

# A CLOSER LOOK AT CCD AND CMOS IMAGE SENSORS

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The Sarix technology platform was designed by Pelco engineers specifically to meet the demands of video security professionals. Great effort was made to leverage technical innovations in order to overcome limitations the security industry previously experienced with megapixel cameras. One example of this was the decision to use Complementary Metal Oxide Semiconductor (CMOS) image sensors over the more traditional Charged Coupled Devices (CCD) image sensors.

Pelco engineers did not view CMOS as a replacement of CCD image sensors. Both CCD and CMOS sensors have distinct advantages depending on the type of camera and its intended use. But after conducting extensive testing, it became evident that advances in CMOS technology added new functionality and flexibility to the sensor, making it the best choice for Sarix megapixel cameras.

According to Pelco Applied Technologies Engineering Manager David Dorn, “There has been a tremendous amount of technology development for CMOS imagers, largely fueled by the consumer industries use of CMOS imagers in still cameras, cell phones and video cameras. We were able to leverage those technical innovations for the video security industry.” Thanks to those advances,

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—David Dorn, Pelco Applied Technologies Engineering Manager

Pelco engineers found that CMOS provided distinctions for megapixel cameras that allowed for industry-leading image quality and a lower overall cost of ownership through reduced energy consumption.

In order to appreciate why Pelco engineers elected to use CMOS image sensors with Sarix technology, it is important to understand how CMOS and CCD imagers work, in what ways the technologies are the same, and in what ways the sensors differ. Fundamentally both imagers operate off the same principal of converting light into electric charge and then processing that charge into electronic signals. The imagers differ in the way they process and transfer the data.

In the past CCD sensors set the benchmark for image quality. In most cases, with a CCD image sensor every pixel's charge is transferred through a single output. The charge is then converted to voltage, buffered, and then ultimately sent out as an analog signal. If the imager was being used in an IP camera, the analog to digital conversion would take place on a secondary chip after the signal has left the sensor.



Because all of the pixels were devoted to light capture and the data was transferred out of a single pipeline, CCD sensors had exceptionally uniform output, a key factor in image quality. "For standard definition cameras, CCD is an obvious choice, however, as you move



into high definition megapixel cameras the advantages of CMOS technology become clear," Dorn explains. "CMOS technology allows for a degree of architecture and design flexibility that is perfectly suited for the Sarix imaging platform."

The advantages of CMOS start the fact that the data coming out of the sensor is digital and consequently does not need to be converted. This digital-to-digital transfer of data is preferable because it leads to a reduction of image noise.

With CMOS, image sensor functionality like the charge-to-voltage conversion, noise-correction and analog to digital conversion can be integrated into the chip for exceptionally compact yet intelligent imagers. Thanks to the recent advances in CMOS technology, the reduction in parts can now account for improved reliability, decreased product size and lower overall power consumption. Another important benefit for customers is that it allows the sensor to be used in higher temperature applications.

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outputs. According to Dorn, "The ability to read data from multiple pipelines is a big advantage with a megapixel camera because it allows us to reduce the amount of noise in an image."

Some manufacturers will make a case for one image sensor over another, but in reality both technologies play an important role in the video security industry. CCD sensors have been optimized for more than three decades and continue to deliver excellent image quality. But today's improved architecture has largely overcome the weaknesses once associated with CMOS sensors. Additionally, the integration possible with CMOS technology now offers several advantages for megapixel cameras, including low power and voltage.

As technology continues to evolve, so will the advances in imaging sensors. Pelco engineers are on the frontlines of innovation in order to deliver the best solution our customers. Because at the end of the day there is nothing more important than image quality, Pelco is committed to leveraging the most appropriate available technology and optimizing its performance to ensure that our cameras produce the most accurate and high-quality images for security professionals.