The Right Solution for Many Applications: Benefits of a Broad CMOS Portfolio

Sony, the world’s largest producer of CCD sensors, announced last year that it was halting production of that technology. Since then, a growing stream of users has made the switch to cameras with CMOS sensor technology. Basler was one of the first camera manufacturers to recognize this trend. This Product Insight provides you with practical examples of the benefits of a broad CMOS portfolio.

The Basler portfolio encompasses more than 300 different models, making it one of the broadest in the industry. Cameras outfitted with CMOS (Complementary Metal Oxide Semiconductor) sensors have come to represent the majority of that range.

We’ve already done an in-depth exploration of the differences between CMOS and CCD (Charged Coupled Device) sensors in our White Paper „Modern CMOS Cameras as Replacements for CCD Cameras“. This time around we’re focusing more closely on the key benefits of CMOS sensors:

- High speeds
- Comparable or even better image quality than for CCD sensors
- Low price
- Reduced image noise
- No „blooming“ or „smear“

Basler recognized the trend from CCD to CMOS early and for several years now has been implementing the latest CMOS sensors almost exclusively into its new camera models. The ace series in particular offers tremendous diversity: from the affordable Aptina sensors and speedy CMOSIS sensors to well-balanced sensors from ON Semiconductor’s PYTHON line and the new Pregius series from Sony that offers outstanding image quality.

In this way we ensure that our customers have a broad range of choices to serve their applications optimally.

The following offers examples of how various applications have been effectively addressed using ace cameras with CMOS sensors.

1. CMOS for Steel Inspection

Industrial image processing has long been used for surface inspection of continuous materials such as glass or, as in this example, steel. Cameras are used to detect and document any flaws.

In this case, multiple 5 MP cameras with rolling shutter sensors from Aptina are used. The application runs at a relatively slow speed, allowing for 100% inspection.

The cameras in use here deliver not just high resolution and good image quality, but also a highly attractive price — the ideal combination for this kind of application.

More information on this application can be found in our success story „Improvement of Production Processes with a Surface Scan System from Basler ace GigE cameras“.

Figure 1: System architecture of an area-scan system for quality control of electrical steel
2. CMOS in Sports Analysis

CMOS sensors can be a major aid outside the field of classic factory automation as well; one good example comes from the world of sports. High speeds are needed to record and replay rapid movements (such as through slow-motion), an essential part of the detailed analysis used in golf and tennis training.

Speedy CMOS sensors from CMOSIS, for example, are a strong choice for this field. They are available in Basler ace cameras built around three different interface types (USB 3.0, GigE and CameraLink).

For the fastest variant (Camera Link), these sensors can handle up to 340 frames per second at 2 MP of resolution. They fit in well with modern training methods, support TV broadcasts and offer photographic support for judges and referees.

Figure 2: CMOS cameras are outstandingly well suited for recording rapid movement, such as found during a golf swing.

3. CMOS in Traffic

The market for Intelligent Traffic Systems (ITS) in particular demands a balance of image quality, speed and economy. Systems used for Automatic Number Plate Recognition (ANPR) and related applications must be able to handle a broad range of lighting conditions and vehicle speeds, and be compatible with a range of budgets.

High sensitivity Global Shutter sensors are particularly good at delivering crisp images of moving objects.

The IMX 249 sensor from Sony is well suited here, given its broad dynamic range and high-speed compatibility.

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Figure 3: In this picture taken by a CCD camera, only the light area of the license plate is visible.

Figure 4: This picture, taken by a CMOS camera, has effectively captured both the light area around the license plate as well as the dark interior of the vehicle, including its driver.
4. CMOS in Microscopy

Medical applications place the most extreme demands on cameras. Conventional light microscopy offers a good example of this. The images are to be used for professional observation, analysis and documentation, meaning that they must display rock-solid reliability, high resolutions and sharp images with unwavering color fidelity. These strict requirements in terms of image quality and speed are handled flawlessly by Sony’s new generation of CMOS sensors. The Pregius series offers impressive performance in a variety of areas, including the strong dynamic performance, high speeds and good color fidelity needed for even the most difficult applications. The effect is enhanced perfectly by Basler’s deep pool of expertise when it comes to color and photo quality in digital cameras. Another recently-introduced feature, the PGI feature set, has further improved color images captured by CMOS sensors. Integrated within the pylon Camera Software Suite, it offers users various options for adjusting color characteristics to meet individual requirements of applications.

5. Summary

In summary, it is safe to say that CMOS technology has become a standard component of many applications. That success is based on the broad range of factors offered by CMOS technology, from high image quality, high speeds and low costs to a refined combination of all these properties. The Basler ace brings all of these factors together within one camera family.
Author

Dominik Lappenküper is responsible for Basler’s ace, Basler beat and racer cameras series, and oversees market launches for new camera models. He is also the first point of contact when new features are rolled out for these camera families. He is additionally responsible for liaising with the market to better understand its needs.

Dominik started at Basler in 2011 as part of a work/study program in industrial engineering, and successfully earned his Bachelor of Engineering. He has since completed a Master of Science at the Polytechnical University of Wedel alongside his work at Basler.

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About Basler

Basler is a leading global manufacturer of digital cameras for industrial and retail applications, medical devices, and traffic systems. Product designs are driven by industry requirements and offer easy integration, compact size, excellent image quality, and a very strong price/performance ratio. Founded in 1988, Basler has more than 25 years of experience in vision technologies. The company employs 500 people at its headquarters in Ahrensburg, Germany, as well as in international subsidiaries and offices in Europe, Asia, and the Americas.