

## 10 truths about smart cameras

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### Abstract

In the world of machine vision and automated optical inspection systems, smart cameras receive a lot of attention. In fact, they are often presented as the favored—if not only solution. Like PC-based vision systems, which include a camera, frame grabber, commercial motherboard and vision library, smart cameras also have strengths and weaknesses. Here are 10 truths about smart cameras—from a smart camera and PC-based vision component vendor—to help you determine if they really are the best choice for your next vision application.



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# Matrox Imaging White Paper

## Abstract

In the world of machine vision and automated optical inspection systems, smart cameras receive a lot of attention. In fact, they are often presented as the favored—if not only solution. Like PC-based vision systems, which include a camera, frame grabber, commercial motherboard and vision library, smart cameras also have strengths and weaknesses. Here are 10 truths about smart cameras—from a smart camera and PC-based vision component vendor—to help you determine if they really are the best choice for your next vision application.

### 1. One vendor

To streamline the procurement and servicing of their vision system, many customers prefer to do business with fewer suppliers—who can each provide more components of the overall machine or system. A smart camera, which integrates the image sensor, processing and an I/O interface, is a perfect choice for customers looking to simplify. These customers are not interested in devoting resources to ensuring that components, which come from many different vendors, work together.

### 2. Limited processing power

Historically, a smart camera has been limited in terms of its processing capabilities. It does not offer the computing power of a traditional PC-based vision system because it cannot dissipate the amount of heat that is generated by high performance but power-hungry CPUs. This makes a PC-based system better suited to extremely compute-intensive applications—those with very high data throughput, the need to inspect very large images or the need to execute very complex algorithms.

### 3. Highly integrated

All machine vision systems require common components—lighting, optics, image capture, image processing and analysis, and communications. A smart camera integrates most of these components in a single package which guarantees compatibility. This significantly reduces the amount of time that customers spend ensuring component interoperability—not only during development but also once the system is deployed. A smart camera customer seeking a highly integrated solution does, however,

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sacrifice processing power, since unlike a PC-based vision solution; he cannot select components based strictly upon their performance. There is a clear compromise between power consumption/heat dissipation and available processing power.

## 4. Longevity

A smart camera's components (e.g., processor and memory) are carefully selected by its vendor to ensure the product's consistent long-term supply. In contrast, PC-based vision systems are subject to frequent requalification because of the short life span of commercial PCs. Of course, industrial-grade PCs with extended life spans are available, but they usually cost significantly more than commercial-grade PCs.

## 5. Single point of inspection

Typically, a smart camera offers a single point of inspection, while one PC-based vision system can provide multiple points of inspection. Therefore, it is more cost-effective for customers to use a PC if they have more than one inspection point. However, if the smart camera fails, only one inspection station goes down. If the PC fails, all inspections cease.

## 6. Software

Usually, a smart camera offers a software environment that does not require traditional programming or coding. Typically, the camera is designed to perform a very specific task, such as measurement or bar code reading. Because the majority of smart cameras are configured, they are well-suited to users with little or no traditional programming experience. The downside to this is that a user cannot work "outside the mold"—his application must match what the smart camera supports. However, applications that require complex logic in terms of numerous decision points, alternate paths of execution and fallback mechanisms, as well as very specialized algorithms, are better suited to traditional programming, which is the realm of PC-based systems but also available with some smart cameras.

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## 7. Limited sensor selection

A smart camera offers a limited choice of sensors when compared to industrial cameras. For example, a typical smart camera offers less than ten sensor options while industrial cameras offer hundreds of choices including UV, infrared, and specialty options.

## 8. Form factor

A smart camera has a smaller overall footprint than a PC-based vision system. And although the camera for a PC-based vision system typically occupies less space than a smart camera, there also needs to be room somewhere for the PC itself; for practical purposes, usually not too far away from the camera.

## 9. Environment

Designed to be used in harsh industrial environments, a smart camera—unlike a PC-based vision system—does not need to be located in an electrical cabinet or other type of enclosure for protection from its surroundings. In addition to a rugged and dust-proof casing, some smart cameras—like the Matrox Iris GT—are IP67 rated, which allows the whole vision system to be used in a washed-down environment.

## 10. Talking to automation devices

A smart camera offers the benefit of interacting directly with automation equipment via its discrete I/Os and built-in industrial protocols, like EtherNet/IP™ and MODBUS®. Unlike a PC-based vision system, which requires a separate discrete I/O card and the integration of third-party software to support these industrial protocols, a smart camera seamlessly supports these devices.

## Conclusion

After carefully evaluating its strengths and weaknesses, you've decided that a smart camera is the best choice for your next inspection/vision system. Now you need to choose your smart camera vendor.

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In the world of vision, smart cameras are a relatively new technology. Matrox Imaging, however, is no stranger to camera technology and embedded computer systems—the foundations of smart cameras. Moreover, Matrox Imaging has built its smart camera software on the Matrox Imaging Library (MIL) with an over 15-year history of successful field use and algorithm development.

Today's short development timelines also make it very important for customers to have access to the best training and support from their smart camera vendor. Matrox Imaging's on-line and classroom trainings for our Matrox Iris GT smart camera and Design Assistant software are given by developers. Students also have the ability to sit down with these trainers and have an in-depth discussion about their application requirements.

In addition to an experienced and skilled technical support group, Matrox Imaging also offers smart camera customers the services of its Vision Squad. This team of algorithm gurus helps users quickly assess application feasibility and determine how to best use processing and analysis tools to arrive at a solution. Services range from providing advice to delivering a proof-of-concept project and even custom tools.

To learn about Matrox Imaging machine vision products—including the Matrox Iris GT smart camera with Design Assistant—visit [www.matroximaging.com](http://www.matroximaging.com).

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