The Quest for the Ultimate High Resolution Camera for the Electronics Inspection Industry

The electronics manufacturing industry is a very demanding market with a wide range of inspection requirements. At one end of the spectrum is the high speed, high volume production requirements associated with mobile device and LED Back Light Unit (BLU) manufacturing. On the other end of the spectrum is the high end, high accuracy inspection requirements associated with manufacturing of micro-electronic components. System integrators are constantly in search of new high-performance cost-effective camera technology that will allow them to address this diverse range of requirements. With this said, the quest continues for the ultimate high resolution camera that is capable of addressing this diverse range of inspection requirements with one state-of-the-art optics system.

When discussing camera specifications, it is important to understand that the maximum resolution of a camera, sometimes referred to as the native resolution, is gated by the density of the camera’s image sensor. This is specified in mega pixels. In the world of digital imaging bigger is indeed better! Higher density cameras will inherently provide a larger Field Of View (FOV), superior image quality and increased inspection performance. As you can imagine, these characteristics are much sought after within the electronics inspection industry. Over the past few years advancements in digital imaging science and improvements in image sensor design and processing technologies have driven the resolution of main stream AOI digital camera technology from 1.3 MP, to 2MP, to 4MP and most recently to 5MP with no foreseeable end in sight.

There are several industrial camera manufacturers that have designed cameras suitable for the AOI industry, however, these products come with their own unique set of trade-offs. Some manufacturers provide high resolution cameras that are designed with a relatively small field of view (FOV). The intent is to acquire extremely small images for high accuracy inspection of the PCB. This methodology is unfortunately time consuming and therefore prohibitive for inspecting an entire PCB. Alternatively, some manufacturers have developed high resolution cameras that will provide a larger FOV. The tradeoff here is that these camera systems typically provide slower frame rates and are therefore prohibitive for high speed inspection. Lastly, ALL of these suppliers charge a premium for their higher resolution camera technology. The system integrator must, therefore, increase the cost of the AOI system to offset the cost of the high resolution camera technology. Since many of today’s AOI systems employ multiple cameras. This cost increases exponentially.

With this in mind, MIRTEC, a leading global provider of Automated Inspection Equipment, set out to design their own proprietary camera technology. After two full years of product development MIRTEC unveiled its revolutionary 15 Mega Pixel ISIS Vision Systems at APEX 2010. ISIS is an acronym for Infinitely Scalable Imaging Sensor. As the name implies the ISIS Vision System may be scaled or modified to address the specific inspection requirements of virtually any production environment without sacrificing speed or performance. At SMTAI MIRTEC unveiled a 10MP variant of the ISIS product line which was developed specifically to address a more budget conscious consumer while still providing twice the native resolution of the current industry standard.
ISIS is the industry’s first optics system fully capable of addressing a diverse range of inspection requirements with a single state-of-the-art camera system. This ground-breaking technology was designed to bring unprecedented speed and performance to the electronics inspection industry, undoubtedly setting a new standard by which all other inspection equipment will be measured. By changing the magnification of the Precision Telecentric Lens, the resolution of the optics system may be scaled or modified to meet the required application. For instance, scaling the resolution to 18.2 microns/pixel results in an incredibly large FOV of 70.6 x 70.6mm with a maximum inspection speed of 15 frames/sec; ideal for extremely high-speed manufacturing. Preliminary throughput comparisons between 5MP and 10 MP technology have resulted in an increased throughput of over 200%. Throughput comparisons between 5MP and 15MP technology have resulted in an increased throughput of over 300%. This is, of course, a tremendous improvement in production efficiency which will certainly be leveraged by manufacturers in volume-driven sectors. On the other end of the spectrum, the magnification of the lens may be scaled down to 5 microns/pixel with a FOV of approximately (19.4mm x 19.4mm) which is suitable for high end micro-electronics manufacturing. Please note that even with a resolution of 5 microns/pixel, the FOV is still very generous allowing for high speed, high precision inspection.

In conclusion, advancements in the development and processing of higher density image sensor technology will continue to bring the ultimate in performance to high resolution digital camera systems. The only limitation in the foreseeable future is the trade-off between camera performance and price. No matter what, it is reasonable to assume that the quest for ultimate high resolution camera system for the electronics inspection industry will persist well into the future.

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