

Step on it!

Servo solution by KOLLMORGEN: Clean cuts with linear motor and rotating blades



The blades driven by AKM servo motors work with precisely regulated centrifugal forces.

In the beginning there is the pipe – and, at the Breyer machine factory, it comes endlessly out of the extruder. If the singular for pipe in Latin is tubus, it is very easy to see why the technological origins of a tube are in a pipe. Breyer is one of the undisputed world market leaders in sophisticated extrusion systems. The company, from Singen on Lake Constance, builds extrusion facilities for the manufacture of tubular hoses. Thanks to the newly designed motion control system by KOLLMORGEN, the new generation of the Topline series produces up to 300 tube blanks per minute.

Whatever the cosmetics and food industry put in the tubes – lat. "tubi" – the customer will one day squeeze out again by hand. It sounds simple, however it is anything but – at least if you take a look at the production. The demands on such a tube are extremely complex and, in the truest sense of the word, multilayered. Breyer is meanwhile manufacturing systems which produce tubular hoses of up to seven layers. They differ in appearance, barrier and adhesive properties, as well as in their color and rigidity. The whole thing is technically implemented using a sophisticated combination of the appropriate number of extruders, which precisely dose each of their materials with temperatures up to approx. 250 Celsius into the shaping nozzle. The soft hose is then pulled through a calibrator, where it receives its final profile using a vacuum while also being cooled in a fine mist.



The finished blanks must be cut accurately so that they can later be printed and processed precisely.

Linear motor positions the cutting head

The speed at which the tube blanks are produced depends on the speed of the puller device, which pulls the solidified hose from the calibration and thus becomes the master. It must be noted that thicker tube walls require a longer cooling time than thinner ones. Functionally, the caterpillar is part of the cutting unit which separates the continuously conveyed material into precise sections in a clockwork fashion. This machine module works with three KOLLMORGEN servo drives in one synchronized multi-axis system. “The caterpillar haul-off is defined as the master,” explains Andreas Bauknecht, employee in the development department (R&D) at Breyer. The pace of the caterpillar is followed by two further drives, which cut the plastic to the desired length. Here, the [ICH linear motor](#) by KOLLMORGEN takes on the positioning of the cutting blade in sync with the prevailing speed of the product. Technologically, the process can be compared to a flying saw. The ICH linear motor brings the cutting head driven by an [AKM servo motor](#) into position before each cut and updates this during the cutting. Each very small deviation in pace between the product and the tool would inevitably lead to a spiral cut.



Two AKM servo motors are used for the caterpillar feed and the blade drive.

“Our customers value the TopLine because of its high speed and, above all, precision,” explains Bauknecht. Customers, in Breyer's case primarily packaging manufacturers, who supply the familiar producers of care products and cosmetics with finished tubes – and they are very precise, because their products don't sell just because of what they contain inside. The appearance also decides the success at the POS. A significant basis for printing a high-quality and promotional tube is therefore the quality of the tube blank. “Larger tolerances make the printed image worse,” says the head of development of Breyer. With tolerances of +/- 0.03 mm in diameter, 0.3 mm in length and 0.02 mm for the overall layer thickness and eccentricity, Breyer is very high up on the world market in terms of precision.

PCMM: More options for motion control

The new motion control solution now puts Breyer in a better position to optimize the processes that are finely tuned to one another. The head of the multi-axis servo system is formed by the [PCMM motion controller](#) by KOLLMORGEN. The compact device controls the three AKD type servo drives and even remains connected to the higher-ranking Siemens SPS via Profinet. The [Kollmorgen Automation Suite \(KAS\)](#) is used for installing the movement profile – for example, in forming the electronic cam profiles. The graphic programming solution uses the standard approach of PLCopen for motion and the modular “drag-and-drop” of the KOLLMORGEN Pipe Network.

From the point of view of actuating elements, two AKM servo motors are used for the caterpillar feed and the blade drive. As a system partner of KOLLMORGEN, the engineering specialists at EAT GmbH (Elektronische Antriebs-Technik – Electronic drive technology) use series ICH linear motors for the positioning. The development trio made up of Breyer, EAT and KOLLMORGEN represents a good example of a successful partnership between manufacturer, system integrator and OEM. KOLLMORGEN and EAT have been working together for more than 30 years. “We are deeply involved in servo technology and automation, and our cooperation with KOLLMORGEN therefore enables us to support our customers with engineering, particularly those in specialist machine construction,” stresses Christian Reinsch, technical head and general manager of EAT in Freiburg.



With the combination of the PCMM Motion Controller and AKD servo drives, Breyer has a compact and high-performing motion control combination.

Reinsch is particularly excited by the ingenious integration of the linear drive. KOLLMORGEN has constructed the ICH series in such a way that it delivers longitudinal forces between 175 and 5341 N (top power more than 12000 N). The speed range lies between the slow 1 $\mu\text{m/s}$ and the fast 5m/s with acceleration force depending on the size, between 3 and 10 G. Subtleties in design reduce the cogging to a minimum – a significant aspect for high quality control, which is precisely what is required in packaging processes

On a control level, the KOLLMORGEN PCMM Motion Controller and the programming options of the KOLLMORGEN Automation Suite (KAS) align the feeder, linear unit and the blade drive. If the caterpillar simulates the pace via the [AKD servo drive](#), which follows the linear unit with wonderfully soft positioning in the form of perfectly designed electronic cam profiles, the blade drive needs to deliver very precise speed ramps.

More productivity with retrofitting

It's because of details like these, that the machinery builders from Lake Constance now opt for PCMM when it comes to motion control. In comparison to the previously used servo drive technology based on the KOLLMORGEN [S700 servodrive](#), the current state of technology offers greater opportunities for optimization. "The pipe network gives us even better control of all brake and acceleration processes," emphasizes Christian Reinsch. The engineering environment within the Kollmorgen Automation Suite (KAS) also paves the way for setting the cuts depending on position and controlled by print marks. This task then becomes relevant if the cutting module needs to make the pre-printed plastic pipes the right length – for instance for laminated material for multi-colored toothpaste. "We also need a good drive technology for this to guarantee a high level of quality," summarizes Andreas Bauknecht; Andreas and Christian Reinsch are both delighted about how fast the change onto the PCMM was carried out. This pace is largely thanks to the PipeNetwork and the Ethernet communication which allows even complex electronic cam profiles to be conveniently and efficiently generated. The motion controller, therefore, brings genuine potential for retrofitting, especially as the real-time Ethernet communication does not come with any restrictions, the manufacturer of which provides the higher-ranking SPS.



The Topline impressively shows what level of productivity machines reach if the engineering team works closely together. EAT and Breyer are delighted



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ABOUT KOLLMORGEN

Since its founding in 1916, Kollmorgen's innovative solutions have brought big ideas to life, kept the world safer, and improved peoples' lives. Today, its world-class knowledge of motion systems and components, industry-leading quality, and deep expertise in linking and integrating standard and custom products continually delivers breakthrough solutions that are unmatched in performance, reliability, and ease-of-use. This gives machine builders around the world an irrefutable marketplace advantage and provides their customers with ultimate peace-of-mind. For further information please contact think@kollmorgen.com or visit our website www.kollmorgen.com/uk