

Complete solution for printing and converting machinery

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Customers are increasing their requests for machine designers and builders to create and build more powerful machinery, specifically machines that have increased throughput, high machine availability, and wide-reaching flexibility. Intense competitive pressure demands that machines be designed to stand out from the crowd with exceptional features like high performance, innovative technology, and modularity. The compatibility of components with one another has an important role to play. One quite decisive aspect is that these machines are developed and brought to market significantly faster. The full solution provider, Kollmorgen, has the know-how, software planning, and optimization tools as well as the automation components necessary to do this. The result from this thorough engineering groundwork is efficiency, optimized system development, and outstanding machine performance.

Efficient automation solutions in converting machines depend on a perfect match of mechanics, electronics and software. These machines are used for further processing of printed material, for example: to create endless form sets, labels, calendars, or mailing products. Different webs are brought together and further processed by perforation, stamping, crimping, gluing or stapling, for instance. Any solution must support high-speed format/tool changes and corrections, as well as affording personnel safe access at all times. Furthermore multi-axis systems must be synchronized exactly to ensure smooth control of materials and tools.

The performance and programming of the Kollmorgen Automation Suite (KAS) has improved the field of highly dynamic applications in the printing and converting sector. An ideal solution is available for applications in which precise synchronization is critical due to the high performance of drives, controllers, and the communications network. In combination with the graphical Pipe Network interface, which simply and intuitively uses the mechanical structure to map the program structure, precise synchronization allows the user to launch high performance machinery to the market in the shortest possible time.

Exemplary results were demonstrated in the development of converting machinery by applying the latest Kollmorgen technology. The development and market launch times were shortened by 30%. When the machine was put into use, the throughput increased 25% and there was a 50% reduction in discards. The machine operator enjoys better results from the sharp increase in overall equipment effectiveness (OEE).

For example, the replacement of all the drive technology in the guillotine of a Jakob Graphic Services GmbH converting machine used in the production of wall calendars will be described briefly to illustrate the deployment of our technology. Although the focus is on converting, the technology can be used in other types of applications. The converting application is a typical high-speed application for further processing of printed, continuous paper. The scope included programming the entire machine control system using KAS including visualization, servo controllers, servo motors, and the I/O interfaces. The objective was to allow changes of format and tool in seconds and to allow corrections to be made to the cross cutter by touch screen.

Webs of differing formats are brought together along the transversely running processing line and fed into the cross cutter which has two rotary knives on the roll. The challenge is that this cylinder cuts the printed continuous webs supplied into variable cutting formats, completely independently of the print format, and permits corrections easily. The corrections between the knives and blades – at material speeds of 200 m/s – always cause an acceleration or a deceleration, yet the cuts to be made are always synchronized with the speed of the paper web. The MotionControl tasks principally comprise: Supporting all principal functions and synchronization of 13 axes Jerk-free, positionally accurate and synchronized control of the material and the tool with the highest degree of precision (< 0.1 mm) and dynamics Design of an electronic cam group for picking up and ejecting the cut material

“The decisive factor in the deployment of the Kollmorgen suite was being able to exploit the company-specific knowledge and experience and being able to

resolve the individual application concerned appropriately for the requirements” explained Dipl.-Ing. (FH) Ulrich Jakob, Head of design and engineering at Jakob Graphic Services GmbH. “It was possible to significantly shorten the programming time and commissioning, while clearly enhancing the machine’s performance. Simply implementing the flexible electronic cam group – graphical CAM programming – allowed us to improve machine throughput by more than 25%.”

Hans-Peter Jakob sees great benefits in the system’s offline simulation capability: “We can verify that we have provided the functionality desired in a partial or even full simulation of the machine. Set-backs caused by errors are prevented, and commissioning becomes a ‘mere formality’”, continued Hans-Peter Jakob, Head of sales and CEO of Jakob Graphic Services GmbH, adding: “The technical properties achieved are significant for Jakob machines and are certainly a USP.”

The flexible, comprehensive and intuitive development platform, Kollmorgen Automation Suite™ (KAS), forms the basis and key to substantially improved machines. It can be used to fully develop and simulate highly complex processes using over 128 axes. The integrated, standardized development environment incorporates the principal functions of a control system – Motion Control, PLC and HMI – and also the software and takes into consideration the hardware components to be linked. In addition to this, machine designers using KAS have a scalable development platform that provides them with



Picture 1 - Rotary knife

graphical programming, various libraries, appropriate simulation tools and versatile configuration options. The simplicity of use is characterized by the clever ‘building block system’ that supports modularity and, in particular, timesaving repeatability.

Intuitive and modular Motion Control programming by Drag and Drop with Pipe Network

The Kollmorgen Automation Suite™ offers two solutions for programming the drive control system. For standard solutions, KAS has the industry standard PLCopen, which adds standardized function blocks to IEC 61131-3. On the other hand, graphical programming with Pipe Network™ is suitable for individual solutions which the machine builder can achieve a genuine competitive advantage. With its Pipe concept, KAS simplifies the conversion to an electronic line shaft, which then adopts the principle of the line shaft for the program structures to be formed. Transmissions, cams, and axes are represented by logical function blocks in their kinetic association. The Kollmorgen Automation Suite™ represents a pioneering innovation in the synchronized motions programming of multiple axes in that highly complex coding is replaced with a drag and drop function with the assistance of Pipe Network™. It is only necessary to describe functions with graphical description blocks and the relations between components in order to program movements and define configurations.

With Pipe Network programming, the user is able to build up his programs in line with the situation on the machine. He has a broad palette of predefined building blocks for standard modules at his disposal. In future he will be able to create his own modules, UDPB (User defined Pipe Blocks) from predefined blocks and his own subprograms so that complete machine modules can be saved and later be retrieved from a library, needing only to be configured.

Simple synchronization and phase shifting

The functions available in Pipe Network can be started, stopped, modified, and restarted so that, for instance, a stationary axis can be synchronized into a running process with angular synchronism. It is possible to transfer the configuration of an axis to other axes and then to define the desired phase offset of the axes.

Synchronization tasks of this kind are the subject of many system designs. Typical examples include revolver machines with feed axes, spindle winders, timed product feed, vertical bag form, fill and seal machines, case erectors, and cartoners. The flying saw (see picture 2) or rotary knife (see picture 1) technology functions are frequently used. With just one command, the flying

saw or rotary knife can be uncoupled at a defined position even when the machine is running, and can be re-coupled at a fixed phase. The user-definable cutting times or welding times can be observed here, independently of the machine cycle.

Using the Kollmorgen Automation Suite as a development platform and incorporating the best drive solution, creates machines of the highest performance. The capability of creating intuitively modular programs with Pipe Network and their re-usability make a substantial contribution to this. According to Kollmorgen, customers have enjoyed significant savings in the course of implementing their applications as well as considerably improved machine performance.



Picture 2 - Flying saw

Conclusion

With some thought and armed with the knowledge of coupling mechanisms, users can be equipped to effectively minimize EMI issues when best practices are not available.

About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of motion control design and application expertise. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For more informations contact us.