

## High-precise length measurement of protective hoses

*The industrial measuring tasks to control the production and monitor the manufacturing quality require increasingly tough and low-maintenance sensors. High-quality final products like protective hoses with their curved surfaces make high demands on the measuring technique. An accurate and reliable length registration can only be carried out by a contactless technique.*



VLM 200 A - Length measurement for the finishing process

The FLEXA GmbH in Hanau manufactures metal and plastic protective hoses as well as guide chains, channel systems etc. As market leader for hose systems, the company is

known to come up to the highest quality demands. It produces connecting parts which enable to establish reliable connections and which proved their performance



Protective hoses made of metal

worldwide, under the most extreme application conditions in the construction of machine and plant.

On fully automatic lines, the base element which determines the mechanical stability of the protective hose, is first produced by means of wire coiling and braiding machines. It is then equipped with a plastic material by a hose extruder. After the cooling and precipitation hardening processes, the finished hose is configured to customers' length specifications. The length measurement for the cutting is made by the non-contact speed measuring system VLM 200.

Until now, this measuring task could only incompletely be carried out with a mechanical

encoder, like for example a rotor wheel. The curved nature of the surface hinders a mechanical contact with the rotor wheel surface. Slippage and indefinable unwinding geometries lead to uncalculable deviations in the length measurement. The slippage results from the inertia of the measuring wheel, the roll resistance (bearing friction etc) and the degree of the static friction between the material and the measuring wheel surface. The static friction depends on the contact pressure, the material deformation, the elasticity of the product and the measuring wheel surface.

Non-contact length measuring systems operate from a distance and are therefore ▶



Manufacturing line with VLM 200 A

slip-free and contact-free. The hoses with their curved surfaces only offer a minimal contact surface to the manually unwinding systems, the so-called rotor wheels. With their spiral-shaped surfaces, the protective hoses form cavities and elevations in the motion direction where the mechanical contact breaks off, or the rotor wheel springs, so to speak, from elevation to elevation. As a result of that, we have a partly considerable length measuring error. The usual length additional charges for high-quality final products whose meter price can amount to 2-digits euro prices, contain a big saving potential.

Therefore the contactless length measuring system VLM 200 developed by ASTECH was used in order to register the wished customers' lengths for the finishing process. The unit enables a

measurement on all surfaces of the manifold products of the company FLEXA. This wide range of different surfaces is measured with one and the same VLM 200 without changing any parameters or further settings. The property of this unit results from the use of a CCD chip and its rapid exposure time control. In addition, the intensity of the light source is adapted to the respective material requirements. With this technological approach, the VLM 200 provides a measurement dynamic enabling to measure more accurately all above-mentioned surfaces while in continuous change. The scope of the recordable materials ranges from deep black rubber to high-reflective chrome-plated or oiled surfaces. The standard system (model family A) works at a measurement separation of  $185 \pm 7,5$  mm and with a measurement uncer-

tainty of 0,1 %. Seen from the sensor, the relief of the hose looks like a flat surface. Consequently, the elevations and cavities of the protective hoses are without any influence on the length measurement.

Laser measuring systems have considerable problems with the waviness of the material surface to be measured. Due to the constantly changing angle between the incident laser beam and the material surface, there are, particularly in case of plastic or metal surfaces, reflections that result in the interruption of the measurement. The VLM 200 does not have these disadvantages since it runs with a white halogen lamp. The light source integrated into the unit contains a fanned out brush which always causes enough scattered light from the object to be measured back to the sensor, which therefore guarantees a measurement. In addition, an ASIC integrated in the VLM 200 checks the plausibility of all raw signals. Thereby any signal disturbances, which remain undetected during the evaluation processes of other units can be filtered out. A lack of checking would result in the fact that the disturbances would be included in the averaging process, and this would lead to measuring errors. Smaller measuring errors reflect in the scatter of the measured values.

The VLM 200 is mounted on a hose confectioning machine. This latter is an integral part of a line and is to be found after

the extruder and the cooling line. According to the customers' requests and the product, the cut length can amount to 1,500 m. The produced length is packed directly after the cutting. Considering an accuracy of better than 0,1 %, the customers could sink the costs, so that the investment in the modern measuring technique paid for itself within a short period of time. ■



Protective hose cut to length

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