

BENDING

The wire forming industry is one that does not have high visibility with the general public, but its products are used widely by each and every one of us daily. At breakfast time, for example, toasted bread slices are stored in a rack formed from chrome-plated wire usually produced on an automatic wire forming machine at high production rates. Similarly, the internal structure of our car seats and electric heating element rings used on domestic stoves are manufactured using the same techniques. It only takes a small deduction to realize that the list of applications for formed wire/heating elements is endless. To set themselves out from the competition, the England-based PAVE Automation & Design Ltd. places their focus on up-to-date controller technology.

PAVE Automation & Design Ltd. Has been designing and manufacturing bending machines for 30 years. They offer a complete "Wire Forming – Process Solutions Package" which not only addresses the difficult production areas of finished

form, accuracy, twist and mark-free wire production, with reduced setup and changeover times, but also one that provides measurable, controllable, and continually improving levels of production efficiency, performance, and output.

Higher Standards at Lower Costs

As with the CNC metal cutting process, automatic bending machines rely on servo control technology for accuracy and speed of operation. Before working with B&R, PAVE's earlier range of wire-forming machines used third-party servo systems which gave equivalent, or simply "me to", performance. It was a significant step for PAVE when they decided to use B&R products, in particular ACOPOS motion products.

The initial application of B&R products on PAVE machines enhanced both the performance and operator interface aspects compared with that offered by the

third-party systems. However,

the most significant advances have been achieved with the recently developed "MicroMac Twin Head" and "Huron Single Head" bending machines. These offer two advantages – firstly, a very cost-effective solution and secondly, drastically reduced manufacturing cycle times. The machine cost has been reduced through an innovative mechanical design and by simplifying methods of assembly without compromising quality and reliability. The new system architecture now offered by B&R also helps to keep system costs to a minimum.

The 4-axis Huron bending machine is fed with wire directly from a coil; there-

WIRES

"They are the right machines at the right time and at the right price. Compared to the machines with third-party servo drives, ours are three times faster and take up half the valuable factory space."

Tony Perna, owner and managing director
PAVE Automation Design & Development Ltd.
Peterborough, England

fore, the wire must be straightened first before it can be formed. When the correct amount of wire is fed through and measured with a second encoder, the wire is formed into the desired shape by one of the two tools selected. After several bend operations, a guillotine cuts the finished part from the wire body at very high production rates. The control system consists of a PROVIT 5000 industrial PC with an XP Embedded operating system and B&R Automation Runtime. Communication to the four ACOPOS axes is handled via ETHERNET Powerlink. The visualization is based on Visual Basic and the control was developed using Automation Studio. The response of the control system is fast, and parts that took twelve seconds to manufacture now take less than five.

Accuracy for Smaller Production Batches as Well

The MicroMac Twin Head and Huron Single Head machines are extremely well-suited to handle the demands of large-scale production. But there's naturally still a market demand for smaller production batches, e.g. hot channels in the injection molding industry where the contours of the heating element must be adapted exactly to the shape of the tool. The heating element must be snapfit into the groove. This in turn means the highest demands on accuracy for the bending radii or bending sections.

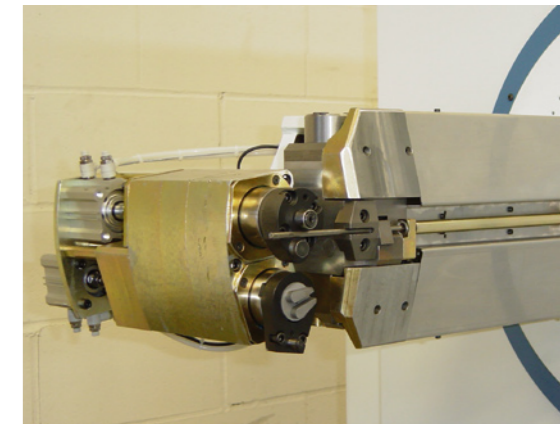
For these applications, a centerline CAD (.dxf) file is produced and loaded via floppy disk or over the Ethernet network. This information file is then converted into a contiguous line and circle file which

is then processed into the machine program code via a CAD engine and is ready for immediate use. At one customer site, it took five men to produce these special one-off parts. Now only one is required. This customer can now produce a special replacement heating element simply by pressing a button.

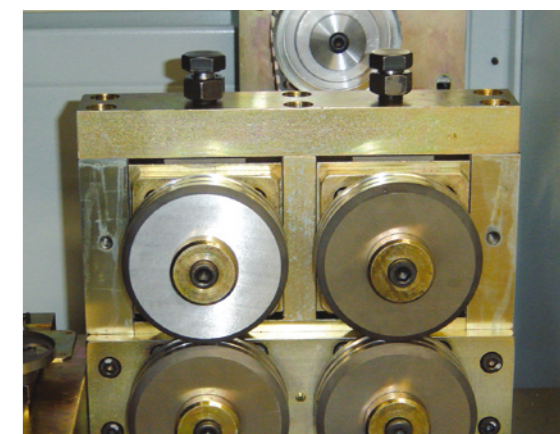
Powerful Cold Bending

In another application, cold bending has been used to produce anti-roll bars for a well-known high-performance car. Previously, these parts were produced using solid metal bars which had to first be heated to aid bending. Unfortunately, the part has to be further annealed and the ends machined for the attachment points, thus adding cost and extending production time. Now these parts are cold-formed from 24 mm of Rockwell 45 steel on a PAVE machine. The bar ends are already completely machined before bending, meaning no further work is required after bending. To bend such parts, a torque of 5,000 NM is required. The largest ACOPOS drives were used in conjunction with gearboxes to achieve these forces. www.pave-wire.com

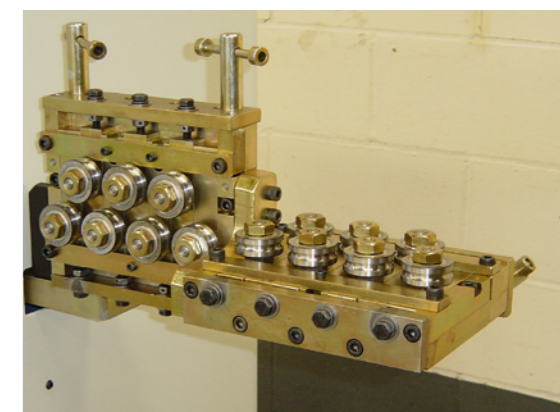
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The belt stabilizer, the double-form head, and the blade on the left side of the Huron. The entire unit can be rotated horizontally.



Belt drive and second encoder.



Straightening mechanism on the right side of the machine.

Unlike the Huron, the MicroMac wire bending machine can form wire on both ends at the same time due to its two bending heads.



Parts that used to be produced in twelve seconds are now produced in less than five with the four-axis Huron bending machine.

