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**Effective  
protection against  
overloading**



## **Process monitoring with rugged piezoelectric strain sensors**

Effective machine protection for print finishing and packaging material

At KAMA GmbH in Dresden, piezoelectric strain sensors from Kistler make sure that the massive die cutters used for post-press work never become jammed or damaged. Customers are so convinced by Kistler's retrofitable process monitoring technology that it has taken only a few years to become established as the de-facto standard.

KAMA can look back on a long tradition in the post-press sector. For almost 125 years, the Dresden engineers have been developing machines to blank folding cartons and printed materials, as well as folding and gluing machines. This company's history dates back to 1881, when the patent was obtained for the "creasing line" that makes it easy to incorporate bending joints into packaging. With a workforce of 120, KAMA today numbers among the major post-press solution providers: the firm supplies its machines to customers across the globe. In Germany, KAMA's customer base includes over two thousand printing companies.

#### Commercial printing as a main business field

Offset printing still dominates the packaging sector, but "commercial" printing – individual items printed in small batches – also offers an enormous variety. KAMA is especially strong in this area: "The emergence of digital printing has generated entirely new impetus. Close collaboration with one of the market leaders has placed us in an excellent position here, so commercial printing has become our main business field," says Steffen Pieper, Managing Director of KAMA GmbH. Printing of packaging materials is another segment where plenty is happening: short run packaging, with products that are increasingly individualized and geared to specific events, is creating the need for flexible machines with fast change-over times for small and medium-sized batch sizes. "As well as the standard version, we also offer die cutters with integrated hot foil stamping – so both processes can be handled in one machine with short changeover times. That's something no other provider can deliver," Pieper points out. Another USP is inline stripping and blanking without the need for tools.

#### Avoiding costly machine outages

Raik Freudenberg heads KAMA's electrical engineering and automation technology team. Ongoing development of KAMA's machines is one of his principal tasks. "Two questions regarding



To prevent a blockade of the heavy machine, strain sensors by Kistler monitor the executed force during the entire process

development that I had to tackle at a very early stage were these: how can we provide even better protection for our plants, and how can we avoid downtimes? One of our first ideas was to use strain gages. In the machine, the force is applied by tie-rods that act more or less like large springs. The motion is highly dynamic but the strain is rather low, so strain gages can't achieve the goal. That's why we soon turned to Kistler, who can offer rugged piezoelectric strain sensors with high sensitivity and accuracy."

Of the 50 or so machines that KAMA builds each year, 30 offer the additional option of hot foil stamping. Two Kistler strain sensors are now installed in almost every one of these machines. "We offer our customers integrated process monitoring as an option. Over 90% of them choose it – and the trend is upwards," Pieper points out. "As well as protection for the machine, there is an added benefit for



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Raik Freudenberg, Head of Electrical Engineering and Automation at KAMA  
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The strain sensors from Kistler are very robust and can be easily mounted or back fitted

operators: a 'feeling' for the force needed for the cutting process – and that makes commissioning much easier," Freudenberg adds. As soon as something is not quite right in the process, the sensors trigger an alarm. For example, it can happen that a cardboard sheet or parts of it are left behind in the machine while the next sheet is already being fed in. This leads to a significant increase in the forces and unless there is an intervention, the machine will quickly jam.

Even if there is no damage, it can take days to free a jammed machine and make it ready to operate again – machine downtime that would be very costly. "We're highly satisfied with the solution from Kistler. Measurements are reliable and stable over long periods; throughout all these years, not a single sensor has failed," Freudenberg emphasizes. "And retrofitting older machines with Kistler sensors poses no problems: we offer this as a service."

#### Digital charge amplifier for Industry 4.0

What is the latest development trend at KAMA? The third generation of die cutters has been on the market since 2012. These machines feature a significantly higher level of automation. "There used to be virtually no electronics in the machines. Nowadays, approximately 14 to 16 servo motors with motion control are built into them. So the machines are considerably more flexible than before," Freudenberg explains. "The trend toward automation is clearly reflected in our folding and gluing machines as well. Many of the adjustments here are made with the help of belts which, nowadays, are positioned automatically. That makes it possible to achieve changeover times of five minutes or even less." However,

machines that contain more electronics have to meet higher EMC requirements so as to exclude the risk of interference.

Until now, most Kistler sensors have supplied an analog voltage signal that could potentially be falsified by large numbers of servo devices. But from 2018 onwards, Kistler is offering a new charge amplifier which digitizes the signals: for the first time, this breakthrough enables users to integrate any desired piezoelectric sensors into the control environment. Martin Fenner, Product Manager for Strain Sensors at Kistler, explains: "For the first time, the new digital charge amplifier gives customers the chance to connect piezoelectric strain sensors with the machine control via Ethernet – a quantum leap towards the Industrial Internet of Things and Industry 4.0."

Industry 4.0 is also a key factor for KAMA. All the firm's machines and plants are network-capable, so they offer simplified data import and export. A cockpit function gives developers access to the control, opening up extended options for remote maintenance and makes it easy to feed in work orders from higher-level systems. Managing Director Steffen Pieper comments: "You simply can't survive without functions such as these nowadays. Customers are using our machines all over the world – and that's exactly why KAMA should be able to carry out remote diagnosis, with no need to dispatch a technician immediately."

## Effective protection against overloading



The surface strain sensor Kistler 9232A measures dynamic or quasi-static forces also on moving parts very precisely

Piezoelectric sensors from Kistler make it possible to measure the strain on a structure with high resolution. It is transmitted to the measuring element via static friction as a shear force.

The measurement in this case is:

- continuously stable (no creep)
- protected against overloading
- robust and resistant to interference

The sensors are simple to install, so retrofits usually pose no problems. For even more accurate strain measurements, Kistler offers measuring pins that are inserted and preloaded with axial or radial alignment in a cylindrical bore hole.

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