

# **Complete solutions for the packaging industry**

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development cycle leading to faster time to market**

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## 20% higher throughput and 20% shorter development cycle leading to faster time to market

The continuous drive for product innovation means that design engineers working on the development of packaging machines are constantly faced with a challenging task - to accelerate the redesign of machines and fully maximize its capabilities to sustain new growth opportunities. A clear increase in productivity and its significant cost advantages can only be achieved with greater throughput, flexibility and higher machine availability.

There's also considerable competitive pressure to ensure that the high performance machines planned for development are launched to the market as quickly as possible. As a complete solution provider, Kollmorgen has the in-depth experience, co-engineering services, software planning and optimization tools, and the motion and automation components to make this happen. The end-result from this broad capability is time-saving, optimized system development and outstanding machine performance that improves the bottom line.

With its integrated automation and motion development environment, Kollmorgen Automation Suite™ (KAS) delivers performance and programming ease for packaging applications, particularly those needing a highly dynamic response. In applications where precise synchronization is critical, KAS delivers an ideal solution thanks to the high performance of the drives, controllers and communications network. In combination with Kollmorgen's graphical Pipe Network™ interface, which simply and intuitively takes the mechanical structure to map its program structure, KAS gets high performance machines to market in the shortest possible time

The continual emergence of new forms of packaging, together with the short periods between changes of product format and constant stopping and starting, results in extremely tough demands being placed on machines employed in the packaging industry, food and beverage industry, and pharmaceutical industry. Assuming a machine service life of five years, the following savings arise from an analysis of the results of a medical product packaging application completed using the latest Kollmorgen technology:

- Throughput was increased by 20% through optimized drive solutions and the performance of the control system
- Development time as well as time to market was reduced by 20%
- Material costs were reduced by 20% thanks to the lower scrap rate made possible by the high performance and precise drive control

The higher throughput and scrap rate reduction leads to a clear increase in productivity creating a growth in profits of up to 50% in just five years. The machine builder enjoys improved results from the sharp increase in overall equipment effectiveness (OEE).

Motion control is the key to higher machine performance for this packaging application. For the rotary knife, which cuts measured strips to their desired length, the drives must be capable of determining a print mark in less than five ms and then of executing a correction movement within 15 ms following a specified curve profile. This puts significant demands on the drive and controller as well as the complete system. If a precise end product is to be achieved, a maximum positioning error of 0.03 mm must not be exceeded at any time. Applications in the medical sector demand the production of very precise products in high numbers; for this reason it is particularly important to employ drives that are tightly synchronized, even at a high number of cycles per minute. This is especially significant due to the precise dosing required with modern medications.

The dynamics and response capability of the drives is also a consequence of the very high performance of the motion control system. Given its ability to calculate set points for all drives at a frequency of 4 kHz (every 250 μs) and to communicate over EtherCAT® to the drives in conjunction with the highly dynamic motor-controller system, Kollmorgen Automation Suite™ (KAS) is capable of handling this task. KAS is the only solution that has demonstrated the ability to achieve the performance and precision demanded of the application.

KAS forms the basis and key to substantially improve machines via its flexible, comprehensive and intuitive development platform. It can be used to fully develop and simulate highly complex processes using up to 128 axes. The integrated, standardized development environment incorporates the principal functions of a control system - motion control, PLC and HMI - and also manages the software and the hardware components to be linked. The "one stop shop" aspect of KAS was a significant benefit for this application by handling the programming of the complete machine control system, along with AKM™ servomotors, digital servo drives and the I/O. This consistent servo design concept, with the versatile capabilities to develop a differentiated packaging machine, was a critical factor for the customer when considering the alternatives.



### **Intuitive and Modular Motion Control using Drag and Drop programming with Pipe Network**

We frequently hear OEMs say that they want to have simple and intuitive user guidance, and modularity and repeatability in programming the drive control. The machine designer wishes to create structures and program modules that correspond to his particular application, with the ability to store these in his own libraries so that he can reuse program code.

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

With Pipe Network programming, the designer is able to build up his programs in line with the machine application. He has a broad palette of predefined building blocks for standard modules at his disposal. In the future, Kollmorgen is planning to add the capability to create the user's 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. A further important function is the ability to simulate the system offline, which supports a total simulation of the complete program execution - without having to connect the actual hardware. The integrated offline simulator allows refinement of motion profiles, axis states, phase shifts and the synchronization of the motion sequences in a multiple axis system in real time. This leads to clear savings in setup and startup, as not only is less time required, but possible collisions on start up can be prevented.

Synchronization tasks of this kind are the subject of many system designs. Typical examples include revolver machines with feed axes, winding applications, timed product feed, vertical bag form, fill, and seal machines, case erectors and cartoners. The flying saw or rotary knife 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 Kollmorgen Automation Suite™ as a development platform, and incorporating the best drive solution through AKD, creates machines of the highest performance and captures significant cost-savings. The capability of creating intuitively modular programs with Pipe Network and their re-usability enhances the ease of development while shortening development time. Customers have enjoyed significant savings in the course of implementing their applications as well as considerably improved machine performance.

## **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.

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