Fast, safe and simultaneous knife positioning with SINAMICS and SIMATIC

Dienes Werke GmbH & Co. KG cuts efficiently from every perspective

Solutions for Converting
**Increase productivity, minimize waste**

For in-line longitudinal cutting, also in the non-wovens industry, increasingly smaller batch sizes and consequently increasingly shorter rolls must be processed just-in-time. This inevitably leads to more frequent formatic cut width changes and therefore higher wastage. A logical consequence for Dienes Werke GmbH & Co. KG (based in Overath close to Cologne, Germany), one of the technology and market leaders when it comes to precision cutting systems: not just continue to do as they had always done – but instead, to significantly reduce changeover times in order to increase productivity even further and minimize waste, while still maintaining the same production speed. And this is precisely what the most recent innovation from Dienes does – the world’s first fully automatic knife positioning system “Simu-Flash”. The name says it all – because with Simu-Flash all of the knives of the cutting system are not individually positioned one after the other, but simultaneously. With high precision (±1/10 mm), and as fast as lightning. Previously, it took up to two minutes until a format was changed, now it is always less than 15 seconds, independent of the number of knives and the machine width (up to 10 m). For short traversing distances, often just a few seconds are necessary. The machine operator or technician only has to press a button and the change is performed completely automatically, without any collisions, and absolutely reliably.

The Simu-Flash system is very compact and is suitable for razor blade, shear and score cutting techniques (also simultaneously). It can be used on almost all of the machine frames and is therefore predestined for modernizing existing systems.

**Based on proven automation**

The electronic backbone of all automatic knife positioning systems from Dienes is high-performance control and drive technology, where Siemens is the preferred component supplier. These components have already proven themselves on a countless number of machines with motor-driven, single knife positioning systems installed worldwide among others, with the modular SINAMICS S120 converter system equipped with the latest CU320 2 Control Unit. For this type of machine Dienes specifically uses the basic positioning functionality integrated in the drive (EPos) to traverse the knives, either with actual value acquisition via the motor – or an encoder mounted on the machine (linear scale). Fast measuring probe signal acquisition in the drive means that the knife positions can be read in fast before adjustment; the cyclic measurement itself is realized using what is known as Drive Control Chart (DCC) with preconfigured Drive Control Blocks (DCB). The latter can be simply and graphically interconnected with one another. This noticeably simplifies the engineering and at the same time ensures that the solution remains transparent.

In the meantime, the SINAMICS S120 drive system has advanced to become a Dienes standard and should also be used in the new, automatic fast positioning system wherever possible. From the very beginning, a project engineer from
Siemens Cologne was involved in the development. He supported the project from selecting and engineering the various products up to first commissioning – and participated in the implementation of the required control and drive functions.

A SIMATIC S7 300 (with CPU 317 2 PN/DP) is the completely new “intelligent” core of the Simu-Flash. It executes all of the calculations (start-stop ramps, traversing paths, velocities, ...) and controls the various logic operations. Compact stepping motors to position the knives and also the motors to drive the lower knives are connected via PROFIBUS and the distributed I/O modules. “We consciously shifted all of the intelligence into the central control system and operate the positioning drives without any encoders. This keeps the cutting systems simple so that they can also be quickly exchanged”, explained Rolf Thielen, Head of Automation & Service for Dienes in Overath.

Format change times of less than 15 seconds and therefore significantly higher productivity with reduced waste was confirmed by one of the first users of a Simu-Flash machine with a working width of 4200 mm and 30 knife holders (PSGs DF 50). This end customer uses his machine to cut non-woven materials at web velocities of up to 1000 m/min – and also makes frequent changes. The 30 lower knife motors in a cartridge-type design are driven at a constant speed by 15 compact and therefore space-saving double-axis modules from the SINAMICS S120 converter system.

Focus on a solution from a single source

“Our objective is to purchase as many automation components as possible from a single source, because then, the interoperability is guaranteed and interface problems don’t crop up in the first place”, explained Andreas Decker, Product Manager, Cutting Systems. Without system interruptions seamless remote maintenance is simplified, which plays a significant role in considerably reducing down times when faults do occur.

However, robust and reliable automation technology from Siemens helps to ensure that this doesn’t happen in the first place. But if it does, then spare parts and support are quickly available everywhere. “In certain markets, Siemens equipment is a real sales argument and is therefore an undisputed standard for us”, stated Andreas Decker.

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Format change at the touch of a panel

A SIMATIC Multi Panel MP377 with 15” touch screen is the first choice for operator control and visualization, which is generally remotely installed in a control room. This can be integrated into a higher-level system (e.g. in production planning or work preparation) and receives its cutting data via the integrated Ethernet interface. As an alternative, new recipes can be created and saved while production is running via the graphic user interface under SIMATIC WinCC flexible.

To do this, the operator enters the required roll widths (generally starting at 20 mm, in this case, 50 mm), and when required, also with what is known as a “Neck-In”. This means that the control system selects the most suitable cutting units and simultaneously positions them. Previously impossible was a center correction function (“recipe offset”). This function involves shifting all of the knives to the left or to the right so that both edges have the same relationship. Worn units that require maintenance can be specifically blocked. When required a manual method is also possible. What is known as a convenience setting simplifies threading the material web. This means that half of the knives are traversed simultaneously from the center to the edges and then back to the cutting positions. This enables optimum accessibility.