► Stable pen production at Stabilo

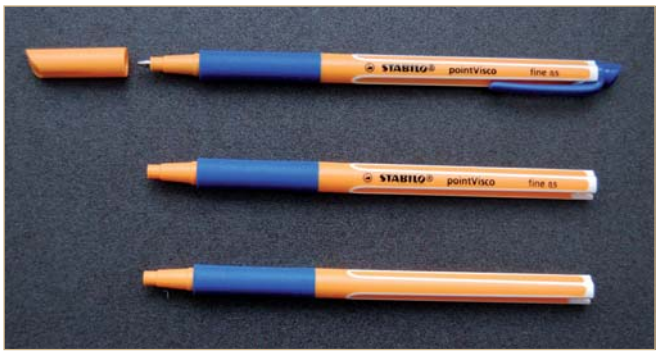
Stabilo, a well-known German pen manufacturer, relies on image processing systems in its production facilities to assure 100% quality. In a new system, FireWire area scan cameras and CameraLink line scan cameras work together in a PC configuration.

The Boss marker pen and the point88 Fineliner are to be found on practically every office desktop in Germany. Stabilo from Franconia in Germany is one of the leading German producers of these pen types and many other writing accessories. The company's two top sellers are manufactured along with other pens in a highly automated plant in Weissenburg. About 75 million Boss marker pens and 150 million point Fineliners - the equivalent of several hundred tons of ink - leave the factory each year.

These quantities can be handled only with a high level of automation in production, and the corresponding equipment is designed almost without exception by Stabilo itself, as Reiner Wiedemann, Quality Manager for Stabilo at the Weissenburg plant, explains: "For a planned production of more than five million pens of a particular type, we invest in an automated production line. The production includes all work processes, from injection moulding, assembly and filling through to packaging, storage and dispatch. We are even responsible for developing the plastic and inks we use."

When installing a new production line, the technical department at Stabilo adjusts the relevant assembly and injection moulding machines to suit the particular requirements and optimises the overall production flow. "We frequently work with experts from various technical areas if we have specific problems to solve," says Wiedemann.

When Stabilo came to develop a new system for producing pens of the type Point Visco, the company sought external support for image processing. After injection moulding, the Point Visco pens are



Point Visco-type Stabilo pen in different production stages: barrel without labelling (bottom), barrel with labelling (middle) and finished pen with tip and cap (top).

labelled fully automatically using a separate system, filled with ink, furnished with a tip and, at the end of the process, fitted with a cap. Image processing is used to check different quality features of the labelling and correct positioning of the pen tip.

"We did not have all the know-how at our company to implement image processing functions in the pen assembly system," Wiedemann says of the situation before implementation of the new assembly line. "We consulted STEMMER IMAGING to design and integrate the necessary image processing sequences as we had already had very good experiences with their products and service in previous systems."

STEMMER IMAGING from Puchheim near Munich subsequently presented a concept for solving the given task for the Point Visco application, coming up with the optimum combination of the image processing components required. The fine-tuning of the software and the exact adjustment to the system conditions was then carried out by Stemmer's system partner, Sidonia Systems from Stockdorf.

► STABILO AND SIDONIA

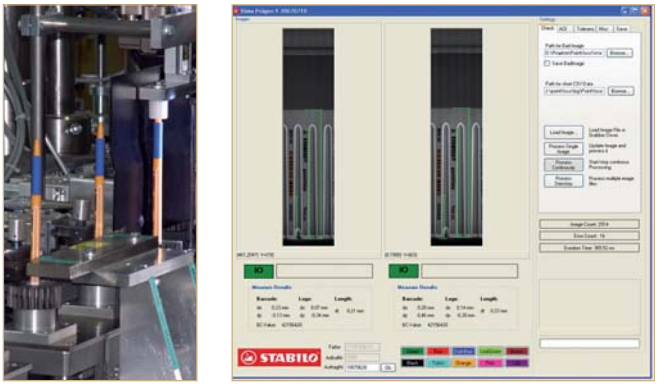
Domiciled in Heroldsberg, Germany, Stabilo (www.stabilo.de) comprises three subgroups focusing on writing accessories, cosmetics and the outdoor sector. The company has a staff of around 3300, 1750 of whom are located in Germany. In the financial year 2006/07 Stabilo was able to increase its sales by about 19% to € 340 million. The subgroups often benefit from synergy effects - for example, the cosmetics business unit often operates as a scout in regard to colours and fashion trends, and passes on these trends to the designers of writing accessories. The different subgroups also exchange technical know-how - the production plants for writing accessories and cosmetic articles (kohl pencils, for example) are relatively similar to each other.

Sidonia Systems GmbH (www.sidoniasystems.de) operates as a system integrator and vendor of image processing systems in all areas of automated quality assurance and production. The company's focus is on the efficient deployment of line scan camera systems and on providing solutions to complex image processing problems. This high-tech company from the south of Munich also offers automation solutions for difficult detection problems under variable conditions.

Label inspection with CameraLink line scan cameras

Point Visco pens are assembled in a series of steps. Firstly, the pen barrels positioned on bushings are labelled in the company's labelling style with the Stabilo logo along with a bar code and other numbers. The first quality inspection then follows: 40 pens per minute are checked on two parallel running stations for correct labelling.

The inspection involves synchronised rotation of the pen barrels, which are illuminated by means of two line lights, and recording of the images with two CameraLink line scan cameras. The individual lines of these cameras are composed in flat images for evaluation on the image processing PC using the Common Vision Blox (CVB) software library from STEMMER IMAGING. This library is modular in structure and provides different preconfigured tools for a number of standard tasks.



The labelling on the pen barrels is inspected using two CameraLink line scan cameras and the Common Vision Blox (CVB) software library.

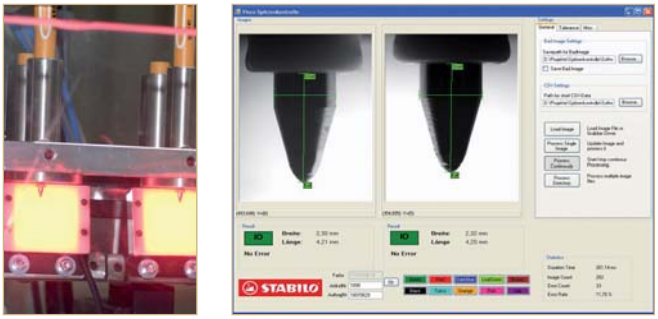
The pen labels are evaluated using the CVB Barcode, CVB Edge, CVB Minos and CVB Printqual tools, which assess a multitude of aspects - for example, the position of the bar code and company logo, and the legibility of the bar code. The length of the plastic barrel is also inspected for compliance with size, and the white stripes along the side are monitored for errors.

FireWire area scan cameras inspect pen tips

Correctly labelled pen barrels are passed on to the next production step, where they are fitted with a metal tip with rollerball and then filled with ink. Following this, two FireWire area scan cameras in combination with the software tools CVB ShapeFinder and CVB Edge verify the length and width of the metal tips and check for the presence of a rollerball under illumination.

The connection of these two cameras is special for two reasons. Firstly, the FireWire surface scan cameras are connected to the same PC as the two CameraLink line scan cameras used for labelling inspection. Secondly, a distance of 13.5 m is safely bridged in this application, which is only possible for FireWire technology using repeaters and a good deal of know-how. These sophisticated implementations by STEMMER IMAGING and Sidonia Systems meant that all requirements specified by Stabilo could be met, as Wiedemann reported: "At our clock rate the processing speed is completely adequate and error detection performance is very good."

In order to provide Stabilo staff with a visualisation of the results, the PC system was installed at an easily accessible position in the production process and equipped with a user interface on which the inspection results are continuously displayed. What is more, production is statistically monitored and evaluated. "We can quickly detect whenever errors become too frequent or if the process starts to leave the tolerance range," says Wiedemann, emphasising the flexibility of the image processing tools. And if the image quality deteriorates (due to ageing of the illumination, for example), countermeasures are in place: a reference image is stored in the PC, which can be referred to for calibration. According to Wiedemann, however, this is seldom necessary. "Just how good the quality of the image processing components is can be seen from the fact that we hardly ever have to recalibrate even though the tolerance range at ± 1 pixel is very tight."



Two FireWire area scan cameras and two CVB software tools ensure perfect positioning of the pen tips.