Author: Wieland Hoffmann, Head of rubber machinery and equipment development/TROESTER

Smart, economical, and sustainable hose manufacture

Extrusion specialist TROESTER stands for high-quality, German-made, development and production of innovative machines for the rubber industry. Hanover-based TROESTER's automatic centering straight heads, crossheads, and double crossheads excel at producing high-quality hoses for all applications. Hose manufacturers welcome the benefits of these extrusion systems. Short start-up processes with minimised wastage and the option to save material due to thinner hose walls make production very economical. At the same time, the raw material and energy savings also reflect the environmentally friendly mindset that underpins all TROESTER developments.

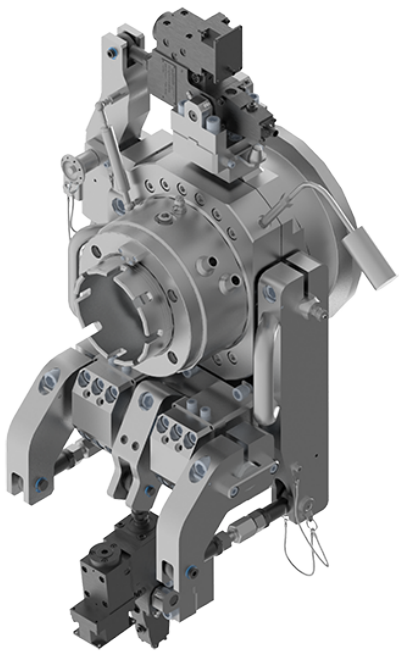
Wall thickness distribution in the 1/100 mm range

TROESTER consistently developed manually adjustable extrusion heads and was able to launch and establish an automatic, single-layer crosshead back in 2010. This product has been a success story in hose production. Since then, TROESTER has added to its portfolio and customers can now choose between automatically centering straight extruder heads, crossheads, and double crossheads to improve the quality of their production and products.

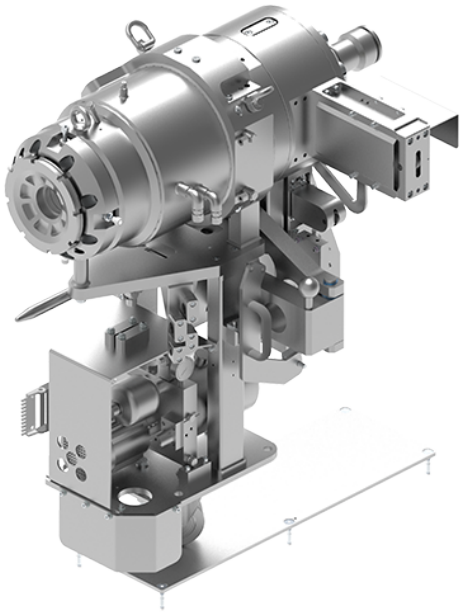
TROESTER extruder heads for hose production with automatic wall thickness centering meet all requirements:

- Hose wall thickness centering within 1/100 mm
- Closed loop control with feedback from the X-ray meter
- Greatly reduced start-up scrap due to fast, automatic centering
- Guaranteed wall thicknesses allow a decrease in wall thickness
- Resource friendly, ideal when materials are expensive
- Can be retrofitted and customary tooling systems possible
- Less time required due to automated processes
- Very quick return on investment (less than a year)
  for a combination of extruder head, X-ray meter and control

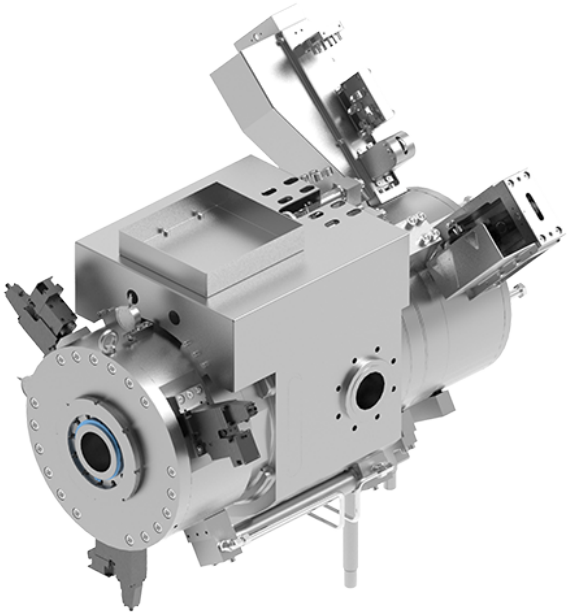
(Fig. 01) Straight head



(Fig. 02) Crosshead



(Fig. 03) Double Crosshead



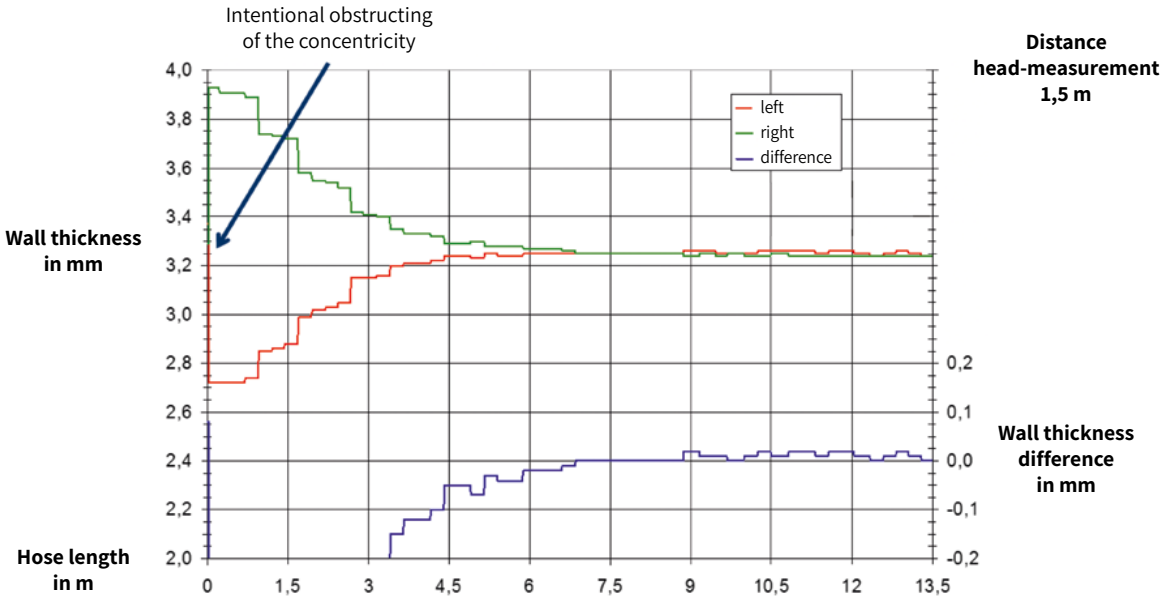
How automated extruder heads works

The tooling is adjustable in X and Y direction, so that the wall thickness is even. The adjustment options for automated extruder heads are similar to those of conventional systems.

The actual adjustment takes place via servo hydraulics. Force is either applied with leverage or the tools are mounted with low friction. As a result, small, careful, and fluid movements without jolts are possible. The adjustment works as a closed loop in conjunction with a wall thickness gauge.

The systems each start with a midpoint setting. As soon as the product has reached the wall thickness gauge, the control system gradually reduces differences in the wall thickness distribution and takes the dead travel between the head and the X-ray meter into account. This initial centering takes place much faster than with conventional extruder heads. During production, the system keeps the wall thickness distribution within a range of less 1/100 mm.

(Fig. 04) Controlling the wall thickness difference



Conditions

The hose layers' wall thickness must be measured consistently online in a defined plane. X-ray meters are suitable for this purpose, some of which are already available for quality assurance and can be integrated into the closed-loop control system. However, without reliable recognition of each of the layers, this isn't possible. This depends on the physical properties of the compounds, i.e. the attenuation of the X-rays. Prior testing is advisable, particularly where multi-layer hoses are concerned.

Limitations of the system

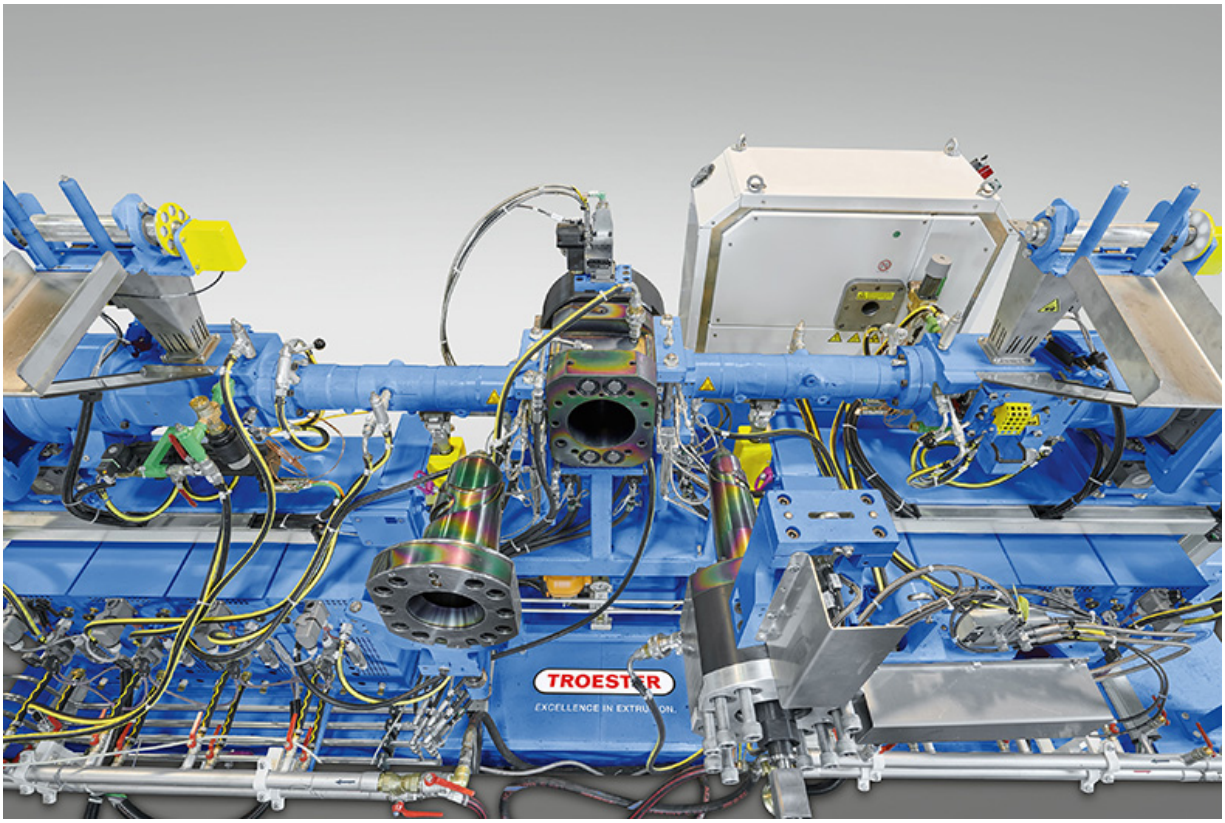
In addition to limited detectability, the system might not work as well if the hose twists. Measurement and adjustment data will then differ. The cause usually lies in reinforcements applied to the hose using spiralling or knitting machines.

As long as the degree and direction of rotation don't fluctuate too abruptly, this can be compensated for by the control system. Too great a distance between the meter and the head amplifies this effect and leads to slower control. Compensating for mirror-image errors (ellipses) is also impossible.

Benefits to the customer

In addition to guaranteed and documented quality, hose manufacturers benefit from saving compound when using the automatic TROESTER extrusion heads on their production lines.

The savings achieved during start-up (due to the scrap saved) and by reduction of wall thicknesses, especially where compounds are expensive, also lead to a very fast ROI of less than one year when a combination of an extruder head, X-ray meter and control is used. The environmental aspects - better utilization of resources and raw materials - are other bonuses on top.



(Fig. 05) Change of a extrusion head equipped with closed-loop control

TROESTER GmbH & Co KG
Am Brabrinke 1-4
30519 Hanover
Germany
Tel.: +49 511 67040
E-mail: info@troester.de
www.troester.de