Supporting customer innovation

Knowledge derived from ongoing wire production can be shared to enhance collaboration between machinery manufacturers and wire producers/fabricators. Solutions for carefully managing and seamlessly documenting wire quality are now available. Modular design of straightening equipment enables customers and users to exercise their creativity and develop their own engineering solutions for the straightening process.

Ideas and expertise are mainstays of economic development. Without them, companies, industries, individuals and societies would simply stagnate. If you look at the wire industry, you might easily get the impression that the basic process of rolling, drawing, straightening and bending has remained the same for a long time. Wire is still rolled into different sizes, drawn through dies to reduce the diameter, fed into straighteners to change the curvature and put into bending machines to produce shaped parts. However, this macroscopic view tends to ignore many small advances in tools, materials, design, automation technology and process parameters. There have been many significant improvements in recent years. Users are getting higher output rates from the rolling process, processing and material speeds have increased during drawing and straightening, and today's bending machines offer greater flexibility and productivity.

But where do we go from here? Are machinery manufacturers and wire producers and fabricators really doing enough if they simply continue to address the same issues in isolation, for example development and design optimization, improved machine and process productivity and the producibility of specific parts?

Witels-Albert is convinced that the future belongs to companies which embrace collaboration and networking with other players in the industry to promote the on-going process of expanding and sharing the wire knowledge base. The willingness to share information



5-roll straightener with two AS 1-20 PO straightening modules

about wire as a process material is the key to a new, knowledge-based wire industry. It is equally important to replace rigid, closed insular solutions with highly versatile, open, modular systems which can address a number of needs in a very cost-effective manner. This article takes a look at two products for the straightening process, which create opportunities to introduce real change.

Wire quality classification

Automation technology patented under number DE 19653569 C2 supports continuous inline wire diagnostics which enable us-



Diagram showing the conceptual design of IWD inline wire diagnostics. Photos: Witels-Albert

ers to monitor mechanical and geometric wire parameters. Information on changes in wire diameter and elongation limit as a function of time and wire length creates a new system for classifying wire quality based on continuous verification of the consistency of these parameters and associated economic factors. Wire suppliers can use seamless verification of product quality as an effective marketing tool. An objective quality assessment by the buyer and seller is no longer limited to the beginning or end of a coil or drum. Information covering the entire length of the product is now available. Quality data acquired during the drawing process, which goes well beyond what is currently available, can be very helpful during the subsequent phase of the wire's lifecycle, giving drawing machine manufacturers and wire producers and fabricators the opportunity to enter into a more open phase of their collaborative relationship.

Everyone involved in the process chain can contribute to the design of drawing machines, wire or shaped parts, and they have a greater say in the development and future of every product in the process chain. Inline diagnostics make full use of our understanding of the roll-type straightening process in combination with acquisition of material and process data. The fact that straightening can only take place if the process material plasticizes can be exploited to calculate the yield limit for non-proportional elongation based on acquisition of wire diameter data. Besides wire diameter, straightening force is also included in the calculation using data acquired from the process. For this approach to work, the straightening equipment must have sensors which can detect the wire diameter and applied force as well as the specific roll positioning configuration.

The key operator for inline diagnostics is the elongation limit operator. This operator contains a relationship-matrix with discrete values for wire diameter, straightening force and elongation limit which are determined in advance using process simulation. A functional relationship based on statistical inference can then be derived. The elongation limit must be provided very quickly for inline diagnostics, and the operator supplies that data based on wire diameter and straightening force data acquired from the process.

Comprehensive component kit

The Witels-Albert component kit provides simulation tools for many types and sizes of roll guides, straightening equipment, straightening and guide rolls and drive units for the wire, tube, rope, cable and strip industry. The process of breaking down straightening equipment into discrete entities continues. The smallest unit is the straightening module which contains the full set of elements in a roll adjustment system which produces reproducible results. The force flow of the mechanical subsystem includes a hydraulic cylinder, a guided roll assembly including roll axis and straightening roll with cover plate, and a limit stop system consisting of a spindle, mounting, a guided stop and a position indicator. The straightening modules are ideal for working with high-strength material between 10mm and 40mm in diameter. More than 5 straightening rolls per plane are needed for this type of wire, along with other design features such as quick opening and closing and the ability to adjust all of the rolls. It is important to keep in mind that a higher number of rolls is recommended for high-strength material. Adjustable rolls are essential to ensure good material handling characteristics and maintain an identical zero line for different wire diameters. The hydraulic cylinder pushes the roll assembly against a limit stop which has a defined position. The stop is adjusted manually by applying a minimal amount of force using a suitable tool, and a mechanical indicator is provided to shows its position. Automatic electrical adjustment is available as an option.

Influencing product design

Series AS PO straightening modules can be configured quickly and efficiently to create many different straightening solutions to meet a wide range of requirements. Several straightening modules can be arranged alternately on a base plate for example to provide the features mentioned above. Other configurations are also feasible which have a higher number of rolls that can be added individually or in groups. A straightener with seven rolls can be configured for a maximum of five straightening triangles and effective bending operations. If we remove four straightening rolls from the force flow, then we can configure one triangle with



AS 7-20 PO straightener, made up of AS 1-20 PO straightening modules

larger roll spacing to straighten large diameter wire. This version significantly expands the application range of the straightener. Other configurations are also possible if roll spacing is adjustable or fixed rolls are mounted in pairs as shown above.

The Witels-Albert straightening module provides users with a valuable resource to generate value-add. It also gives them the freedom to innovate, as other configurations can be created by remixing the straightening modules and adding peripheral equipment. Based on the "shuffle your straightener" approach, customers have limitless freedom to influence product design.

Marcus Paech is Technical Managing Director at Witels-Albert in Berlin. Witels-Albert at wire 2010: hall 9, stand E 37.

Witels-Albert GmbH

Malteserstrasse 151-159 12277 Berlin, Germany Tel.: +49 30 723988-0 Fax: +49 30 723988-88 e-mail: info@witels-albert.com http://www.witels-albert.com