MIDA X, the Next Generation in Optical Inspection

How Today’s QC-Systems Can Be Made More Powerful

Jochen Koenig
Schenk Vision Inspection Systems
Local defect detection & overall properties monitoring

- Design & manufacture
- Modular in-line and off-line inspection and measurement systems
- Quality & process control of flat surfaces for the following industries:

- Nonwoven Inspection
- Textile Inspection
- Paper Inspection
- Plastic Inspection
- Metal Inspection
- Glass Inspection
- Display & Touch Panel Inspection
- Solar Inspection
- Material Handling
- Customized Solutions
Ready for Your Project
Production Line with In-Line Inspection

Extrusion, Coating, Drying

Inspection base film

Inspection after coating

Inspection after drying
Quality & Process Control for Coated Materials

Production of Base Material
- Extruder
- Castline
- Blow Line

Converting of Material
- Coating

Final Inspection of Base Material / Incoming Quality
- Grammage
- Reflectivity, gloss
- Inclusions
- Fish-eyes
- Gels, Knots ...

Converting Steps / Final Quality
- Coating voids
- Pinholes
- Inclusions in coating layer
- Bubbles
- Coating streaks ...
- Layer thickness
- Surface structures (haze)
- ...
System Configuration

Reflection Darkfield + Brightfield
Transmission Brightfield

Illumination BRIGHT_LINE

Material

Illumination BRIGHT_LINE

MIDA Camera Technology
Example: combination reflection + transmission channels

- High sensitivity for many different defects (e.g. inclusions, holes, contaminations, embossing defects, lines, cluster, wrinkles, …)
- Comprehensive defect analysis for reliable defect classification
- Only one camera - saves footprint and investment costs
One System – Two Tasks

Shared Hardware

Local Defects

Material Analysis

EasyInspect with EasyMeasure is a complete & unique solution
Base Film: Detection of Local Defects
## Inspection & Measurement of Plastic Films

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**Local Defect Detection**

**Film Properties Monitoring**
Inspection Results Base Film

Material: Flexible Packaging Base Film

Defect: Particle, Inclusion

Transmission Brightfield

Reflection Brightfield

Reflection Darkfield
Inspection Results Base Film

Material: Flexible Packaging Base Film

Defect: Gels

Transmission Brightfield

Transmission Brightfield
Knife Edge
Inspection Results Base Film

Material: Flexible Packaging Base Film

Defect: Wrinkles

Transmission Brightfield

Reflection Darkfield
Coated Film: Detection of Local Defects
Examples for Defects and Inhomogeneities

Examples for local defects in coated films

- Through hole
- Pinhole
- Inclusion, stain
- Stain, particle
- Overcoated particle
- Scratch
- Coating agglomeration

Variation in layer thickness
Variation in layer surface topology (haze)
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Material: Packaging film, coated

Defect: Spot / coating void

Brightfield Transmission

Brightfield Reflection
Material: Packaging film, coated

Defect: Coating void / particles

Brightfield Reflection

Darkfield Reflection
Material: Packaging film, coated

Defect: Oil contamination

Transmission Brightfield

Reflection Brightfield
Inspection Results Coated Film

Material: Packaging film, coated

Defect: Orange peel, gels

Transmission Brightfield

Transmission Brightfield/Knife Edge
Material: Plastic film, waterbased coating

Defect: Dewetting

Reflection Brightfield

Reflection Darkfield
Inspection Results Coated Film

Material: Plastic film, extrusion coating

Defect: Coating streak

Reflection Brightfield
Streak detection
Inspection Results Coated Film

Material: Plastic film

Defect: Bubbles in extrusion coating

Transmission Brightfield

Reflection Brightfield

Reflection Darkfield
Inspection Results Metallized Film

Material: Packaging Film / Metallized

Defect: Metal void, pinholes
MIDA → MIDA X: Closing the Intelligence Gap

The 1st revolution in optical inspection

MIDA

Hardware

Multi-Processor Technology

Multi-CPU / GPU Architecture

Software

Multi-threading capability

Architecture EXPLOITS hardware optimally

The 2nd revolution in optical inspection

MIDA X
next-generation
MIDA X: Visual Intelligence

The way to higher yield

Gray image with reduced noise

MIDA X: real defect size

Enhanced evaluation
MIDA X: Precise defect differentiation

Gray Image

Standard Inspection

MIDA X

Contamination

Insect
Filter Mat / Nonwoven

Conventional: white light + color line camera

MCI Technology: 3x more light!
Multi-Color-Illumination + monochrome line camera
Filter Mat / Nonwoven

Conventional Color Camera

Dr. Schenk MCI Technology
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Examples for local defects in coated films

- Through hole
- Pinhole
- Inclusion, stain
- Stain, particle
- Overcoated particle
- Scratch
- Coating agglomeration

Examples for layer inhomogeneities in coated films

- Variation in layer thickness
- Variation in layer surface topology (haze)
Monitoring Coating Thickness

Material: PET with coating

Variation in coating layer thickness

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<th>Samples</th>
<th>V0</th>
<th>V1</th>
<th>V2</th>
<th>V3</th>
<th>V4</th>
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<td>Average Grey Level</td>
<td>~32.300 GL</td>
<td>~25.900 GL</td>
<td>~23.900 GL</td>
<td>~22.700 GL</td>
<td>~21.100 GL</td>
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<td>Coating Thickness (μm)</td>
<td>19 μm no coating</td>
<td>+3 μm coating</td>
<td>+4 μm coating</td>
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R² = 0.9911
In-Line Coating after MDO / Monitoring after TDO

Extrusion → MDO-stretching → Coating → TDO - stretching

Coating after MDO, thickness 5 µm

Thickness after TDO:
- Base film: 30 µm
- Coating: 1000 nm

1000 nm ~1.200 Graylevels (GL) => 1 GL ~ 0.8 nm
Homogeneity Map

Material: Plastic film, extrusion coating

Defect: Flow lines

Reflection Brightfield

Reflection Darkfield

Gray Image

Homogeneity Map
Monitoring Adhesive Coating / Tapes

Material: Coated paper

Defect: Gloss variation

Reflection Brightfield
Film / Coating Properties Monitoring

Material: Battery electrode film

Monitoring of calandering

- calandered area
- not calandered area

Camera

RDF

Grayvalue count

Histograms showing differences in grayvalue counts between calandered and not calandered areas.
Inspection Results Coated Film

Material: Plastic film

Defect: Missing adhesive

Reflection Brightfield

Reflection Darkfield
Advantages of AOI

- Cost reduction in converting
  - In-line quality check prior to subsequent process steps
- Increased Yield
  - Continuous monitoring of material/coating layer
  - Process remains within process window
- Consistent Performance
- ROI < 2 years
  - 24 h/day + 7 days/week
  - Based on customer experience depending on various factors
Summary and Conclusion

- Quality data
- Reports and statistics
- Inspection system
- Process optimization
- Process parameters adaption
- Production process
- MES (Management Execution System)
- PIs (Performance Indicators)
- Inline quality control
- Delivery to customer
- Rejects
Thank you for your attention

Jochen Koenig
Managing Director
Schenk Vision
Inspection Systems

www.schenkvision.com