# Fast 100% Inline Print Inspection for the Packaging Industry

## Towards the optimal interaction of line scan cameras and software

*Quality control within package printing processes is one of the key fields of application of fast, high-performance color line scan cameras. To this end, Irish machine vision specialist OneBoxVision has developed an "out of the box" solution for 100% inline inspection. The central component of this solution is a CCD color line scan camera by Chromasens.*

Packaging is fundamentally used for the protection and transportation of products. However, packaging also features colorful "buy me!" advertising messages as well as essential information on the packaged goods and coded data to facilitate logistics, serialization, and tracing.
To ensure good print quality and the legibility of this information, the results of the package printing process must be inspected. Nonetheless, full monitoring throughout the process presents an enormous challenge. Here, a suitable technical solution is provided by the combination of a high-performance color line scan camera and extremely fast image processing hardware and software.

## Expertise und Know-how

Chromasens GmbH, based in Konstanz, Germany, has specialized in the development, production and worldwide distribution of industrial image processing systems since 2004. Fast color image acquisition is one of Chromasens's areas of expertise. Thanks to the comprehensive knowledge and experience of the company's engineers and scientists, the company has successfully developed high-performance color line scan cameras and optimized LED lighting systems for such systems. During the development process, all components of the camera system, from the light source, optics and sensors to digital image processing, are carefully considered. This results in fast and efficient customer-specific systems, for example, for print inspection, quality control and defect detection in the inspection of glass and semiconductors.

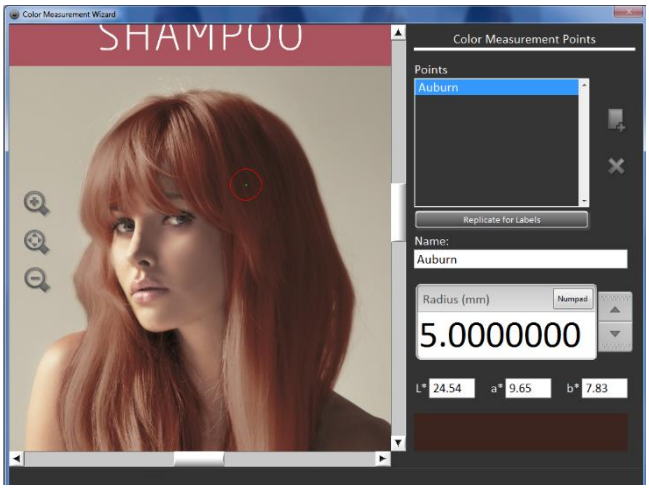


*Illustration 1 PackFlow provides the user with extensive tools to control the printing results in the packaging process. For example, for color proofing with a allPIXA proCCD line scan camera. (Image: OneBoxVision)*

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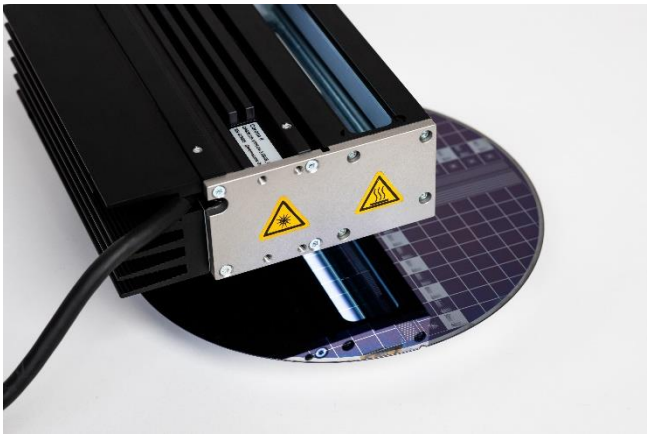
## Why line scan cameras?

CCD line scan cameras are ideally suited for image acquisition tasks where extensive areas and objects with large surfaces must be rapidly captured and analyzed.

With a CCD line sensor, light-sensitive pixels are arranged in a single line and read out according to the operating principles of the CCD sensor. The readout frequency is adapted to the throughput speed of the objects or surface areas to be captured. In color line scan cameras, one sensor line is used for each primary color. The individual lines are then combined to generate the full image.


*AllPIXA pro CCD line scan cameras of the Chromasens camera series are currently the fastest line scan cameras of its kind. Together with the Corona II LED illumination, they form the heart of the OneBoxVision PackFlow solution. (Image: Chromasens)*

By timing the line-by-line scanning with the object transport cycle in the transport direction, an almost distortion-free image can be achieved. The particular strength of line scan cameras emerges when they are used in conjunction with specially adapted line lighting, which illuminates a single line on an object. This form of illumination is extremely homogeneous and achieves a high light intensity. Moreover, in terms of color, it can be adapted precisely to the required image acquisition.



*Chromasens' Corona II LED illumination module is optimized for use in conjunction with the allPIXA pro camera series. The reached speed and accuracy of the two interacting systems is impressive and great for applications like PackFlow from OneBoxVision. (Image: Chromasens)*

With the allPIXA pro camera series, Chromasens has crafted the world's fastest CCD-color line scan cameras. The expertise applied in the development of these cameras has resulted in line frequencies of up to 156 kHz that feature very high color reproduction and outstanding image quality. The highly sensitive, trilinear RGB color line sensors generate resolutions of 4096 x 3 to 7300 x 3 pixels.

The special features and specifications of the allPIXA pro camera series make these devices particularly suitable for highly challenging inspection tasks in the packaging industry, such as verifying the print quality on flexible packaging materials.

## Fast 100% inspection with PackFlow

OneBoxVision, based in Clonmel, Ireland, was founded in 2011 and is implementing machine vision applications that can be used directly and without additional programming by the user. The company's core competence lies in the development of application-specific solutions for very large images, which arise in the packaging industry during the inspection of rolls and sheets, as well as films.

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Complex inspection tasks, such as for flexible web goods in roll-to-roll production, are highly demanding in terms of image acquisition and image processing. The central requirement is to process images in real time and thus software must process extremely large images extremely quickly. "We have a slightly different approach compared to most other vendors," explains Conor O'Neill of OneBoxVision. "We're using a method called pipeline processing. This is a special processing technique for high-speed applications."

As a modern user interface, OneBoxVision application software offers users a “recipe” system that allows them to define their desired inspection algorithms. Different recipes can be selected, such as the VisionFlow recipe, SurfaceFlow recipe and PackFlow recipe, all of which can be run on the same packaging machine.

As O’Neill states, "The core technology is our ImageFlow, which is based on pipeline processing. This is why we have developed a selection of application-specific solutions. One of these applications, PackFlow, is used, for example, by customers that package products for the pharmaceutical industry.”

PackFlow is a set of tools designed for use with Chromasens color line scan cameras. To achieve 100% real-time inspection, the color and geometry specifications for the monitoring of the print design are first determined. All deviations are segmented, stored and displayed to the operator. Subsequently, defective material is automatically sorted on the basis of the deviations identified.

"All criteria and standards are integrated into one algorithm," highlights O'Neill. "We can run up to four algorithms in parallel: for the detection of random defects, for the identification of color variations, for CopyCheck, i.e. for the monitoring of the target design, or for DensityCheck, which we use to verify whether coatings such as paints or adhesives have been applied correctly. What's special is the variety of algorithms that run in parallel and in real-time.”

OneBoxVision provides its customers with ready-to-use packages that contain high-performance software and hardware components that are ideally suited to function in conjunction with each other. The PackFlow toolkit for the packaging industry includes an Axion 2XE frame grabber from BitFlow and color line scan cameras from the Chromasens allPIXA pro series.

O’Neill explains the toolkit in the following terms, "For PackFlow, we selected the Chromasens allPIXA pro camera family together with the Chromasens Corona II LED illumination as this technology was developed with the printing industry in mind. With this finely tuned solution of camera and lighting, we have complete control over color management and white balance.”

Service is another leading concern for OneBoxVision and its customers. The engineering departments within the organization’s customer companies and system integrators receive on-site support from Chromasens worldwide. This level of service distinguishes Chromasens from many other suppliers.

## Conclusion

As numerous examples from the packaging industry demonstrate, fast and high-performance line scan cameras are destined to play an increasingly important role in real-time inspection. Further applications are likely to result from the ability of these cameras to perform fast and accurate color measurements. Moreover, in the future, the use of color line scan cameras will open up new possibilities for rapid 3D inspection.

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