

Straightening machine type CS 34-3

Modern straightening machines

The trend in the wire industry is towards increasingly higher process speeds, minimized scrap quotas, lower production costs, shorter setup times and optimized energy consumption. At the same time it is expected that tooling, machinery and plants will work with a high level of reliability, and that finished products will display lasting quality of excellent standard.

Witels-Albert has promoted this trend from the outset through its development and introduction of innovative solutions for the wire industry. An example is the modern type CS 34-3 straightening machine, which was built for a company specialized in the processing of flat wire. Forming is performed within close tolerances, enabling the material to leave the machine bent in either one or two dimensions. High-strength material up to 4.5mm wide and 1.5mm thick can be processed.

Straightening technology

This particular type of machine merges components of conventional straightening technology with elements of advanced drive and automation engineering. Two parallel process-

ing lines consist each of a roller guide, straightening apparatuses, a drive unit and a further straightening apparatus (looking in the direction of wire throughput). After entering the machine horizontally, the wire is first straightened in the directions of its main axes of inertia by two rail straightening apparatuses of the LR-CS series. When the material exits this straightening system its residual bend is zero. As the next step the material is formed across its thickness by an apparatus of the RB-CS series, i.e. the torque vector of the bending operations performed in the RB-CS straightening apparatus is always horizontal. The result is a one-dimensional bend that remains unchanged if no further forming is performed by the remaining straightening apparatus of the RB series.

It is possible, however, to produce material bent in two dimensions by now feeding in the rollers of the RB straightening apparatus, thus augmenting the temporary one-dimensional bend with an elastic-plastic deformation in the transverse direction of the material. The drive unit needed to convey the material through the processing line is positioned between the apparatuses of the RB-CS and RB series.

Automation

Key automation elements include a control terminal, a PLC, inductive sensors and electronic modules for supplying, triggering and controlling the actuators, e.g. stepping motors, three-phase AC motors and pneumatic cylinders.

The rail bending apparatuses of the LR-CS series have 13 straightening rollers fitted to two opposing rails. One rail can be moved by two actuators around a centre of rotation and be positioned in translatorial direction of the second rail. It is thus possible to perform wedge-type feed movements of various magnitude and to influence the straightening results accordingly. Positioning accuracy is in the micrometer range thanks to the high precision observed in the production and assembly of the elements used in the straightening apparatus and to the use of high-tech components such as inductive sensors. If the nominal width and the nominal thickness of the material change, each actuator undergoes an automatic reference performed with the help of sensors in order to ensure a high level of accuracy and repro-

Ralf-Torsten Hübner is head of the construction department at Witels Apparate-Maschinen Albert GmbH & Co. KG, Berlin/Germany.

ducibility. Roller feed positions are thus set exactly and reproducibly with due consideration to the specific zero line of the material. Actuators are selected in the planning phase according to the straightening forces determined by a calculation program. Reliable and fast positioning of the rollers under load is therefore guaranteed.

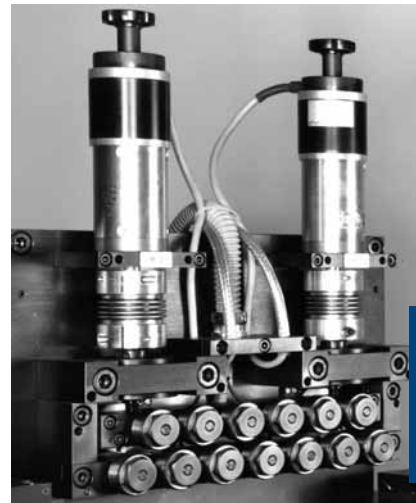
Unlike the wedge-type feeding possible with the rail straightening apparatuses, the rollers on the apparatuses of the RB-CS series can be individually positioned in pairs. The two remaining rollers of the second row are fixed in position. Stepping motors and high-ratio gears are used the same as on the rail straightening apparatuses.

A type NAD 100 drive unit with two roller pairs driven by a three-phase AC motor is assigned to each processing line. The speed can be varied by parameterisation of a frequency converter and processing of an externally supplied analogue voltage signal. From their position above the zero line the rollers are pressed onto the material by pneumatic cylinders. Contact pres-

sure can be adjusted by means of a proportional pressure control valve in order to enable low-slip feeding of the material with due consideration of relevant parameters. The size of drive unit and the type of actuator are selected to cope with the maximum work of plastic deformation required.

Operation

At the heart of a CS 34-3 machine is a PLC which – in interaction with the control terminal, the implemented software and the data entered by the user – has a determinative influence on the straightening process. Software and hardware help to define the machine's capacity and reliability and that of the upstream and downstream equipment. Characteristic features include not only the implementation of positioning operations but also the monitoring of component standby, the visualization and documentation of machine status, the checking and assessment of external information supplied via interfaces, and the man-



Rail bending apparatus LR-CS with 13 straightening rollers

agement of parameters including data import and export, start-up runs and servicing runs. Operating the machine is easy thanks to the logical interlinking of ergonomically designed menus and the use of visual aids. To keep machine setup times short for a large spectrum of materials and finished products the system can manage up to 500 data records, each containing 40 data fields. ■