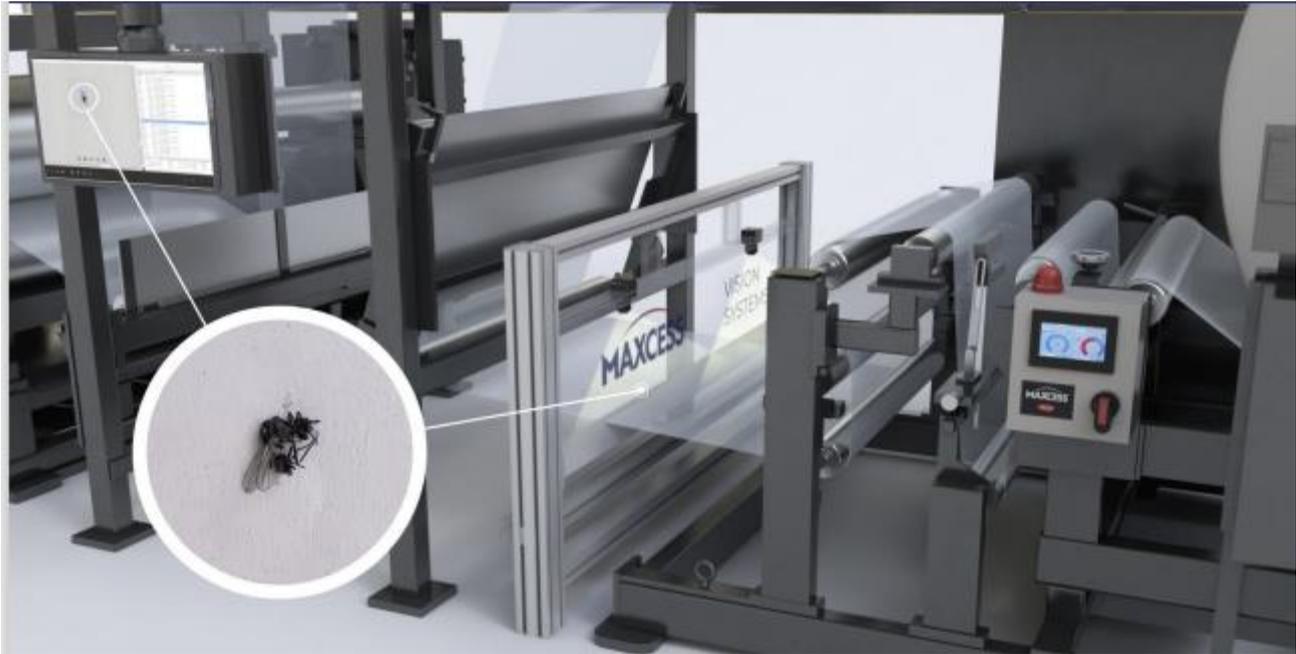


ImageFlow Technical Software Description



Contents

- Inspection 4.0 3
 - So what can ImageFlow deliver? 3
- How the inspection systems are built? 4
 - Camera Technology 4
 - Lighting 7
 - Processing 10
 - Input/output 10
 - Ancillary devices 13
- Understanding how the man machine interface works 13
 - One touch mode 14
 - Using Recipes 14
 - Setup up new recipes 15
 - Auto back up 17
 - Defect display 17
 - Roll map 18
 - Defect list 19
 - Measurement table 20
 - Navigation pane 20
 - Localization 21
- Inspection algorithms 22
 - Key features 22
 - Common Applications 22
 - ASI -100% Surface inspection for roll and sheets 23
 - Key features 24
 - Common Applications 24
 - Print inspection tool 25
 - Key features 26
 - Common applications: 26
 - Auto edge detection 26
 - Key features: 27
 - Common applications: 27
 - Material edge locator used of sheet inspection 27

- Key features: 28
- Common applications: 28
- Rewind module 28
 - Key features 29
 - Common applications: 29
- Measure Color, intensity or formation 29
 - Key features 30
 - Common applications..... 30
- Perforation analysis..... 30
 - Key features: 31
 - Common applications: 31
- Auto detect seams and tears 31
 - Key features 32
 - Common applications..... 32
- PDF Verification 33
 - Key features 33
 - Common applications: 33
- 2D/1D Code Inspection..... 34
 - Key Features: 34
 - Common applications: 34
- Calipers 34
 - Key Features: 35
 - Common applications: 35
- Integrating inspection systems into your process 36
- Making it work for stake holders 37
 - The Operator 38
 - The Engineer..... 38
 - The Quality Manager..... 40
- Why Oneillco? 41

Inspection 4.0

Industry 4.0 requirements are now a staple element of modern industrial automation solutions. For inspection systems this translated into the ability to conform to automation standards and integrate with historians while supplying real time data for analytics. To this end we have developed a complete video data archival capability that conforms to ISA 95 automation standards.

Typical manufacturing operations are split according to Enterprise, Site and Line. Each layer has its own priorities and goals. Oneillco has developed a suite of technologies and services that address all of these while lowering capital expenditure costs and reducing risk.

- Enterprise: Quality management & standardization - At a corporate level, the goal is to deliver consistent yields and faultless products across several plants while improving the ability to win new business! Global customers will expect shipments to come from different plants to minimize risk. The Corporation needs to standardize information about quality levels at different sites, to access quality process control data to measure continuous improvements (=> 6s / Kaizen programs), and to have a real time view on asset utilization so as to understand the net return on assets.
- SITE LEVEL: Yield management- The site as an entity needs to maximize yield management. Faulty deliveries result in direct AND indirect penalties (penalty grade system used by most multinational clients). Repeated deliveries with minor quality will reduce order volumes, and lead to loss of eligibility for additional contracts while incurring the cost of replacement. Oneillco delivers the tools to guarantee quality from printing to shipping.
- LINE LEVEL: Waste reduction- inspection systems can eliminate customer claims and reduce run time waste. The key at line level is to identify the best location and what strategy is going to be employed once defective product is identified.

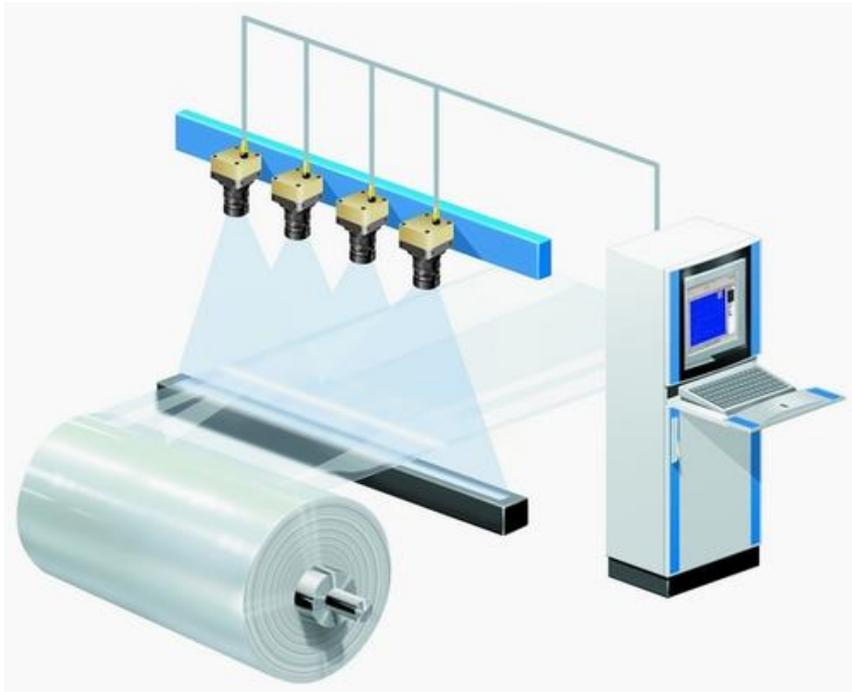
So what can ImageFlow deliver?

- Stop embarrassing defects being delivered to customers
- Identify repeating defects as quickly as possible
- Improve the quality of substrates
- Reduce waste , remove inline waste and push make ready waste to a minimum
- Improve yields by early intervention in the process and tools to enable improvements
- Support standardization across process lines and sites so as to guarantee consistency
- Empower CI and Lean Manufacturing requirements by providing up to the minute enterprise level statistics.

How the inspection systems are built?

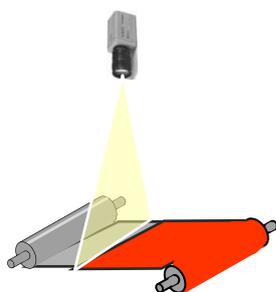
Our systems are built completely from commercial off the shelf components (COTs). This is key to ensuring that once purchased a system can be supported independently of the vendor for its complete lifecycle. Machine vision systems are no different to industrial IT solutions and all the parts and elements must conform to industrial standards. Let's look at the key elements

1. Camera technology
2. Lighting
3. Processors
4. Input/output
5. Enclosures
6. Alarms, marking systems and taggers

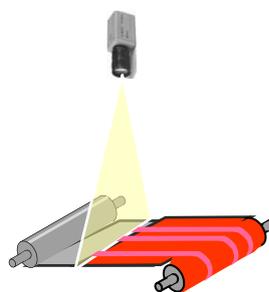


Camera Technology

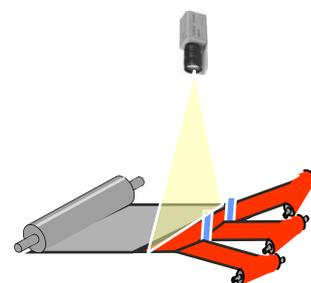
High speed rolls or sheets are imaged using linear sensors. Oneillco uses a variety of suppliers with the chart describing the sensor array and interfacing technology.



Endless material



Inspecting sections



Split web

understand the standards used for camera communications:

Let's

1. CoaxExpress, a high-speed serial digital bus designed specifically for machine vision cameras,
2. The USB 3.0 standard, also known as SuperSpeed USB, is the second major revision of the USB standard for computer connectivity.
3. Gigabit Ethernet is a new camera bus technology for machine vision systems. With relatively high bandwidth, long cable lengths, and wide usage in the consumer and industrial applications, Gigabit Ethernet shows promise for security and long-distance vision applications.

Line Scan
Color or Monochrome



ImageFlow supports all open commercial interfaces for industrial cameras, and has specific acquisition features for the high speed processing of large images from line scan cameras. The software can have it's image source configured for native video files and images also. The use simply configures the input feed much the same as a TV at home. Each image source may be configured with the following features

- Calibration steps for x and y co-ordinated and units such as inches, yards, meters or millimetres.
- Frames per second for video files to control speed of playback
- Buffer for cameras to determine the number of images to store for processing
- Machine directional offset for roll to roll operations, distance from camera to knife cut.
- Speed control for lines that are not stable under a certain line speed
- Alias to name the source

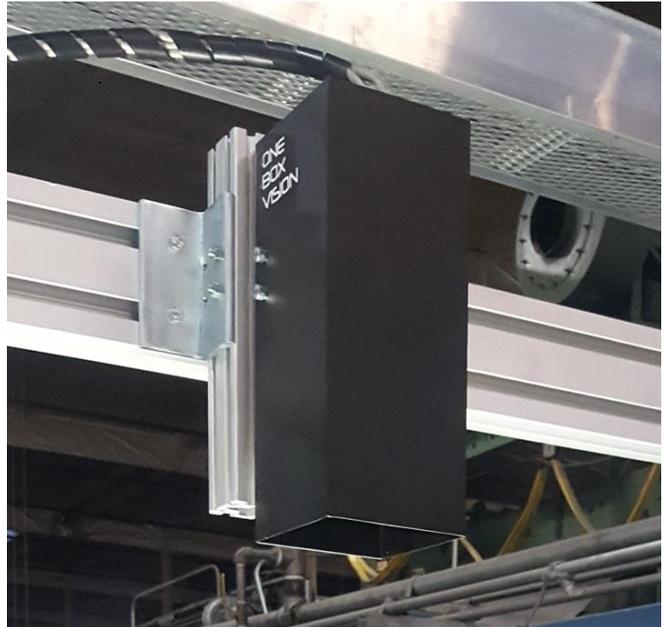


ImageFlow supports the following types of cameras:

- Line scan - ImageFlow has a unique interface for stitching and blending images
- Time delayed integration
- Contact image sensors
- Matrix cameras
- Thermal cameras

The lens choice will determine the working distance. If there is a small envelope to install a system a wide angle lens may be used . Oneilco generally uses Nikon-F mount lens from Schneider or Apo-Rodagon. Each camera comes includes an industrial mount and camera enclosure to protect the unit.





Lighting

Oneillco uses advanced LED lighting with a number of cooling options . The standard system will be supplied with passive cooling for the Lotus and fan cooling for the Corona. All lights are controlled via ethernet and include safety systems to avoid over powering. The Lotus is a low power solution suitable for backlighting clear film while the Corona is a high powered solution typically used in high speed applications.

Top light / Dark field:



[Link to dark field](#)

- Up to 3.500.000 Lux
- Patented reflector technology

Back light / Bright field:



[Link to bright field](#)

- 300.000 cd/m²
- High homogeneous light distribution

Tube light:



[Link to tube light](#)

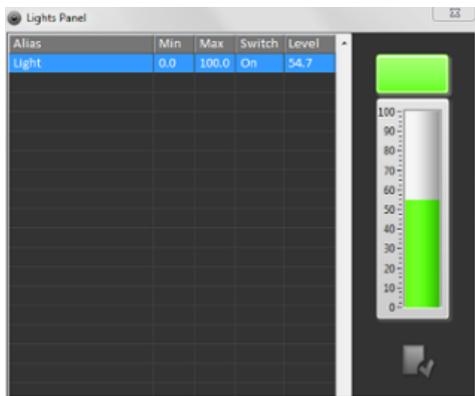
- 1.200.000 Lux
- Compact design

The Corona shown below is used in four configurations

- Dark field illumination typically used for materials that will diffuse
- Bright field , used for glossy or shiny materials
- Back light for clear film or hole detection
- Cloudy day for applications that are highly reflective.

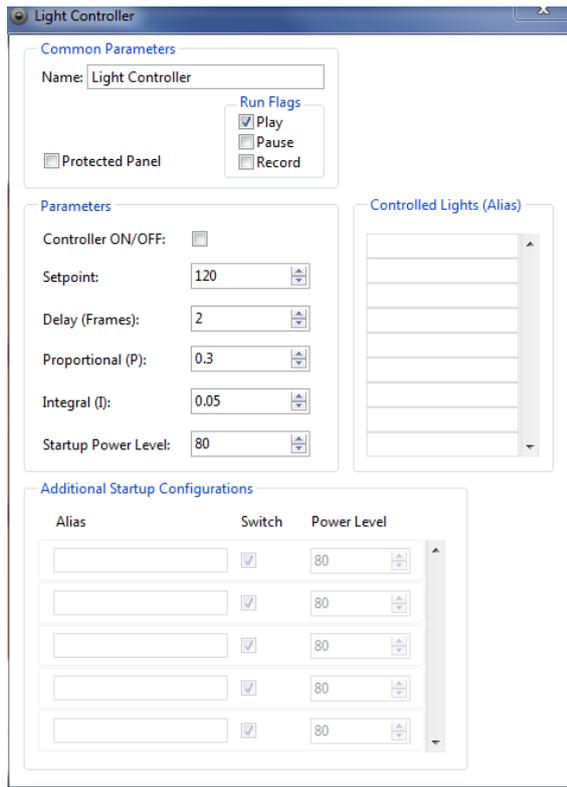


ImageFlow supports a variety of industrial LED light controllers using Ethernet. There is no limit to the number of lights a single application can manage. If a light requires multiple controllers, the control of that light can be aggregated to one slider by giving all the controllers the same alias. Maximum and startup power as well as rest conditions may be set for each light.



ImageFlow also supports the control of the light using a closed loop PID algorithm. Simply select the aliases of the lights to be controlled and set the target gray level. The user simply selects the region of interest that will be used to calculate the current value. This tool can be used to control lights for different product setups, and also the output for TDI cameras.

Technical Description - Confidential



Processing

Oneillco processor is an Intel based industrial PC complete with image pipeline processing. Oneillco again supports open industry standards and can use any commercial off the shelf frame grabber. The key attributes are as follows

- I9 Class CPU
- 32 GB Ram
- 1 TB Drive
- Windows11 64 bit professional

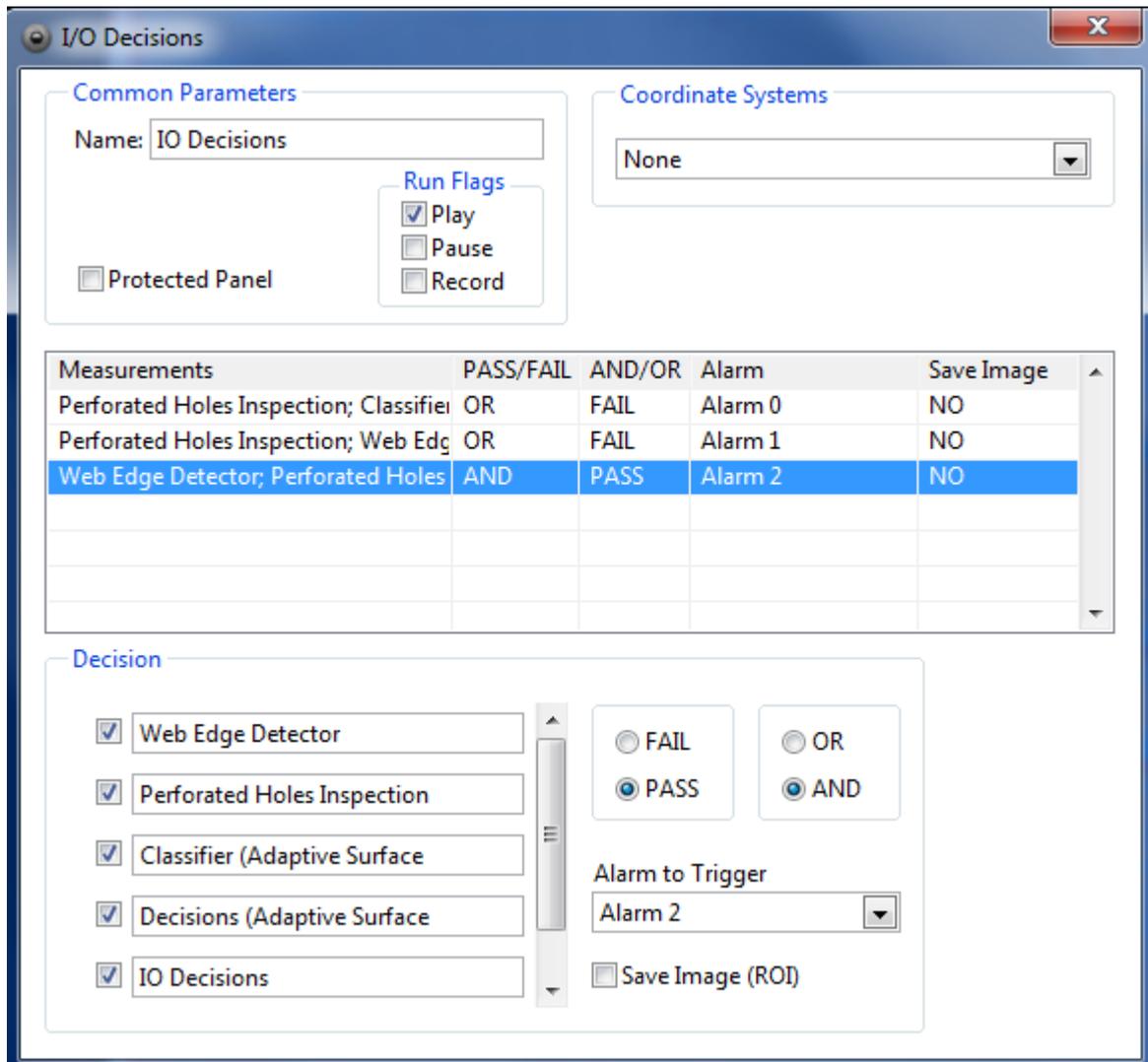


Input/output

Oneillco has interfaced National instruments solutions for input output control. These devices allow the inspection system to take signals from sensors, the line controller and output signals such as alarm events to reject material or drive ancillary devices such as taggers and audible alarms.

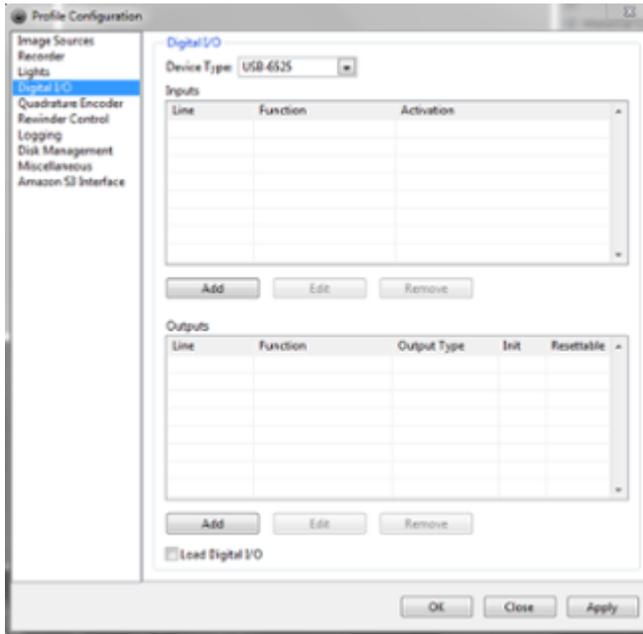


All inspection tools are supported by ImageFlow's event management matrix. For example if a defect is detected by any inspection tool it can be set up to generate an application event. This event then can be used on it's own or together with other events to activate an alarm. The decision tool is the interface used to define these alarms.



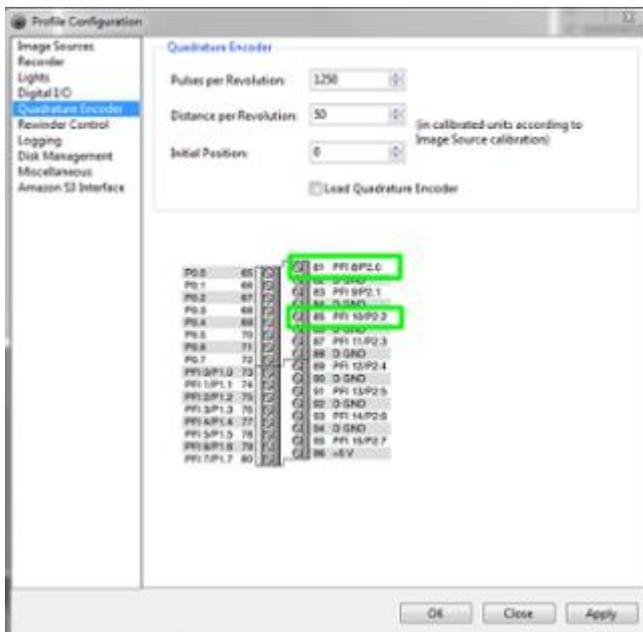
Once an alarm has been generated it can activate a physical electrical I/O line based on the system configuration. This is done through the interface below.

Technical Description - Confidential



ImageFlow supports two I/O controllers from National instruments. The first is USB-6525 and the second is USB-6341.

- USB-6525 is a simple low cost relay block to be used for turning on lights and alarms.
- USB-6341 is an advanced controller and incorporates an encoder interface. This can be used for real time mapping of defects in a queue to the encoder for point rejection. This interface is also used for the rewind control.



Ancillary devices

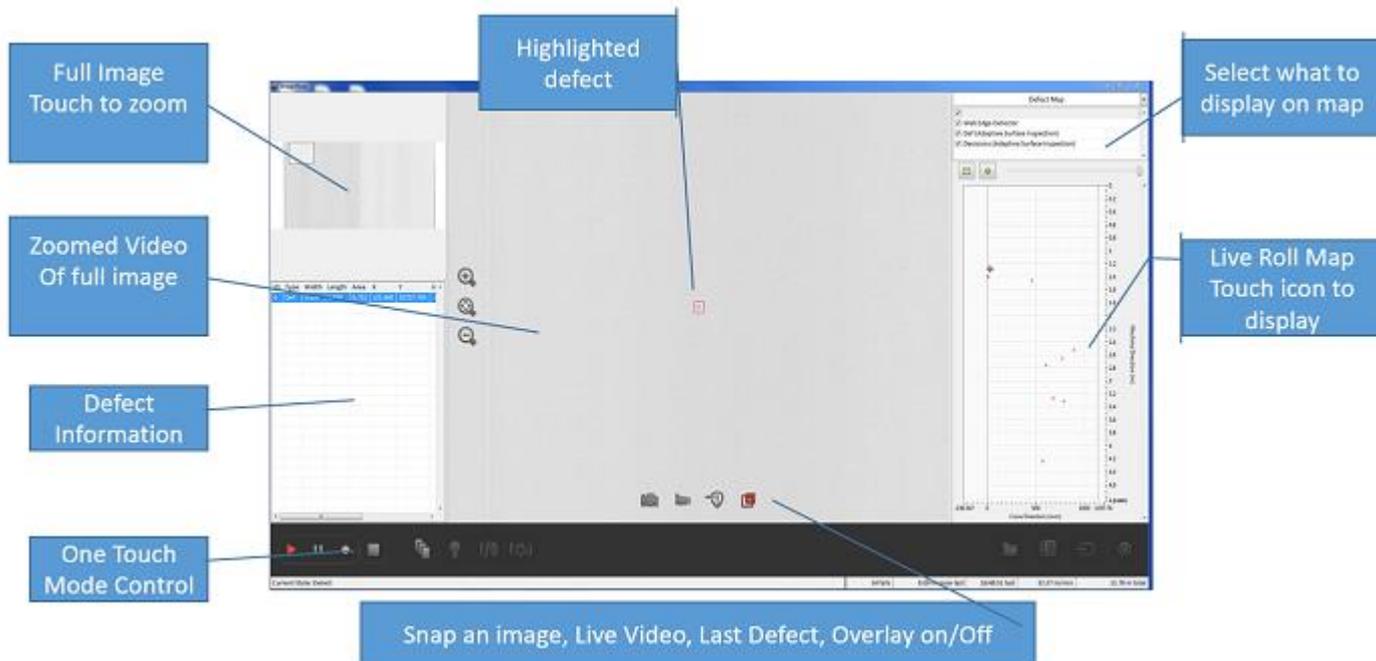
Oneillco uses supports interfaces to a variety of ancillary devices.

1. Spray marking system – Used to mark sheets or edges of a web.
2. Tagger – Used to place a tag to mark a defect, or start and end of defects
3. Tree lite and alarm – This can be mounted anywhere.
4. Encoder and bracket to mount it.



Understanding how the man machine interface works

ImageFlow's operator interface has been designed to be used with a touch screen or mouse. There is a limited number of controls and the operator is only ever one touch away from an action point. This philosophy enables the training of operators to run the inspection system in minutes. All advanced configuration or setup is done using the tool manager, a configuration tool used by process engineers and integrators.



One touch mode

The inspection process is operated using the following modes. Play , Pause Record or Stop. Each mode can be setup to do different actions depending on your process.

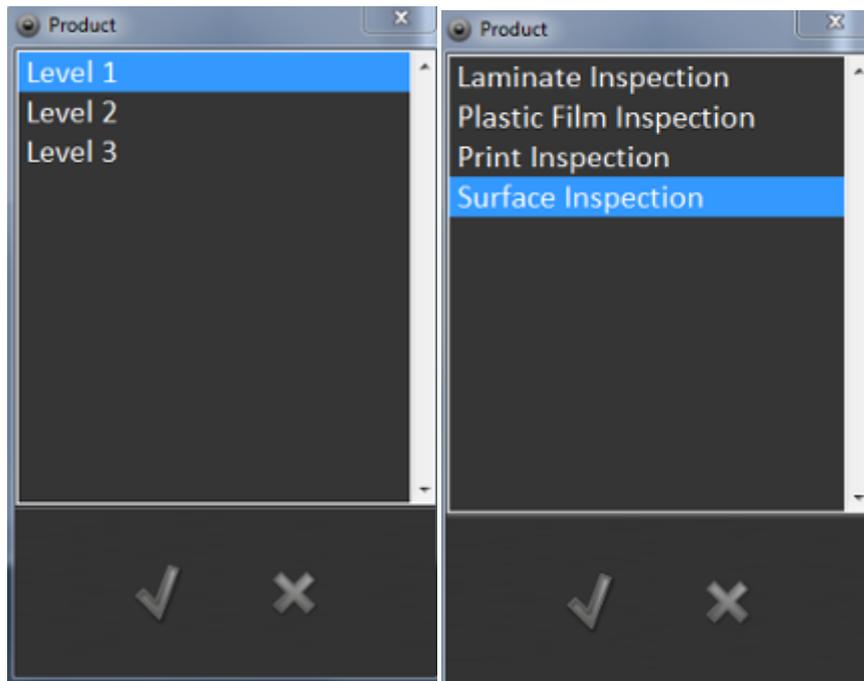


The operator can simply click the camera on the left to take a snap shot of the video that is being acquired by the camera, or press the video camera to view the live display while still inspecting, the exclamation panel will set the system to display the past defect detected and the last will turn on and off the overlay.



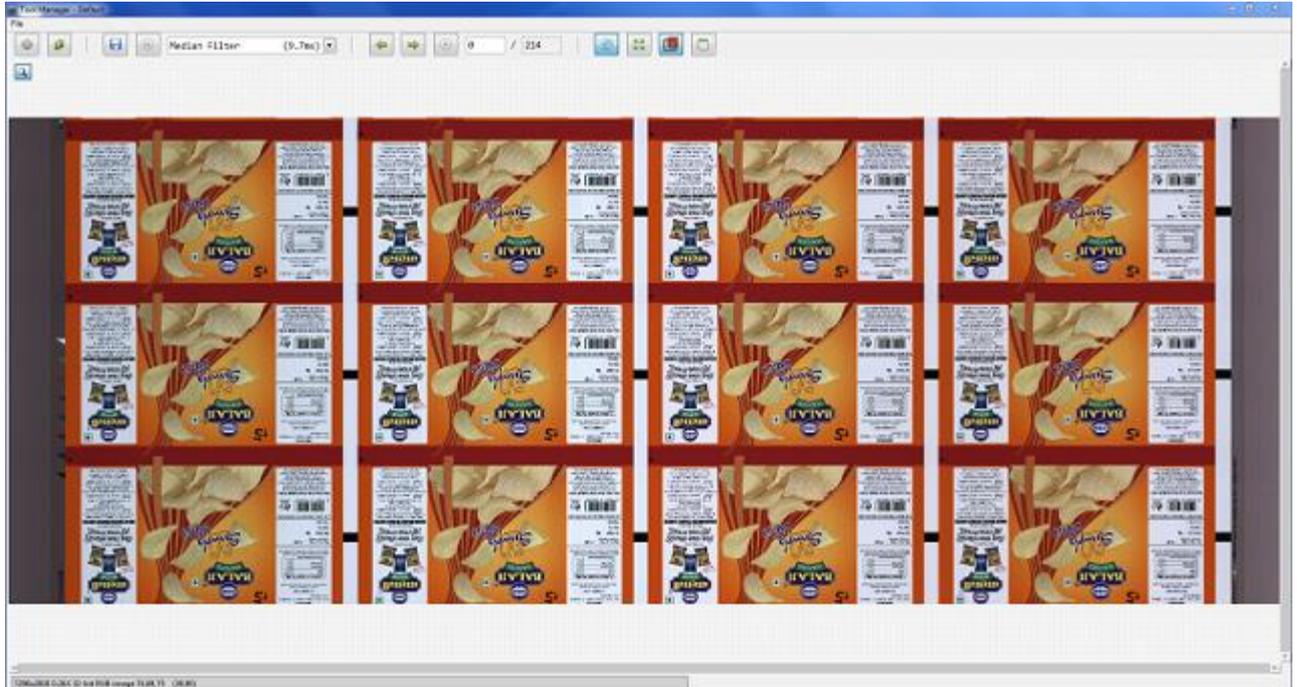
Using Recipes

ImageFlow supports a full up recipe management system. Recipes can be applied by product, algorithm and quality level. The operator simply chooses from a list and starts inspecting. When configured there is no interaction required on a new job or batch



Setup up new recipes

- Product recipe management
- Playback of video or images through pipeline
- Bench marking to determine speed of processing
- Trouble shooting tools for process profiling



The tool manager is an easy to use configuration tool that allows process engineers configure the inspection tools and setup recipes. Video can be stored using the camera system and played back through the tool manager to see how a pipeline or settings perform. Each operations run time on the processor used is displayed so as to conform to real time goals. Tool manager can be run at your desk or on the system on the factory floor. Key features include the product manager where it is possible to setup inspection pipelines and quality standards as recipes.

Defect storage and reporting

All defect and measurement data stored with images in real time with batch information

- Real time storage of all defect and measurement information with images
- Assign batch or job IDs via software interface or using bar code reader
- Use data cloud to backup data or each system and share with other sites
- Generate excel report for each inspection file

ImageFlow generates a unique inspection file for each session. This includes start and end tie and length for roll operations. A job or batch ID can be electronically assigned or using a bar code reader. The data can be backup automatically to the data cloud. The operator can select any inspection and display the data and browse using the roll map and video display.

Technical Description - Confidential

The screenshot shows the 'Inspection Browser' application window. It contains a table of inspection jobs and a separate list for assignable job IDs.

Job ID	Start Time	End Time	Length	Data Local	Data Cloud
Batch ID 10010021	30.06.2017 16:51:33	30.06.2017 16:52:10	21.619859 m	Yes	No
Batch ID 10010020	30.06.2017 16:04:16	30.06.2017 16:09:28	131.918295 m	Yes	No
	30.06.2017 16:03:52	30.06.2017 16:03:57	27.930000 m	Yes	No
	30.06.2017 16:02:13	30.06.2017 16:02:27	5.862940 m	Yes	No
	30.06.2017 16:02:03	30.06.2017 16:02:06	1.188000 m	Yes	No
	28.06.2017 14:50:06	28.06.2017 14:50:54	24.917819 m	Yes	No
	28.06.2017 14:48:00	28.06.2017 14:49:50	42.506938 m	Yes	No
	28.06.2017 14:47:34	28.06.2017 14:47:51	6.229380 m	Yes	No
	28.06.2017 14:47:07	28.06.2017 14:47:21	6.229380 m	Yes	No
	28.06.2017 14:46:53	28.06.2017 14:46:56	15.960000 m	Yes	No
	28.06.2017 14:46:44	28.06.2017 14:46:47	1.188000 m	Yes	No
	15.06.2017 16:40:25	15.06.2017 17:11:02	1122.920052 m	Yes	No
	15.06.2017 16:09:00	15.06.2017 16:09:30	15.444000 m	Yes	No
	15.06.2017 16:08:29	15.06.2017 16:08:30	0.396000 m	Yes	No

Assignable Job ID's

Buttons: ✓, ✗, Remove

Path: C:\Users\ConorOffice\Documents\IF\Inspections\49

Reports can be generated in excel simply by right click and exporting.

The screenshot shows an Excel spreadsheet titled 'Report [Compatibility Mode] - Excel'. The report is for 'Inspection Batch ID 10010020 30.06.2017 16:04:16'. The data is organized into columns for Property, Value, Time, MD Position (m), and Mode.

Property	Value	Time	MD Position (m)	Mode
Total MD Length (m)	131.918	16:02:03		0 View
Job ID	Batch ID 10010020	16:02:13		0 View
Start Time	30.06.2017 16:04:16	16:03:52		0 Detect
End Time	30.06.2017 16:09:28	16:04:16		0 Detect
MD Origin Offset (m)	0			
Material CD Width (mm)	7296			
Frame Size MD (mm)	2818			
Frame Size CD (mm)	7296			
Units Scale	0.001			
Calibration X Step (mm/px)	1			
Calibration Y Step (mm/px)	1			

Excel tabs: Header, Frames, Print Inspection, Classifier (Print Inspection), Decisions (Print Inspection), Blocks (Print Insj ...)

The user can generate an excel report for each inspection with all data and a summary page, or export to a zip file that may be imported using another ImageFlow workstation.

Classifier (Print Inspection)									
<i>ID</i>	<i>Type</i>	<i>Width</i>	<i>Length</i>	<i>Area</i>	<i>X</i>	<i>Y</i>	<i>Intensity Min</i>	<i>Intensity Max</i>	<i>Intensity Mean</i>
0	Small	1.69	0.91	1.065	521.49	27128.756	11	152	74.127
1	Small	1.3	0.65	0.591	521.664	27129.823	18	154	76.171
0	Small	1.95	0.91	1.149	521.721	27487.792	16	140	50.118
1	Small	1.56	0.91	1.014	521.798	27488.842	15	152	67.85
0	Small	1.69	0.91	0.879	521.59	32139.296	17	150	79.712
1	Small	1.56	0.91	0.862	521.876	32140.312	16	150	74.373
0	Small	1.56	0.78	0.98	521.656	32498.242	17	152	76.466
1	Small	1.3	0.78	0.608	521.845	32499.312	11	152	67.417
0	Small	0.91	0.78	0.473	524.053	36403.598	16	95	48.607
0	Small	1.56	0.78	0.896	521.656	37507.703	17	152	72.811
1	Small	1.43	0.78	0.828	521.839	37508.776	17	134	61.878
0	Streak	0.52	1.3	0.355	396.073	38643.143	-13	-11	-11.429
0	Streak	0.13	1.43	0.186	911.3	41046.478	-20	-12	-15.727
0	Small	1.95	0.91	1.048	521.669	42517.072	17	123	54.903
1	Small	1.17	0.65	0.524	521.694	42518.16	17	152	55.839
0	Streak	0.52	1.82	0.389	509.459	42881.832	11	28	18.435
0	Small	1.04	0.65	0.507	524.073	46786.326	17	95	51.8

There is a tab for every tool used in the pipeline and the detailed measurement information is available for all events.

Auto back up

Oneillco offers on a subscription basis data storage and sharing using its data cloud. There is no limit to the time and size of data that the system can be stored using this service. Users can share data between sites, machines or workstations electronically and through the same browser service.

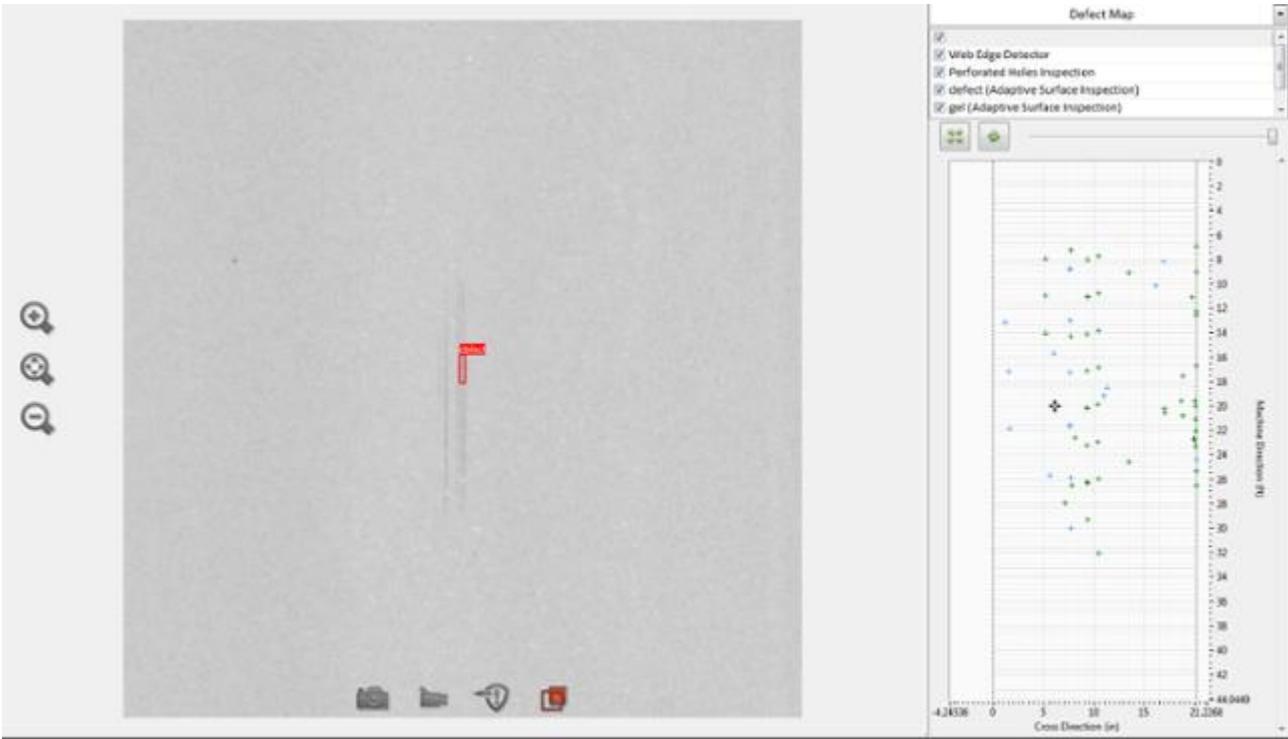
Defect display

- Overlay - color can be defined and how large to expand around defect
- Roll map - color coded map showing complete history
- Block map - color coded map showing history of block statistics
- Defect list - list of defects from classifier with key measurement information
- Measurement table - select any tool from wed edge to register and see all information
- Navigation pane - complete overview of image with one touch zoom
- Filter pane - select which classes of measurement or defects should be mapped



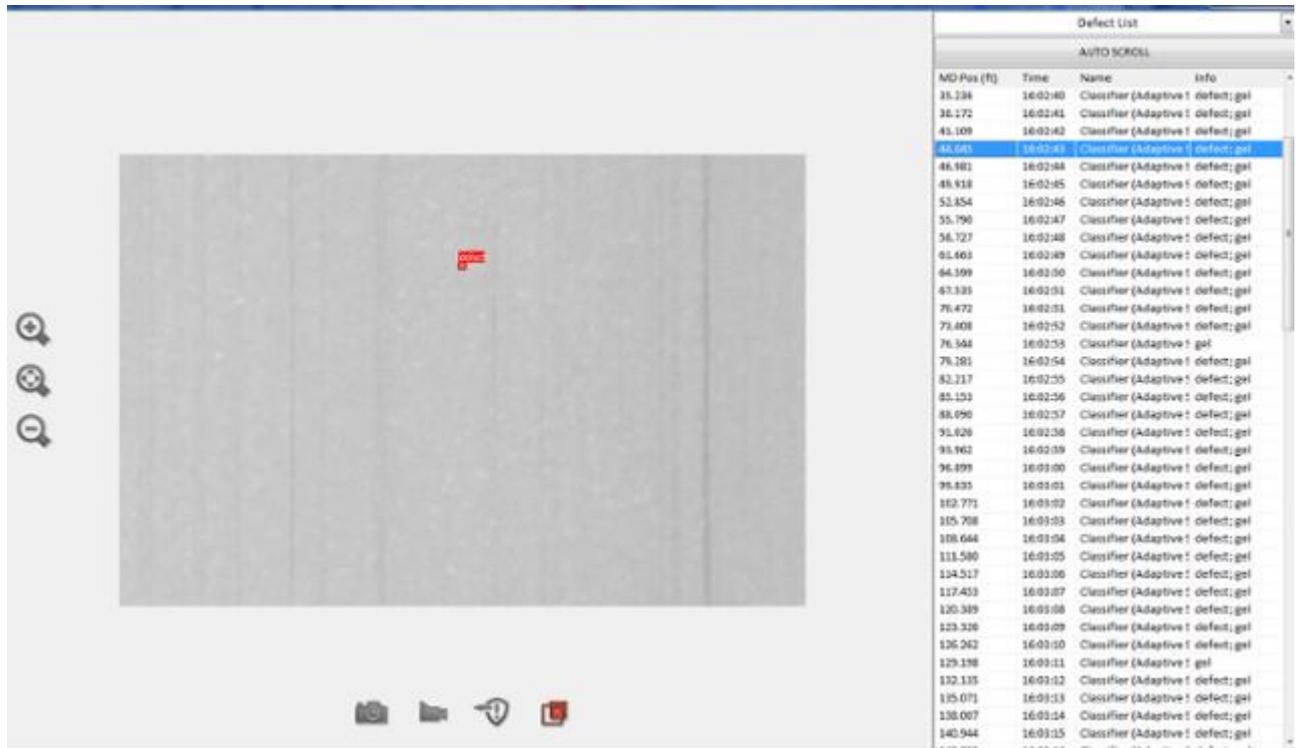
Roll map

Clicking on a defect brings up an image of the defect in the main display, along with the measurements associated with it. Defects in the defect map are color-coded by class and tool so you can see, at-a-glance, what type of defects were found with the ability to filter by class at a click.



Defect list

The defect list in ImageFlow allows you to view a list of defects found during inspection that updates in real-time. Clicking on a defect from this defect list will show you an image of the defect, along with an indication of where the defect was found on the substrate.



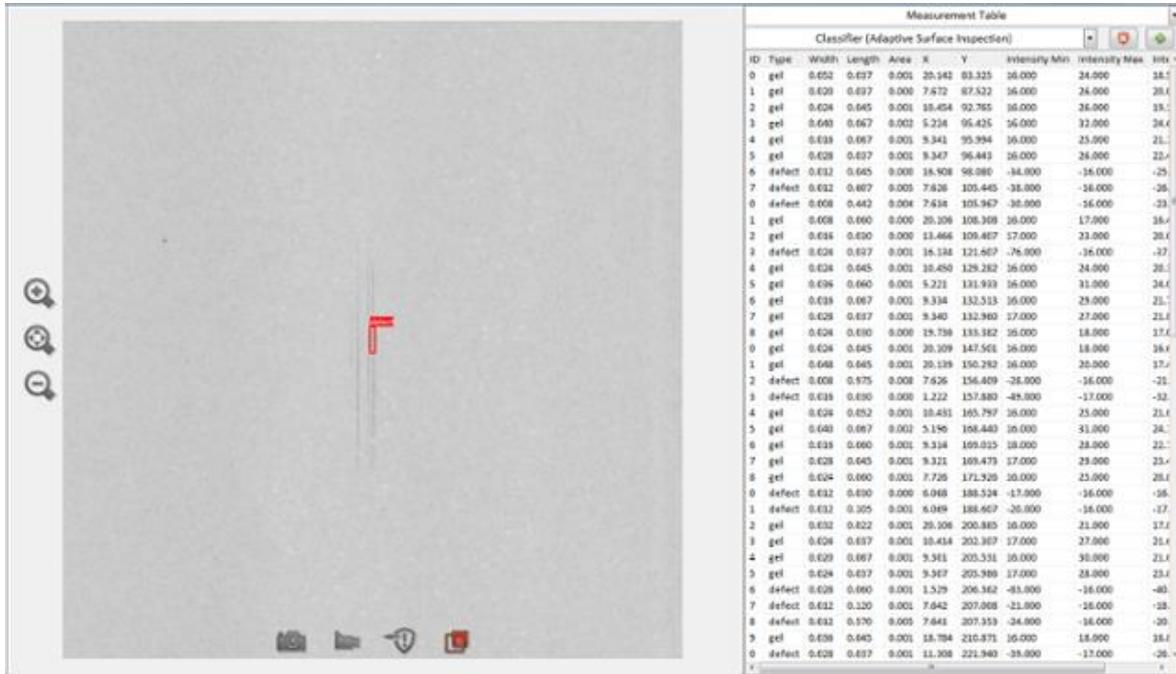
The screenshot displays the ImageFlow software interface. On the left, a large gray rectangular area represents the substrate being inspected. A small red rectangular box is overlaid on this area, indicating the location of a detected defect. To the left of the substrate image are three circular icons: a magnifying glass, a plus sign, and a minus sign. At the bottom of the substrate image are four icons: a camera, a folder, a shield with a checkmark, and a red square with a white 'L'.

On the right side of the interface is a 'Defect List' window. It features a scrollable table with the following columns: MD Pos (ft), Time, Name, and Info. The table contains a list of defects, with the entry at MD Pos 44.643 and Time 16:02:43 highlighted in blue. The 'Name' column for all entries is 'Classifier (Adaptive : defect; gel' and the 'Info' column is empty.

MD Pos (ft)	Time	Name	Info
35.134	16:02:40	Classifier (Adaptive : defect; gel	
36.172	16:02:41	Classifier (Adaptive : defect; gel	
41.109	16:02:42	Classifier (Adaptive : defect; gel	
44.643	16:02:43	Classifier (Adaptive : defect; gel	
46.161	16:02:44	Classifier (Adaptive : defect; gel	
48.118	16:02:45	Classifier (Adaptive : defect; gel	
51.354	16:02:46	Classifier (Adaptive : defect; gel	
55.790	16:02:47	Classifier (Adaptive : defect; gel	
56.727	16:02:48	Classifier (Adaptive : defect; gel	
61.463	16:02:49	Classifier (Adaptive : defect; gel	
64.399	16:02:50	Classifier (Adaptive : defect; gel	
67.333	16:02:51	Classifier (Adaptive : defect; gel	
70.472	16:02:51	Classifier (Adaptive : defect; gel	
71.408	16:02:52	Classifier (Adaptive : defect; gel	
76.344	16:02:53	Classifier (Adaptive : defect; gel	
78.281	16:02:54	Classifier (Adaptive : defect; gel	
82.217	16:02:55	Classifier (Adaptive : defect; gel	
85.153	16:02:56	Classifier (Adaptive : defect; gel	
88.090	16:02:57	Classifier (Adaptive : defect; gel	
91.026	16:02:58	Classifier (Adaptive : defect; gel	
93.962	16:02:59	Classifier (Adaptive : defect; gel	
96.899	16:03:00	Classifier (Adaptive : defect; gel	
99.835	16:03:01	Classifier (Adaptive : defect; gel	
102.771	16:03:02	Classifier (Adaptive : defect; gel	
105.708	16:03:03	Classifier (Adaptive : defect; gel	
108.644	16:03:04	Classifier (Adaptive : defect; gel	
111.580	16:03:05	Classifier (Adaptive : defect; gel	
114.517	16:03:06	Classifier (Adaptive : defect; gel	
117.453	16:03:07	Classifier (Adaptive : defect; gel	
120.389	16:03:08	Classifier (Adaptive : defect; gel	
123.326	16:03:09	Classifier (Adaptive : defect; gel	
126.262	16:03:10	Classifier (Adaptive : defect; gel	
129.198	16:03:11	Classifier (Adaptive : defect; gel	
132.135	16:03:12	Classifier (Adaptive : defect; gel	
135.071	16:03:13	Classifier (Adaptive : defect; gel	
138.007	16:03:14	Classifier (Adaptive : defect; gel	
140.944	16:03:15	Classifier (Adaptive : defect; gel	

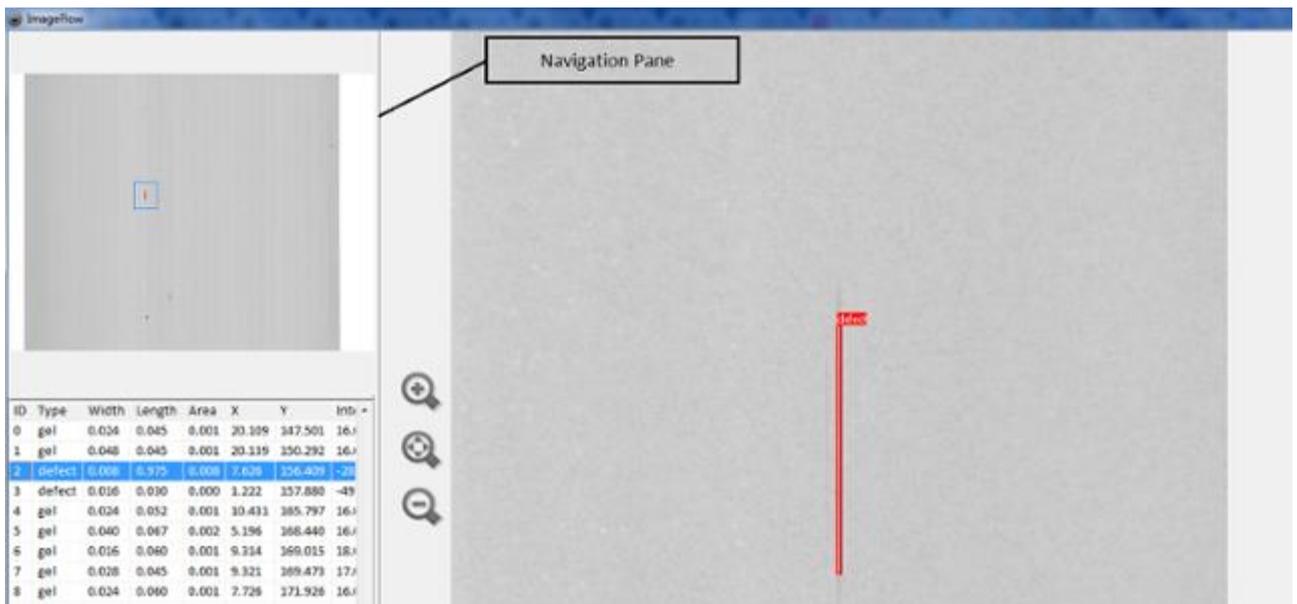
Measurement table

The measurement table gives you in-depth information and measurements to do with each defect found in the software. Measurements such as defect size, position, and intensity are all readily available in this view.



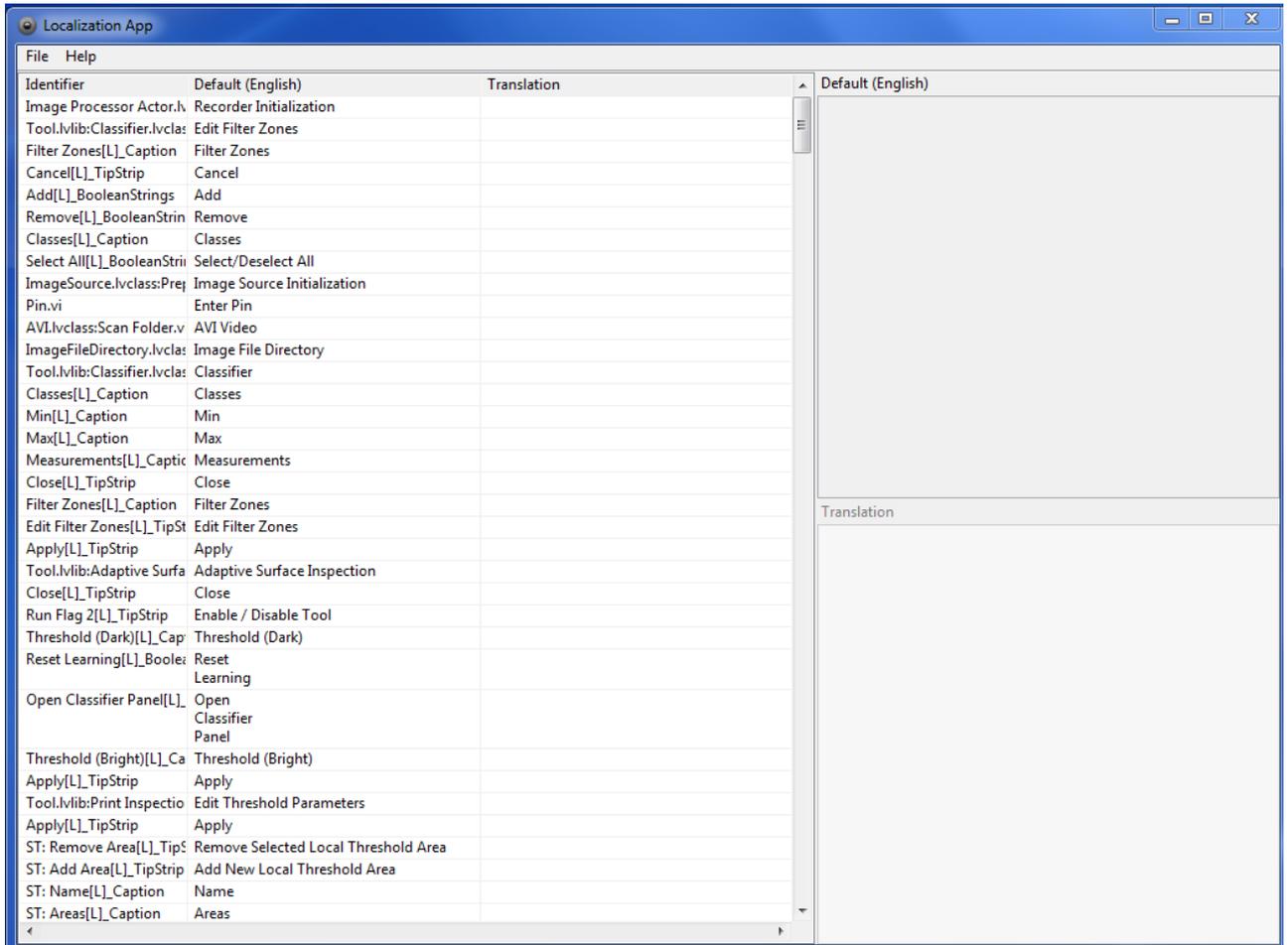
Navigation pane

The Navigation Pane in ImageFlow can be used in conjunction with these views in order to give you an indication of the position of a defect in the context of the overall web. The blue box shown below in the navigation pane, shows the subsection of the web where the main defect display/visualization is taken from.



Localization

ImageFlow supports multiple languages. Simply use our localization tool to create a language map for all of the phrases displayed and the system will auto load that file based on the configuration setting in the app data directory. Its a simple solution to make it easier for the operators.



Inspection algorithms

ImageFlow is a complete vision solution designed for high speed manufacturing. ImageFlow uses "*Pipeline*" processing, where the user can configure tools that operate on the image sequentially. ImageFlow is not only unique in how it is configured but also in how it is applied. There is no need for a programmer. Inspection recipes can be configured in minutes. Record the video of production and run fit through the inspection algorithm to tune and verify.

Key features

- Three modes, play , pause and record
- Panel interface to allow operator make key run time adjustments
- Recipe system with no limits on numbers
- No limit on algorithms and types
- Includes standard image filters, particle analysis and I/O control
- Graphical mapping displays for roll to roll operations
- Real time video display
- Display last defect
- Active overlay to highlight defects
- Pin control to access restricted features
- Supports multiple LED lights
- Supports National Instruments I/O modules
- Supports linear slides
- Playback video files through application
- Playback images through application
- Data manager to manage storage of inspection data

Common Applications

- Flexible packaging inspection
- Gel counting.
- Plastic film inspection.
- Foil inspection.
- Non-woven inspection
- Glass inspection.
- Currency inspection.
- Textured inspection for non-woven and composite.
- Print inspection for wide web and sheet packaging.
- Advanced pattern analysis for decorative printing.
- Label inspection for tag and label machines.
- Autocoding and Serialization.

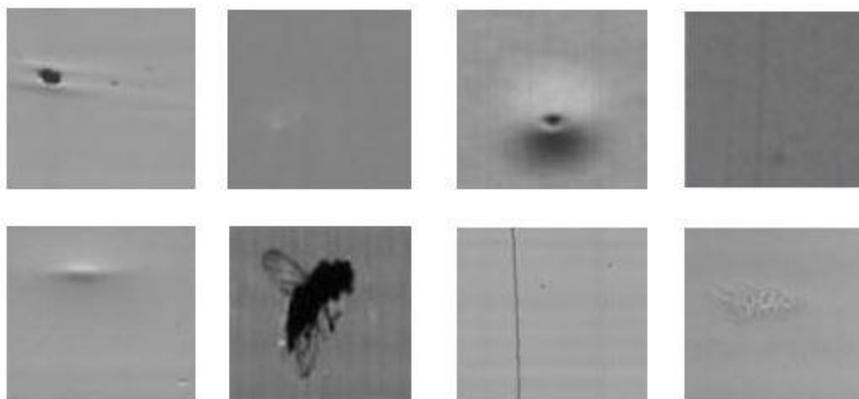
ASI -100% Surface inspection for roll and sheets.

The ASI or automated surface inspection expert is a machine vision solution designed for 100% inspection of plastic film, paper, foil and non-woven substrates. The ASI will detect defects and track them through the manufacturing process.

ASI is used for inspection of a number of plastic applications including Plastic packaging, Medical film, Blown film, Flexible packaging film, Cast film, Window film, Battery film, PCB material, Polarizer film, Glass fabrics, Prepreg inspection and others. The simple user-interface make it easy to use for any member of a production team.



Typical defects detected include.



- Holes
- Bubbles
- Dent detection
- Dark Spots
- Water Stains
- Gels
- Fish Eyes
- Fractured Melts
- Wrinkle detection
- Splices
- Scratches
- Coating voids
- Insects
- Contamination

Key features

- Adaptive surface inspection This feature enables the tool to adapt to normal substrate variations and ambient conditions while optimizing the segmentation of anomalies.
- Supports up to 40 feature including shape, location, orientation and intensity to enable classification.
- Configurable decision system to classify anomaly as defect, or event.
- Decision matrix to alarm operator , save defect image and if alarm is to be generated.
- Interfaces with web edge detection for accurate location tracking and trim masking.
- Store all results for each roll, including images of defects.
- Interface to tagger or spray systems.
- Image display for the operator in real time.
- Optional opacity and formation analysis.
- Optional dimension measurements.

Common Applications

- Plastic film extrusion lines.
- Spunbound non-wovens.
- Coating application.
- Glue verification.
- Glass printing.
- Technical textiles and composites.
- Optical films.

Print inspection tool

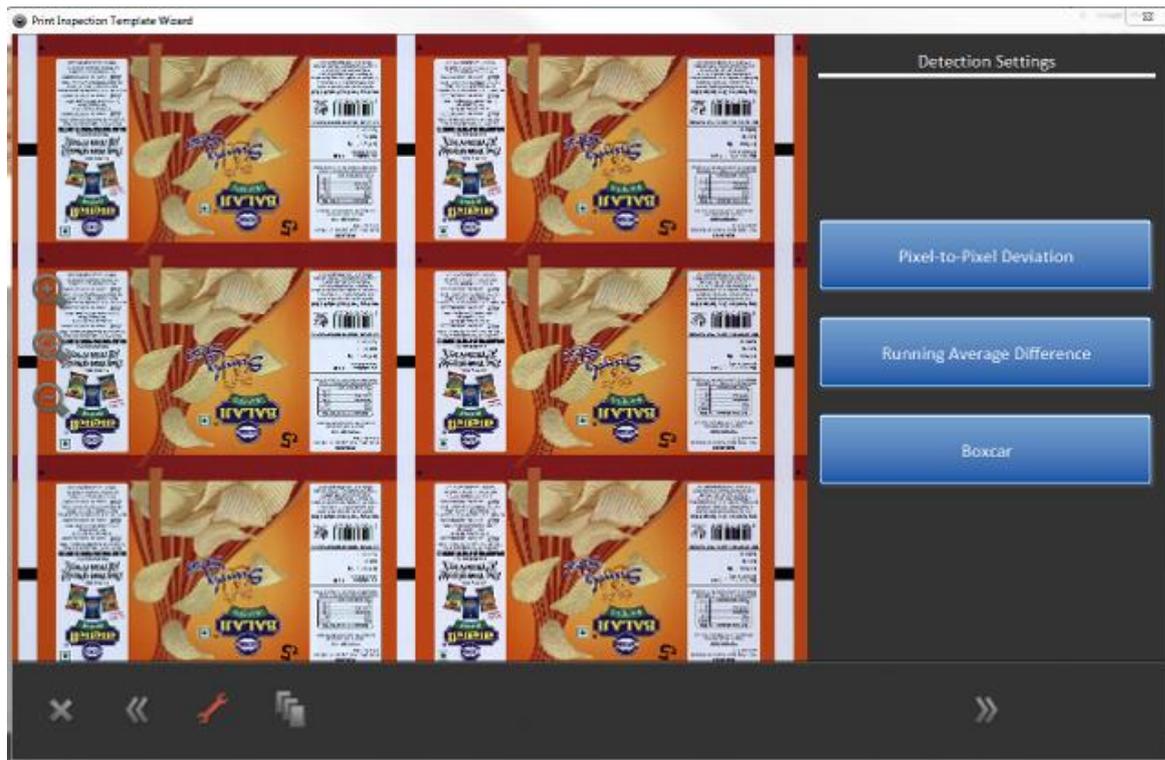
The print inspection tool is designed to inspect flexible packaging, labels, screen print, corrugated cases, folding cartons or printed electronics. The algorithm is unique in that it is what we call pattern based adaptive. The software will analyze the printed patterns, and based on configured guidelines optimize the inspection based on the content and color of the pattern. The tool includes three distinct inspection routines in one. Print inspection can be tuned to inspect flexo, gravure, offset, ink jet and screen printing processes. Any repeating pattern can be analyzed in real time and anomalies segmented and classified.



Typical defects detected include.

- Missing Print
- Smearing, Toning and Hazing
- Substrate Issues
- Doctor Blade Streaks
- Bleeding
- Drying in
- Color variations
- Drags
- Holes
- Color Fading
- Contamination

ImageFlow's print inspection tool is an easy to use golden template inspection. Choose a template from the gallery, or acquire a new one. There is no limit to number of jobs and the operator can choose from any number of preset quality levels. See our 3 in 1 wizard below.



Key features

Print inspection is a comprehensive tool rich with functionality with some of key features listed below:

- 3 in 1 Print inspection using smart pattern adaptive techniques.
- Template library for easy job recall.
- Optional PDF interface for design file check on new jobs.
- No operator interaction required from job to job.
- Running density variation algorithm to detect hazing, lacquer skips and color variation.
- Supports up to 40 feature including shape, location, orientation and intensity to enable classification.
- Configurable decision system to classify anomaly as defect, or event.
- Decide to alarm operator , save defect image and if alarm is to be generated.
- Masking for die cuts.

Common applications:

- Flexible packaging.
- Tags and labels.
- Flexible circuits.
- Metal decorating.
- Glass printing.
- Screen printing.
- Label counting.
- Carton serialization.
- Label serialization.

Auto edge detection

Auto web edge detection is used to track cross directional movement of the roll or sheet being inspected. The user can set trim values to ignore the areas that will be cut off. Parameters can be set to alarm for excessive movement or cracked edges.

The Web Edge Detector has two inspection modes, auto and manual.

- If Auto mode is selected, ImageFlow will automatically detect the edges of the web and then allow the user to fine-tune the selection to their liking using the “Trim” left and right side options.
- If Manual is selected, then the user can manually select the web’s edges by clicking on the web displayed within ImageFlow



Key features:

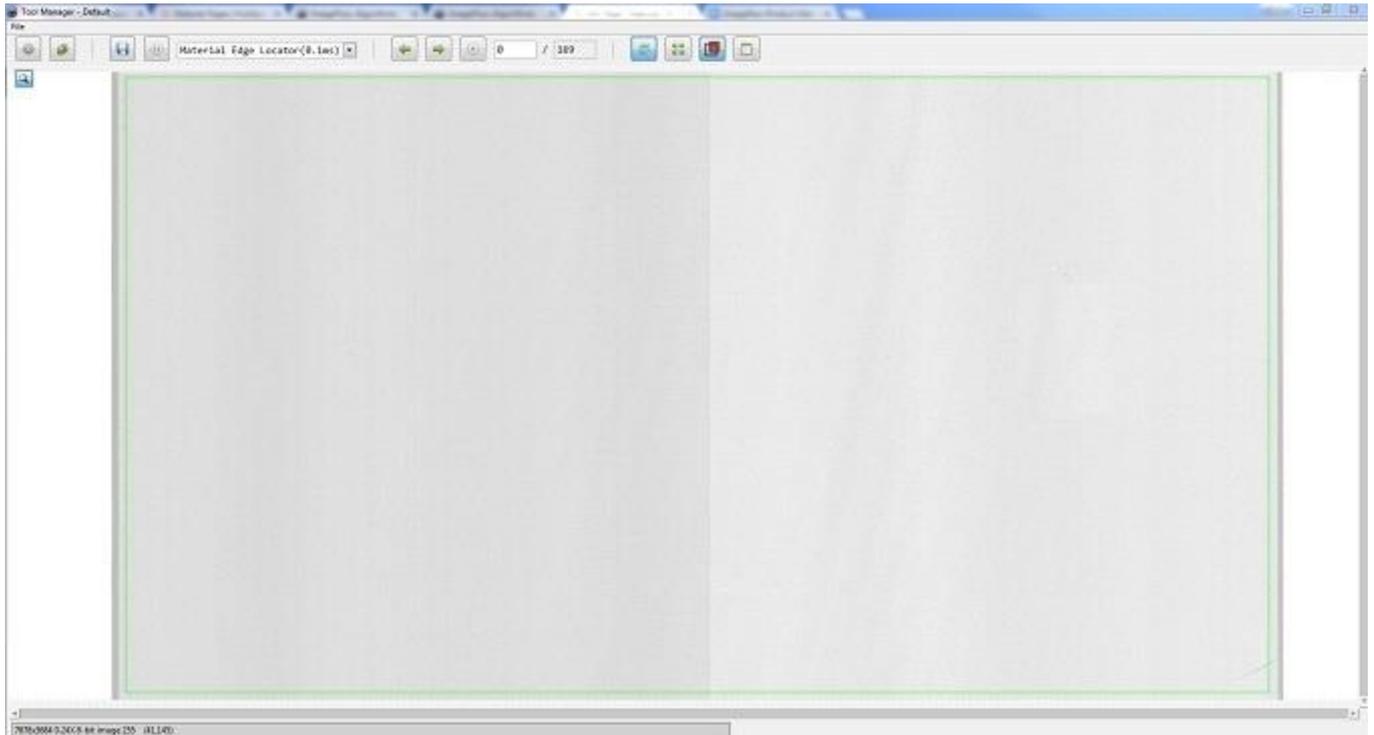
- Auto and manual modes
- Jump tolerance
- Auto trim application
- Auto update of location for surface inspection mapping

Common applications:

- Roll to roll inspection
- Edge monitoring and guiding
- Sheet location detection
- Statistical analysis of web width during production

Material edge locator used of sheet inspection

The material edge locator can be configured a region of interest to apply all subsequent tools in the pipeline. It may be used in auto or manual mode. In auto mode the user selects a region for the software to automatically detect edges, while in manual mode the region of interest selected is the area defined for inspection.



Key features:

- Auto and manual modes
- Auto trim application
- Auto update of location for surface inspection mapping

Common applications:

- Roll to roll inspection
- Edge monitoring and guiding
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- Statistical analysis of web width during production

Rewind module

ImageFlow automatically stores all defect and measurement information along with images as part of a roll map. This map can then be reversed for processing at the next converting operation. The rewind module uses this data to automatically control the operation of that machine based on the user selecting defects to stop on from the roll map. The user simply zeroes out the map based on an event such as a tag or splice and all defects are then offset from that point. The rewind module will accelerate the removal of waste.



Key features

- Parent machine interface to stop, start, jog, forward, backward
- Automatic control to lower speed when defect approaches
- Safety lock
- Queue defects with location tag.
- Integrated with ImageFlow Map

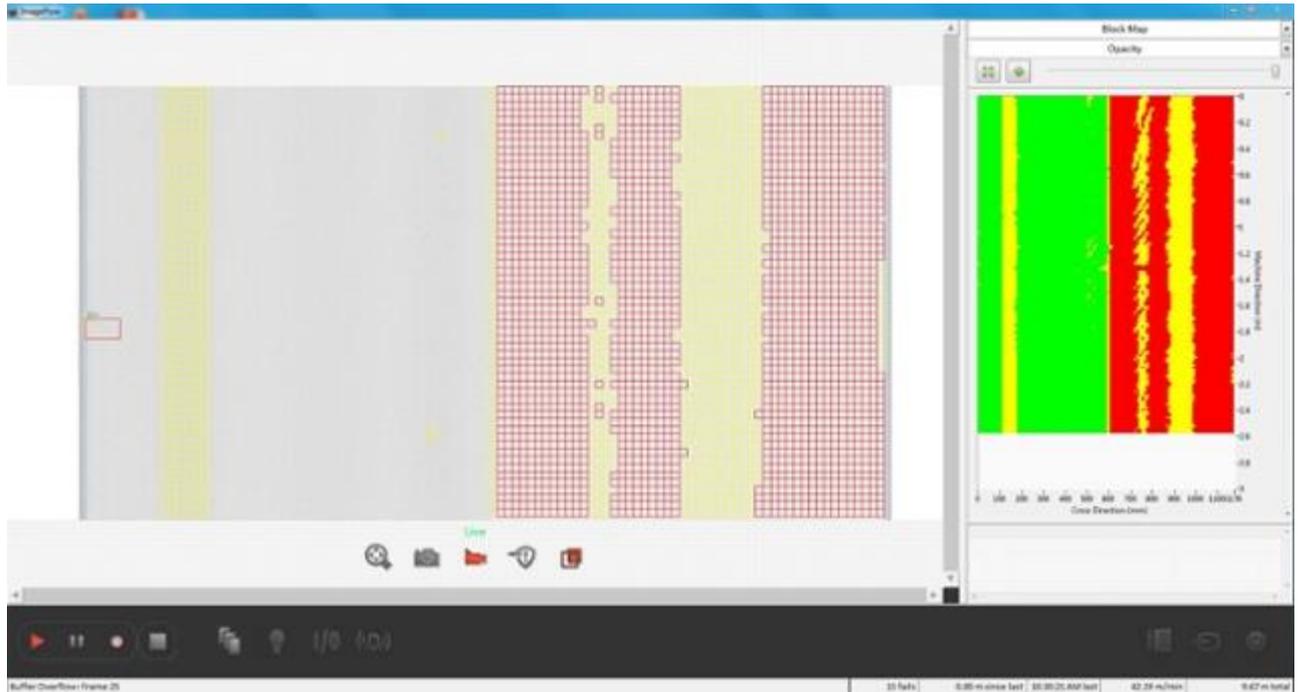
Common applications:

- Removing waste on doctor machines or slitters.

Measure Color, intensity or formation

Often it's difficult in high speed manufacturing to get good feedback on what you would consider obvious issues. Opacity measurement, color reflectivity in plastic film processing, textiles, coating variations for converters, formation analysis for non woven inspection and other visual measurements that change during a long run are not normally measured in real time and 100% inspection vision systems usually target defects that are visually obvious, ignoring the slow moving process issues that cost you dearly in the long run.

Block statistics enables a user to define a live grid analysis , using a number of statistical algorithms. If balanced and calibrated color cameras are feeding the tool, it is possible to map your product using CIE76 Delta-E. The user may define how large each block should be, how much the blocks should overlap, setup acceptable tolerances, warning and error limits. ImageFlow will provide the operator with a real time map of the measurements while storing data and images for subsequent analysis.



Key features

- A suite of statistical tools for each block, including intensity, color and formation analysis.
- Variable settings for warning and alarms.
- Supports color, monochrome and thermal images.
- Separate run time map on operator display showing run time variations using color codes.
- Can be run in parallel with standard surface inspection algorithms..

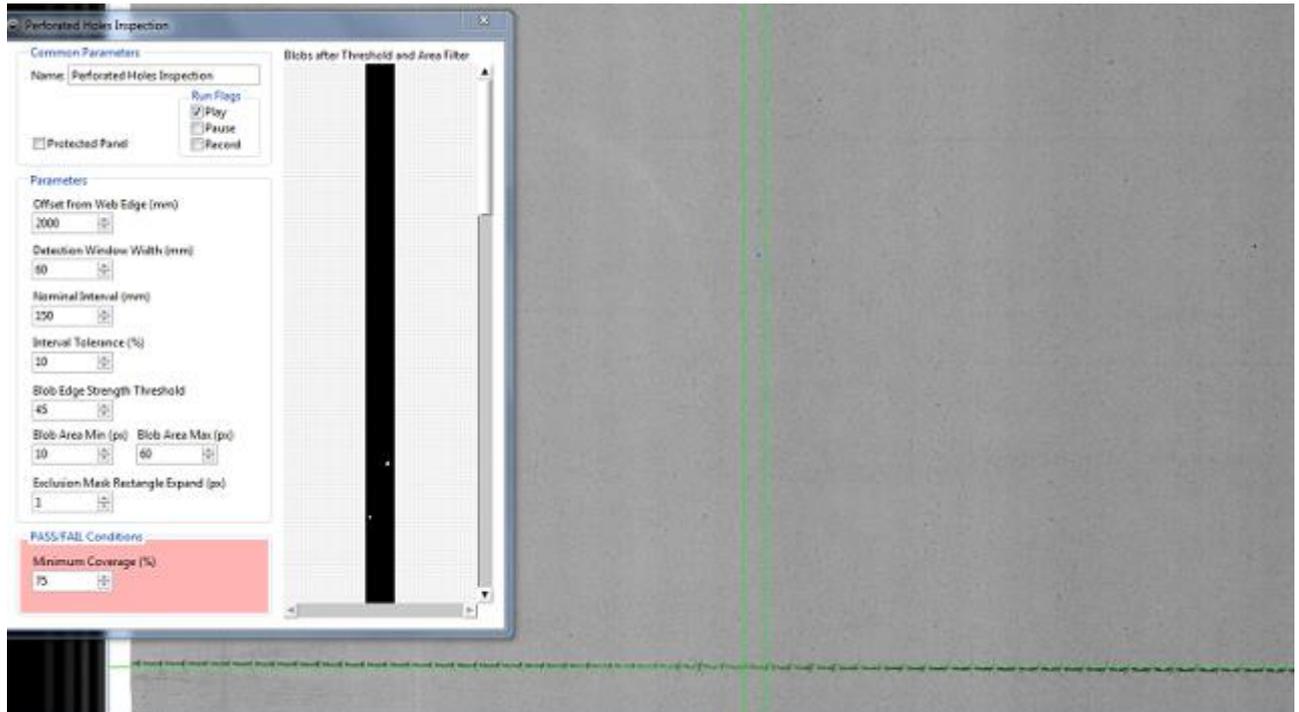
Common applications

- Opacity measurement for plastic films
- Color measurement on plastic films, textiles, and nonwovens.
- Formation analysis
- Coating inspection
- Glue inspection

Perforation analysis

The perforated holes inspection tool in ImageFlow is designed to detect the presence and quality of perforated holes within a detection window specified by the user. The size and default positioning of this window is set using the Tool Manager. The only parameter that the operator needs to edit is the Offset from Web Edge. The Offset from Web Edge dictates the position of the detection window for perforations from the left edge of the web.

The detection window is an area on the image that ImageFlow looks to detect perforations. The user can edit the position of this box and ImageFlow will then search the entire vertical space encapsulated by this box to find perforations. The expected interval of perforations, as well as the box width and position are set in Tool Manager.



Key features:

- Programmable region in machine direction.
- Learns hole profile.
- Interval check.
- Automatic masking for surface inspection.

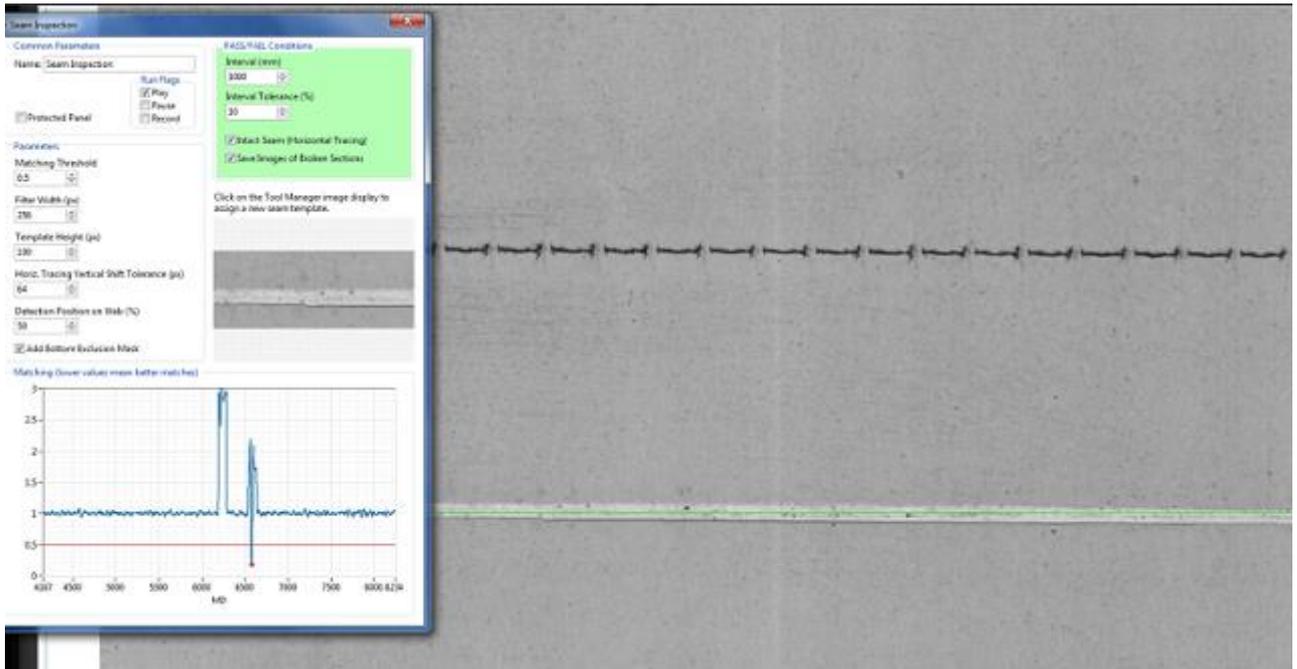
Common applications:

- Breathable film inline on a bag machine.
- Thermoform packaging inspection.
- Laser perforation
- Rotary perforation

Auto detect seams and tears

The seam inspection tool is a show and forget setup. The user learns what a typical seam or tear will look like, inform the tool of the expected interval if any, and decide if the seam or tear should be inspected for continuity. The tool then runs in sequence to other tools, and can be the resultant seams can be removed from the inspection process of tools following in the pipeline to avoid false alarms.

The tool includes it's own pass fail criteria which can be used to generate user interface events or hardwired electrical signals.



Key features

- Learn seam profile and auto detect.
- Verifies that the seam is complete
- Verifies seam to seam interval.
- Automatic masking for surface inspection

Common applications

- Inspection of plastic film inline on a bag machine.
- Medical pouch inspection.
- Inspection of creases
- Automasking of splices

PDF Verification

VeriFlow (VPACK-VER) is a label verification package that can be integrated with any other Oneilco application. It can be launched to proof a template used by the label or standard print inspection packages. A printer can often spend as much as an hour proofing a job before going into full production on a pharmaceutical label.

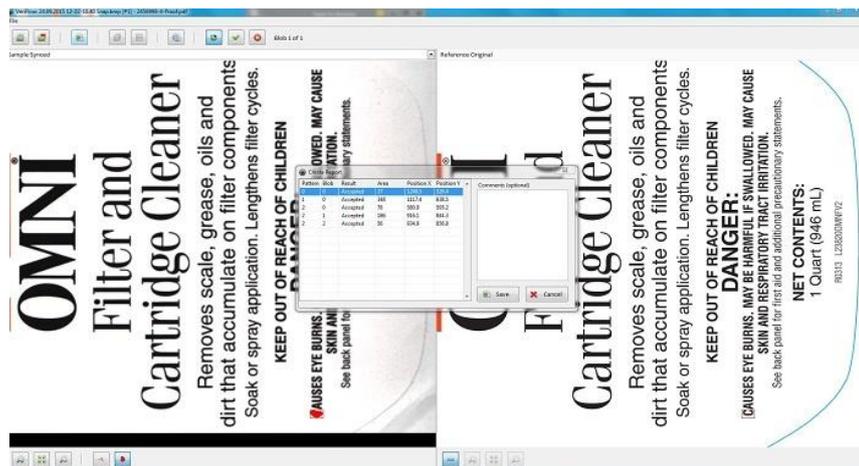


Key features

- Multiple label browsing. Compare 1 Up to multiple labels in an image.
- Supports multi-layered PDF files.
- Step through each difference and record if accepted or rejected.
- Export complete report to excel for validation and quality audits.
- Image processing adjustments for copy and intensity.
- Overlay skeleton of design on target image.
- Synchronize images for easy comparison.
- Auto select features for scaling.
- Raster design file to any resolution to match sample.
- Learn to use in minutes.

Common

- Flexible packaging.
- Tags and labels.
- Flexible circuits.
- Metal decorating.
- Glass printing.
- Label counting.
- Carton serialization.
- Label serialization.



applications:

2D/1D Code Inspection

The ID tool supports all standard 1D and 2D codes. The tool can be applied automatically to a complete repeat with multiple codes using our auto repeat step function. Codes may be serialized and can be sequential or random. The 2D code also includes a grading function. The codes can also be verified against an excel file for batch operations. Standard operations include:

- Verify against a fixed value
- Verify against a file
- Grade 1D and 2D codes.



The tool can be linked to a co-ordinate system updated by a fast geometric match so that the location of the tool can be dynamically updated if the target moves within the field of view.

Key Features:

- Grading to international standards.
- Auto learning of parameters.
- Ability to set grading conditions.
- Choose to fail on grade and/or read verification.

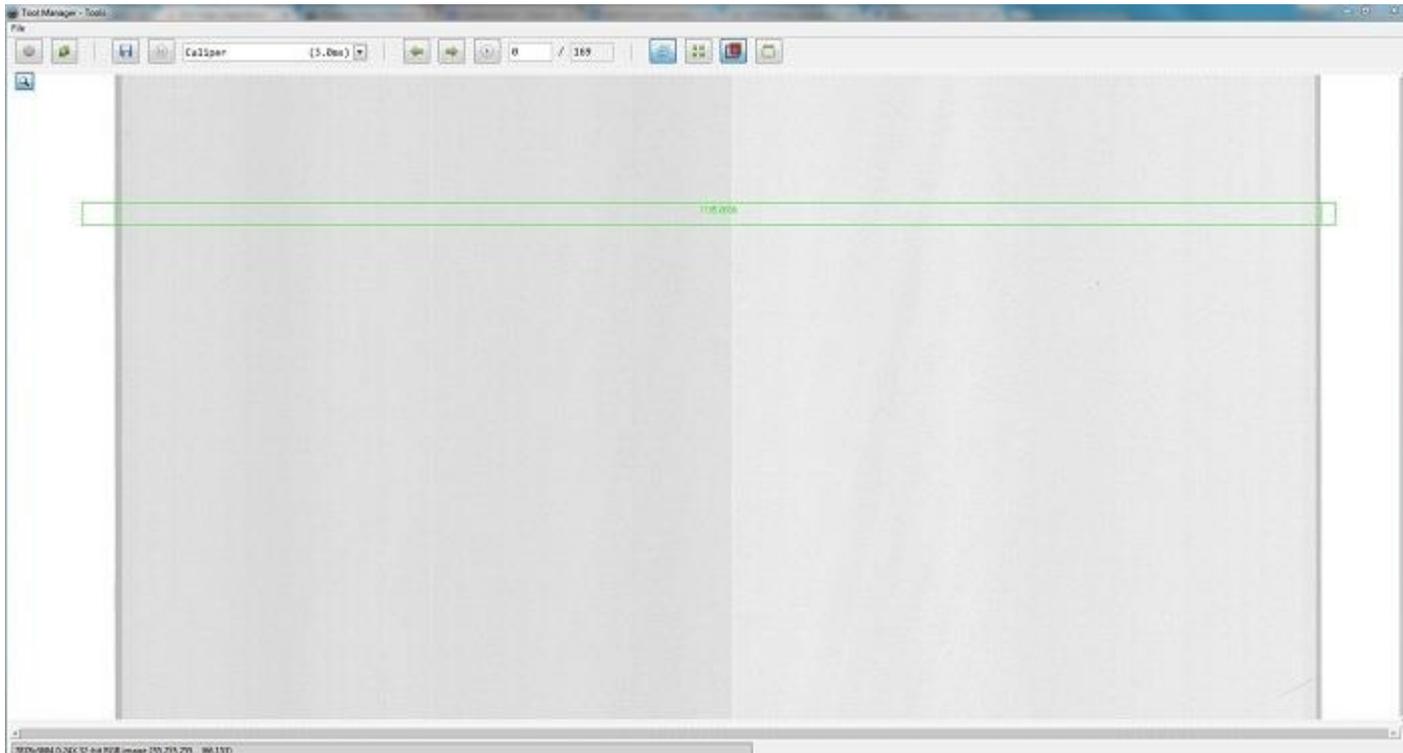
Common applications:

- Auto coding for food and beverage
- Barcode verification for printers
- Medical device label printing
- UID / DQSA and FMD serialization
- Product tracking

Calipers

Caliper can be configured to measure features horizontally or vertically in the image. It uses advanced edge detection and filtering to locate the two points in a user defined region of interest. That ROI can

be automatically updated using a dynamic co-ordinate system. It can be applied across multiple areas in an image automatically by using our step and repeat function.



The calipers can use a co-ordinate system generated by the match pattern tool for automatic updating its region of interest.

Key Features:

- Point to point measurement.
- Edge detection parameters.
- Fail tolerance linked to I/O.
- Auto apply to multiple patterns .
- Supports multiple coordinate systems

Common applications:

- Part inspection
- Point to point measurements
- Print to print register
- Sheet width checks

Integrating inspection systems into your process

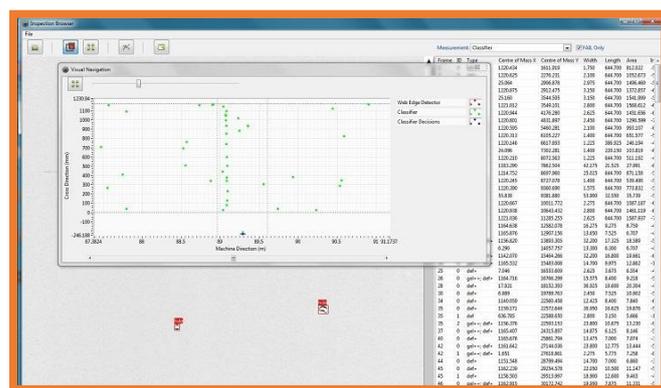
When manufacturing discrete items like boxes of biscuits, pharmaceutical products, cans and bottles there has always been the capability to inspect and reject. This has been taken for granted. When operating in a roll to roll environment the challenges are quite different. It is not always possible to stop the line so when a defect is detected it will continue to the rewind and become part of the product to be shipped.

The common approach is to mark the edge of the web or apply a tag as shown below. This works well and an operator in a converting department can then stop and cut the waste out.



100% inspection systems detect many defects

However if using a 100% inspection system, often the defects detected is of an order of greater. The image below shows roll map of a plastic roll of 1800mm in length and 1.4m were close to 2,300 issues with user in this case only wanted to so it was easy for the inspection classify the defect and automate the slitter to stop.



automated volume of magnitude a graphical material wide. There the roll. The mark holes, system to

However there were over 200 instances of contamination. If a tag was to be inserted for each instance, the end result would be a telescoped roll that looked like a hedgehog with many tags.

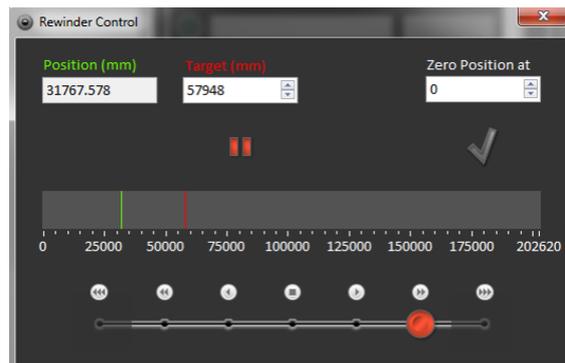
Work flow for inspection systems

So if an inspection system is installed on a slitter to inspect material prior to shipping, then it can be considered a quality control device. If installed on the process that produces the defects then it can be considered a process control device providing early warning and allowing the operator to stop further issues. If you add the ability to track defects from the upstream process to the converting department you now have process control and a quality management system in place. This could also be referred to as smart converting. Machine vision systems enable this process.

There are a number of requirements to smart converting:

- Storage of defect images and statistics to enable a review.
- Classification of defects.
- Software to filter defects.
- Synchronisation method so as to stop slitter at correct position.

The image shows a simple control screen to operator control a rewinder by selecting a and the software together with some simple will move the roll and stop it at the correct Synchronization in this case is by zeroing out position by using any event such as a splice roll, and then all defects are offset from that This is a simple and well tested method.



allow an defect hardware location. the on the point.

[Making it work for stake holders](#)

When purchasing an inspection solution you must think about the end user. Often it is a project engineer or engineering manager that specifies a vision system for their surface inspection requirements. Oneillco has years of experience dealing with this issues while developing and deploying web inspection systems for surface inspection, print inspection outline some key aspects that need to be considered

Let's look at the key stakeholders in a factory that interact with vision systems

1. The operator - this includes the personnel at the process line and converting lines.
2. The engineer - this normally is the process engineer that is responsible for the operation and upkeep of the process lines.
3. The quality supervisor - this is the individual tasked with using the data to guarantee quality of goods and the interface between customer service and production.

The Operator



The operator wants something simple to use that will not add complexity to his daily duties.

- Fast setup for a new job
- Clear feedback when there is an issue
- Historical information on existing run

ImageFlow RT achieves this with a one touch system for mode operation and recipe selection. The defects are clearly displayed with context. Rather than displaying a small region of interest that looks like a postal stamp, the operator sees the defect on an image of the complete web. Finally the historical information for that run with a time stamp and location is displayed on a list to the right hand side. The operator simply selects the event and can see the web image at that time.

The Engineer



The process engineer needs a simple system that he can use at the line or his desk to set up recipes and to troubleshoot process issues.

- Software must be easy to configure
- System must have a complete set of features
- Support machine troubleshooting

ImageFlow TM or Tool Manager provides a process engineer with exactly those capabilities. The software may be installed on an office work station or can be remotely accessed.

The tool manager supports an easy to use product manager. The application comes with configured recipes that can be copied and modified for new products, The tool set includes a complete set of algorithms for inspection, measurement, and parent machine interfacing. Finally the application supports the playback of video files recorded on the machine for trouble shooting.

The Quality Manager



The quality manager needs to be able to apply standards, check against those standards and monitor customer shipments against customer orders. The goal is simple, optimize production while reducing claims to zero. The features the quality department requires are:

- To be able to generate reports for each production run
- To be able to remove waste if generated from an upstream process
- To be able to archive results for customer service

ImageFlow's Inspection Browser is an application designed to provide that feature set to a quality manager.

The application includes a graphical map of each production run. The user can export all data to excel for reports, and all production runs are archived with the defect images. The software includes the ability to link to a rewind module and automate the removal of waste.

Why Oneillco?

Oneillco delivers integrated machine vision inspection solutions to industry using commercial off the shelf components combined with an open architecture approach to software.

Key benefits include:

- **Lower cost of project execution** –Oneillco has dramatically reduced the cost of high speed web and sheet inspection through innovation in design and packaging.
- **Lower total cost of ownership** – Oneillco chooses COTS components enabling easy upgrade in the future, low support costs while reducing maintenance and operational costs.
- **Increase Value** – As the component supply is transparent the step cost between, say for example, 1 camera and 2 camera systems is reduced. Therefore with the same budget you can purchase more enhancing the system performance.
- **Better choice** – Oneillco works on a purchase per line item basis. The customer can choose to supply an element of the project thus reducing out sourced costs.

Oneillco works with clients to achieve value. The following are benefits seen by our global customer base after deployment

- Reduce customer claims and increased productivity on rework - Customer facing business benefits are probably the hardest to quantify and the most valuable. What price do you place on a lost contract? It can be part of any business strategy to include borderline product to fulfil a delivery. This is not a viable business strategy if the product quality has not been determined and stored. The cost of rework, if this product is returned, should be negated as the location of borderline issues will have been identified prior to shipping.
- Root cause analysis and process improvements - reduce inline waste and increase asset OEE. Vision networks integrated with sensor historians enable this.
- Smart converting - This is the use of data to optimize the follow on processes. An example of this is to rework a substrate roll prior to lamination. Why add the second layer to product that will be scrapped anyhow.
- Lower maintenance costs - can be expected through root cause analysis. Assets that are run at a steady output without constant stops due to quality issues will require less maintenance.
- Increased Output - Operators only deal with issues due to their process, there will be an increase in throughput.

Oneillco delivers to clients globally. Our solutions are used by manufacturers, original equipment suppliers and engineering integrators on four continents.