

Factory Automation in Practice

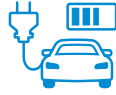


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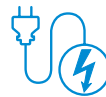
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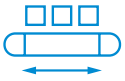
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 about our solutions.



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Pallet System for the Optimal Process Flow



Task

An operation installing car seats requires a circulation system where workers can fit and process the seats.

mk Solution

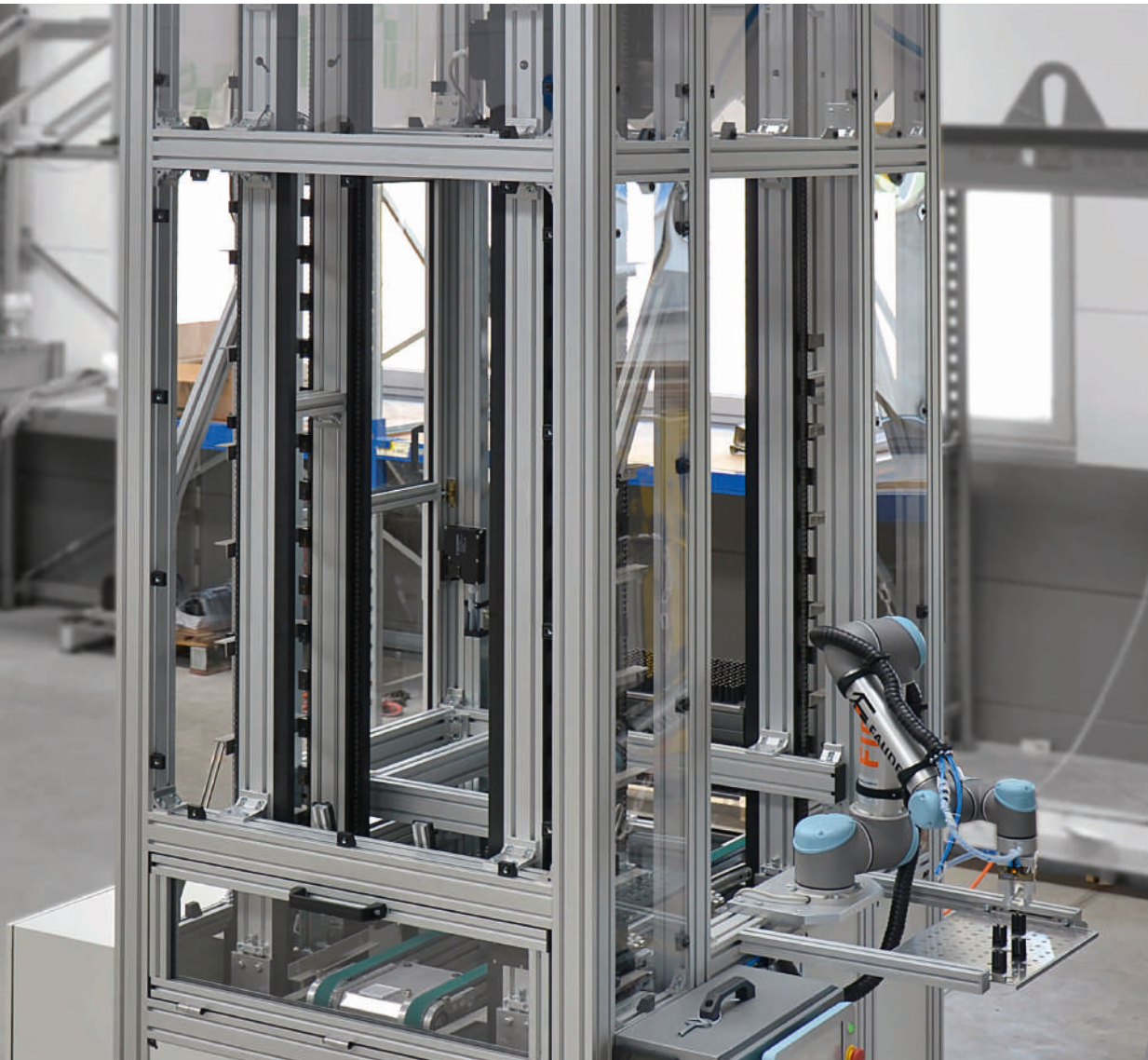
The SRF-P 2010 accumulating roller chain conveyor safely transports the car seats to the individual workstations as part of the Versamove system. The free-spinning conveyor rollers run smoothly, even during accumulated operation. The system can stop, separate, index and accumulate, which means it can be adapted to the specific tasks involved in the assembly process. The conveying path is designed to let staff work on the seats at an ergonomic height. Suitable lighting and an emergency stop switch at each workstation also help make the work ergonomic. A top rail at the workstations prevents the pallet from being lifted during the tasks.

Benefits to the Client

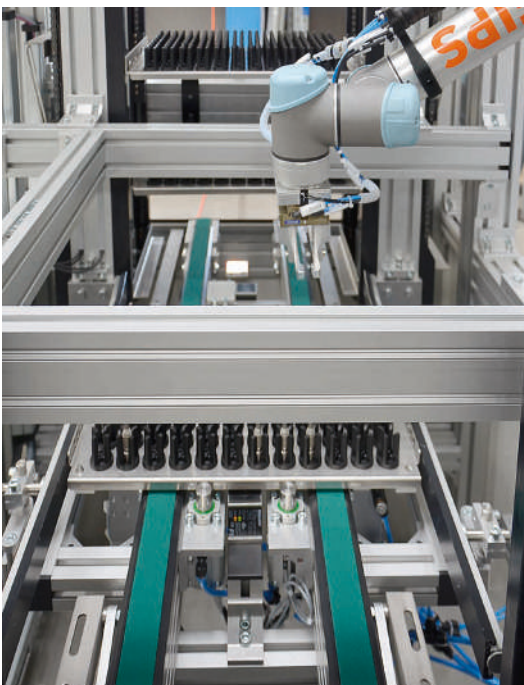
- Good price/performance ratio thanks to high-level in-house value creation
- Custom client solution made from standard components
- Optimal process flow and ergonomic work



Automotive Suppliers



**Space-saving Lift Storage System
with Higher-level System Controller**



Task

A system is required where trays for steel turned parts are loaded and unloaded fully automatically. The trays are to be buffered upstream and downstream from the palletising station for further automation. Once the first buffer store is manually filled by a worker, the system should be able to operate completely automatically.

mk Solution

Palletiser consisting of the ZRF-P 2010 timing belt conveyor with pneumatic positioning unit for stopping and centring the trays. Its 6-axis robot can load the trays or remove turned parts from them with precision positioning. Connected buffer storage system, consisting of two KTF-P 2040.02 double-line chain conveyors for storage of supplied or removed parts.

Benefits to the Client

- Higher-level system controller
- Automated work process
- Installation area saves a massive amount of space by storing items at a height.



Automotive Suppliers



**Ergonomic Workbenches
with ESD Protection**



Task

Workbenches for assembling wireless mobile phone charging cradles. The workbenches must be individually adapted to the respective work steps. Furthermore, they require a feeding and removal system to keep conveying times to a minimum. The workbenches must be designed with full ESD protection.

mk Solution

Workbenches from the mk Series 40 profiles with integrated roller conveyors for feeding and removal. The workbenches, including the roller conveyors, were designed with hydraulic height adjustment. This allows workers to set the workbenches to a suitable ergonomic height. Table tops, roller conveyors, extensions and frames are all designed in accordance with the ESD protection needs of the customer. The workbenches were individually planned and implemented together with the customer in accordance with the assembly steps to be performed.

Benefits to the Client

- Everything in the one system with no complicated control programming
- Minimal changeover times at the trays' loading and unloading positions
- Transport boxes to increase the tray capacity



Automotive Suppliers



Interlinked Assembly with Universal Pallets, Without Any Retrofitting





Task

In the production of longitudinal and cross beams, the production systems, the packaging robots and a station for manual tasks need to be interlinked.

mk Solution

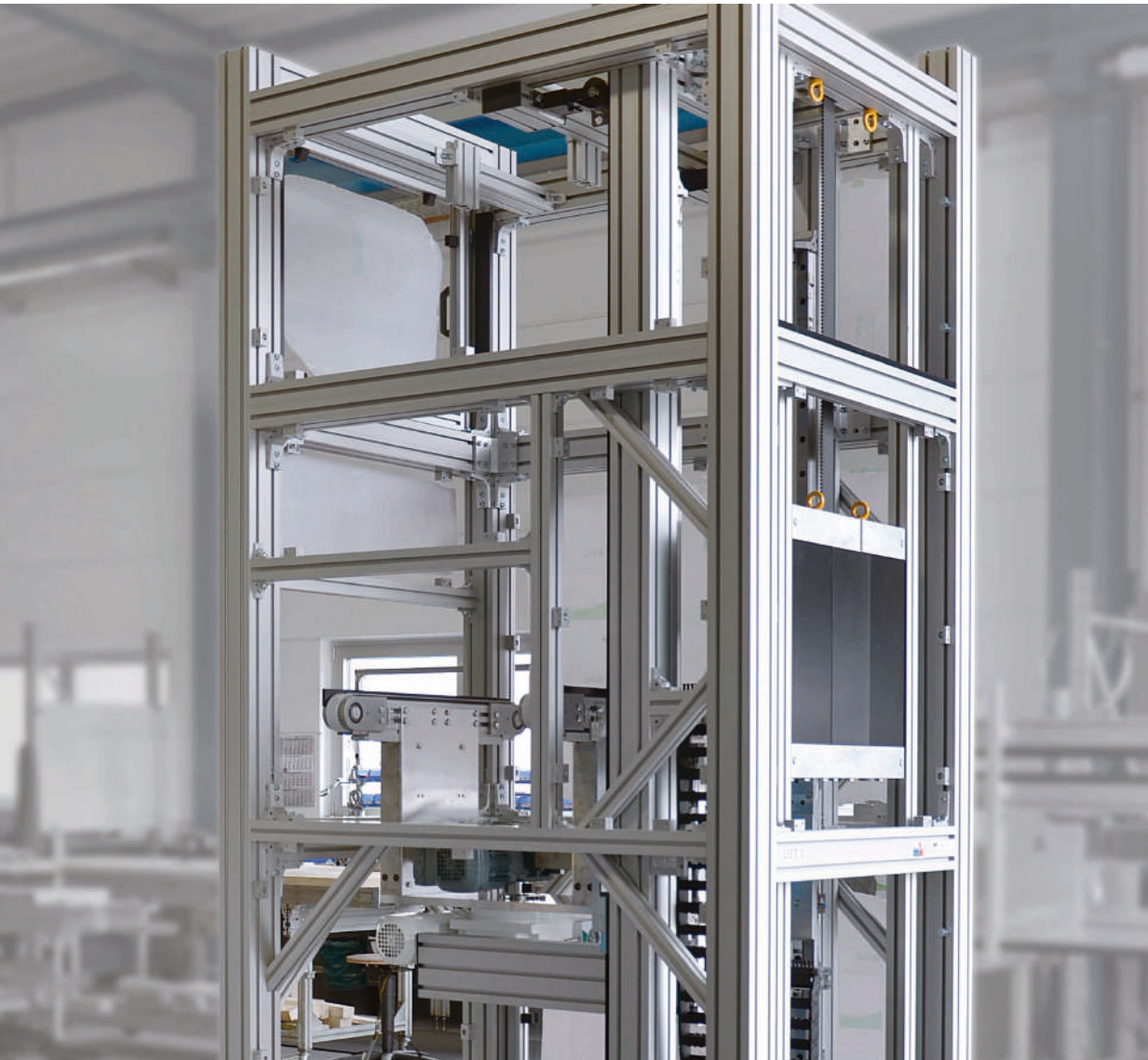
Universal workpiece holder for longitudinal and cross beams with both left-hand and right-hand orientation. The main conveyor line is built from SRF-P 2010 accumulating roller chain conveyors and also serves as the buffer line. Transverse and vertical conveyor systems consisting of ZRF-P 2025 timing belt conveyors with a pneumatic lifting unit allow different track paths to be implemented. The pallets are equipped with RFID so that their type and status can be clearly mapped by the controller.

Benefits to the Client

- Reliable interlinking of multiple machining stations with different cycle times
- One universal pallet for quick and easy retooling
- The modular design allows for independent safety zones and circuits
- Design complies with automotive production equipment regulations

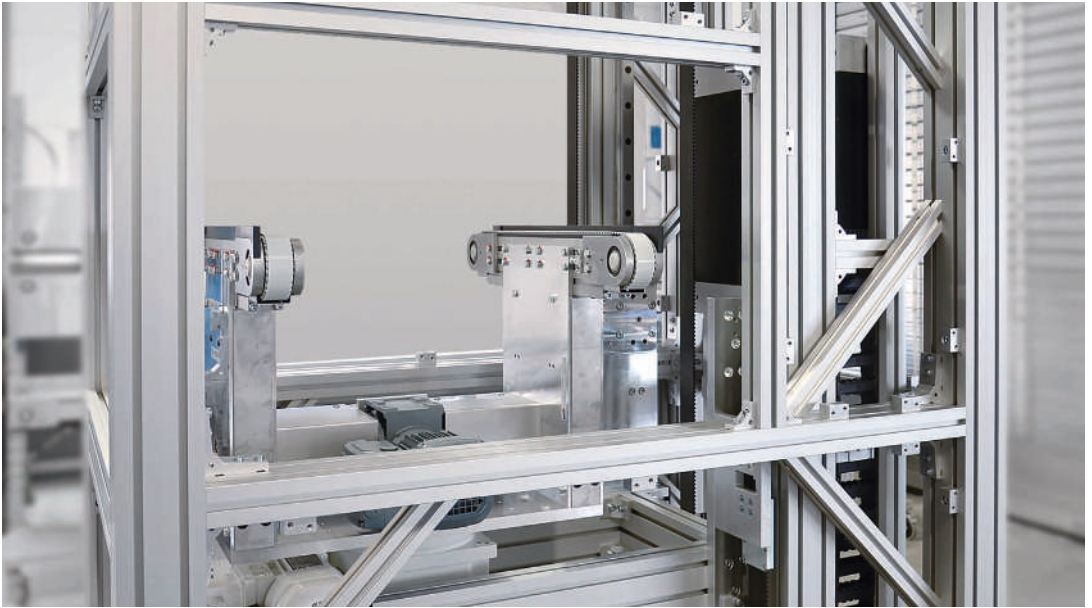


Battery Production and E-mobility



**Lifts for Loads of up to
100 kg per Pallet**





Task

A solution with interlinking across multiple levels and processing stations is required for the production of electric motors. Lifts for lifting, lowering and turning are used to transport the pallets to the various levels and align them. The total load per pallet is about 100 kg per pallet over an area of 500 x 500 mm.

mk Solution

The lifts are constructed from LZR 2005 motorised linear modules with timing belts. A counterweight allows more affordable and energy-efficient motors to be used for the lifts. Pneumatic rod locks secure the lift and prevent it from falling in case of a malfunction. A ZRF-P 2010 timing belt conveyor is integrated into the lifts and acts as a separator. They have turning modules that allow the entire conveyor to rotate by 90° within the lift.

Benefits to the Client

- Safe conveyor technology including guards for lifting and lowering
- Excellent price/performance ratio thanks to the use of standard components

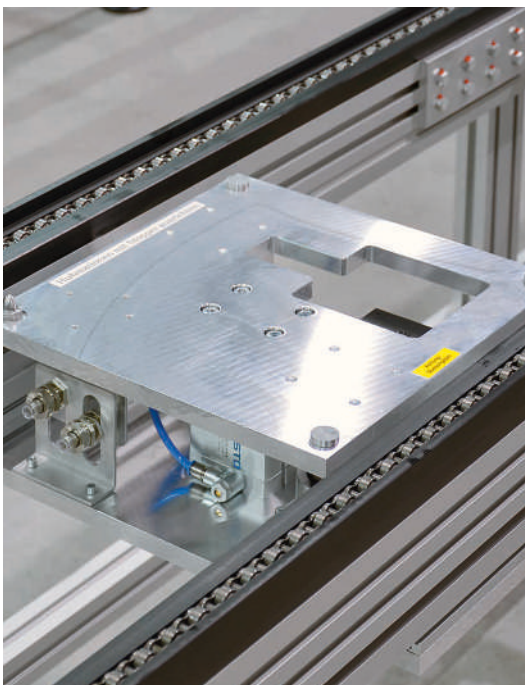


Battery Production and E-mobility



**Pallet System in Accordance with Automotive
Production Equipment Regulations**





Task

A horizontal pallet circulation system was needed for the production of electric motors for an electric SUV. The workpiece and pallet weigh about 100 kg, which means a total load of 160 kg per meter of conveying path.

mk Solution

The Versamove Plus pallet circulation system is built from standard components from mk's modular construction system. This is advantageous in terms of both price and delivery times. The conveying paths employ SRF-P 2010 accumulating roller chain conveyors, which are particularly well suited for accumulated operation. Pneumatic positioning units along the path position the pallets to allow for automated handling of the workpieces. The system, and the corner transfer units in particular, were designed with expansion in mind and allow the conveying path to be extended.

Benefits to the Client

- Full pallet circulation in accordance with automotive production equipment regulations
- Use of standard mk components
- Quick and simple extension of existing systems



**Guided Transport of
Loads Weighing up to 1700 kg**





Task

A cooling and curing section is required for a battery production line. The section must be able to process loads of up to 1700 kg on the upper line and 1000 kg on the lower one, of which up to 500 kg is for accumulated operation.

mk Solution

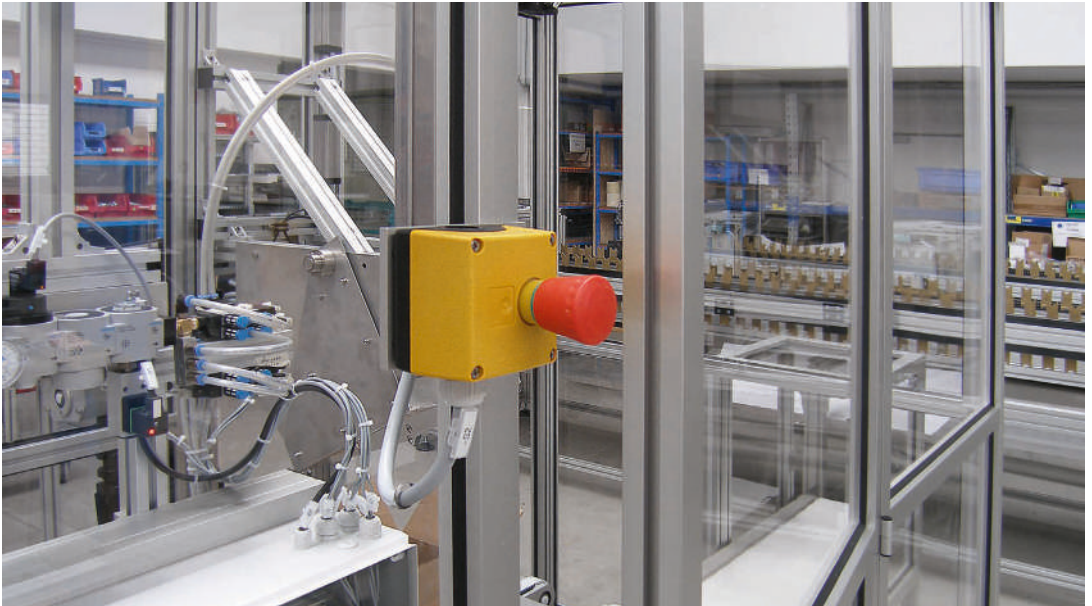
The ZRF-P 2040 was the right solution for the job. Its robust design means it can safely transport the necessary heavy loads. The conveyor comes fitted with protective covers that can be moved along its entire length. Cams on the timing belt and a central guide rail prevent the pallet from slipping in X or Y direction during transport. The system was seamlessly integrated into the existing line.

Benefits to the Client

- Suitable for heavy loads in battery production
- Custom integration into an existing line
- Fulfilment of customer-specific safety requirements



**Complete System for Filling Cardboard Boxes
with High-level Hygiene Requirements**



Task

Design and creation of a carton filling machine for different tube shapes in the cosmetics industry. Interlinking of carton erectors, from filling to further packaging.

mk Solution

Complete system with T-slots that are open on the inside for maximum flexibility and closed on the outside for a smooth and clean surface. Feeding tubes and cartons with mk belt conveyors. Index belt stations with timing belt conveyor, with swivelled bearing for lowering items to be weighed. Funnel for receiving the whole carton fill quantity in the event of a malfunction. During nominal operation, pneumatically closed only to change cartons.

Benefits to the Client

- Consultancy and design by mk ensures the optimal client solution
- Comprehensive modular system enhanced with custom functions
- Meets hygiene requirements
- Assembly and installation for everything up to and including I/O modules in the control cabinet from one single source.



Fast and Flexible Transport of Flat Cardboard Boxes



Task

Unfolded shoe boxes first need to be sprayed with adhesive and then folded in the next machine in a packaging plant.

mk Solution

The mk Versaflex flat top chain conveyor system was used in this case. The flat top chain allows the conveyor to convey both over straight paths and around curves. The cartons lie directly on the transport chain and jut out over the chain. They also rest on lateral guide rails next to the transport chain to ensure stable transportation. Pressure rollers made of sponge rubber additionally press the cartons onto the transport chain from above so that they are also fixed in the Y-direction.

Benefits to the Client

- Easy and convenient solution for customer requirements
- Flexible application
- Reliable



Sorted Feeding and Item Collection for Mail Order Business



Task

For order processing, a mail order business requires a conveyor on which the products from individual orders can be further processed manually. The individual orders must not get mixed up.

mk Solution

mk's all-rounder GUF-P 2000 was the best solution for the job. Its high level of standardisation and modular design make it an extremely flexible application for the packaging industry. A belt with transverse cleats welded on was chosen in this case. It forms a separate compartment for each order to prevent the products from becoming mixed up. The delivery note for the order is printed out directly in the appropriate compartment, which ensures they are always matched correctly.

Benefits to the Client

- Sorted delivery with "inline delivery note printing" for orders
- Item collection, order by order
- Use of standard mk components



Cost-effective Automation System for Small Production Runs



Task

For use with our innovative and reusable small load trays known as IKLTs, the customer requires a low-cost automation solution with semi-automatic transfer and an automatic unit for stacking and unstacking the trays from the base of the transport box.

mk Solution

The tray transfer and handling system is tailored to a fully automated multi-use tray. The products remain in a defined position throughout the entire value creation process. Only the inlay has to be replaced when switching products. Tried and trusted belt and timing belt conveyors from the standard mk range are used to transport the trays. A linear three-axis gantry that is extremely easy to control is responsible for handling the trays.

Benefits to the Client

- Everything in the one system with no complicated control programming
- Minimal changeover times at the trays' loading and unloading positions
- Increased capacity thanks to the transport box

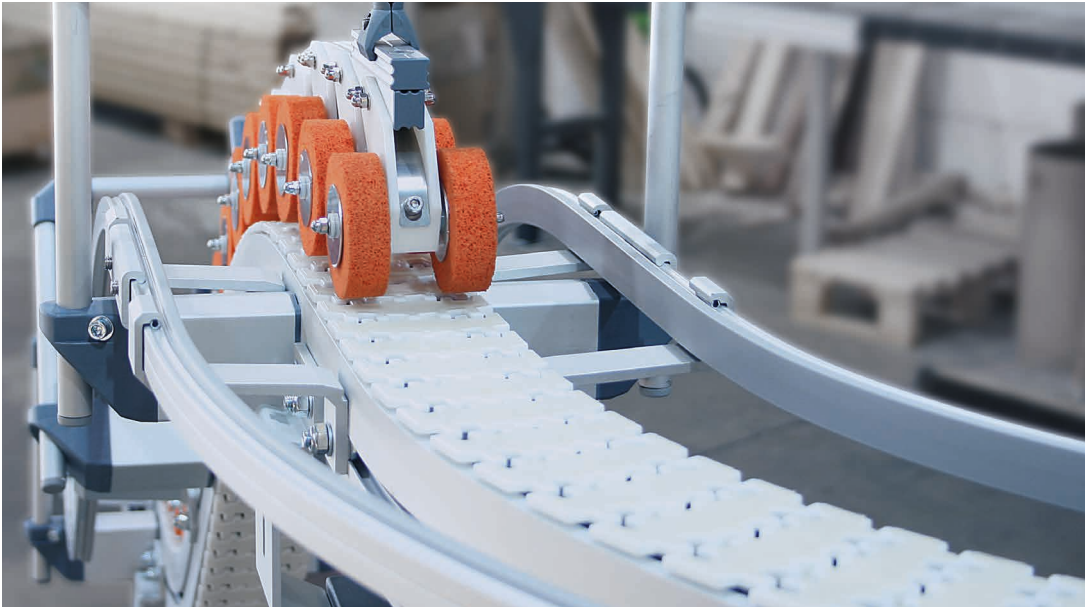


Food and Beverage Industry



**Gentle, Space-saving Transport
Including Vertical Lifting**





Task

Only a very limited amount of space is available for a solution to transport chocolate bars. A height difference of around 480 mm and a 90° curve must be circumnavigated. During the vertical ascent, the chocolate bars must not slide backward even when the conveyor is stopped.

mk Solution

In the tightest of space, the Versaflex A08 flat top chain conveyor system reliably and gently transports the bars to the adjacent higher-level conveyor. The chocolate bars are held vertically on the chain by spring-loaded foam pressure rollers. A high friction coating on the chain provides a more secure grip. Round belt transfer points (for loading and delivering the parts) keep transitions to a minimum and allow the bars to be transferred safely.

Benefits to the Client

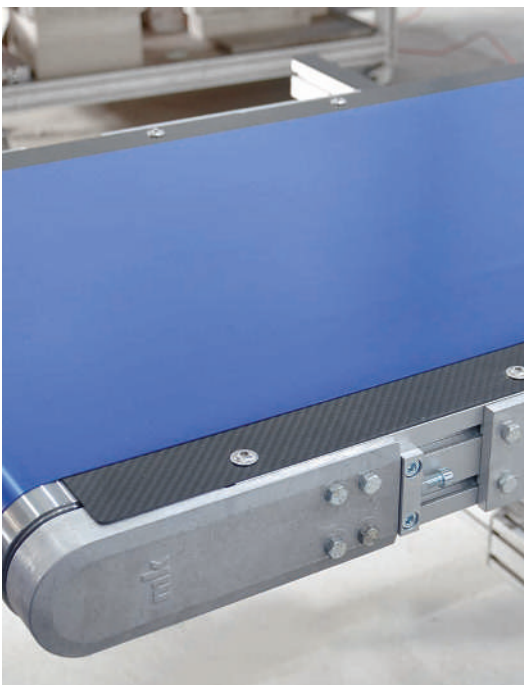
- Integration into the existing production system
- Simple project planning and commissioning
- Cost-effective thanks to the use of standard components



Food and Beverage Industry



**Belt Conveyor with X-ray Testing
for Quality Assurance**



Task

A manufacturer of X-ray systems for the food industry requires a conveyor in which X-ray plates can be installed. The material to be conveyed, in this case large fish, must be X-rayed on the conveyor as it passes through the system and then conveyed through a CT scanner. The system will be integrated into an inspection area without food standards.

mk Solution

A belt conveyor with a metal-free conveyor belt was developed based on the GUF-P 2041. Since the area above the X-ray plates must be metal-free for X-ray processing, the slide bed was made of carbon fibre reinforced polymer (CFRP) instead of steel. The entire conveyor frame was removed in the area where the CT scanner operates. The customer installed the conveyor in its plant and used an alternative metal-free solution for the missing conveyor frame.

Benefits to the Client

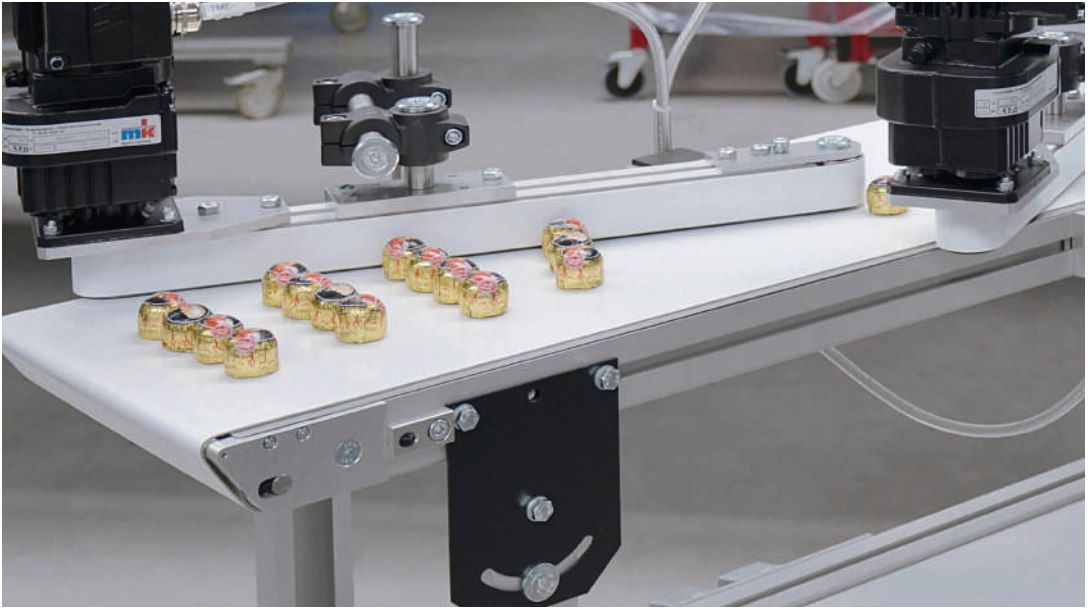
- Product satisfies exact customer requirements
- Easily adjustable to varying requirements by using standard components
- Close collaboration between customer and mk



Food and Beverage Industry



Mobile Infeed and Separation of Food Products in Primary Packaging



Task

In a confectionery production department, packaged chocolates need to be separated upon exiting the individual packaging unit and conveyed to the repackaging process. The conveyor unit needs to be mobile in design so that it can be used on different production lines. In addition, the parts of the unit that come into contact with the product must meet the hygiene standards for transporting foodstuffs.

mk Solution

Based on the GUF-P 2000 belt conveyor, a mobile belt conveyor with three separator conveyors mounted vertically above it was designed. The conveying path features a knife edge with a diameter of 12 mm at both the infeed and outfeed side to ensure smooth delivery of the chocolates. To ensure optimum centring of the belt, the separator is equipped with round tails, the position of which can be adjusted. The conveyor belts are also FDA-compliant.

Benefits to the Client

- Mobile and flexible design
- Customised design according to customer specifications
- Simple operation



Food and Beverage Industry



Mobile Inspection System for Yoghurt Cultures, with Storage System



Task

An entire system for a testing process needs to be integrated into a maritime container so that it can be shipped and used worldwide. The products must be stored until the inspection process is complete. They then have to be discharged based on the first in, first out principle.

mk Solution

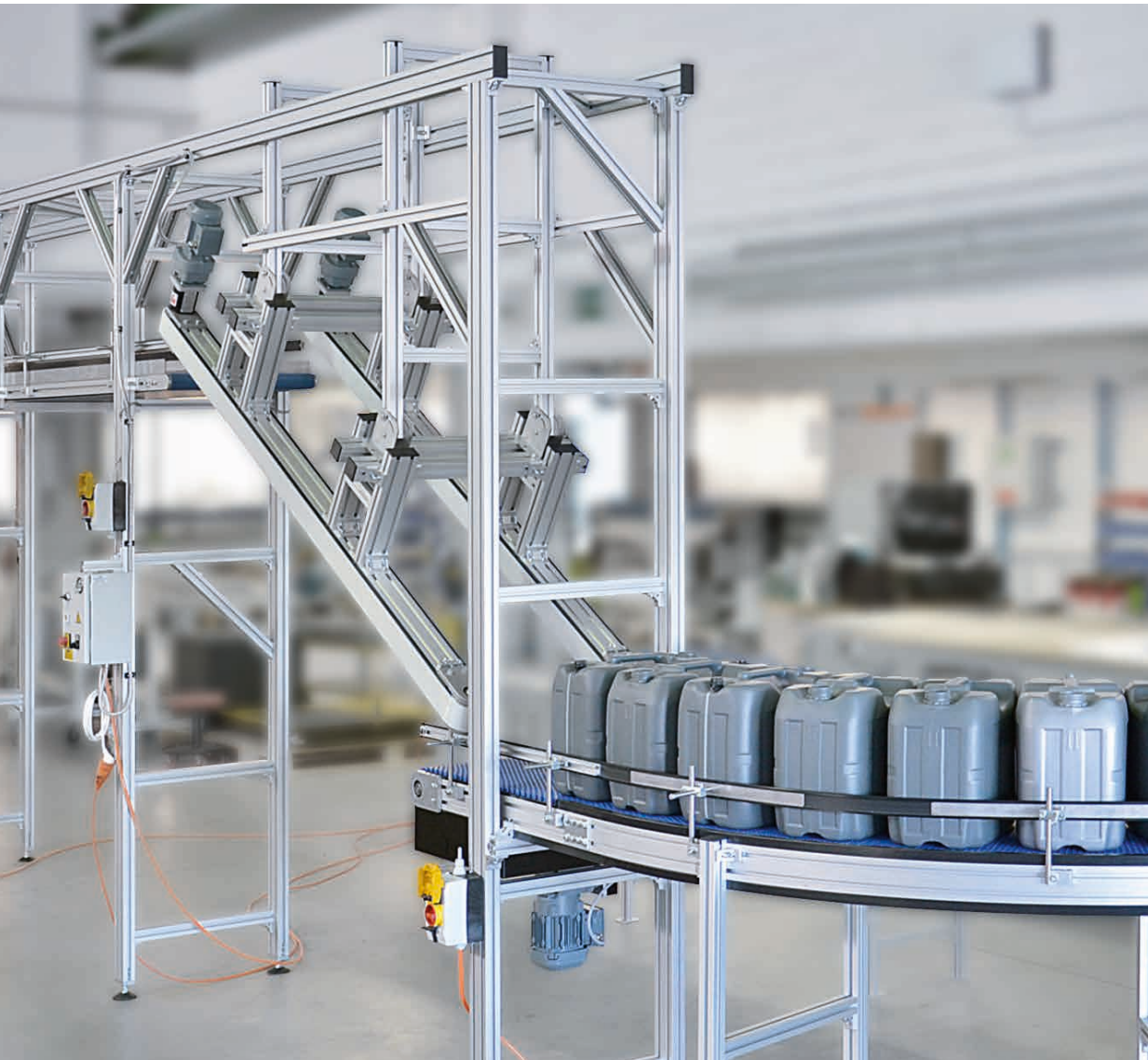
Paternoster made from three parallel, vertically aligned ZRF-P 2040.02 timing belt conveyors. Cams for the containers are mounted between the timing belt conveyors. One line cycles upwards, and the other line cycles downwards. The conveyors are driven by a single drive with a servomotor. The lines are connected to each other by a timing belt with teeth on both sides. An Omega drive is used to change the conveying direction.

Benefits to the Client

- Extremely compact system with high storage capacity
- A simple, low-maintenance and reliable mechanical solution
- Ergonomic and safe for workers



Plastics Industry



Position-oriented Transport Around Curves and Across Walkway and Track



Task

Upright plastic canisters have to be interlinked with each other through two processing stations. The required interlinking crosses a walkway and track.

mk Solution

Position-oriented feed via the KMF-P 2040 curved modular belt conveyor without time-consuming stopping and turning. Two ZRF-P 2040 timing belt conveyors with an upward incline and timing belts equipped with longitudinal grooves serve as the incline track. The high friction of the timing belt and gentle clamping between the lines ensure that the canisters are transported upwards. A closed-loop controller is used to precisely synchronise the two timing belt conveyor lines so that there is no offset. A GUF-P 2000 belt conveyor serves as the bridge, while two additional timing belt conveyors transport the canisters downwards again.

Benefits to the Client

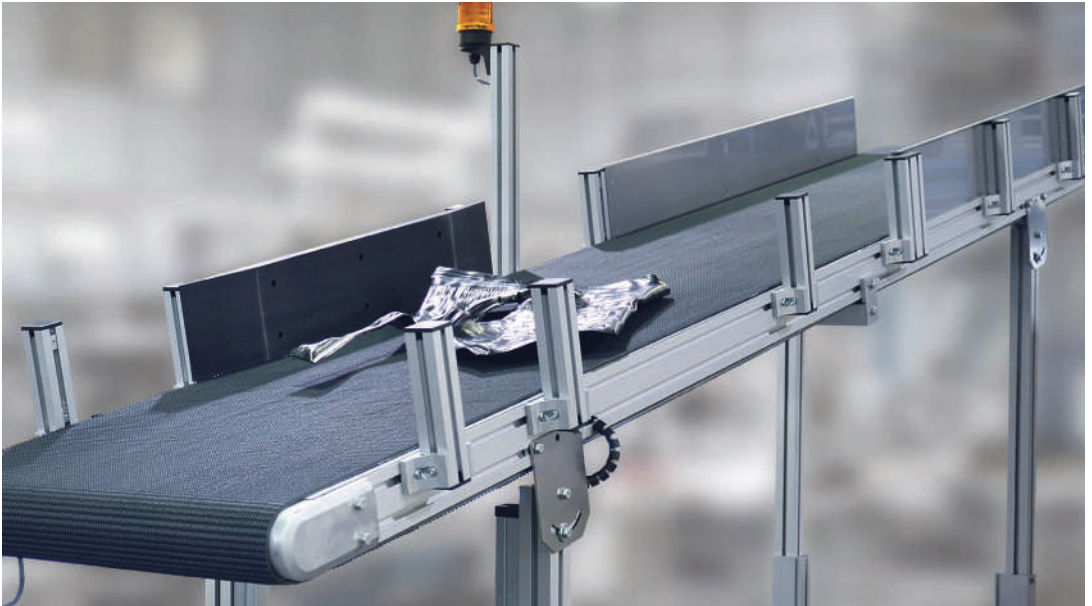
- Adaptation to unfavourable spatial constraints
- Continuous transport with no stopping or turning
- Product orientation is maintained



Plastics Industry



Belt Conveyor with Metal Detector for Plastic Slugs



Task

A plastic processing application requires a conveyor belt with an integrated metal detector for reliably eliminating metallic impurities.

mk Solution

A belt conveyor with a metal detector based on the GUF-P 2041 was the best solution for this task. The metal detector is installed in the conveyor frame and scans piece and bulk goods with a material height of up to around 100 mm. If metal is detected, the motor stops and a connected signal transducer issues a visual and audible warning. A side rail prevents the goods from falling, while an additional PE strip in the metal detector area serves as a product guide.

Benefits to the Client

- Reliable detection of passing metal
- Adapts to spatial constraints
- Simple and cost-effective solution thanks to the use of standard components



Plastics Industry



**Gentle transport of
plastic bottles**



Task

Cooling line for plastic bottles. The bottles are ejected from the blow moulding machine in two lines and must then be converged on a conveyor line for feeding to the subsequent cutting machine and inspection. The bottles must be transported upright.

mk Solution

The line was constructed with the Versaflex A08 flat top chain conveyor system. First, the two lines of the machine separator are guided around a curve and then converged in it. To ensure a smooth start, the slower converged line was separated from the faster main conveyor line and then connected to a transfer section. Due to the low weight and high centre of gravity of the standing bottles, the line was equipped with a double side rail free of gaps. The system can be adapted to a variety of different machines without any issue.

Benefits to the Client

- Simple and cost-effective solution
- Custom solution from standard components
- Can be used with various machines



Assembly and Testing Line for Analysis Units Based on an ESD Protection Concept



Task

Assembly line with 10 workstations where workers have to install and check analysis units, connected via a conveying path. In order to support lean production and reduce the burden on employees, it is important that the workstations are designed to be as ergonomic as possible. Since the products to be assembled are very sensitive to ESD (electrostatic discharge), the workstations must also feature ESD protection.

mk Solution

Workbench constructed from Series 40 profiles with electrical height adjustment. The components are supplied by an RBS-P 2065 gravity roller conveyor for each assembly line. Both the workstations and the roller conveyors were designed in accordance with the customer's concept for ESD protection. At the request of the customer, a pick-to-light system was also integrated.

Benefits to the Client

- 40% increase in efficiency within production
- 20% fewer sick days
- Measurements and competent consultation provided on-site
- Custom design with standard components



Rack System for Use in a ISO-4 Cleanroom





Task

Storage of various transport containers over several levels. The boxes have to be put away in accordance with the cleanroom class ISO-4.

mk Solution

Shelf made from mk cleanroom profiles and cleanroom fasteners mk cleanroom profiles feature a smooth, flat surface that prevents dirt from accumulating. The typical mk edge radius of just 1 mm ensures smooth connections between profiles, with virtually no gaps or spaces. Thanks to its clean, smooth design, a construction made of cleanroom profiles has the added advantage of having a high-quality, attractive appearance.

Benefits to the Client

- Designed to ensure low particle content by using cleanroom profiles
- Mobile and flexible design
- Modular design allows for quick and easy assembly and disassembly



**UV-impermeable Dust Extraction Hood
with ESD Protection**



Task

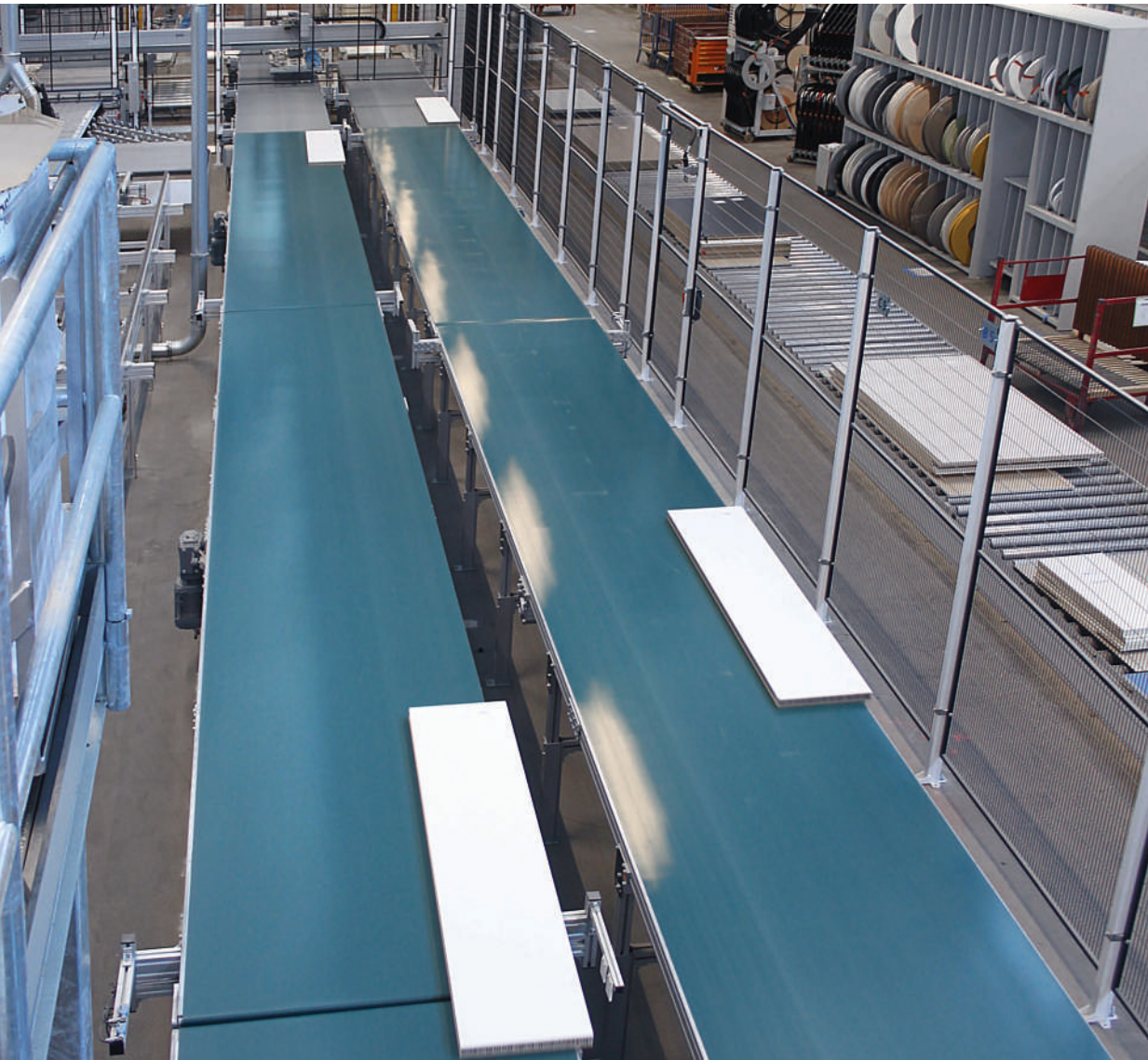
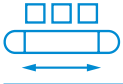
A hood for extracting dust particles is required for the production of electronic parts. The contour as well as the inputs and outputs are specified by the customer. The hood must be equipped with a suction nozzle for an extraction system provided by the customer. The circulating dust must not produce electrostatic discharge. The housing needs to be transparent but must also block UV radiation.

mk Solution

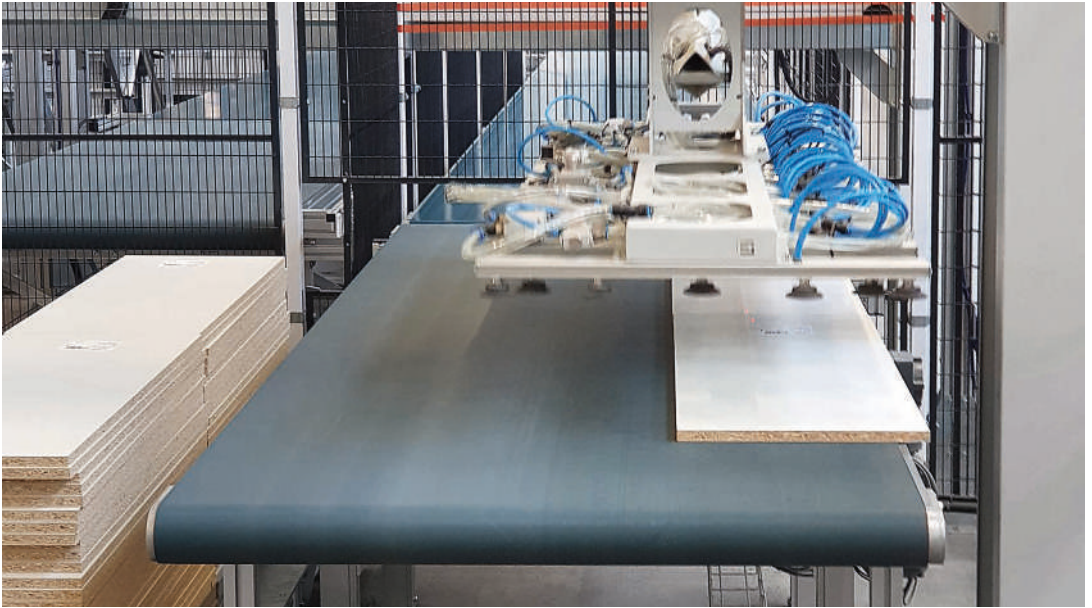
Dust extraction hood built from Series 25 profiles. Acrylic glass panels provide the necessary level of transparency without letting UV radiation through. The box is screwed on and can be removed easily for maintenance purposes. The hood has an earth terminal and PE nuts. This prevents undesired charges from building up.

Benefits to the Client

- Designed according to customer specifications
- All types of contour are possible thanks to the mk modular system
- Earth terminal and PE nuts ensure conductivity



Belt Conveyor for Picking Lines



Task

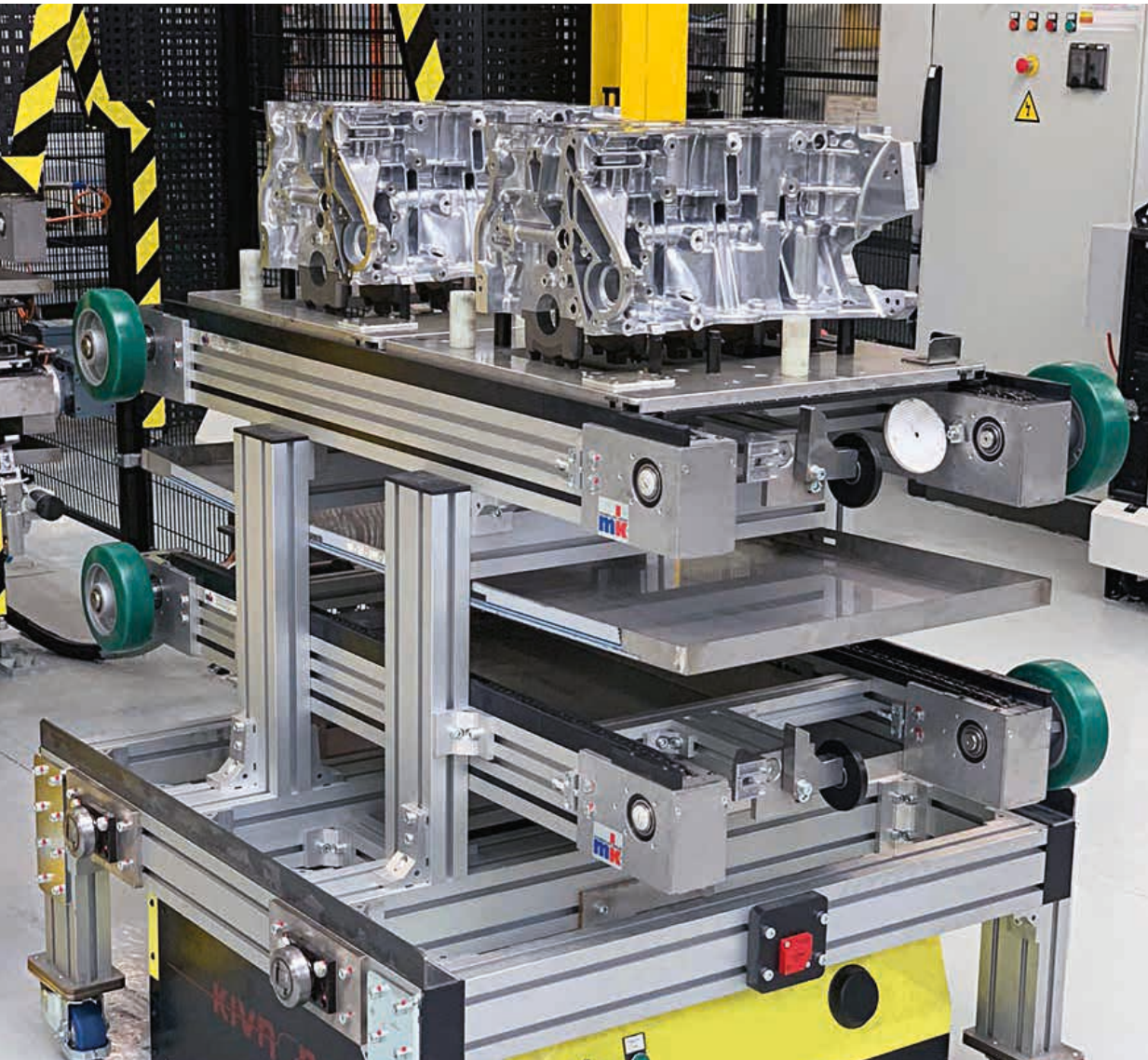
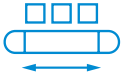
Wooden furniture panels in different sizes and with heavy loads are to be picked and transported from the warehouse together.

mk Solution

GUF-P 2004 belt conveyors convey the picked wooden panels from the warehouse. The conveyors are up to 7800 mm in length and up to 1100 mm in width. They are extremely stable and designed to convey heavy loads. A belt with high adhesion ensures that the wooden panels can be transported in the correct position without shifting around. Special wipers on the belt remove any chips and impurities. The drives have been positioned in such a way that the conveyors can be deployed one directly after the other. Rolling knife edges with a diameter of 22 mm were used to ensure that even the small panels can be transferred safely and in the correct position without tipping.

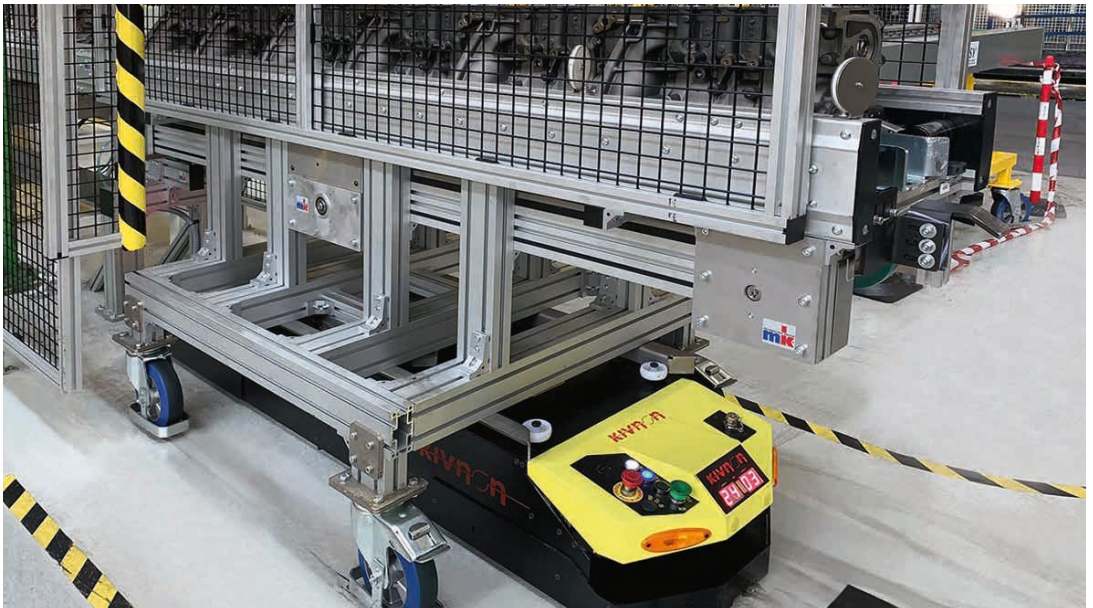
Benefits to the Client

- Customised solution based on standard components
- Simple solution to the customer's problem
- Safe and cost-effective design



Load Bearing Equipment for Automated Guide Vehicle (AGV) Systems





Task

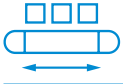
A flexible solution for conveying components for the assembly of motors is required. There is no interim storage on the assembly line, meaning that production occurs just in time. Zones for walking and driving must remain clear with a relatively low flow rate.

mk Solution

For the system, mk supplied mobile racks that are coupled and carried by the AGV systems as towing devices, thus allowing them to be brought to the respective stations in a flexible manner. Driven roller conveyors act as load handling equipment on the racks and transport the motor components onto the AGVs and onto the subsequent lines at the stations. Applications with chain conveyors or accumulating roller chain conveyors can also be used as load handling equipment. The controller for both the load handling equipment and the AGV are integrated in the master controller for the production process.

Benefits to the Client

- Expertise in automation solutions with competent consultation and implementation
- Excellent integration into existing systems and controllers
- Flexible application thanks to modular profile design



Full Interlink of a Logistics Process





Task

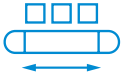
A simulation of the complete logistics process for beverage crates is required. In doing so, the actual transport technologies used in the logistics system are to be sensibly interlinked with each other.

mk Solution

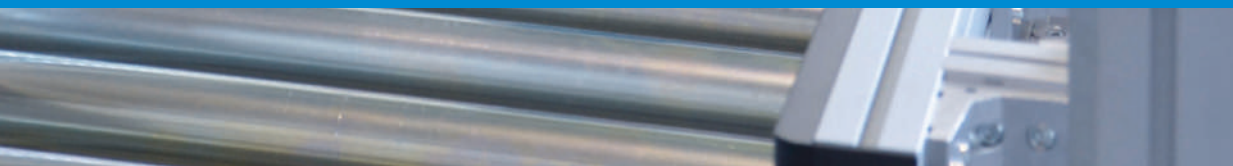
mk supplied a complete circulation system for beverage crates. RBT-2255 driven roller conveyors are used to transport the boxes from station to station along straight and curved sections. Palletisers made from mk linear technology stack the boxes on pallets. Lifts are used to overcome height differences and, for instance, keep walkways and tracks clear or transport the beverage crates to the second level.

Benefits to the Client

- One single application for every task, including conveying, stacking, lifting and lowering
- Comprehensive modular system and high-level in-house value creation ensure a good price/performance ratio
- Short delivery times thanks to the high degree of standardisation



Large-format Solution for Heavy Loads such as Those Common in Battery Production





Task

A solution for transporting standardised plastic euro pallets to and from a production system.

mk Solution

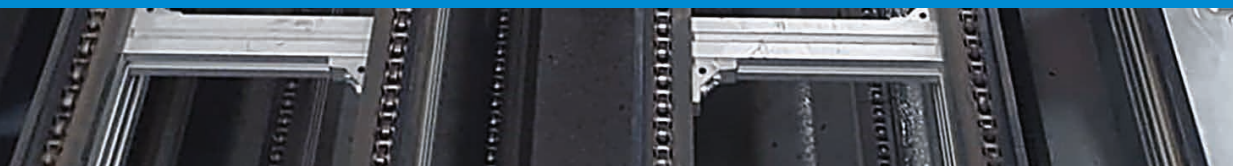
In-feed and out-feed conveyor with four drive segments based on the RBK-P 2061 gravity roller conveyor. The pallets are transported into the gripping area of a robot, where they are stopped and positioned so the robot can remove the parts from the boxes. The empty pallets are conveyed onto the parallel return line via a lift-and-transfer module. From there, they are transported to the start of the line to be prepared for loading again.

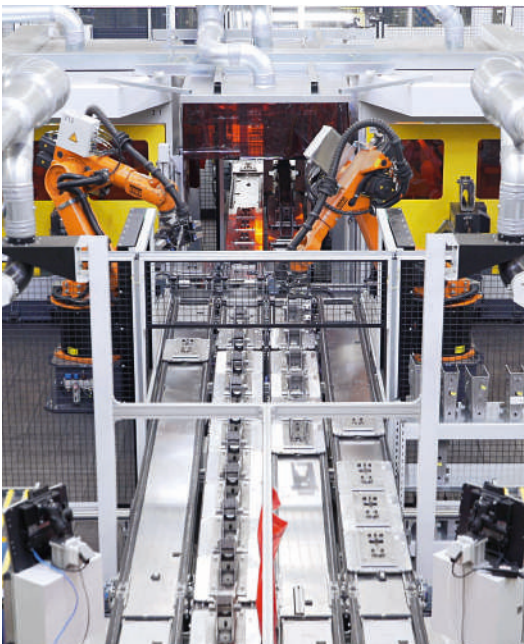
Benefits to the Client

- Heavy loads such as those commonly found in battery production
- Reliable in-feed and out-feed
- Positioning designed for robot handling



Interlinking a Fully Automated Welding Plant





Task

Interlinking workstations with welding cells. The manually pre-cured components are transported on conveying paths and delivered with precise positioning. Handling robots distribute the components to the appropriate welding cells. The pallets are returned automatically once the parts are removed. In addition, the finished welded parts have to be placed on another conveying path by the robots for removal following the welding process. Furthermore, an inspection workstation where a staff member is to perform quality control is required.

mk Solution

The Versamove plus pallet circulation system with positioning units transports the pallets to the handling robots. The pallets themselves are fitted with RFID chips that store all the relevant information about the respective components.

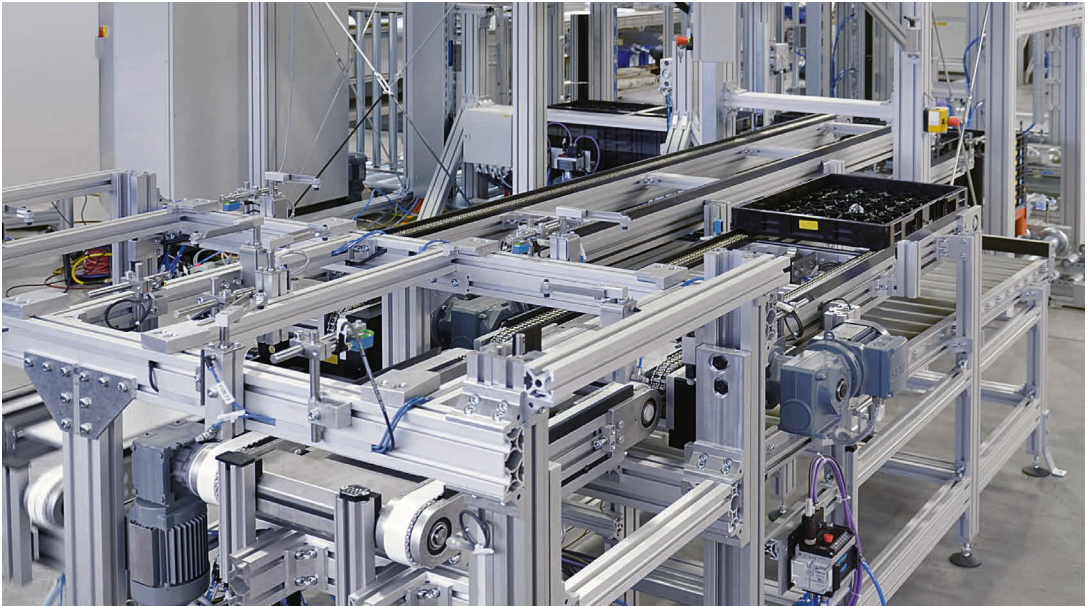
Benefits to the Client

- Pallet circulation system tailored to customer requirements
- Economical price thanks to standardised components
- Compliance with customer-specific production equipment regulations



**Fully Automated
Three-axis Handling**





Task

The customer required a palletiser with a tray recirculation system: Pallet trucks are used to feed Euro pallets loaded with trays into the system using an index station and then remove them again at the end of the process. The palletiser destacks filled trays from the pallets and feeds them into the recirculation system. The system needs to be able to recognise and handle different tray types and different stack heights on the pallets.

mk Solution

Transport system with feeding and removal of pallets via heavy-duty roller conveyors. Alignment of tray stacks using pneumatic positioning units with approach angle. 3-axis palletiser gantry, consisting of linear modules with a rotating gripper and balancing stroke. Tray recirculation system, consisting of KTF-P 2010 chain conveyors combined with lifting units. Index station and device to hold down the trays so the workpieces can be removed by a customer-provided robot.

Benefits to the Client

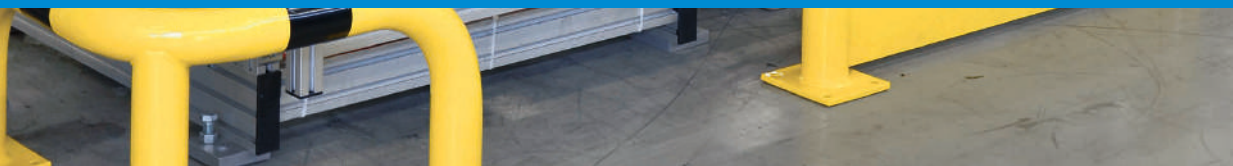
- Fully automated system with robust components
- Custom solution with cost-effective standard components and adapted special functions

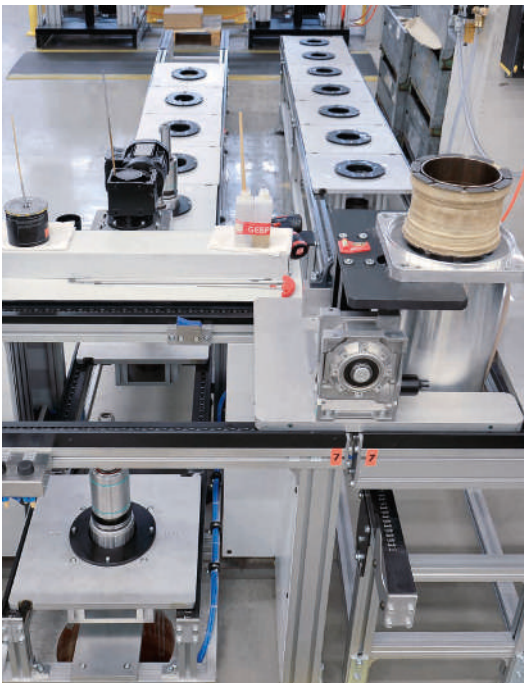


Machine and System Construction



Semi-automated Workstation Interlinking





Task

Semi-automated workstation interlinking of rotating assemblies for stretching synthetic fibres. The solution required was an interlink between the shop floor press, marriage station and electrical testing station that was optimally adapted to the space from a logistical perspective.

mk Solution

mk built the whole solution, including an ergonomic assembly workstation with press made from mk Series 40 profiles, a solid station for the hydraulic shop floor press, the marriage station with stopping, separating, lifting and lowering function and the appropriate interlinking between the individual stations. In addition, mk supplied a high-voltage electrical test station with an overhanging, balanced protective cover, which is pneumatically fixed using a pedal switch.

Benefits to the Client

- Maximum capacity while maintaining flexibility thanks to the semi-automated system
- Cost-effect alternative to full automation
- The pallet system interlinks the individual work steps to assist with assembly



Protective Device Guard for 45-metre Long Assembly System



Task

Fully automatic assembly line for suction pipe modules that is approximately 45 metres long, equipped with guarding including protective fences and machine housings. Passages and transitions for system maintenance also have to be created.

mk Solution

Profile frames with polycarbonate panes were designed as guards for the assembly and inspection stations. Protective doors with safety interlocks and locking devices were installed for maintenance purposes. The palletiser robots were enclosed by protective fence partitions. The openings for the supply and discharge of material are secured with light barriers equipped with a muting function. Pallet transfer is secured via lock gates with a brush strip and safety interlocks.

Benefits to the Client

- Comprehensive modular construction kit for an optimal customer solution
- Modular construction allows for independent safety zones and circuits
- Automation solution, protective device guard and integrated conveyor technology from a single source



Consumer Goods Industry



Protective Device Guard with Integrated Conveyor Technology to Meet the Customer's Needs



Task

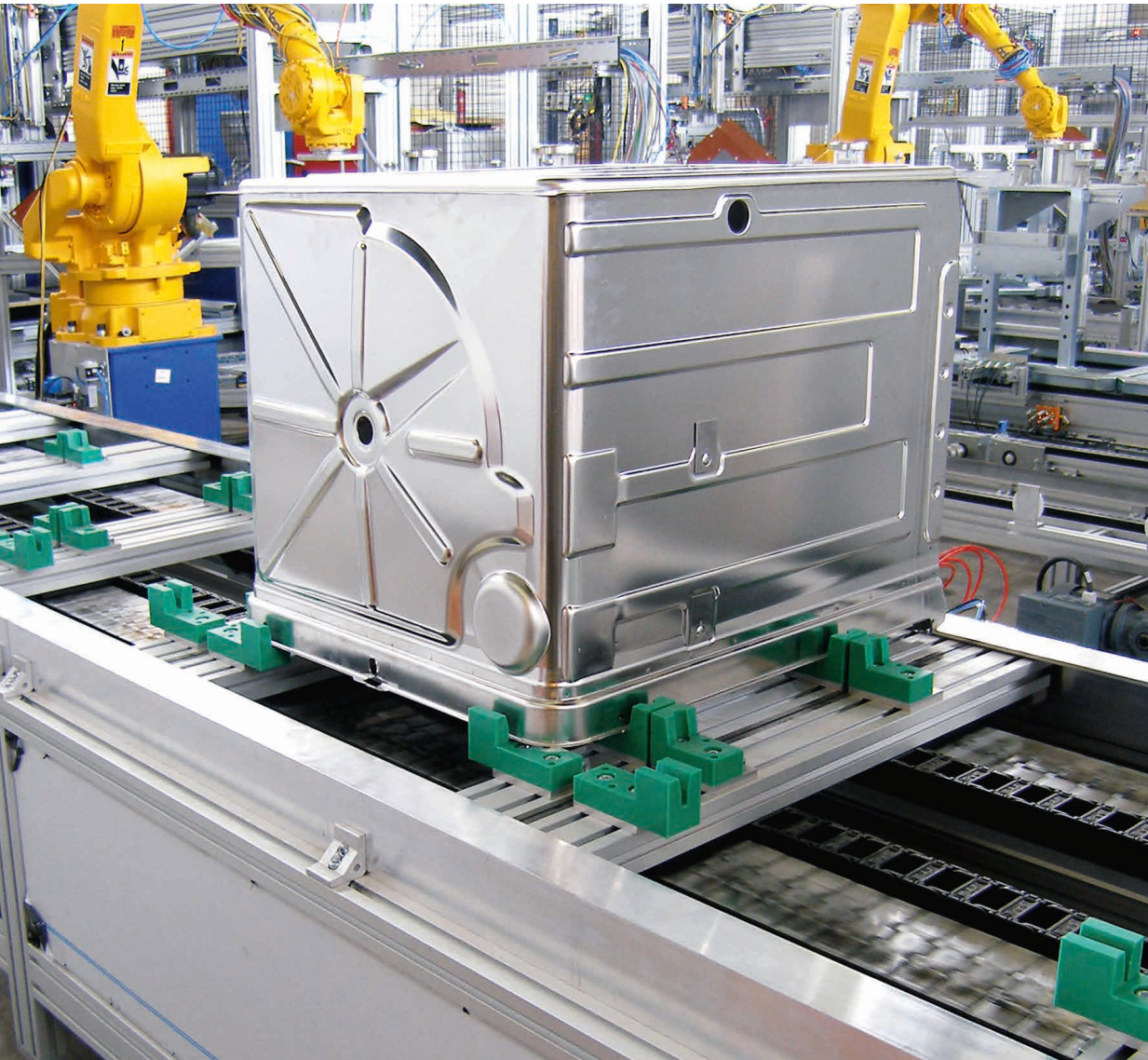
A protective device guard built according to the customer's specifications is required for the packaging area of a toothbrush production operation. The protective device guard is located in a typical cleanroom. A timing belt conveyor needs to be integrated in the protective device guard. The enclosure must allow easy access to the interior to allow for maintenance work.

mk Solution

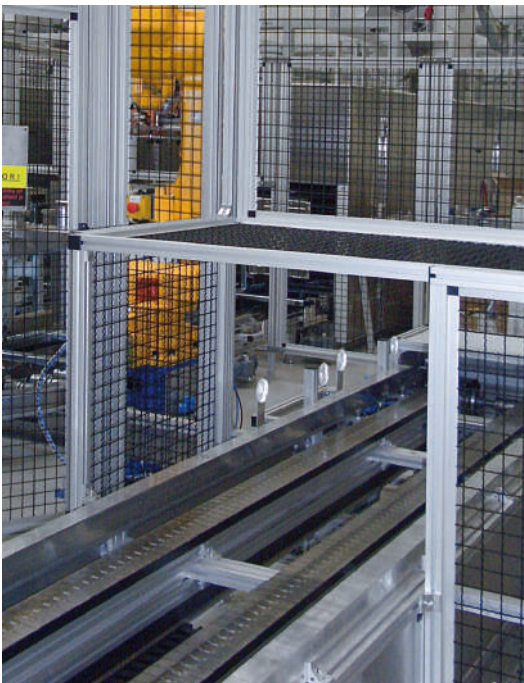
Protective device guard made from Series 40 profiles. The T-slots are closed with closure strips. A ZRF-P 2040.02 AF timing belt conveyor is integrated in the protective device guard. Two maintenance doors allow for easy access to the interior for performing maintenance work. The customer provides the locking mechanism for the door. Different panelling made from powder-coated sheets, Makrolon and powder-coated perforated sheets are used according to customer specifications.

Benefits to the Client

- Protective device guard and integrated conveyor technology from a single source
- The comprehensive modular profile system and accessories allow for solutions that precisely meet requirements



Space-saving Interlinking of Machines in the Production of Household Appliances



Task

Interlinking multiple work stations with different cycle and changeover times. Large dishwasher casings need to be stopped for visual inspections and to assemble additional components. The conveyor technology must be designed in such a way that the casings can be transported safely and at the same time removed easily by workers.

mk Solution

In this system, the SPU 2040 accumulating pallet recirculation system was installed as a dual-line conveyor to safely transport the large dishwasher casings. After the workpieces are removed, the empty pallets are safely carried over the tail and then conveyed back suspended below the transport level. This eliminates the need for a second conveyor level or lift-and-lower units with complex control elements. It also eliminates the need to load the pallets on the belt, whether manually or automatically.

Benefits to the Client

- Minimal space requirements thanks to very compact conveyor technology
- Modular construction kit allows for flexible expansion



Consumer Goods Industry



**Interlink and Discharge Function
for Changing Product Formats**



Task

An operation producing cosmetics bottles requires the interlinking of two machines. The bottles need to be transported around a 90° curve. When the product is changed, the bottles are to be discharged so that the interlink can run to empty. The interlink must be able to transport different formats.

mk Solution

An MBF-P 2000 curved modular belt conveyor with a rolling 90° curve serves as the interlink. The side rail has an adjustable design, which lets the conveyor be adapted to different product formats. The bottles can be discharged through a switch to run the conveyor to empty. The discharged bottles are collected in a box that can easily be removed together with the frame using the swivel casters.

Benefits to the Client

- Adjustable side rails for different product formats
- Flexible thanks to its modular design
- The conveyor can run to empty quickly and easily



Modular Profile Frame with No Welding





Task

Flexible light-duty frame for a desalination plant, designed to ensure a long service life.

mk Solution

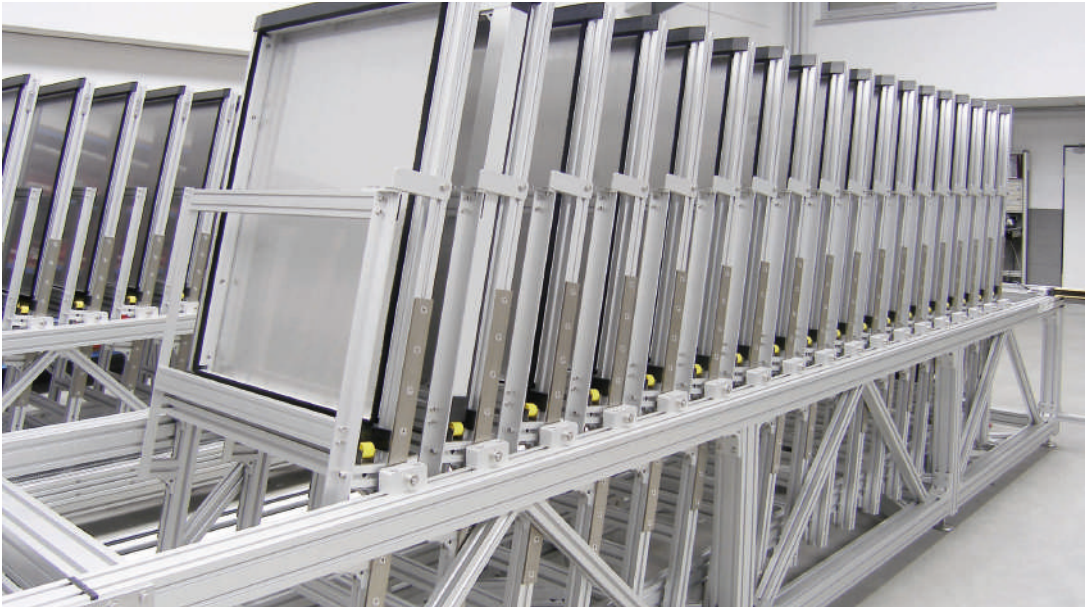
Our standard 10 µm anodised aluminium profiles from Series 40, including angles with keys as connecting elements, were deployed for this task. Sturdy and reusable connection technology makes the system easy to assemble and dismantle. The slots allow for a multitude of assembly and connection options. This application did not require any special measures for increasing corrosion protection.

Benefits to the Client

- The use of mk profile technology in place of expensive VA welded structures
- Low-weight and therefore easy to handle, which also saves transport costs
- Completely simple to assemble and dismantle thanks to the screw connections and modular design
- Surfaces protected by anodising
- More corrosion protection can be provided through powder coating, full anodisation and the use of stainless steel connecting elements



Custom System for Researching Root Growth



Task

Planning, design and construction of an automated system line for researching root growth in plants. The plant packs are to be automatically swivelled to take repeated photographs of them in a darkened enclosure. It also has to be possible to remove them individually. Process reliability is required to ensure the research results are valid.

mk Solution

Series 40 profile frame with rotary actuator using lifting spindle and coupling rods. A dual LZR 2005 acts as the base axis for the camera enclosure, while an LZR 2000 removes the plants and serves as the axis for moving into the camera position. The housing has a lightproof design with a shutter blind.

Benefits to the Client

- Automated and compact custom system
- Everything from a single source, from consulting, through problem-solving, and on to operation
- Process flow is controlled by PC
- Ozone and UV resistant, and suitable for environments with 99% humidity (VA/anodisation)



Automated Measuring Chamber for Vision System



Task

The measurement chambers must be completely enclosed and blacked out for the use of 3D camera systems. The products to be inspected are to be transferred to the chamber using AGV systems and fed in automatically. Inside the chamber, they are to be separated, photographed and weighed on individual measuring stations.

mk Solution

The chamber enclosure as well as the holders for cameras, lighting and product supports are constructed from mk Series 40 aluminium profiles. To ensure a reflection-free environment for long exposure times, all internal components are anodised or painted black. The overall system is also interlinked by mk conveyor and linear technology with protective device guards from mk.

Benefits to the Client

- Individually configurable thanks to an extensive range of profile, conveying and linear technology
- Interlinking with the entire system via interfaces that offer process reliability
- Suitable for specific environmental conditions



Machine for New Coronavirus Antibody Rapid Tests with ESD Requirement





Task

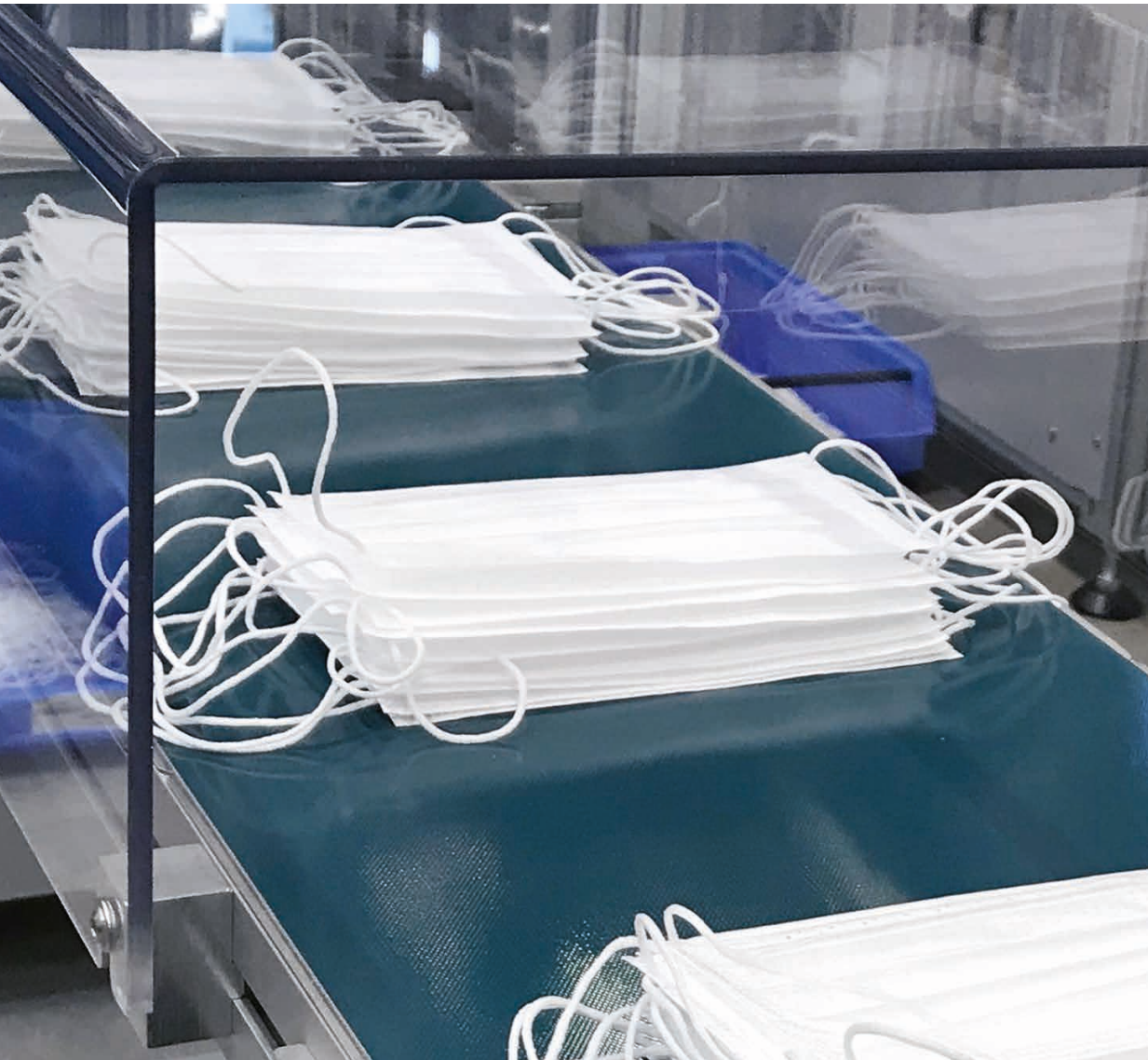
System for producing digital antibody tests. Because sensitive electronic components are used in the tests, the entire system will be located in an ESD protection zone.

mk Solution

The Versamove plus pallet circulation system was the perfect solution. The circulation system was implemented using timing belt conveyors equipped with antistatic wear strips and timing belts. The circulation system can stop, store, position and separate. Each item had to be positioned in a very small hall measuring 10 x 15.5 m. Lifts are used to transport the pallet to an additional level below the first transport line. Under these unique circumstances, mk managed to deliver the complete conveyor technology within just a few weeks of the request.

Benefits to the Client

- Exceptionally fast delivery
- Machine for ESD-sensitive components
- Competent consultation, planning and execution



**Rapid Availability of Conveyor
Technology for Mask Production**



Task

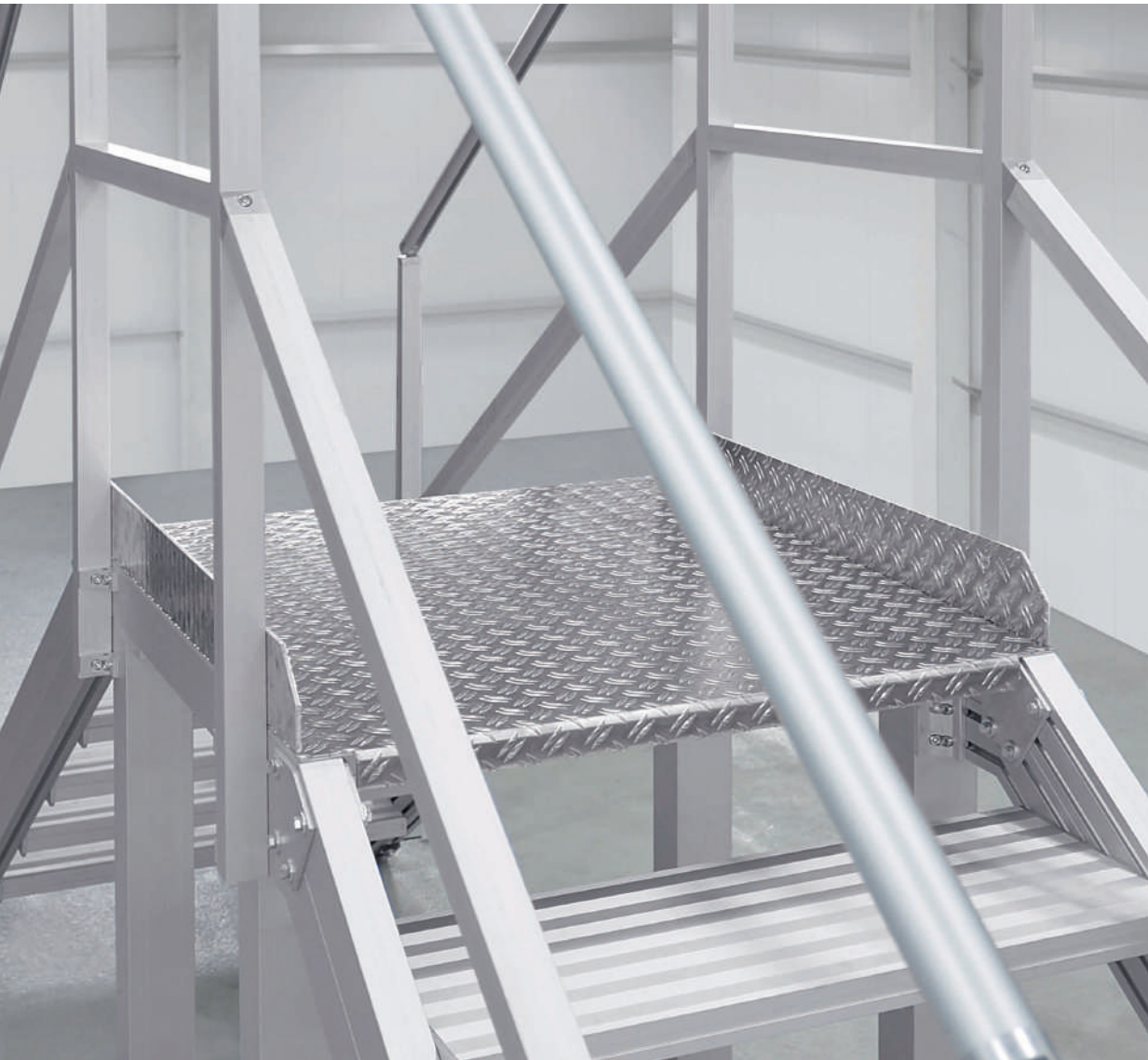
A customer from the medical technology sector required a large number of conveyors for a fully automatic system for producing up to 100 respiratory masks per minute at short notice. Due to the massive demand for such systems during the coronavirus pandemic, the conveyors had to be supplied rapidly and needed to be simple to put into operation. The mk conveyors must convey the masks to the individual production steps within the plant, which include folding and bonding the masks and supplying them with nose clips.

mk Solution

We configured a conveyor made from standard components but that met the required hygiene requirements. The best-selling mk GUF-P 2000 conveyor was the optimal solution for the job. The highly standardised belt conveyor could be delivered quickly and integrated with ease. An FDA-approved belt was used in order to keep the masks free of contamination.

Benefits to the Client

- Very fast processing and delivery
- Reasonably priced thanks to the high level of standardisation
- Reliable delivery during times of crisis thanks to high storage capability



Bridge Design Based on Cleanroom Profiles



Task

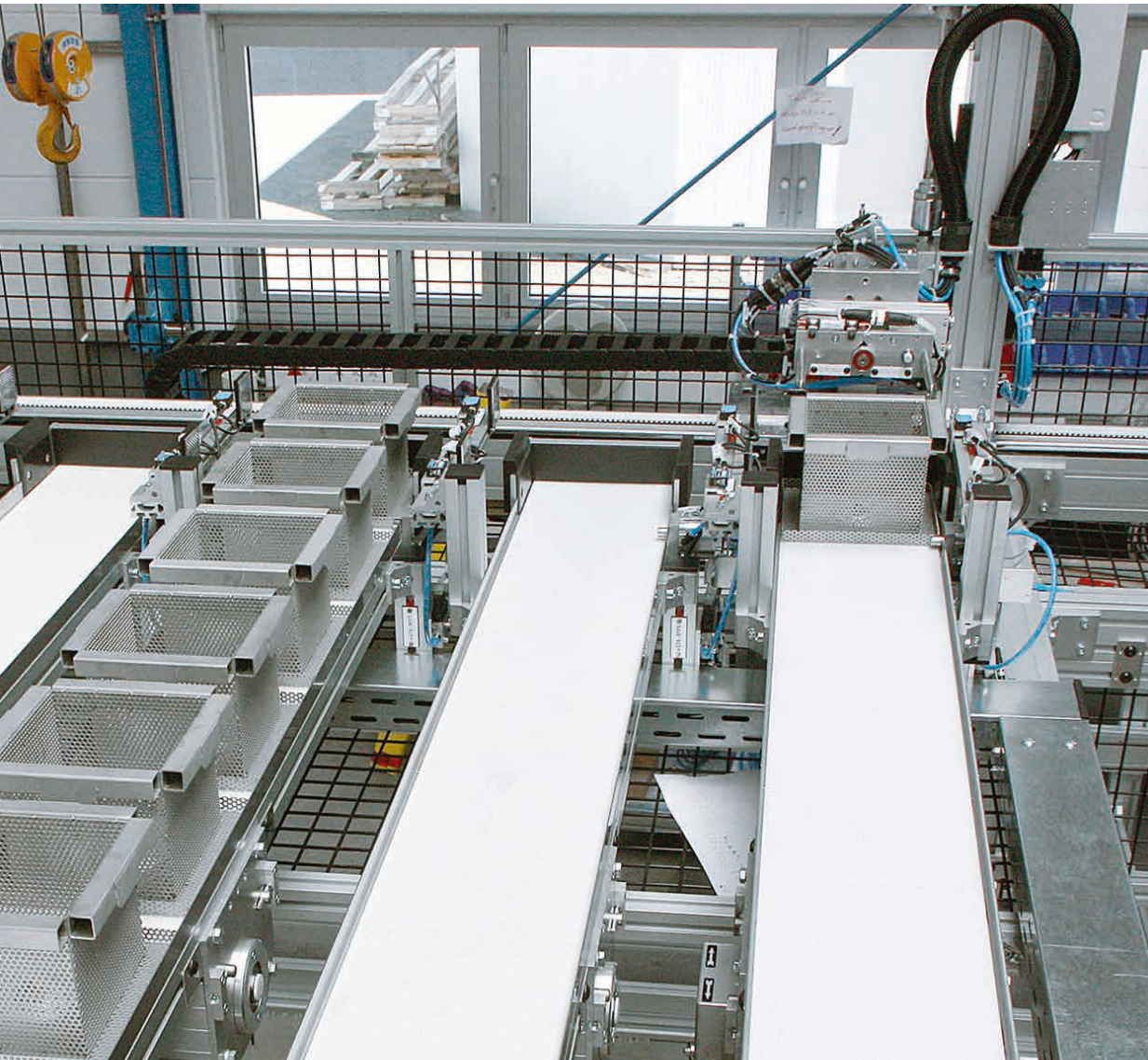
In a production plant for pharmaceutical products, a mobile bridge construction over a conveying path is required as part of the fire protection concept. The bridge must be made from non-flammable, cleanroom-compliant materials and must be non-slip. In addition, the bridge must be able to withstand a load of at least 240 kg and must not affect the transportation of products beneath it.

mk Solution

Bridge consisting of staircase and guardrail elements with Series 40 closed cleanroom profiles, designed to ensure low particle content. The bridge can be removed for cleaning and maintenance work on the bridge and the conveying path below. All surfaces are resistant to common cleaning agents. The design was carried out in accordance with the regulations of the occupational health and safety directive (traffic routes).

Benefits to the Client

- Designed to ensure low particle content by using cleanroom profiles
- Mobile and flexible design
- Modular design allows for quick and easy assembly and disassembly



System for Transporting and Handling Titanium Screws, Including Order Management





Task

A solution is needed to interlink lathes in a production process for titanium screws with thread whirling machines. The following functions are required for the baskets: lifting/lowering, guided conveying, positioning, gripping, tipping and buffering. The system must be fully automated and be able to operate autonomously for at least one shift.

mk Solution

Transport system consisting of belt conveyors as the main conveyor line, with vertical lifting devices at the lathes, three-axis handling with a buffer station and transfer to the thread whirling machines. The entire system can run in reverse, allowing it to both process full baskets and return empty baskets. The main conveyor line is installed at a height of about 2500 mm and runs above other machines. The screw baskets are equipped with RFID chips. A higher-level controller records the entire order management process and includes an interface to the ERP system.

Benefits to the Client

- Design complies with the customer's production equipment regulations
- All the required functions from a single source
- Use of standard components



**Interlinking with Automatic
and Manual Operating Mode**





Task

The labelling and packaging machines in a food supplement production line are to be interlinked with each other. The bottles need to be transported around a 90° curve and separated on the line so that the appropriate number of them can be packaged in cardboard boxes. Manual packaging should also be possible without any major refitting measures.

mk Solution

With its curved flat top chain, the Versaflex flat top chain conveyor system made it easy to interlink the machines in the space. The bottles are separated for automatic packaging at the belt outlet. A stopper can be activated on the line to use the manual packaging station. A pusher then pushes the required number of bottles across to the manual workstation.

Benefits to the Client

- Custom-designed to meet the client's requirements
- Full solution for the required transport task from a single source
- Comprehensive customer service – from consulting to final commissioning



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