Solid State Laser Reflection (SSLR) Technology for Clear and Reflective Webs
Laser Scanners

Pros

- Superior detection of distorting and scattering defects.
- Multiple optical channels/”views”.

Cons

- Resolution limited.
- Very expensive.
- Difficult to install.
- High maintenance costs.
Camera/AOI Systems

Pros

- Low cost.
- High resolution.
- Solid state; no moving parts.

Cons

- Optical limitations.
- Difficult to install and maintain alignment, & calibration.
- Limited modularity and upgradability.
- High energy consumption.
The IDEAL Clear Film/Glass or Reflective Media Inspection System

1. Detection levels to 5µm - 10µm.

2. Operates on a production line (not clean room).

3. Easy to install.


5. Consistent performance. Self aligning; no need to retune/adjust/calibrate.

6. Low maintenance, low energy consumption—no light bulbs!
IDEAL Inspection System (continued)

7. All active components on one side of the web.
9. 100% haze measurement.
10. Modular; easily upgradable.
11. Domestic support; field service, engineering, development, production.

12. Reasonable cost!!!!!
NxtGen® SSLR
Solid State Laser Reflection

The most significant advance in plastic film, glass and metals inspection in 20 years.

2. The beam interacts with the defect and expands as the beam moves away from the web.

3. The image of the defect expands; an enhanced defect image is created.

4. The enhanced defect image hits the Laser Reflector. The Laser Reflector sends the image back along the incident path.

5. Line scan cameras inside the SSLR image the defect at plane A-A, capturing the enhanced and enlarged defect.
NxtGen® SSLR ReflecXun

Reflective Glass/Film/Coil inspection.
Conventional reflection systems are HIGHLY unstable; slight changes in reflection angle can mean missed defects and false alarms; constant tuning required.

SSLR - the ONLY self-aligning system in the world. It solves the problems associated with missed defects, false alarms and alignment.

The light EMITTER and COLLECTOR are the same module.
SSLR Technology - Examples
SSLR Comparison with Conventional Cameras

Conventional Camera System
White Light

Same Resolution, BUT
18 Times More Pixels of Information!

18X Optical Enhancement

NxtGen® SSLR
Coating Defect – ITO on Clear PET

NxtGen® SSLR vs. Conventional Systems

Same System Resolution

Microscope Image

Conventional Camera/AOI

NxtGen® SSLR

Same Resolution, BUT
12 Times More Pixels.

12 X

Coating structure
Clear Film – Camera/AOI vs. NxtGen® SSLR

Gels and Distortion Line

Same System Resolution

Conventional Camera/AOI System

NxtGen® SSLR

Gels and Distortion line lost in background.

Gels and Distortion line easily detected.
Clear Film – Camera/AOI vs. NxtGen® SSLR

Crater

Same System Resolution

Conventional Camera/AOI System

NxtGen® SSLR

Crater barely detectable.

Crater easily detected.
Clear Film – Camera/AOI vs. NxtGen® SSLR

Gel String

Same System Resolution

Conventional Camera/AOI System

Gel string not detectable.

NxtGen® SSLR

Gel string easily detected.
Clear Coated Film
Orange Peel – NxtGen® SSLR

Orange Peel not detectable with conventional camera/AOI.
Repeating Defect, Reflective Film

Same System Resolution

Conventional Camera/AOI

NxtGen® SSLR
Metal Coil - Scratches

Microscope Images

8µm Scratch (width)

Scratch Cluster

NxtGen® SSLR System Images
65µm Resolution
Repeating Defects

Roll Marks

Dimples

Repeat Interval = Roll Dia.
Note: Evaluation was performed on dirty samples, not in a clean room.
NxtGen® SSLR - Aerospace Glass
NxtGen® SSLR - ITO on Glass

- NxtGen® SSLR scanner.
- Transmission operation.
- No active modules under the line.
NxtGen® SSLR Extraordinary Benefits

◆ Optical enhancement means
  ➢ Superior detection.
  ➢ Extraordinary performance for less cost; fewer pixels, less processing.
  ➢ More accurate sizing.
  ➢ Greater depth of field. Patent pending!

◆ Solid state means no maintenance. Reliable, consistent operation. No light bulbs! No moving parts.

◆ Self-aligning means
  ➢ No need to monitor and tune system.
  ➢ System not affected by vibration or mechanical drift.
  ➢ No shrouding.

*No active modules under the production line.*
Typical Operator Screen

- **Spot inclusions - Repeating**

- **Defect Image**: Click on this button to save defect image to a file

- **Save Image**: 1.00

- **Roll-map showing repeating and non-repeating defects**

- **Defect List**: This window lists all defects detected in the current coil. Clicking on a defect in the list displays the detailed defect feature and the image in the defect data window.

- **Repeat Defect List**: This window lists all repeating defects.

- **Defect Data**: This window displays detailed information about the last or selected defect.
Software: Data and Image Files

- **Defect data:** Defect locations, sizes, classification, gray scale values and other information are logged into an XML file.

- **Defect image:** The image of the defect for each panel is captured as a TIF or JPEG file.
**Defect Action Matrix – Reject Alarms**

**Coated Film**

So, the system detected a defect. What next?

**Defect Action Matrix**

<table>
<thead>
<tr>
<th>Defect Classification</th>
<th>Ignore &lt;150µm</th>
<th>Small 150 - 300µm</th>
<th>Medium 300 - 800µm</th>
<th>Large &gt;800µm</th>
<th>Defect Density Reject if</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coating Void</td>
<td>Ignore</td>
<td>Report but do not reject.</td>
<td>Reject</td>
<td>Reject and Alarm</td>
<td>5 Ignores or Smalls in 1 ft.²</td>
</tr>
<tr>
<td>Scratches (width)</td>
<td>Ignore if width&lt; 75µm</td>
<td>Reject. Width 75-300 µm</td>
<td>Reject. Width 300-500 µm</td>
<td>Reject. Width &gt;500 µm</td>
<td>4 Ignores in 1 ft.²</td>
</tr>
<tr>
<td>Contaminant</td>
<td>Ignore</td>
<td>Report but do not reject.</td>
<td>Reject.</td>
<td>Reject and Alarm</td>
<td>4 Ignores in 1 ft.²</td>
</tr>
<tr>
<td>Coating Streak (width)</td>
<td>Ignore</td>
<td>Ignore if less than 1 ft. long.</td>
<td>Reject.</td>
<td>Reject and Alarm</td>
<td></td>
</tr>
</tbody>
</table>
Dark Field Production Rewinder & Conveyor
CT Engineering Center

◆ 60” x 24 ft sheet conveyor.  Speeds to 50 ft./min.
◆ Dynamic testing of full size sheets and panels.
◆ Rewinder for full scale simulations to 100 ft./min.
The IDEAL Clear Film/Glass or Reflective Media Inspection System

√ Detection levels to 5 – 10 µm.

√ Operates on a production line (not clean room).

√ Easy to install.

√ Easy to use – Windows 7.0 operation/interface.

√ Consistent performance. Self aligning; no need to retune/adjust/calibrate.

√ Low maintenance, low energy consumption—no light bulbs!
IDEAL Inspection System (continued)

√ All active components ABOVE the web.
√ Operation in ambient light – no shrouding.
√ 100% haze measurement.
√ Modular; easily upgradable.
√ Domestic support; field service, engineering, development, production.

√ **Reasonable cost!!!!**

SSLR technology improves quality, yield and cost for RTR processes
Thank You!

2011 Grand Prize Winner New Technology