolution down to 1 µm, depending on the objective magnification.

High resolution analysis of surfaces

The roll-to-roll inspection system consisting of CCD-linescan cameras is a powerful instrument to detect defects on homogeneous webs. Bright defects (reflected or scattered light) and dark defects (absorbed light) with different contrast or topography to the web environment can be detected. A rollmap, showing the position of the classified defects on the scanned area, will be created. The defects will be classified by their brightness and shape.

Further defect analysis of the 100% web inspection is possible by successive defect review with the moveable microscope. The higher resolution allows a better understanding of the defect origin.
The web handling avoids any front side contact to maintain the surface quality during the inspection. The winding unit is suitable for metal, glass and plastic films with a width of 300 mm and a thickness between 50 µm and 500 µm. For surface

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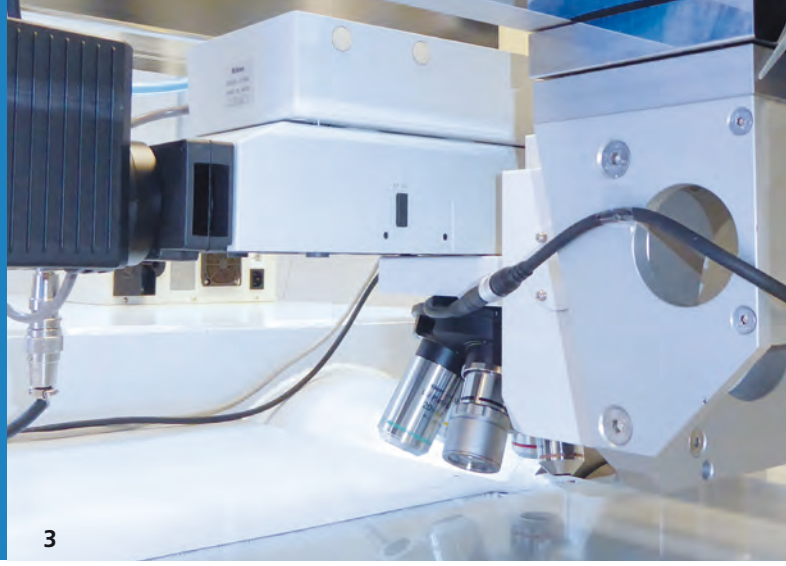

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protection it is possible to unwind and rewind a protective liner film. The tape guiding will take care of edge straight winding. If required web cleaning with sticky rollers can be performed.

Position data defects from pre-inspection can be combined with the position data of a post-inspection. There is a possibility to recognize additional, removed and remained defects of a process in one chart.

This method is suitable for:

- Identification of rollers/machines which cause scratches
- Comparison of cleaning technologies
- Determination of particle contamination by processes

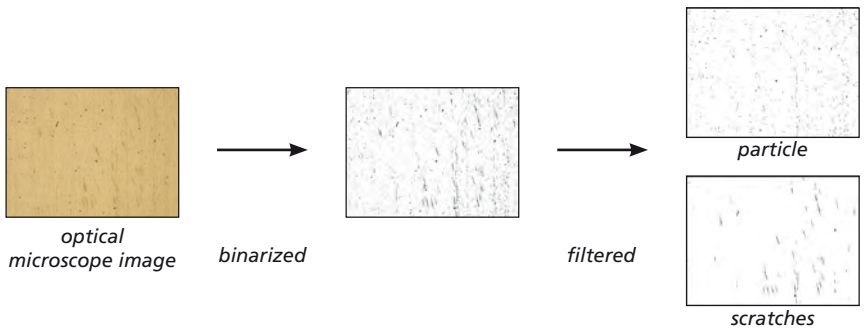
Our offer

- Roughness measurement by atomic force microscopy
- Thermal infrared measurement
- Luminescence-current-voltage (LIV) measurement
- Confocal microscopy
- 100% web inspection
- Defect density determination down to defect sizes ≈ 1 µm
- Quantitative defect classification

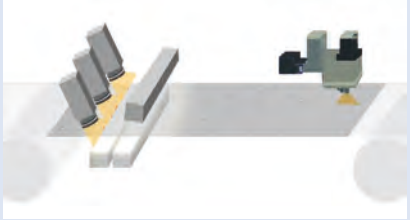
Technical data

	100% web inspection by CCD linescan cameras	automatic image recording with moveable microscope
samples	▪ homogeneous webs ▪ optical scanning of the surface during winding process	▪ homogeneous and patterned webs and sheets
resolution	▪ pixel resolution 14 µm ▪ defect resolution 40–50 µm (depends on the material)	▪ high resolution depending on magnification of used objective down to 1 µm region
defect classification	▪ possible	▪ possible
modes	▪ reflectance and transmission modes	▪ different reflecting light modes (bright field, dark field, DIC, UV)

Schematic drawing of image analysis



Schematic drawing of inspection system



2 *Sensors for edge detection*

3 *Moveable microscope*

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