

Machine Vision Web Inspection Technologies

Superior Quality Control



RKB web based material imaging and measurement technologies provide superior quality control, increase production and slash costs. Smart sensors, advanced signal processing, reliable measurement and control software deliver optimum material qualities and maximum production.





Welcome to RKB

Founded over 55 years ago as Nash & Harrison Ltd., R.K.B. OPTO-ELECTRONICS, INC. (RKB) was the first commercial on-line web inspection manufacturer and supplier in the world. Today we are a global leader providing web based material manufacturers with reliable, accurate and quality machine vision imaging and inspection technologies unequaled in cost, performance and reliability. With our leadership, global presence, application knowledge and expertise, we offer products, systems, solutions and services that allow our customers to improve their quality assurance initiatives, process control, productivity and traceability.

RKB History

Known as Nash & Harrison Ltd, Ottawa, Canada, we designed and patented many of the void and defect fault technologies in use today by many multinational companies. Many installations dating back 30 years are still on-line performing with unprecedented reliability. In 1960, Nash & Harrison was acquired by Leigh Controls PLC (a United Kingdom company.) Under the guidance of Leigh, we designed, patented and successfully introduced the first camera-based web inspection system in the world for on-line quality assurance and control. Called the "Vidicon 7000", this innovative technology changed how many film manufacturers handled their quality initiatives and laid the groundwork for our revolutionary technology yet to come.

In 1976, RKB relocated to the United States to improve its logistics and purchasing power where it has remained today. In 1980, William Dobbie, considered one of the most renowned engineers in the web inspection industry and Leigh head design engineer acquired their inspection technology division and found RKB. In 1987, RKB introduced the first successful CCD line scan inspection system for use on high end watermark and security papers. In 1992, RKB designed and patented the web inspection industries first and only successful coating streak & scratch inspection technology. Using the most advanced defect signal processing technologies, experience and leading sensing solutions, RKB's coating streak and scratch inspection technology monitors any coated web material with detection capabilities down to sizes that no other technology or

company can compare to. Not only industry proven! RKB's streak detection technology will perform with unprecedented performance no matter what speed your production process may go. Called our OPTOMIZER®, it is the latest breakthrough in the art of quality assurance and control. This advanced scanner truly represents a quantum leap forward in high-speed, on-line defect fault imaging and inspection.

Many of our employees have been with RKB for more than 20 years with key personnel celebrating more than 25 years with RKB. RKB's technological expertise coupled with our leading market position and support disciplines provide all of our customers with leading edge technology that is unsurpassed in performance. Since we rely on openness and cooperation unlike other suppliers, RKB can offer customers the ability and flexibility to customize their inspection solutions to meet their quality assurance initiatives. This allows RKB to become an integral part and valuable link in the overall process of web based material manufacturing.

In addition to our Corporate Headquarters in New York, RKB successfully opened its Asian Headquarters located in Suzhou, China. Centrally located, our Asian facility provides our esteemed customers in the Pacific Rim area with quality technologies and services our customers here at home rely on. RKB also has affiliated partners and offices in Europe, South East Asia, Korea, and South America.

Tradition of Excellence

Early RKB technologies were based on patented ultraviolet, photomultiplier and infrared, phototransistor sensing technologies. Today! RKB uses a variety of sensing technologies that makes RKB the most diverse designer, manufacturer and supplier of machine vision technologies in the world. Over the years, our tradition of excellence in web inspection related design, manufacturing, service and support has been experienced by thousands of multinational, medium and private enterprises in a wide variety of industries throughout the international market. With so many inspection technologies installed worldwide, discover how you can benefit by choosing RKB for your next machine vision imaging project.

Table of Contents

INSIDE THIS ISSUE:

Welcome to RKB	2
Tradition of Excellence	2
RKB History	2
Mission Statement	4
High Performance and Reliability	4
Chose from a Broad Range of Products	5
Analyze Your Process	5
Model 1032 (Edge Mount Splice Detection System)	6
Model 1032B (Center Mount Splice Detection System)	6
Model 1032C (Center Mount Splice Detection System)	6
Model 1108 Keymark Registration Control Technology	7
Model 1122 Reject Gate Control Technology	7
Model 1280 Multicolor Spray Marking Technology	7
Model 2060 Flaw Detection Technology	8
Model 2084 Ultraviolet Hole Detection Technology	8
Model 3010 High Resolution OPTOMIZER® MV-WIS	9
Model 3020 High Resolution OPTOMIZER® MVS-WIS	9
Model 3030 High Resolution OPTOMIZER® MV/S-WIS	9
Model 3040 OPTOMIZER® MV-WIS	10
Model 3050 OPTOMIZER® MV-PHS	10
Model 3060 OPTOMIZER® MV-WIS	10
Model 4010 Crease/Lump Detection Technology	11
Model 9000 MMFC ImageSmart	11
R.K.B Installation Pictorial Guide	12
Successful Case Study	14
Defects Detected by RKB Technology as submitted by RKB Customers	18

RKBTM

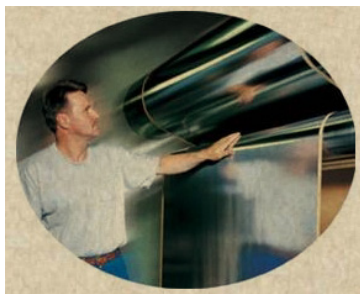
OPTOELECTRONICS

Mission Statement

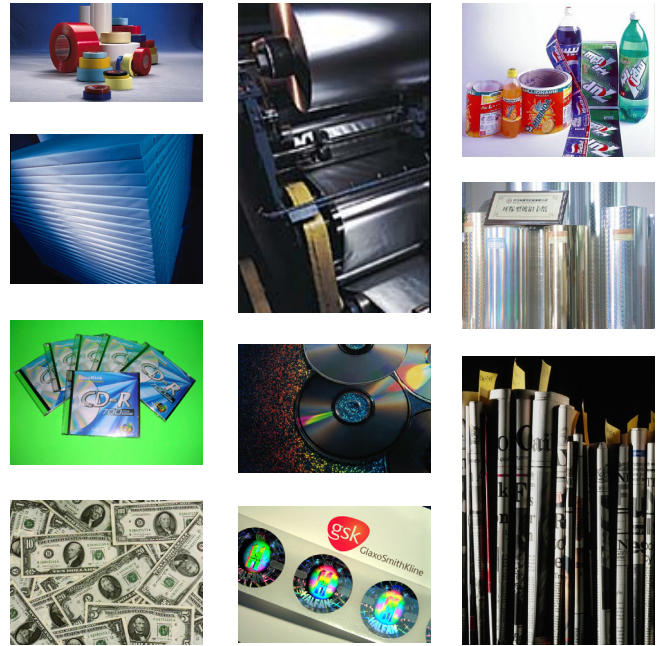


R.K.B. OPTO-ELECTRONICS is a designer and manufacturer of high-speed machine

vision web inspection technologies and related products. We are committed to web based material manufacturers, converters, customers and our industry that depend on us to guarantee that product superiority is maintained at the highest possible level. We are dedicated to increasing customer satisfaction, continuously improving our products and services, and providing opportunities for our employees to achieve their maximum potential.

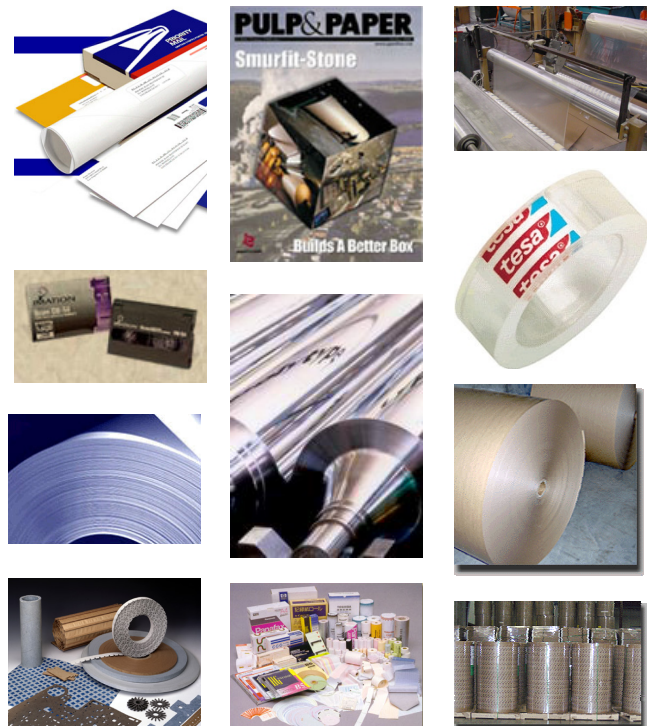


- Pressure Sensitive Adhesive (self-adhesive)
- Siliconized Release Papers and Films
- Construction Papers
- Magazine Papers, Fine Papers, & Packaging Boards Products
- Newsprint Products
- Industrial and Consumer Packaging Products
- Food, Protective and Specialty Packaging
- Flexible Packaging
- Plastic Packaging
- Advanced Polymeric Coated Products
- Film, Foil, Fiber, Composite, Paper & Non-woven Laminates
- Custom Formulated Adhesive Products
- Home and Office papers
- Commercial Printing & Publishing Papers
- Converting and Specialty Papers
- Industrial Papers
- Primary Aluminum, Fabricated Aluminum, and Alumina
- Vinyl Products
- Magnetic and Optical Data Storage Products
- Extrusion Products
- 100% Cotton Fibers Products
- De-inked Recycled Papers
- Films
- Gloss and Matt Coated Products
- Metals and Foils
- Non-wovens
- Rubber



High Performance and Reliability

RKB provides high performance, reliable, and field proven equipment proficient in detecting and analyzing many different types of defects commonly found in web based processes used for manufacturing papers, paperboards, films, foils, steel, aluminum, fabrics, magnetic media and related allied products. Our equipment is compatible with a wide variety of web manufactured materials including:

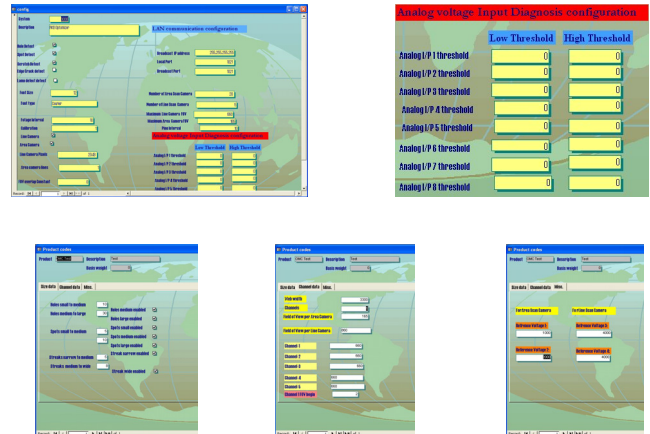


Chose from a Broad Range of Products

Since its inception, RKB continues to develop the most diverse line of high-speed machine vision and web inspection solutions in the industry. Our inspection technologies for defect detection, measurement, analysis and control include:

- Splice Detection
- Hole Detection
- Pinhole Detection
- Spot Detection
- Defect Flaw Detection
- Registration and Reject Control
- Machine Vision Imaging
- Patented Coating Streak/Scratch Detection
- Magnetic Media Micron Fault Detection
- Fuel Cell Defect Detection

Our extensive product line makes it possible to choose the right solution for your specific web based quality inspection, assurance and control application.

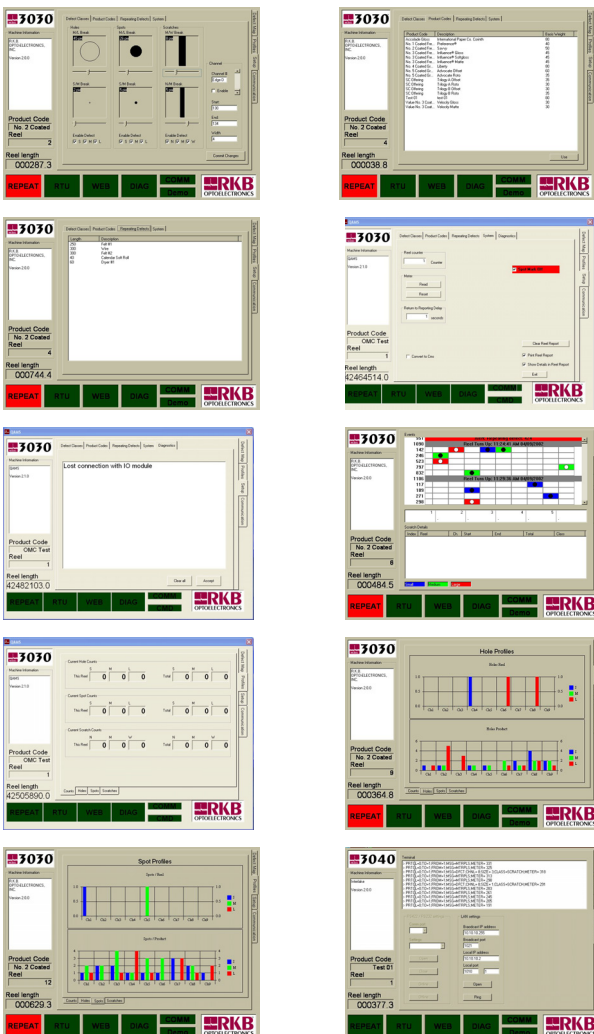


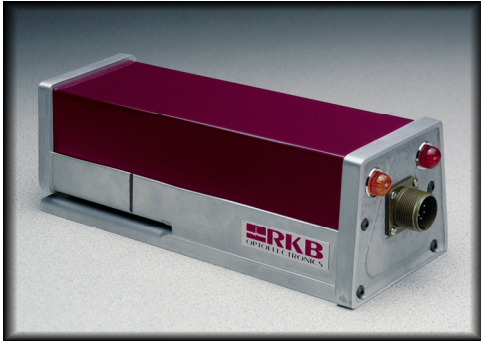
Analyze Your Process

Our Windows XP® based QAMS® program (Quality Assurance Management System) provides complete data anthology, analysis, and reporting resources for defect distribution and process diagnosis. QAMS is included with each of our 2000 and 3000 Series products and is optionally available for any of our other web inspection systems or specialized technology.

QAMS receives data information via digital I/O from proprietary signal processing hardware and deciphers the data into user friendly parameters that operational, technical and supervisory staff can utilize. This information can be defect type, defect size, defect location in MD and CD direction, defect quantity, product reel footage, defect start/stop times, etc. Additional intelligence such as process machine diagnostics (i.e., repeating defects analysis, defect intervals, location, and likely cause; dryer, felt, wire, etc.) and machine vision diagnostics (i.e., power supplies, sensors, lamps, blowers, etc.) as well as a variety of other significant data is received, processed and scrutinized by the QAMS.

QAMS can be connected to your plant network facility to provide mill-wide users, from the manufacturing sector to the administrative sector with full data access capability. QAMS uses industry standard ODBC (32 bit) data sources to ensure easy integration with other quality assurance, production and plant enterprise systems. A real-time operative interface shows current inspection data on-line all the time. The open network architecture, distributed across the plant enterprise systems, enables all users to view current and historical inspection data and statistics remotely.





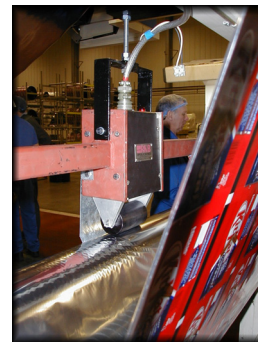
Model 1032 (Edge Mount Splice Detection System)

This Splice Detector reveals abrupt changes in web material thickness due to splices, tearouts, foldovers and web breaks in high speed paper, film, coating and conversion processes. The 1032 is self calibrating and can monitor single to multiple webs of material simultaneously. No adjustments, settings or re-calibrations are required and our 1032 is unaffected by material basis weight changes, color or process speed. The unit automatically adjusts itself to new conditions. Special splice tapes or color marking are not required and the operation is unaffected by printed material. Designed to work off of 220/120 VAC, 50/60 Hz, the Model 1032 can be implemented quickly and easily in application worldwide. This unit is stock and is shipped DHL upon receipt and payment of order. Estimated ROI is within one full production day. RKB has been the preferred supplier for many well known sheeter, laminator, coater and paper machine suppliers worldwide. With over 2000 units in operation worldwide, the RKB Model 1032 has been proven the industry standard where splice detection initiatives are required.



Model 1032B (Center Mount Splice Detection System)

Based on the same operational principal as the Model 1032, this Splice Detector reveals abrupt changes in web material thickness due to splices, tearouts, missing plies, and web breaks in high speed paper, film, coating and conversion processes. This unit is stock and is shipped DHL upon receipt and payment of order. Estimated ROI is within one full production day. RKB has been the preferred supplier for many well known sheeter, laminator, coater and paper machine suppliers worldwide. With over 2000 units in operation, RKB splice detection technology has been proven the industry standard worldwide.



Model 1032C (Center Mount Splice Detection System)

Based on resistive technology, this Splice Detector reveals abrupt changes in both metallized and non-metallized web material thickness due to splices in most paper, film and foil processes. This unit is stock and is shipped DHL upon receipt and payment of order. Estimated ROI is within one full production day. RKB has been the preferred supplier for many well known sheeter, laminator, coater and paper machine suppliers worldwide. With over 2000 units in operation worldwide, RKB splice detection technology has been proven the industry standard where splice detection initiatives are required.

Model 1108 Keymark Registration Control Technology

The Model 1108® Keymark Register Control System is designed for integration with existing production equipment to ensure in-register processing of web materials. It is suitable for many types of processing, printing, and converting applications requiring material registration or similar process controls. The most important aspect of registration control is reliable and accurate detection of the registration mark. Our Model 1108 is compatible with a wide range of illumination, sensing, and signal processing technologies for detection of any type of mark including keyed, non-keyed, and printed watermarks. A PulseGen processor ensures that registration accuracy is maintained throughout the process at any process speed. Since the PulseGen is derived from a machine driven shaft, registration accuracy is not speed dependent. Designed to work off of 220/120 VAC, 50/60 Hz, the Model 1108 can be implemented quickly and easily.



Model 1122 Reject Gate Control Technology

The Model 1122 interfaces with a wide variety of inspection and material handling equipment to provide automatic sorting or rejection of defective material. The systems processing technology makes it possible for the unit to determine how many complete sheets and fractional sheets are between an inspection source and the reject gate. The system can be used to process multiple products of differing lengths through user friendly settings located on the front panel of the control station. If a large defect occurs that spans multiple sheets, the unit ensures that all defective sheets are rejected. Designed to work off of 220/120 VAC, 50/60 Hz, the Model 1122 can be implemented quickly and easily in any application requiring reject gate control. This unit is adaptable to any sheeter/cutter system and is compatible with third party sensors and inspection equipment.



Model 1280 Multicolor Spray Marking Technology

The Model 1280 Multicolor Spray Marking System positively marks the types and locations of defects in web materials. The specialized spray head system applies accurately controlled marks along the edge of web material. Marks produced by the Model 1280 can be categorized to indicate defect location or type of defect. Additionally, the marking unit can be used in combination with our Model 1250 AutoBreak sensor to control subsequent processes to a stop for defect correction such as culling, patching or splicing out problematic areas. Spray marks can also be detected visually as concentric circles on the outside edge of the roll for manual sorting or grading operations. Advanced electronic edge tracking is employed allowing precise web edge tracking through its full 12" (30.48cm) of travel. The spray head assembly can also be retracted or advanced under manual control for setup operations. Designed to work off of 220/120 VAC, 50/60 Hz, the Model 1280 can be implemented quickly and easily.





Model 2060 Flaw Detection Technology

Model 2060 Flaw Detection System makes it possible to expand your inspection requirements beyond basic hole detection. The 2060 provides complete hole and spot detection down to 1/32" (0.8mm) diameter up to production speeds of 5000 fpm (1524 m/min). The Model 2060 is suitable for a wide variety of paper, film and foil applications including inspection of low basis weight materials.

Each Model 2060 system is designed to span the entire web width for 100% inspection of the web material. Our QAMS® (Quality Assurance Management System) data management programs also provide:

- Analysis and Charting
- Footage Tracking
- Product Code Identification
- Material/Process Traceability
- Real Time/Historical Data
- Status & Parameter Displays
- On-Line Diagnostics

Model 2060 Systems can be quickly and easily added to existing production equipment. These systems provide production with immediate notification of defects types, location and potential causes. Our Model 2060 technology will improve productivity and profitability with immediate results.

Each Model 2084 system is designed to span the entire web width for 100 % inspection of the web material. The 2084 provides complete hole detection down to 1/16" (1.5mm) diameter up to production speeds of 6000 fpm (1828 m/min). The Model 2084 is suitable for a wide variety of paper, foil, steel and applications involving very high basis weight or caliper materials.

Products can now be fully qualified prior to shipment to customers. Repeating defect detection and hole size classification capabilities are included with each Model 2084 System. Our QAMS® Quality Assurance Management System software also provides:

- Analysis and Mapping
- Product Code Identification
- Material/Process Traceability
- Real Time & Historical Data
- Repeating Hole Diagnostics



Model 2084 Ultraviolet Hole Detection Technology

The Model 2084 Ultraviolet Hole Detection System provides cost effective, real time, detection and classification of holes in web manufactured materials greater than 22lbs/3300 sq. ft. Outputs produced by this technology can be used to control or activate audio visual alarms, counters, sorters, and other types of equipment. The Model 2084 can be quickly, easily, and inexpensively added to your existing production line.

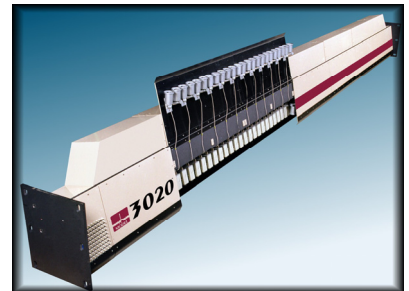
Model 3010 High Resolution OPTOMIZER® MV-WIS

The Model 3010 high resolution machine vision technology detects, classifies and analyzes subtle autonomous defects such as pinholes, dirt, scale, light spots, and oil. The 3010 will save time and money in your production operations through reduced machine downtime, elimination of costly repairs, and fewer customer complaints. An array of high speed CCD Line Scan Sensors, combined with proprietary signal processing technologies, makes it possible to achieve very high resolution capabilities. Defects are detected and categorized in real time and under real world conditions. Each Model 3010 System is designed to span the entire web width for 100% continuous inspection of the web material. Now you can ensure that your products are fully qualified prior to shipment to customers.



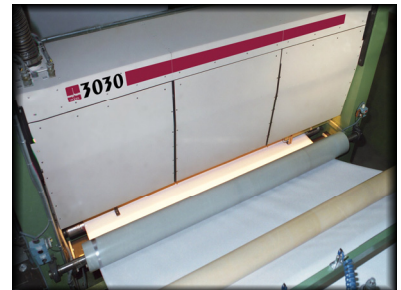
Model 3020 High Resolution OPTOMIZER® MVS-WIS

Model 3020 high resolution machine vision technology provides accurate, reliable, high speed detection of any coating streak or scratch as they occur during web material coating operations. They can be integrated with existing web inspection equipment to add complete capabilities for streak and scratch detection. The Model 3020 uses special CCD Streak sensors and proprietary streak enhancement signal processing technologies to achieve high resolution detection of any streak or scratch. Our innovative approach provides detection capabilities that are unachievable with line scanning technologies commonly used by most suppliers. Depending on the Field of View, continuous line type defects as small as 1 micron will be detected, classified and archived at any known production speed, guaranteed.



Model 3030 High Resolution OPTOMIZER® MV/S-WIS

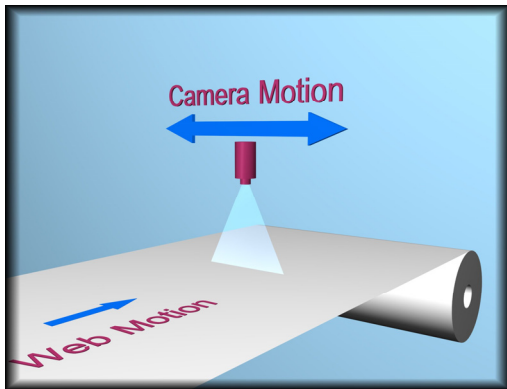
Undetected defects often result in excessive costs in customer returns, repairs to sensitive production equipment, and machine downtime. The Model 3030 high resolution machine vision imaging technology provides real time detection and categorization of holes, spots, dirt, coating streaks, and many other types of defects common to coating processes. The Model 3030 uses an array of high speed CCD Line Scan sensors for detection of random defects such as holes, spots, and edge cracks. An array of high resolution CCD Streak sensors are used to provide coating streak and scratch detection capabilities that are unachievable with any line scan sensor alone. This combination of both types of sensors with proprietary and patented RKB signal processing technologies provide unprecedented performance in a single web imaging inspection system. This technology maximizes profitability of your coated web manufacturing operations by providing production with immediate notification of defects that can be quickly corrected reducing waste and coater down time.





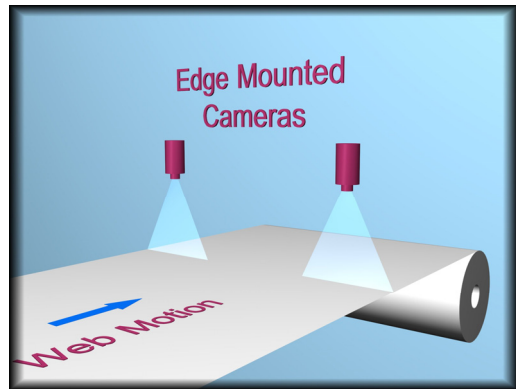
Model 3040 OPTOMIZER® MV-WIS

The Model 3040 machine vision system makes it possible to add economical, high speed, inspection capabilities to existing web manufacturing operations. This technology detects and categorizes common types of defects that can adversely affect product quality. Our Model 3040 will help your company reduce overall production costs through reductions in machine downtime, elimination of costly repairs, and fewer customer complaints. An array of high speed 2048 CCD Line Scan sensors provides industry standard resolutions at costs unequaled by competitive solutions. Our QAMS® Quality Assurance Management System software provides complete data collection, analysis, reporting, setup, and diagnostic capabilities. Our Model 3040 provides accurate, consistent, and reliable online inspection for a wide variety of web materials including paper, films, foils and steel.



Model 3050 OPTOMIZER® MV-PHS

Our Model 3050® MV-PHS makes it possible to economically add pinhole detection analysis to your web manufacturing processes. The system combines a high speed CCD Line Scan technology with state-of-the-art signal processing technologies to achieve very high resolution detection of pinhole defects. Depending on web speed, defects as small as 0.0008 sq. mm can be detected. The sensor housing of the system is designed to be mounted to existing process control equipment, such as a basis weight measurement sensor, that is capable of providing motion in the cross machine direction. Mounted to such equipment, the Model 3050 can provide continuous sampling inspection of the web material.



Model 3060 OPTOMIZER® MV-WIS

The Model 3060® MV-ECS makes it possible to economically add edge crack detection to existing web manufacturing equipment. The system includes two high speed CCD line scan sensors. Each sensor is mounted above an edge of the web for continuous edge monitoring. These cameras, combined with our signal processing technologies, make it possible to achieve high resolution detection of edge cracks. Depending on web speed, edge defects as small as 0.0008 sq. mm can be detected.

Model 4010 Crease/Lump Detection Technology

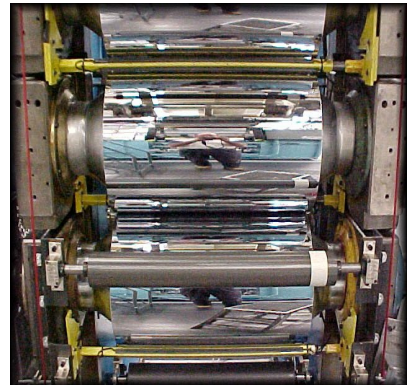
The Model 4010® Crease and Lump Detector is designed to detect creases, lumps, splices, and other types of elevation defects in moving webs of material. Because of their mechanical construction and operating principles, these detectors can be used in a wide variety of web inspection applications. The Model 4010 monitors metallic and nonmetallic papers, plastics, foils, films, textiles, and other types of web manufactured materials. As elevation defects are encountered, an inspection roller in the device momentarily loses contact with the web material allowing light to reach a sensor producing a defect alert.



Sensors in the Model 4010 use specialized low pressure rolling technology preventing any damage to web material such as cast coating (as depicted above). Each sensing head is self-compensating and self-aligning. The Model 4010 Crease and Lump Detectors uses modular design to provide a minimum 6" (00.00cm) wide inspection window. These sensing heads can be combined, side by side, to span any web width required for your application.

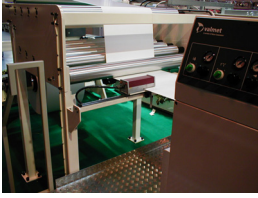
Model 9000 MMFC ImageSmart

The Model 9000 MMFC imager technology was developed for the emerging markets of magnetic media and fuel cell technologies to combat very subtle defect anomalies commonly found in these types of production. Using fast scan line and streak sensors, proprietary filtering techniques, and specialized lenses developed by RKB facilitates defect detection down to 5 microns for autonomous defects and 2 microns for streaks. Developed over a period of two years in close cooperation with leading magnetic media manufacturers, this technology will deliver unprecedented performance in a single web



This technology maximizes profitability of your magnetic media and fuel cell production operations by providing immediate notification of defects that can be quickly corrected reducing waste. The 9000 MMFC will save time and tens of thousands of dollars per annum through reduction in machine downtime, elimination of costly repairs, and fewer customer complaints. Our QAMS® (Quality Assurance Management System) will provide defect and machine analysis, mapping, profiling, product traceability, real time and historical data collection, defect reporting and on-line diagnosis.

R.K.B MACHINE VISION TECHNOLOG



1032 on Bobst Atlas Sheeter



1032B on Voith Coater



1032B on Bielomatik Sheeter



1032B on Jagenberg Sheeter



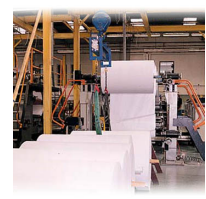
1032 on SHM Sheeter



1032 on Valmet Sheeter



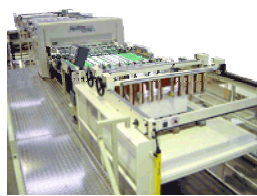
1032B on Marquip Sheeter



1032 @ Colombier Paper



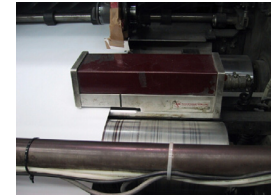
1032B @ Mondi Corp.



1032 @ Belmont Press



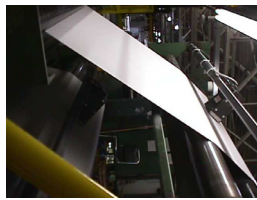
1032B @ Fox River Paper



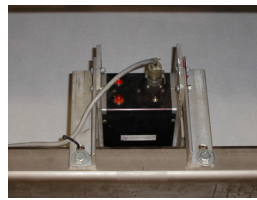
1032 @ SCC Australia



1032B on Coater in Poland



1032B @ SAPPI Paper



1032B @ Avery Dennison Corp.



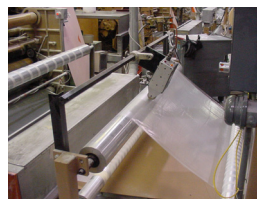
1032 @ Spicers



1032B @ Avery Dennison Corp.



1032B on Coater Laminator

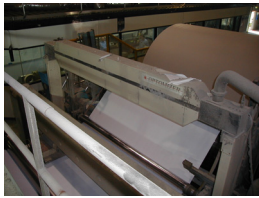


1032C @ Bemis Corp. Laminator



1032C @ Alcan Packaging Corp. Laminator

GY INSTALLATION PICTORIAL GUIDE



3040 @ Visy Paper



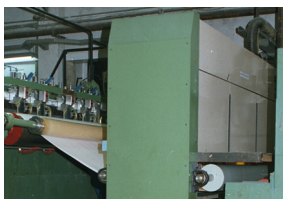
3040 @ Asian Paper Maker



3040 @ Specialty Paper Mfg in USA



3040 @ Canadian Paper Maker



3030 on Sheeter



3010 @ Kimberly-Clark Corp.



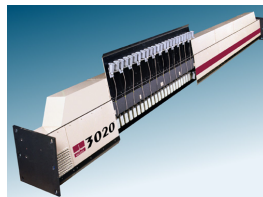
3030 for Coated Paper in Europe



3020 @ Tesa AG



2084 @ International Paper



3020 @ Coated Board Mill



2060 @ DuPont Corp.



3040 @ Riverside Paper Corp.



2060 @ Georgia Pacific Corp.



3020 @ Loparex Corp.



2084 @ Appleton Papers



3030 @ Reno de Medici Ibérica s.l.



2084 @ STORA Corp.



3010 @ Kimberly-Clark



1280 @ Visy Paper



1280 @ Glatfelter Corp.

SUCCESSFUL CASE STUDY

COATING STREAK & SCRATCH DEFECTS ARE NO LONGER UNATTAINABLE!!!!

R.K.B. OPTO-ELECTRONICS, INC., (or RKB®) was contacted by Reno de Medici Ibérica s.l., (Reno) sited in Almazán, Soria (Spain) to help solve the companies problematic and costly coating streak and scratch defect phenomenon commonly found in most coated material processes. RKB was to provide a reliable, accurate and consistent solution to detect, classify and eliminate these defects subsequent to shipment. Reno is Europe's second largest manufacturer of high-quality coated white lined, grey back, kraft back, white back, and bleached (220gsm to 500gsm) boards, and was established in 1967 in Milan, Italy. Reno has developed a reputation of providing extremely high quality coated products with a capacity of over 950,000 tons and a market share in Europe of 20%. In a concerted effort to maintain this leadership role, Reno set out to combat one of the most virulent defects that can dramatically affect the quality of coated products and damage highly sensitive conversion processes that use their coated products for various high end printing and packaging commodities.



Jesús Simon, Director Técnico of Reno, involved in the project from the beginning to end, explains the success of RKB's innovative solution this way. *"We are highly satisfied with the performance of this system since it was installed. It can detect every kind of defect: spots (any grade of shade), holes, non-coated areas and coating streaks and scratches (even when these streaks are very, very narrow) .we chose it among other suppliers because it was the only system that could detect coating streaks from the very beginning until the end."*

HIGHLY ADVANCED STREAK ENHANCEMENT TECHNOLOGY

Since all inspection solutions require a transmission of luminance and a collector of that luminance (i.e., light to camera) of some form to operate, these lighting and sensor techniques and types are very critical to a successful detection system. The system RKB provided Reno consists of two configurations, one for discrete defects such as small dirt and one for subtle continuous defects such as coating streaks. A schematic of the system used for discrete defect detection is described in *Figure 1*.

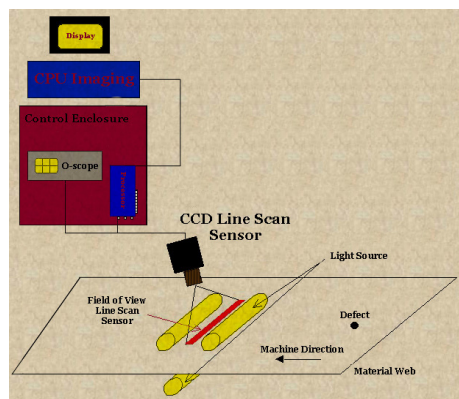


Figure 1 – Diagram of RKB system for hole/spot defect detection

The RKB system for discrete defect detection can work both with reflective and transmissive light for defect detection, classification and mapping. The principle of this part of the system is as follows: a lens is imaging periodically a line across the web surface into a linear array of CCD (Charged Coupled Device) pixels (photosites, photodiodes). The quantity of light collected by each pixel is independent from the other. An increase or a decrease of the energy collected by a pixel above or below a fixed threshold indicates that a hole (light or bright spot) or a dark spot is present on the web surface. If more than one-pixel experiences an increase or decrease of energy at the same time, then the defect can be, and is, classified into three main categories (small, medium or large), depending on the number of pixels affected.

A schematic of the system used for subtle continuous defects such as coating streak detection, using the same frame, cabinet, and computer, but different sensors, lighting techniques and electronic processing techniques, is shown and described in *Figure 2*.

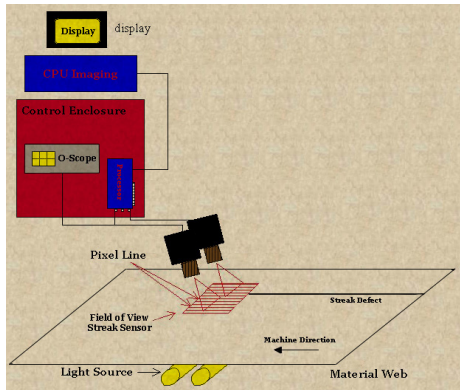


Figure 2 – Diagram of RKB system for subtle continuous defect detection

As shown in *Figure 2*, transmissive light can be used for the detection of subtle continuous line defects using RKBs OPTO-TEK II® Streak Cameras developed and patented by RKB. This detection technique, as with the technique used for discrete defects, can use reflective, transmissive or both lighting techniques for reliable, consistent and accurate detection. In this installation, standard type reflective lighting was used for illumination. The principle of this part of the system, however, is confidential and proprietary. Nonetheless, similar to the discrete defect detection, the absence or increase in light plays an important roll in the overall detection capability. Of course, the signal processing, especially that designated for noise reduction is one of the main operational aspects of the ability to detect subtle continuous line defects.

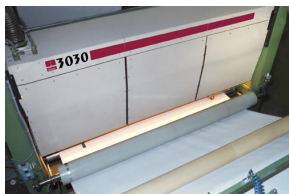


Figure 3 – Sensor Station



Figure 4 – Lighting



Figure 5 – Processing Station

Figures 3, 4 and 5 show the control, sensor, lighting and interface sub-units of the system in greater detail. These sub-units are designed with flexibility in that, they can deal with the detection of holes only, dirt only, hole/dirt, streaks only or all defects that can occur during the process of coated and non-coated material manufacturing. The lighting and the sensors are attached on the same frame.

Since material base colors and coating colors are generally similar in appearance as a coating streak defect, the streak or scratch generally does not facilitate a significant increase or decrease in energy (luminance) received by a sensor. Therefore the electronic noise level appears the same or similar to the actual material in which the defect is present. In most cases, light present at the streak edges where coating has furrowed is more widely tried by “line scanning” system integrators and suppliers in an attempt to detect the defect. Notwithstanding a slight signal at the edges of streaks, the process of furrowing in many cases does not provide for adequate signal strength where one might see a thicker accumulation of coating – *Figure 6 & 7 & 8*.

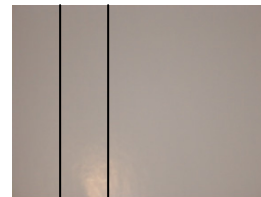


Figure 6 - Coated White Board – Reflective Lighting Technique Coating Streak 0.25” (6.35mm) wide

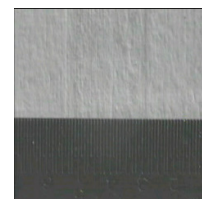


Figure 7 – Figure one streak defect magnified Scale shown 100ths (inch)

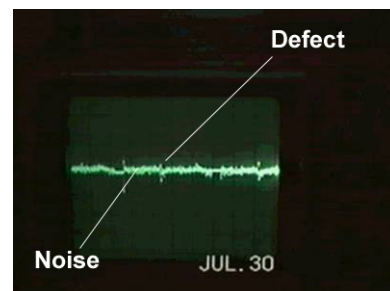


Figure 8 – Signal to noise of streak using line scanning techniques

Depending on the type of material (OMC, Supercalender, Paper, Film, Metal Board, and their associated basis weights), the variations in surface transmission or reflectance can produce a great amount of electronics noise in the initial raw data (signal) out of the sensor – *Figure 9*.

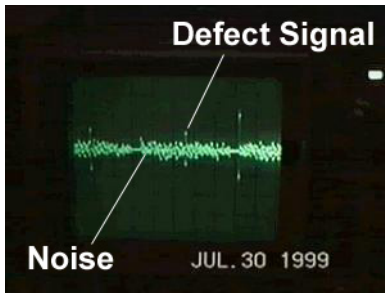


Figure 9 – Initial Raw Data

Thus, inherent high background noise makes detection of very subtle streaks or narrow scratches, much more difficult. To compensate for this problem, RKB designed proprietary noise reduction circuits that work with any color, weight or material equally and reliably. The result is a very clean, consistent signal that can be detected on a ratio as small as 1.5:1 or 200% higher than standard line scanning techniques (*refer to Figure 10*),

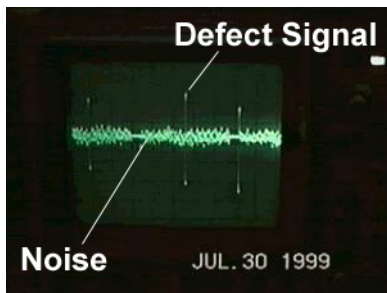


Figure 10 – Electronics Signal after RKB noise reduction

Based on various installations, system evaluations (i.e., The Institute for Paper Science and Technology) and overall sample evaluations from thousands of samples of coated materials, RKB's coating streak detection technology detects 99.9% of all streaks and scratches for which the solution is designed for. This means rejects due to streaks (varies from mill to mill) can be eliminated prior to product shipment, and in fact, eliminated from being produced all together when properly implemented on coating process machines such as off machine coaters, on machine coaters, laminators and supercalender machines.

POWERFUL PROCESS INTELLIGENCE

Once one has reduced the noise level and stabilized the raw data (signals), the systems process intelligence controls take over. Once the electronic noise has been “squashed” the process control circuitry takes the resultant defect signal and further filters and amplifies it prior to digitization and outputting. This ensures that there is a solid, reliable and consistent signal to work with. If digitization was done prior to filtering and amplification, the signal would become unstable and potentially break up (i.e., those fortunate to have digital cable at home will notice the picture transmitted too their television breaks up or freezes from time to time).

Once the defect has been processed and digitized, the output is then sent to audio/visual alarms and the main systems quality assurance management system called QAMS®. QAMS will report the type of defect, length, start and stop times and footage, exact location cross direction and machine direction, as well as many other features required for accurate data logging and historical purposes – *Figure 11*.

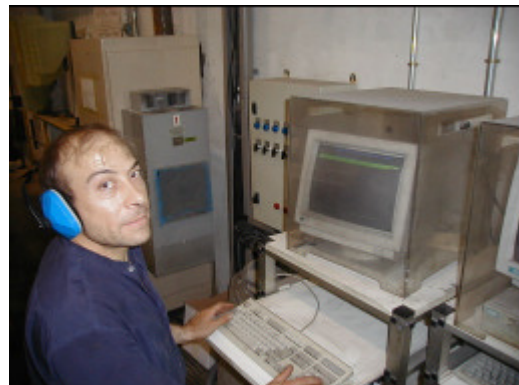


Figure 11 – Reno personnel utilizing QAMS.

BENEFITS GAINED

Obviously the first and foremost benefit gained by using the RKB Streak Detection Solution is the ROI and annual savings in lost profits due to rejects, customer complaints and the impact from lost business with customers. Additional benefits gained are:

- Streaks Detected – RKB's streak detection system can detect coating streaks and scratches as small as 1 micron wide at any known production speed – GURANTEED!!!

- Fewer Machine Stops – less scheduled and unscheduled stops to clean the coating station(s) representing thousands of dollars saved.
- Optimized quality and pricing – a very important factor, both during saturated or under-saturated market conditions.
- Product Grading – Although many product runs are manufactured to order, roll quality data as provided by the streak detection solution can be very advantageous.
- Elimination of streaks and savings in the tens of thousands of US Dollars per annum.

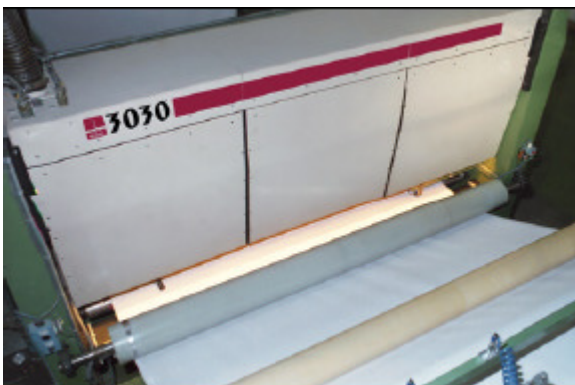
IMPRESSIVE MAINTENANCE

When RKB installed and started up this unit, it was estimated that maintenance costs would be mid range in the area of USD 10,000.00 per annum. After careful analysis of maintenance costs over a number of years, costs for maintenance including spare parts has not exceeded USD 6,700.00 total for the ten years of data collecting. An astounding statement of system capability, accuracy and reliability.

RKB does have a service contract with Reno to provide bi-annual preventative maintenance, calibration and performance verification.

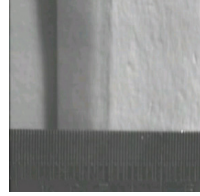
WORKING FOR YOU

For more information on RKBs coating streak and scratch detection solution, please visit our web site at www.rkbopto.com. If you have an immediate application that requires reliable detection or your companies “Line Scan” system just does not deliver, call RKB and invest in technology that truly is a quantum leap in the art of subtle defect detection.



RKB System Installed at
Reno de Medici s.l.

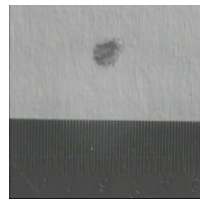
SOME OF THE MANY TYPES OF DEFECTS DETECTED



Bad Edge



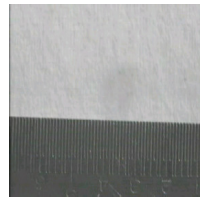
Coating Skip



Coating Void



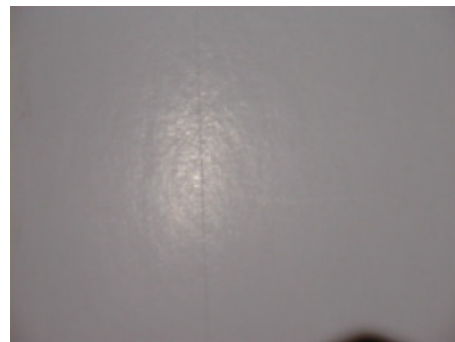
Fiber Clump



Light Spots



Oil Spots



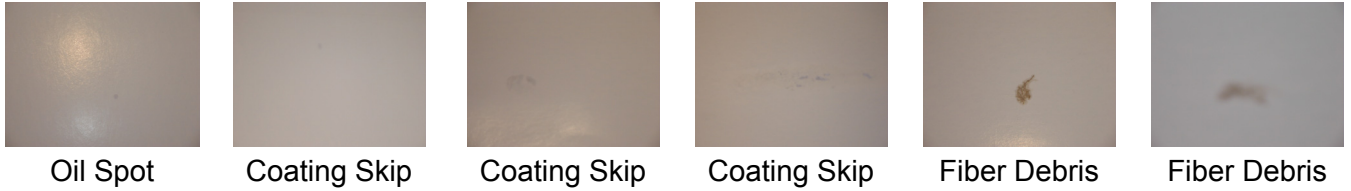
Coating Scratch



Coating Streak

DEFECTS DETECTED BY RKB MACHINE V

AUTONOMOUS DEFECTS (i.e., Hole & Spot Type)



Dirt
35-lb linerboard @
2500 feet/min (762
m/min)



Black Spot
33-lb linerboard @ 2500
feet/min (762 m/min)



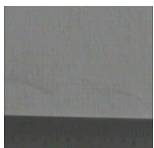
Scale
33-lb linerboard @ 2500
feet/min (762 m/min)



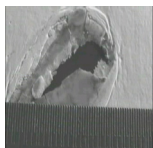
Light Spot
33-lb linerboard @ 2500
feet/min (762 m/min)



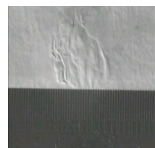
Dirt
35-lb linerboard @
2500 feet/min (762
m/min)



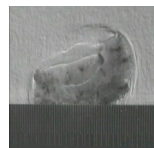
Orange
Peel



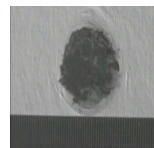
Hole



Coating
Void



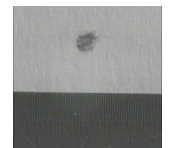
Coating
Void



Coating
Void



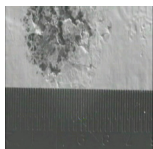
Bad
Edge



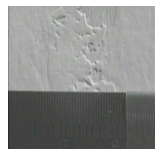
Coating
Void



Hole



Coating
Void



Coating
Void



Bad
Edge



Hole



Hole



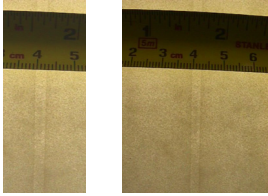
Hole



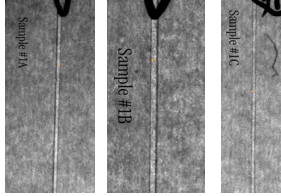
Black Spot
53-gsm newsprint @
5000 feet/min
(1524 m/min)

VISION WEB INSPECTION TECHNOLOGIES

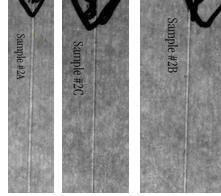
CONTINUOUS (LINE) DEFECTS (i.e., Streaks & Scratches)



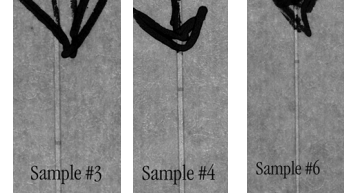
Coating Scratches
27lb CFS Matte @ 3300 feet/min (1006 m/min)



Coating Scratches
80# CN @ 1200 fpm (365 m/min)

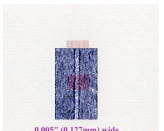


Coating Scratches
80# CN @ 1200 fpm (365 m/min)



Coating Scratches
80# CN @ 1200 fpm (365 m/min)

RUN ONE 09/10/97 RUN TWO 09/10/97



0.005" (0.127mm) wide
110# REFLECTION @ 2200 fpm (670 m/min)
One Coating Scratch Detected by the
OPTOMIZER

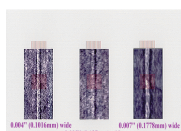
Coating Scratches
110# Reflection @ 2200 fpm (670 m/min)



0.009" (0.228mm) wide
110# REFLECTION @ 2200 fpm (670 m/min)
One Coating Scratch Detected by the
OPTOMIZER

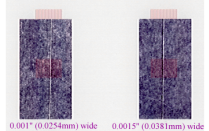
Coating Scratches
110# Reflection @ 2200 fpm (670 m/min)

RUN FIVE 09/10/97 RUN SIX 9/11/97



0.004" (0.101mm) wide 0.005" (0.127mm) wide
110# REFLECTION @ 2200 fpm (670 m/min)
Two Coating Scratches: Both Detected by the
OPTOMIZER

Coating Scratches
110# Reflection @ 2200 fpm (670 m/min)



0.001" (0.0254mm) wide 0.0015" (0.0381mm) wide
110# REFLECTION @ 2200 fpm (670 m/min)
Two Coating Scratches: Both Detected by the
OPTOMIZER

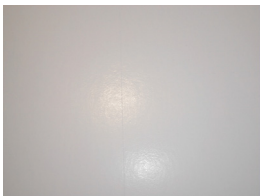
Coating Scratches
110# Reflection @ 2200 fpm (670 m/min)

RUN SEVEN 09/11/97



0.002" (0.0508mm) wide
220# CN COVER @ 1200 fpm (365 m/min)
One Coating Scratch Detected by the
OPTOMIZER

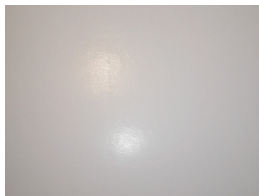
Coating Scratches
220# Reflection @ 2200 fpm (670 m/min)



Coating Scratch (OMC Board)



Coating Scratch (OMC Board)



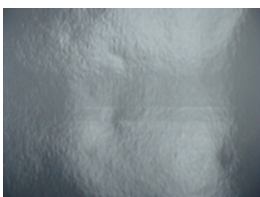
Coating Scratch (OMC Board)



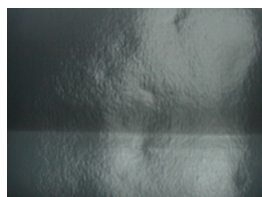
Coating Streak (silicone coating)



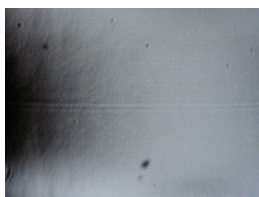
Coating Streak (silicone coating)



Coating Streak (silicone coating)



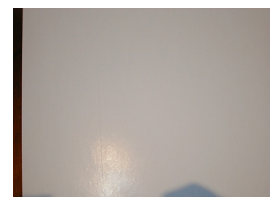
Flood (silicone coating)



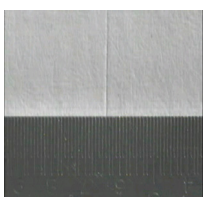
Coating Streak (magnetic media)



Coating Streak (magnetic media)



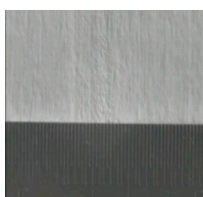
Coating Scratch (OMC Board)



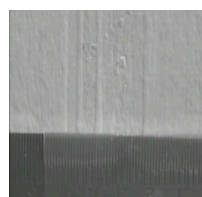
Coating Scratch



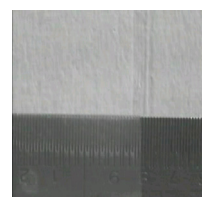
Coating Streak



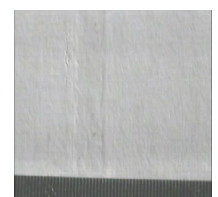
Coating Streak



Coating Streak

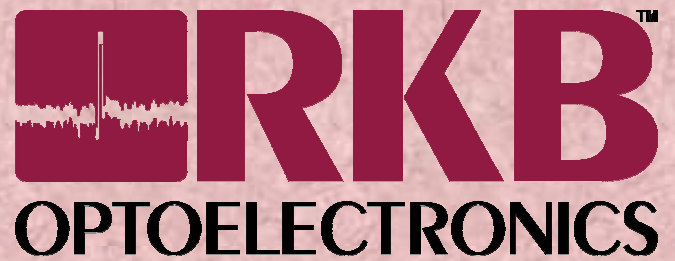


Coating Streak



Coating Streak

ALL DEFECT SAMPLES PROVIDED BY RKB CLIENTS AS PART OF ISO CERTIFICATION VERIFICATION



**R.K.B. MACHINE VISION
WEB INSPECTION PRODUCT APPLICATION GUIDE**

DEFECT TYPE	MODEL 1032	MODEL 1032B	MODEL 1032C	MODEL 2060	MODEL 2084	MODEL 3010	MODEL 3020	MODEL 3030	MODEL 3040	MODEL 3050	MODEL 3060	MODEL 4010
Blisters						*		*	*			
Blur defects						*		*				
Bugs				*		*		*	*			
Burst				*		*		*	*			
Coating Scratches							*	*				
Blade Lines							*	*				
Coating Streaks							*	*				
Coating Skips						*		*	*			
Coating voids				*		*		*				
Creases						*		*	*			
Dirt				*		*		*	*			
Edge Cracks						*		*	*		*	
Fish Eyes				*		*		*	*			
Gels				*		*		*	*			
Holes				*	*	*		*	*			
Indentations						*		*				
Knots				*		*		*	*			
Linting						*		*	*			
Lumps												*
Missing Ply		*										
Oil				*		*		*	*			
Pin Holes						*		*		*		
Scale				*		*		*	*			
Smear defects						*		*	*			
Splices	*	*	*									*
Spots (light, gray and dark)				*		*		*	*			
Tearouts	*					*		*	*			
Web Breaks	*	*				*		*	*			
Wrinkles			*			*		*	*			*

**SPECIALIZING IN HIGH END, HIGH SPEED DISCRETE DEFECT DETECTION OF
MAGNETIC MEDIA, ALUMINUM FOILS AND COATED WEB BASED MATERIALS**

**R.K.B. OPTO-ELECTRONICS, INC.
6677 Moore Road
Syracuse, NY 13211
United States of America**

**Tel#: 001-315-455-6636 • Fax#: 001-315-455-8216
Email: sales@rkbopto.com**

http:// www.rkbopto.com • www.hole-detection.com • www.webinspection.us