# **Clever Wire Handling**

by:

Bob Flower Witels-Albert USA Ltd. 208 East Pier Street, Unit B, 21654 Oxford, MD 21654 USA www.witels-albert-usa.com Intelligent processing of wires promises easy wire handling, high productivity and lasting value. And now a web-based service enables personnel who operate straighteners to plan roller-type straightening processes with minimal effort.

For **WITELS-ALBERT GmbH** of Germany, ideas are the raw material of the future. The art of promoting and developing this raw material is becoming increasingly important for the success of companies. Accordingly, WITELS-ALBERT GmbH is very committed to designing adequate products, accessories and services.

# Radial & Axial Roller Displacement

Roller boxes of the RK and RK VE series have been part of the product range of the WITELS-ALBERT GmbH for decades. The robust designs are used to stabilize the path of process materials in a defined horizontal and vertical direction. Due to the permanent contact of the process material, wear and tear often only occurs in a very small area on the rollers, especially if the guide gap is set close to the process material diameter. Usually only 25% of the roller length is damaged. In order to avoid damage to the process material, standard maintenance strategies recommend replacing only locally damaged rollers. Although this is good for the final product quality, it has a detrimental effect on the cost effectiveness of the production.

Roller guides of the new RK VE SH series provide a solution to this problem, as they permit both radial and axial displacement and securing of the individually positioned rollers. The radial adjustment and securing of the roller axles with the rollers is achieved by means of slotted holes in the basic body of a roller box and associated hexagon nuts. This is known from the RK VE series.

Due to the special design of the roller axles, axial displacement of the roller axles with the rollers is also possible. The multi-part and externally threaded roller axles protrude more or less laterally from the basic body of a roller box section after axial displacement. This may take some getting used to, but it gives users the advantage of setting the contact or wear point correctly and achieving a four times longer roller life.



Roller guides of the RK VE SH series are available in two sizes for process material diameters up to 5.0 mm and 10.0 mm.

# **Revolutionary New Roller Design**

In addition to the radial and axial adjustment of roller axles and rollers, the selection of the roller material has a decisive impact on the service life of the tools of roller guides.

The WITELS-ALBERT GmbH models RK 20 and RK 30 are made of the wear-resistant material 1.2436. Each roller is also fully hardened to a nominal hardness of 63 HRC.

Rough environmental conditions and wire surfaces as well as ever-higher process material speeds cause wear, which must be avoided as far as possible from the point of view of permanently reducing costs. Use of alternative materials is recommended, which can be hardened up to 68 HRC. However, the disadvantage of these materials is that they are costly, which makes it possible to reduce costs only to a limited extent. Of course, ceramics and tungsten carbide can also be considered, but the prices of these materials are much higher. From our point of view, these materials do not represent a solution for the economical production of solid roller bodies for roller guides.

Nevertheless, how can the service life be increased? This is achieved by a design that uses a high-quality material such as tungsten carbide in a special geometry, which can be produced inexpensively and is available at a reasonable price. The roller designs of the newly developed roller guides RK HM series use tungsten carbide bars placed over the roll circumference.



Roller box RK HM series introducing a revolutionary new tungsten carbide roller design.

# **EMPHASIS: Wire Handling**

The bars are supported by a rotation-symmetrical design element, which also houses the bearings of a guide roller and the axle studs. Due to the gaps between the individual bars, the effect of the automatic proportional descaling of the process material results when guiding wire rod.

Nevertheless, if the tungsten carbide rods installed in the contact area with the wire are worn out after some time, they do not have to be replaced. A simple turn around the longitudinal axis by 90° increases the service life significantly. The disassembly and assembly required for this purpose can be carried out quickly and easily within the scope of maintenance.

#### **Handling Challenges**

The processing of wires with a diameter of more than 8 mm is associated with handling challenges, since the large moment of resistance requires correspondingly high forces and moments to be applied when processing the process material. In addition, there are binding health and safety requirements such as those contained in European Directive 2006/42/EC. This Directive requires that the physical stresses on operators must be reduced to a minimum. This is where the new straightener products for processing large wire diameters from WITELS-ALBERT come into play, regardless of whether it is the processing of rolled wire, reinforced steel wire, cold heading wire or spring steel wire.

#### **Incompatible Features Combined**

If the geometric and mechanical parameters of a wire as well as the parameters of the straightener or the straightening machine are known, the forces and moments occurring during straightening can be calculated with good approximation. For large wire diameters, there are sometimes straightening forces of more than 100 kN per straightening roller. A simple mechanism for the individual adjustment of straightening rollers under this load is possible and available. A compact and affordable mechanism for the quick-opening/closing mechanism working against all straightening rollers and using only the muscular power of the operator is not, however.

Therefore, it was considered impossible to implement the following features for processing large wire diameters in one design:

- Individual adjustable straightening rollers to ensure an identical zero line for different wire diameters and for a collision-free wire path between the first and second straightening plane.
- Mechanical positions indicators PO for the defined and reproducible adjustment of the straightening rollers.
- Quick-opening/closing mechanism. Compact, simple and reasonable.

WITELS-ALBERT has solved this conflict and introduces a total of nine new straightening machines for the processing of wires with a total diameter range from 9 to 40 mm. Depending on the application area and wire properties, models



RA 9 H PO with an increased roll quantity for optimizing the residual straightness of the process material.

with five, seven or nine straightening rollers can be selected.

All RA H PO straightening machines come ex works with hydraulic cylinders for the quick-opening/closing mechanism and with straightening rollers of the WR series. Depending on the application, the wire material, the yield point of the wire and/or the wire speed, it can be useful to utilize rollers of the GB SL series on straightening machines RA H PO series. These high-performance straightening rollers have special bearings, a fully hardened sleeve made of a very wear-resistant steel material and they can be re-greased.

#### **Finding the Required Roller Positions**

Any technical solution for straightening, however, relies on knowing what the required roller positions are. If this knowledge is not available, it has to be worked out. But this subjective process involves high costs resulting from the time, material, labor and energy involved. From both the economic and technical standpoints, this situation is untenable.

To address the problem, WITELS-ALBERT has set itself the goal of creating a virtual representation of the roller-type straightening process, so that the roller positions can be calculated a priori. As has been shown in numerous straightening trials, this goal can be accomplished by simulating the roller straightening process. Simulation is based on a theoretical model of the elastic-plastic alternating deformation of a process material and the link between bending moment and curvature, which can be defined for every bending operation, which is performed in the straightening equipment.

To create a simulation of the process, knowledge of the process material characteristics and the geometric characteristics of the particular straightening unit is required. Given the large variety of applications for straightening units, the diversity of types and models, and the varying objectives of differentiated straightening processes, it is often desired that the simulation process can be moved directly into the wire manufacturing or processing environment. The operators themselves should be given the tools to calculate the required positions of the rolls. To address the complexity of process

# **Clever Wire Handling** ...continued

simulation, a web-based service has been developed, which produces results that allow even an inexperienced operator to determine roll positions, so that a defined level of production quality can be achieved.

*How2Straight.com* is a new and simple we-based service, which uses unit libraries containing information about the roller positions to produce straight steel wire having a round cross-sectional geometry. It has the advantage that it can be used without change in case there is a need for creating and implementing new libraries or improving existing ones.



Web-based service *How2Straight* for finding straightening roller positions.

*How2Straight.com* calculates and visualizes the roll adjustment data considering the specified process material properties (wire diameter, yield point, modulus of elasticity) and the individual type of roller straightening unit. The user interface provides appropriate input fields and buttons for this purpose. It is normally quite straightforward to determine or look up the properties of the process material.

All adjustments, which have been calculated and visualized on the user interface, should be made on the straightening unit using the individual process material zero line as a starting point. The term process material zero line means that the straightening rollers are positioned in relation to defined geometric conditions on the unit in such a way that a process material of a specific dimension is only touched, but no deformation takes place in the area influenced by the rolls. Whether conventional or semi-automatic straightening equipment is being used is irrelevant. Using the *How2Straight.com* data in the daily routine of setting up roller straightening units saves labor, time, energy and process material. For the first time the service *How2Straight.com* opens up the possibility to eliminate the empirical or trial and error roll adjustment method.

## **Transport Force On Demand**

For managing the needed transport forces for larger sized wire in relation to straightening units and straightening machines, feeding units NAH and NADH series are recommended. Supported by the so called direct-drive technology, using two or four hydraulic motors for driving the shafts, a new level of performance is reached.

The maximum opening of 60 mm allows curved wire to pass the feeding throat without any collisions. The feeding units can be installed horizontally or vertically using the



Powerful NAH 160 feeder with wide opening.

mounting holes provided. As a general rule, a mounting position is recommended for RA H PO series straightening machines and for NAH or NADH series feeding units, which corresponds to the primary curvature plane of the wire. The new products work properly upstream to fastener machines, on horizontal support arm decoilers or upstream and/or downstream from individual bull blocks.

To learn more, visit the Witels-Albert-USA website: www.witels-albert-usa.com

## **Company Profile:**

Witels-Albert USA Ltd., is the exclusive stocking office for North America, South America and Central America and many other countries around the world, for WITELS-ALBERT GmbH of Germany. WITELS-ALBERT specializes in wire straighteners, tube straighteners, straighteners, wire and tube feeders and drive units, guides and preformers for wire, tube, strip and flat wire, cable, wire rope and profile shapes. The company's products are engineered and produced in the German tradition of innovation, precision and quality. www.witels-albert-usa.com