Success Story

Blueprint Automation
Fast & energy-saving packaging
The starting point

These days virtually all food products come into contact with robots in the production phase – especially in the packaging process. High-speed Delta robots are experiencing a continuing boom in packaging applications, picking products from the production conveyor belts and placing them in order in multi-packs. Delta robots are an affordable investment, can be set up fast and easily and are relatively low-maintenance. Additionally, products and packaging sizes change frequently these days. With Delta robots you can react easily and quickly to such product changes as they are considerably more flexible than rigid packaging machines.

Many control system suppliers can also handle demanding packaging requirements. If you take a closer look, however, you will see that there are major differences not only in necessary programming and start-up but also in terms of performance, productivity and energy consumption at the packaging line.

Disadvantages of a classic PLC with motion control functionality

In most control system concepts an existing PLC with motion control is used to control the movements of the robot. This means that a robot control system is reproduced based on a robot transformation (position, acceleration) and a cyclic interpolation module. Motion commands are run sequentially by means of function modules. The application developer has to combine typical robot functions such as path blending, jogging and object tracking based on these function modules in an elaborate and time-consuming process. This is a particularly sensitive task even for experienced users, especially in the case of object tracking whereby the robot movements have to be dynamically redefined.

It is not until the basic functions mentioned have been finally implemented that you can begin with the actual application – i.e. defining the best pick-and-place strategy. This optimum pick-and-place strategy is an extremely important step which makes the difference of the added value of a packaging line over that of a competitor.

In the case of robot control systems based on motion control, therefore, valuable application resources are constantly “wasted” on basic robot functionalities without the respective manufacturer of the packaging machine benefiting from key USPs and competitive advantages in the marketplace.

The disadvantages of a motion control concept also continue when it comes to the start-up of the robot packaging line. Reference systems such as the robot base and conveyor belt levels, for example, have to be precisely aligned mechanically so they are horizontal with each other. Image processing is similarly complicated.

All in all there are many time-consuming processes which have to be dealt with and, as a result, important production capacities of mechanical engineers are tied to a single project for a client for an unnecessarily long time. Further time-consuming optimizations are then still necessary after start-up to achieve the highest possible pick rates.
BluePrint Automation (BPA) redefines the requirements on the control system of packaging robots.

The Dutch company BluePrint Automation (BPA), one of the world’s leading manufacturers of flexible solutions for packaging automation, also recognized the limitations and restricted possibilities of motion control systems.

The sequential program execution which is common for motion control was identified as a main problem which makes look-ahead track planning across several track segments virtually impossible. This results in unavoidable major time losses – especially in the case of path blending from one track section to the next.

This fact and the disadvantages mentioned previously prompted the packaging machine specialists to rethink their control concept. The aim here was to keep the throughput of the packaging plants as high as possible and offer customers the most user-friendly and fastest overall concept every time.

In their search for a new, enhanced control principle the specialists from Holland defined the following requirements on the control technology of their packaging robots:

- **User-friendlier programming** with the focus on easy implementation of the optimum pick-and-place strategy. Robot functionalities should already be ready and available in the control system with the best possible performance.

- **Improved performance** through a further reduction of the cycle time by means of faster robot movements at mechanical and physical limits to increase the entire line productivity.

- **Reduction of engineering times and risk minimization** when planning thanks to offline program generation and pre-simulation plus a significant shortening of the time it takes to set up and adjust the robot line result in faster start-up.

- **Greater solution competence and flexibility** through open functions and interfaces to be able to integrate own know-how, basic expansions and new solution ideas easily and quickly.

User-friendly setup of conveyors in software
Impressive, intelligent control system concept from KEBA

Once these requirements had been defined BPA began to search for a suitable control system. They soon came across KeMotion Packaging from KEBA - an innovative control system solution especially for packaging robots. KeMotion Packaging presented itself as a flexible and scalable combination of intelligent robot control and classic motion control – united in just one piece of hardware.

This unique, high-performance combination enables you to start up the entire plant extremely quickly and gives you the best possible robot performance.

Straightforward, user-friendly start-up with offline simulation

BPA finds the easy KEBA robot programming language KAIRO convincing. Thanks to KAIRO, motion patterns can be generated conveniently and intuitively. Numerous pre-built wizards help in the process of generating the program.

An offline simulation package of KeMotion allows the packaging robot specialists from Holland to plan plant projects and simulate how the actual facility will perform later even prior to the real robot line being in place. The simulation behaves exactly like the real control system. Critical partial areas can thus be identified beforehand and taken into account in the engineering. The project risk is reduced to a minimum by means of realistic cycle-time analyses which enable you to say in advance whether the throughput the customer would like is in fact feasible.

Track points and dynamic values such as speed and acceleration plus the logical sequence of the movements can thus be simulated offline on a PC before the respective hardware is available and, if the equipment already exists, it can already be taught in directly to the robot. This means that optimization and the testing of pick-and-place strategies are already possible in advance.

All parameters can then also be modified online “on the fly” and the result can be seen immediately on the line. This offline/online concept saves an enormous amount of time during the commissioning and optimization phases.

Furthermore, KAIRO’s easy-to-use concept enables the user to get off to a very good start even in the case of demanding assignments. User-friendly Wizards, for example, enable you to set up the camera for object recognition and the appropriate conveyor belt conveniently and directly on the operating unit. All that is necessary is to teach in a maximum of 8 points to automatically determine the position of the camera and that of the conveyor belt together with its incremental encoder resolution. This means that the entire robot line is set up in only a matter of minutes and ready for the start of the motion sequence and robot program.

Even with the pilot facility in 2011 which was used to place yogurt sticks in a multi-pack, BPA noted a significant reduction in engineering times thanks to the KeMotion packaging system. It was then possible to complete the start-up of a robot line with 3 Delta robots in only a few hours.
Faster and more energy-saving thanks to „Intelligent Motion“

BPA attaches great importance to the coordinated control of several robots in the shared workspace. It was for this reason that KEBA looked into the topic in detail and developed the look-ahead path and movement planning „Intelligent Motion“ for KeMotion. This enables the robot to react to external events and thus adjust speed and motion-sequences accordingly.

One main goal of “Intelligent Motion” is the effective prevention of harsh start and stop processes that would be caused by sudden interruptions of the robot. As a result, vibrations and energy consumption are reduced at the same time. If the product flow on the pick conveyor is briefly interrupted, for example, the robot does not move to the waiting position; instead, it moves to the next planned pick-up point but at an adapted, reduced speed. Smoothly flowing movements are the result which can also be seen in practice.

Thanks to the effective elimination of stop & go operation the motion profile is low-vibration with reduced energy consumption and increased pick performance and productivity. “Intelligent Motion” also works with the control of several robots in shared workspace. The movements of the robots are synchronized with each other and also adjusted in line with the product flow on the conveyor belt.

Users benefit from the advantages of “Intelligent Motion” without having to face any additional programming. Like most KeMotion technologies, this feature is also integrated in the KeMotion control system when supplied.

The first plant in the world to have “Intelligent Motion” as a standard feature will be a BPA robot line with two Delta robots. These will be used to stack tortillas and then move the eight stacked tortillas on to a foiling machine for the next step.

KeMotion Packaging from KEBA is particularly fast and energy-saving thanks to look-ahead motion planning.
An interview with BPA CTO Ron Fortman about the KeMotion robot control system

The first project at BPA to use the KeMotion control system is for the packaging of yogurt sticks. Why did BPA decide to change the control system to KEBA?

Fortman: The KEBA control system gives us added functionality and more possibilities as a result – and the performance is better. Besides that the KeMotion system is more reliable and it is very robust. The system we used previously simply didn’t have this.

The programming of the control system was handled by Electro ABI, KEBA’s partner in the Netherlands. We didn’t have any experience with this but we were able to watch them at work a little and learn at the same time. Our aim is to program the KeMotion control system ourselves in future but we still need the practical training for this.

Have you noticed any increase in productivity with the packaging line?

Fortman: Unfortunately we have no comparison for this particular project but we are highly satisfied with the output.

Are there any other projects in the pipeline?

Fortman: The next project will be a tortilla stacker for 12” tortillas. The tortillas will be stacked and then moved to a tubular bag packaging machine for the final packaging step. Besides this we will soon be operating 2 Delta packaging robots in series with KeMotion control to increase the throughput of our machines even further.

What future challenges do you see in packaging automation?

Fortman: At BPA we have set ourselves the target of reducing engineering and programming hours even further. Ultimately we want to reduce project lead times even more. The goal is to handle more projects every year with the same team. Delivery times should also be reduced as a result, these are still a little too long. We will also be quicker in this field in future.
In addition to this we also see a general trend towards smaller packages which presumably has something to do with the increasing number of single-person households and small families.

Furthermore, so-called retail packages will play a larger part. The advantage of retail packages is that supermarket staff simply have to put the package as a whole on the shelf instead of putting individual articles in place.

Shoppers simply take the items from the retail package which has been torn open. This makes shelf stocking faster and easier and many supermarket staff hours can be saved. Successful discount supermarket chains are typical examples.

Mr Fortman, many thanks for the interview.
Fit for the future with KEBA.

Founded in 1968, KEBA AG is an internationally successful electronics company based in Linz/Austria with subsidiaries in Germany, Romania, Turkey, Italy, the Czech Republic, USA, Taiwan, Japan and China. In line with its credo, “Automation by innovation” KEBA has been developing and producing inventive, top quality automation solutions for over 40 years for industrial, banking, services and energy automation branches.

Indeed, as a result of competence, experience and courage, KEBA is the technology and innovation leader in its market segments. Extensive development and production expertise have proved a recipe for highest quality.

www.keba.com

KEBA AG Headquarters, Gewerbepark Urfahr, A-4041 Linz,
Phone: +43 732 7090-0, Fax: +43 732 730910, keba@keba.com

KEBA Group worldwide
Austria • China • Czech Republic • Germany • Italy
Japan • Romania • Taiwan • Turkey • USA