

Variant development of complete automation provider

Automation in Motion

Technical products – from compact individual products such as mobile phones to cars to very large production machines – mainly consist of small parts. Because lot sizes are always getting smaller, due to increasing product individualization, it is essential to bring the parts required in the production process for the variants to where they are needed. This often eliminates the option to install stationary conveyor systems. In the future, their job will be assumed by small, self-driving floor conveyor systems such as the AUGMOS Q40 from Melkus Mechatronic. This automated guided vehicle (AGV) was developed based on the extensive automation technology from SIGMATEK.

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„It is no longer enough to automate only the individual machines or production cells“, Andreas Melkus is convinced. „So that the vision of Industry 4.0 – production that adapts to changeable requirements and thereby enables mass fabrication of individual products – can come true, the logistics within production facilities must also be included in the overall automation.“ With this belief, the founder and co-owner of SIGMATEK started Melkus Mechatronic GmbH in 2014. Because stationary handling and conveyor systems aren't flexible enough, the focus was placed on the development and manufacture of automated guided vehicles (AGV).

Closing the Automation Gap

This commitment to intralogistics began at the end of 2013. Back then, a German manufacturer of floor conveyor equipment approached the Salzburg automation experts with a project for self-propelled pallet transporters. SIGMATEK supported the southern German company Eisenmann in the product development of the independent fork system, which Eisenmann took over from the university of Stuttgart, continued development and added it to their product portfolio under the current name LogiMover. The automated guided vehicle consists of two paral-

lel travelling tines. Their dimensions are the same as the tines of a forklift truck, which however, are not mechanically connected to each other. Each tine contains its own control, which communicates with the stationary system control via WLAN. To stay synchronized on course, the tines communicate with one another via infrared. Integrating the control technology into the confined interior of the tine, as well as the perfect system communication were a challenge for the SIGMATEK engineering team.

The automation task was equivalent to a completely new design of the →



The automated guided vehicle AGUMOS Q40 from Melkus Mechatronic brings the required small parts during the production process on time, where they are needed and thereby supports production with increasingly smaller lot sizes.

vehicle as a mechatronic system, including current supply, control, drive, safety and data technology. „For SIGMATEK, it was too far removed from the actual core business“, remembers Andreas Melkus, who personally accepted this mechatronic mission with his own newly started company Melkus Mechatronic. „I could not only utilize the bundled expertise and experience from SIGMATEK in all aspects of the automation, but also my own experience with the design and construction of mechatronic systems from my professional past.“

Solution for Small Quantity Transport

„During a trip to Japan, I could study the various implementations of the Toyota principle while visiting different companies; since above all, the automobile industry today operates globally“, says Andreas Melkus. „It was thereby clear to me that this system, optimized for serial production, needs a finely structured

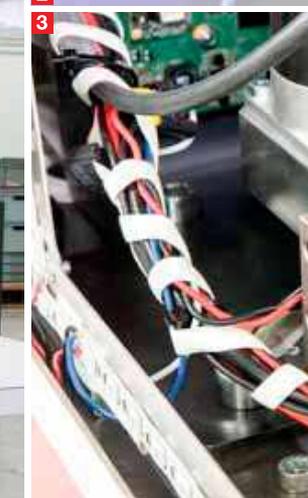
intralogistics system in order to be suitable for small lot sizes with high variant diversity.“ For this purpose, the material to install – mainly small parts – need to be transported to the installation site in 40 x 60 cm transport container used in production halls all over the world, instead of on pallets.

With the experience gathered in logistics, Melkus Mechatronic then set out to develop a self-driving system for the automated transport of small parts. Since important components could be utilized, which are already used in the LogiMover system from Eisenmann, the vehicle could be developed in a very short time. The „transport cube“ AGUMOS Q40, with a payload of up to 60 kg and 40 x 40 x 40 cm base area, is extremely compact. It can therefore also be used in narrow production lanes and storage rows. Its ability to flexibly align the height and rotational direction of the load carrier, enables the ergonomics to optimize and simplifies

adapting the existing configurations. An integrated laser scanner ensures a safe stop in front of people and unexpected obstacles. At the SPS IPC Drives 2015, the AGUMOS Q40 was first shown in action.

Automation from the Best Hands

In view of the high function density of the automated guided vehicle, it was clear for Melkus Mechatronic that its visualization, control electronics, safety and drive technology had to be developed as a complete solution from one source – based on an overlapping, standardized software platform. The automation solution of the agile hall-flitter therefore comes entirely from SIGMATEK. „Without the discipline-overlapping expertise of the complete automation technology provider, this kind of new design that in addition to control, safety and drive technology, also includes camera technology and communication via WLAN, would not be



1 For the complex new development of control, Safety and drive technology, as well as camera technology and communication via WLAN, Melkus Mechatronic utilizes the extensive experience from SIGMATEK.

2 An integrated laser scanner and a newly developed intelligent image processing solution ensure a safe stop in front of people and unexpected obstacles.

3 The automation solution of the free-moving, agile hall-flitter comes completely from SIGMATEK. For the AGUMOS, the form factor of the S-DIAS system was reduced even more.



“„Without the discipline-overlapping expertise of the complete automation technology provider, this kind of new design that in addition to control, Safety and drive technology, also includes camera technology and communication via WLAN, would not be possible.”

Andreas Melkus, Managing Partner, Melkus Mechatronic GmbH

possible“, Andreas Melkus is convinced. „This includes the extensive experience of the company in the development of customer-specific systems, as well as in serial productions. New designs were needed in several areas, which began with the new construction of the drive units, including the gears. Even with the development of an internal battery pack, it was still not finished.

Miniaturization Continues

As the product line S-DIAS impressively shows, SIGMATEK system components already demonstrates extreme miniaturization. For AGUMOS, the form factor

was reduced even more. For the servo drives, the SIGMATEK engineers relied on the proven servo motor output stage DC 062 from the S-DIAS module series. This is suitable for 6 A of continuous current and 15 A of peak current, has an incremental encoder input for position feedback, as well as the integrated Safety function „Safe Torque off“ to SIL 3/PL e, Cat. 4. However, they shrunk its electronics even further and gave it a customer-specific form. „This variant is exactly attuned to the innovative drive units of our floor conveyor equipment and is produced exclusively for Melkus Mechatronic“, reports Andreas Melkus. „However, this recent step in miniaturization

can be seen as a look ahead to later SIGMATEK serial products.“

Look Ahead to Serial Products

In the case of the control CPU, the backflow of technology to serial products is more concrete. This involves the circuit of a CPU module from the S-DIAS product line, however, for the first time with a directly integrated WLAN interface. „This technology will be assumed into the S-DIAS product series and integratable in future CPU modules“, confirms Andreas Melkus. The result of this development symbiosis simplifies the connection to all →



left The entire process, motion and Safety technology, based on S-DIAS and the visualization was exclusively designed with the object-oriented software suite LASAL.

right At the SPS IPC Drives 2015, the AGUMOS Q40 was first shown in action.

external systems without real-time requirements, e.g. higher level management systems or remote maintenance. Here the circle also includes Eisenmann as a cooperation partner, who provides their main computer for automated guided vehicles to handle complex tasks.

Also integrated into the same customer-specific control board, is a safety-oriented CPU. The need for a connection of safe and non-safe control functions exists in all application areas of industrial automation technology and is continually rising.

Image Processing Design with Vision

As they created the complex image processing systems for the floor transport vehicle from Melkus Mechatronic, SIGMATEK engineers entered uncharted territory. „Here, the know-how now extends to the chip level. Sensors and imaging in industrial automation are rapidly advancing, and SIGMATEK can build new expertise on the gained experience. The first projects in process monitoring are already underway“ according to Andreas Melkus.

At least just as important as the normal operation, is the response of the AGV to obstacles and special situations. Even the best imaging processes are unable to look around corners. For this reason, a head station in the AGUMOS from Melkus Mechatronic serves as a primary

control computer, assumes the function of dispatcher. It monitors the status of individual vehicles (e.g. battery level, position, speed) and translates the transport tasks from the logistic system into guaranteed collision-free motion commands. The station, built from components of the SIGMATEK product series S-DIAS, is configured with 4-fold redundancy, so that even double errors cause no damage. Therefore the system even allows a safe emergency stop function via WLAN and that using standard Safety hardware from SIGMATEK. The head station communicates with primary CPU or management systems via TCP/IP. Using the OPC UA protocol, communication with all third-party systems is possible.

By Object Class for Class Object

To develop the software, the engineers from SIGMATEK and Melkus Mechatronics could also utilize the standard range of products from the Salzburg manufacturer. „Not just all process, motion and Safety technology as well as visualization were developed exclusively with the object-oriented software suite LASAL“, says Andreas Melkus. „To implement the very complex motion pattern, the technicians could also utilize the matured, tested technology modules from the extensive SIGMATEK libraries; which drastically reduced the work and above all, testing.

The use of the SIGMATEK software

User

Melkus Mechatronic was founded in 2014 in Oberndorf (Salzburg) based on many years of experience in automation technology. The company develops and produces mechatronic conveyor systems that should contribute to enabling „the factory of the future“. The main focus is on the flexible material flow with free-moving transport systems as an essential component.

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environment without deviating from the standard has an additional benefit. The development team therefore did not have worry about the connection of third-party systems or remote maintenance mechanisms via the Internet. „We could draw from the extensive resources that SIGMATEK provides in the standard program“ says Andreas Melkus pleased. „At the same time, we profited from the flexibility of the company with the implementation of specific requirements, as well as the fact that the expertise from SIGMATEK encompasses all automation technologies; from the visualization to integrated Safety.“

■ www.sigmatek-automation.com