

Surface Defect Detection

Documentation

Surface defect detection identifies holes, tears, voids, contamination, and other quality issues on moving webs in real time. Roll-2-Roll Technologies provides high-resolution sensors that detect defects as small as 1mm at line speeds up to 500 m/min—preventing defective material from reaching customers and enabling immediate process corrections. Unlike manual inspection or end-of-line quality checks, our sensors provide 100% inspection coverage, catching defects the moment they occur.

The Challenge: Defects Discovered Too Late

Traditional quality control methods create costly delays and customer rejections:

- **End-of-Line Inspection:** Manual inspection after winding means defective material has already been produced—requiring expensive rework or scrap.
 - **Sample-Based QC:** Inspecting only samples (e.g., every 10th roll) allows defective rolls to ship undetected.
 - **Operator Fatigue:** Human inspectors miss defects during long shifts, especially on high-speed lines or repetitive patterns.
 - **No Process Feedback:** Without real-time defect detection, operators cannot correlate defects with process parameters to identify root causes.
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The Solution: Automated 100% Web Inspection

Roll-2-Roll defect detection sensors scan the full width of the web continuously, identifying defects in real time and triggering automatic responses.

How It Works

1. **Full-Width Scanning:** Line scan sensors with viewing areas up to 960mm inspect 100% of the web surface
 2. **Defect Classification:** Advanced algorithms distinguish between holes, tears, contamination, and coating voids
 3. **Size & Location Mapping:** Each defect is measured and its location logged with timestamp and web position
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4. **Automatic Actions:** When defects are detected, the system can trigger alarms, reject mechanisms, or stop the line

Key Advantage: Real-time detection enables immediate process corrections—preventing continuous production of defective material that traditional end-of-line inspection cannot stop.

Key Benefits

- **100% Inspection Coverage:** Every centimeter of web is inspected—no sampling, no gaps
 - **Real-Time Process Feedback:** Defects detected instantly, allowing operators to correct process parameters immediately
 - **Prevent Customer Rejections:** Defective material is identified and removed before shipping
 - **Data-Driven Quality Improvement:** Defect logs enable root cause analysis and continuous improvement
 - **Eliminate Operator Fatigue:** Automated inspection provides consistent quality monitoring regardless of shift length
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Applications by Industry

- **Battery Manufacturing** — Detect holes, tears, and coating voids in electrode films that create cell safety hazards.
 - **Nonwovens & Hygiene** — Identify tears and holes in diaper topsheets and backsheets before assembly.
 - **Flexible Packaging** — Detect pinholes and contamination in barrier films that compromise package integrity.
 - **Medical Device Manufacturing** — Ensure defect-free materials enter sterile packaging lines (FDA compliance).
 - **Film Extrusion** — Detect gels, contamination, and thickness variations in real time during production.
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Related Solutions

- **Splice Detection** — Detect splices and joints
- **Flag Detection** — Identify defect flags and markers
- **Edge Detection** — Monitor web position