The innovation of IMAGES

As camera technology advances, there are still firms developing astonishing devices that are fuelling ingenuity in a range of industries

The high-end camera market offers researchers a huge range of technological possibilities. While research and development can often take a backseat as economic times constrain company's budgets, the innovations continuing to come from the ever-improving camera industry mean that this market will always be at the cutting edge of scientific advancements.

One firm that has specialised in the delivery of advanced camera systems is German-based PCO AG. Launched in 1987 in the small Bavarian town of Kelheim, PCO is now one of the world's leading manufacturers of cameras for both commercial and scientific research, with high resolution, speed and dynamic range their specialities. The company's head of research, Dr Gerhard Holst, spoke to *The New Economy* about how the company has developed since its inception and what has fuelled this success.

How has the company evolved since launching in 1987?

We've grown slowly, but continuously. It started in 1987 as the offspring of the Technical University of Munch. The owner and founder of PCO, Dr Emil Ott, was a scientist at the university. At the time he wasn't so satisfied with the performance of some image-intensive camera systems. As he had to deal with the cameras, he realised the improvements needed and made his own business out of that.

During the 1990s, we were the first company that had a pure digital camera system, providing a scientific camera with a digital output, delivering the image to a computer to be processed or stored. We were also one of the first to develop extremely small cameras at the beginning of 2000, and the first to offer a 12-bit dynamic instead of an 8-bit dynamic. Over time, we have grown into a company that offers high performance camera systems. We offer customers something others cannot.

Nowadays, it has become a lot easier to make a good camera because there are a lot more electronic devices that allow you to read an image sensor and lots of companies making good image sensors. The market for us has changed in that sense. If you now want to offer something unique, you have to get your own image sensors just made for your own particular requirements.

We have a very flat hierarchy, and so the decisions made here are very fast. Furthermore, we have very motivated, small teams working on projects. We are technically driven, so we are always looking at ways to improve.

> It doesn't make sense to shoot small birds with Canons

How do you keep in touch with customer needs?

Before I joined the company in 2001, I was a scientist myself and a customer of PCO. I very much appreciated at the time that PCO was able to deliver an additional camera feature that I needed for my systems. When there were problems, I immediately got to speak to an engineer and discuss the problem. This behaviour is rare to find with manufacturers and I have had a great deal of experience of this.

We are not a mainstream manufacturer. We are making high-performance cameras for niche-market segments. My colleagues in the sales team speak with the customers to find out what it is they really need. You need to take the time to discuss and figure out what they need. In our opinion, only a satisfied customer is a good customer. It is only through feedback that we are able to improve our systems, so we show up to those exhibitions where a lot of our customers pass by.

How do you ensure that your standard of production is higher than your competitors?

We always try to get the best out of these image sensors and are part of some international industry associations. There is the European Machine Vision Association (EMVA) and American Imaging Association. For example, EMVA has created the EMVA 1288 Standard, which describes how to measure and present quality performance data of image sensors and cameras, and we are part of this working group.

We've never been afraid of any comparison. Usually, if you try to buy a camera and take product sheets off various manufacturers, it's nearly impossible for the customer to compare them, as certain features will be promoted over others. I don't want to sell a camera to a customer that doesn't meet their needs. If a customer needs a camera that is a lot cheaper, then they should use that one. A camera has to fit into their requirements and nothing else. It doesn't make sense to shoot small birds with Canons.

What is the most popular use of your cameras?

There are many different uses for our cameras. One is for when sensitive and cool cameras are required, which is mostly in physical and life science, and metrology. Then there is high-speed photography, which means high frame rates, and that can be for safety tests for the auto industry, metrology, scientific research, and also ballistic research and defence uses. We have a number of cameras installed in the crash-test facilities of Mercedes and Volkswagen.

And there are the extremely short exposure time applications, which even nowadays you can only do with an image intensifier because there is no image sensor that can realise exposure times of three nanoseconds or less. This is for physics research. There are other applications like aerial photography or 3D metrology where our cameras are used.

Since 2010, we have developed, with two other partners, a new type of CMOS sensor called Scientific CMOS, which has an unbelievable combination of performance parameters. It has a very low noise and a really good capacity, which makes up a dynamic of better than 1:25,000, which is more than 14-bit.

It also has a resolution of 2,560 x 2,160 pixels, which is 5.5 megapixels, and can record at 100 frames per second. These new Scientific CMOS images are now well accepted in the life science industry, so a lot of new microscopy research, like structured illumination, super resolution, or light sheet microscopy, are all really fuelled by these new cameras.

What is the future for PCO?

It's not too complicated now, with all of the new technology and image sensors that are available, to make a good camera. So in order to stand out from the rest, you have to offer something more than that. In that perspective, our business has changed. We plan to invest in and push forward image sensor technology.

Cameras will always be used. To a certain extent, we depend on the economic situation of the industry, because if there is money to spend on research then we will make good sales. If cameras become more sensitive or faster and uncover more things that were not seen before, then the market will always continue. TNE