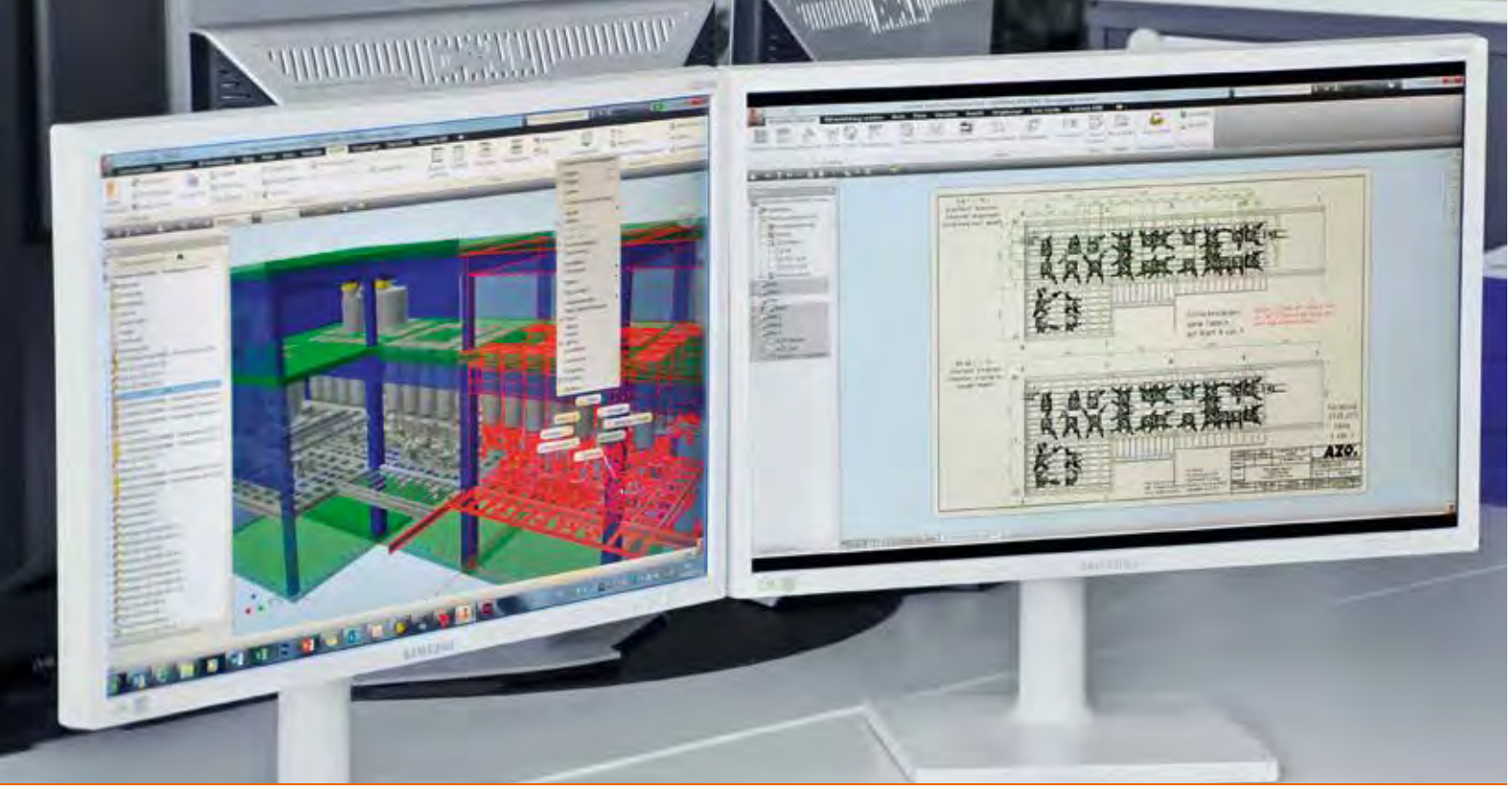
Retrofit delivers the very latest standard in current technology

Improved flexibility and safety in mixer feeding

THE SOLUTION

The no. 1 in mixer feeding

AZO®



The entire plant was designed in the existing building using 3D CAD.

No production downtime for spice-processing plant retrofit:
Versatility and failsafe production ensure future success

The customer

Raps GmbH & Co. KG is a leading international producer of spices and ingredients for foodstuffs. Raps optimises processing, production and costs for its customers and finds innovative solutions at the interface between product and process. With 14 branch offices and agencies in over 40 countries, Raps provides a premium innovation service for products and processes throughout the world.
Its customers are factories in the retail grocery business, butcher's and delicatessen trades, the meat products and grocery industries and catering.

Raps was founded in Hamburg in 1924 by Adalbert Raps. Since 1953, the long-standing family business has had its registered offices in Kulmbach and is also headquartered there. Raps produces for the global market in seven factories at three sites in Europe.

It focuses on bespoke new developments for customers. Every year, Raps develops around 30 standard products and almost 600 bespoke products.
The company manufactures over 35,000 tons of liquid and powder mixes and ingredients in its factories every year.

Raps GmbH & Co. KG Kulmbach

Investment objectives

1. Creating the fundamental conditions for sustainable further development
2. Expanding production capacity
3. Conditions for future container management
4. Dismantling current silo groups and replacing them with silo groups for raw materials to ensure automatic weighing processes
5. New, flexible use of the silos in order to satisfy market requirements
6. Increased productivity by:
   - reducing manual weighing thanks to options for optimum metering
   - storing hygroscopic and free-flowing materials in silos
   - using weighing groups that are free of cross contamination
7. Reducing the minimum weighing quantities
8. Faster, more precise metering thanks to use of discharge units
9. Plant design in chromium-nickel steel (state-of-the-art technology) as a flagship object for international key accounts
10. Decreasing dust in the transfer area with closed hopper systems with trickle guards at the individual discharge point and lid handling
11. Ability to carry out cleaning and maintenance during ongoing production

The initial situation

Powdered products are manufactured and processed in work 1 at the Kulmbach site. The silo plant, dating back to the 1970s, was starting to show its age, and this caused frequent bottlenecks when it came to spare parts. This reduced plant availability appreciably and therefore product availability too. Above and beyond this, there was a need for cleaning and maintenance operations that took up significant time and staff. The old plant left little leeway for optimising the workflow for processes.
These facts, combined with ever-more stringent requirements for production plants for foodstuffs, for example, preventing cross contamination with allergens, made modernisation of the plant urgently necessary. The existing production building and plant, for which no up-to-date plans were available, posed challenges. This is why management decided on pre-engineering, during which they explored new avenues:
The existing structural fabric of the building and the installed equipment were mapped as a 3D model using laser scanning. This would have only been possible at very great expense using manual measurements and the results would have been far less accurate. Thanks to the 3D model, it was possible to track the stock status at any point in the planning phase and to design the new plant in precise detail.

Previous plant

3D laser scan of previous plant

»Such a complex modernisation project during ongoing operations without production downtime is only feasible if the customer and vendor view each other as partners on equal footing.«

Stefan Kulms,
head of process engineering
Raps GmbH & Co. KG

Big bags are discharged using a lifting device on account of the existing low storey height

Retrofitting – a challenge for operator & plant engineers

Pre-engineering keeps risks to a minimum

The AZO solution in detail

Requirements

Successful completion of a retrofit of this magnitude requires extremely close cooperation between the operating and plant engineering companies. Together they conducted an analysis of the quantities that were accessed and metered in the existing plant and existing manual weighing system. Then the quantities of raw materials that could be stored in silos were calculated and compared with quantities that are accessed and metered. This was used to calculate the number of silos and quantities of raw materials to be stored in them. The following requirements had to be considered in planning the plant design: It was not possible to change the storey heights, it was essential to ensure that there was no inadvertent mixing of raw materials and to reduce dust levels. Modernisation was to be carried out in several stages on the weighing level. The concept for the controls needed to comply with the "Raps standard". Existing interfaces to SAP and the existing automated guided vehicle system (AGV) had to be retained. The operating level of the plant was to be built parallel to the existing plant.

The next stage was to plan the phases for modernisation including a detailed schedule. Detailed planning was started on for the plant and platform engineering and the tracks for all modernisation phases. Production started on the components for the plant and controls, while changes were made at Raps to the building's fittings. These were followed by the integration test for the control systems at AZO CONTROLS and the preliminary acceptance test of plant components at AZO.

Filling the indoor silos with herbs from sacks via a vibrating perforated sheet

»The sophisticated concept for dosing and weighing has given us extensive flexibility in production despite stringent requirements with regard to colour, taste, allergens, hygroscopic and sticky raw materials, herbs and lumpy products. High accuracy in dosing and weighing with switching between coarse and dribble feed helped in achieving even higher, consistent quality in production.«

Stefan Kulms,
head of process engineering
Raps GmbH & Co. KG

Indoor silos with vibration bottoms and dosing screws for accurate feeding of scales

Implementing the retrofits in five stages

without any downtime in ongoing production

Feeding of the indoor silos

Salt required in larger quantities is delivered by bulk tanker and poured into the indoor silos using pressure conveying. Raw materials in sacks and big bags are discharged manually into the indoor silos on the upper level. A screen prevents contaminants and packaging residue from entering production. The indoor silos made of chromium-nickel steel have been equipped with level indicators.

Vibration bottoms are used in combination with dosing screws for discharging. This combination and the use of a frequency converter to toggle between coarse and dribble feed, results in high accuracy for dosing when feeding the scales.

Assigning scales according to product groups

Silos and scales are assigned according to the aspects of colour and taste compatibility, amount of allergens, lumpy spices and herbs, hygroscopic and sticky products. By assigning scales systematically like this, throughput rates were increased considerably. Further increases in capacity are expected as a result of continuing optimisation.

A total of 250 raw materials are in use; about 2,000 recipes are produced with them. Minor quantities and the medium components, stored in the indoor silos, are pre-weighed in the scales. The scales are only used as continuous hoppers for bulk quantities, i.e. the products are metered straight into the container underneath, which is on the AGV's scales.

Assigning scales according to product groups

Discharge area for the salt silo with vibration bottoms and dosing screws

»We can manage the high number of raw materials, the great variety of recipes and our customers' increased requirements so much better thanks to the new plant from AZO.«

Stefan Kulms,
head of process engineering
Raps GmbH & Co. KG

Collecting raw materials in special containers using AGVs

Automatic batch preparation

Flexible, energy-efficient and no contamination

Collecting the pre-weighed components with AGVs
According to the recipes, the automated guided vehicles move below the individual dosing points and are docked dust-tight. The preweighed batch is discharged into the container and simultaneously check-weighed. This ensures that the entire batch has been discharged from scales into the container. Bulk quantities are weighed straight into the docked container. As the AGV's travel path can be configured as needed, this gives a maximum of flexibility and speed.

Feeding other raw materials and discharging them into the mixer
To ensure maximum quality and freshness, certain spices, such as pepper, are milled freshly just before pouring and weighing into the container. Once all the raw materials are in the container in accordance with the recipe, the AGV takes the container over the filling spouts, which are recessed in the floor, for the mixer assigned in the production job.
The container's design allows preweighed liquid or powdered minor quantities to be added via a flap. This happens directly over the mixer at the discharge point. The large flap can also be used to check whether the container has been fully emptied. If necessary, any residue product can be removed manually with a brush. Larger volumes of liquids are filled into a separate hopper and sprayed straight into the mixer via the spray head.

According to the recipes the AGVs move to the scales hanging in the platform

Docking point under the scales with trickle guard slider

»Retrofitting the controls is comparable to open-heart surgery. The risk is significantly lower when things have been properly planned and prepared. However, if on the other hand, you wait until the control system is past it and stops working, replacing it is similar to "emergency surgery" – with all the much higher risks this is known to entail.«

Klaus Kilian,
Business Director engineering & services
AZO GmbH + Co. KG

Container docked onto the discharge points above the mixer

Close working partnership for successful retrofit

Opportunity for process optimisation

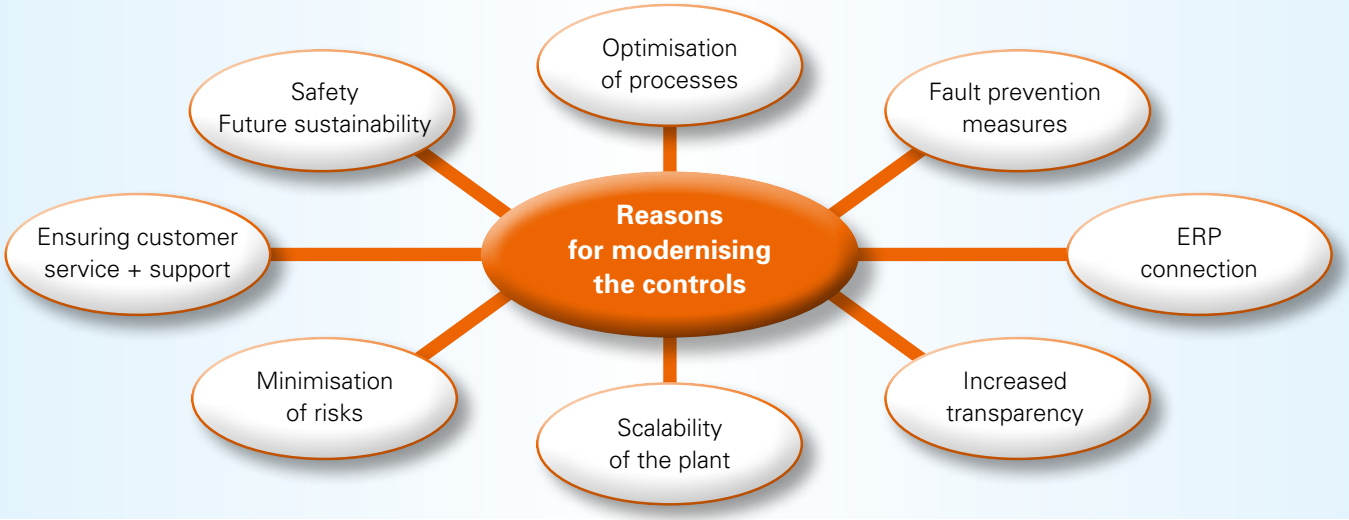
Modular concept for controls

The new design for the controls is modular. It was possible to test each stage individually thanks to the separate controls. The switchgear was also assigned according to each phase of modernisation. In order to reduce commissioning time to a minimum, the system was built using PLC and the process control and instrumentation system at AZO CONTROLS. The sensor system was simulated during this time. It was now possible to run through the entire production process for each phase of modernisation together with the responsible representatives from Raps. Commissioning at the customer's site did not start until all problems from the simulation were resolved.

Concept for commissioning

Construction and installation in the modernisation stages were carried out in succession on site, without however first making the network connections. Visualisation was set up in parallel as a separate system. This meant each stage could be tested as a standalone version (I/O test, functional test, etc.) Communications with the previous and following stages were simulated in order to avoid any impact on the current system in operation.

Once all tests had been concluded, the various stages were integrated into the overall structure as it then stood on the weekends. It was thus possible to complete all five construction stages with a minimum of production downtime for the running plant.



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Conclusion:

»AZO's new plant design has completely convinced the IFS auditors. We can now guarantee that there will be no product entrainment in our plant. The plant is very easy to service and saves costly maintenance work on weekends or holidays.

Modernisation of the plant overall in five stages without downtime in production was only possible thanks to close coordination between AZO and Raps on project management. Concepts were developed jointly and problems that occurred were resolved in mutual agreement. Collaboration was exemplary from all aspects, starting with consultation, project management and implementation down to commissioning and was marked by great team spirit and partnership.«

Stefan Kulms,
head of process engineering, Raps GmbH & Co. KG

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