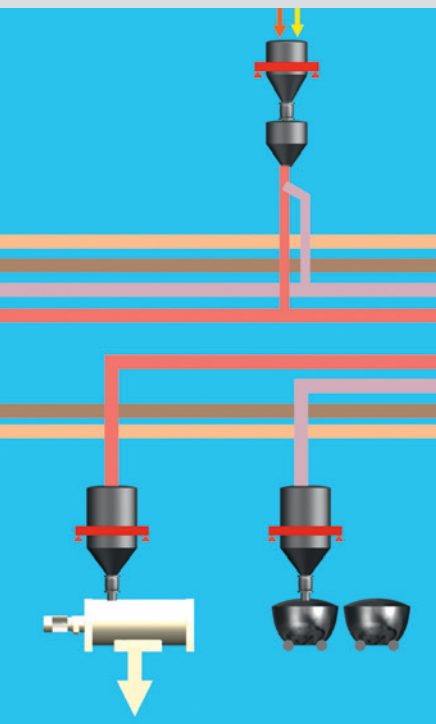


Hygienic design in the fully automatic production of biscuits and pastries

THE SOLUTION





The Bahlsen factory in Barsinghausen

Manufacturing of biscuits and pastries – fully automatic feeding of raw materials in hygienic design

Our customer



Bahlsen, a European company located in Hanover, has manufactured leading products in terms of innovation and quality for the baked goods sector since it was first founded in 1889. Bahlsen's success is not based solely on the high quality of its products but also to a very large extent on the company philosophy, which puts people at the centre of its efforts.

This not only applies to staff on all levels of the hierarchy but also to customers, suppliers and other business partners. Baked goods from Bahlsen stand for enjoyment and joie de vivre. Generations associate delicious biscuits with the name of Bahlsen. The unmistakable taste, consistently high quality and trust in the products are what have made Bahlsen what

it is today: a successful, modern family business. Under the umbrella of the two brand names Bahlsen and Leibnitz, Bahlsen is the market leader in Germany and is known as one of the leading suppliers of sweet biscuits and pastries throughout Europe. The national brands Kornland (Austria), Krakuski (Poland) and Brandt (Germany) round off the range of products,

which are made at five European production sites and exported to over 80 countries.



Outdoor silos and production buildings in Bahlsen's Barsinghausen factory



Dr. Uwe Bretschneider, head of engineering and technology, Bahlsen GmbH & Co. KG

Investment objectives

An overview of the requirements

- Simple handling on the complex production line with intelligent controls
- Explosion protection, hygiene, traceability and balancing of raw materials
- Screening and detection of foreign bodies
- Easy cleaning and maintenance of the system according to specific guidelines

1. Fully automatic feeding of several consumers (kneading machines)
2. Automatic sampling during discharge of bulk tankers
3. Vacuum conveying system as the preferred technology
4. Screening of raw materials on the way through production

5. Automatic separation of any metal contamination
6. Changeover from central weighing to mostly decentralised weighing
7. Highly accurate weighing
8. Automatic balancing
9. ATEX certification of the entire system, production areas without zones

10. System designed to facilitate maintenance and to be ergonomic
11. Of particular importance: refurbishment of the system during ongoing operation without any appreciable impact on production

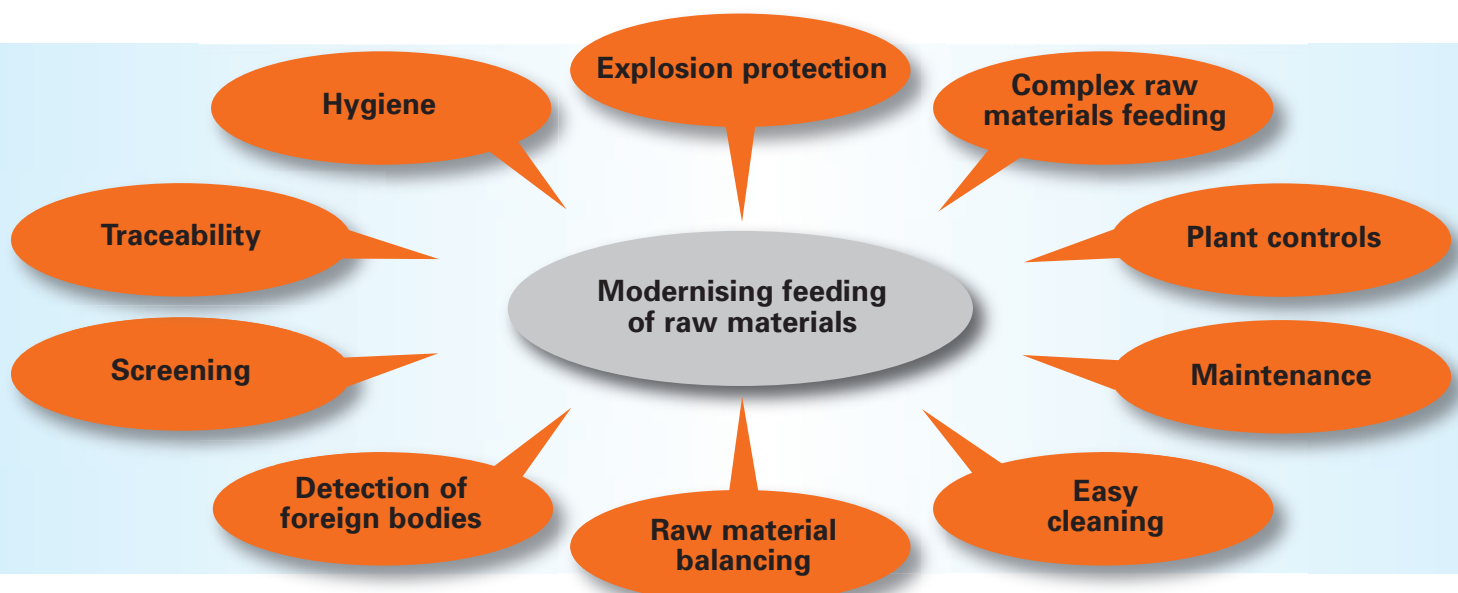
Advance planning from technical and technological aspects:

It was obvious to all those responsible that comprehensive and detailed advance planning as well as intensive cooperation between the operator and system supplier are fundamental in an individual concept for the plant. Reliable, optimised solutions result from using standardised, proven components for correct dimensioning, adapted to the

customer's requirements and combination. For instance, the situation with regard to raw materials supply and the sampling were taken into account in planning. The balancing of quantities also needed to be clarified as regards weighing technology at the receiving silos and weighing accuracy at the consumer. Throughput and the arrangement of consumers were

defined here. On the fundamental issue of deciding between vacuum and pressure conveying system, the customer made a choice for a vacuum conveying system, as it creates considerably less dust in operation. As sugar is processed, it was important to agree on the explosion protection document with the property insurer, to decide on the division into zones and to work out the technical solutions in detail. A crucial point was the

issue of hygiene and quality, which allowed for an interior designed to be without dead space. The HACCP concept was also included in this area along with the release of raw materials with detection of foreign bodies, screening concepts and sampling. Yet another important detail was sugar grinding and handling of icing sugar, large quantities of which are needed in the manufacture of biscuits and pastries.



»Sugar is a key raw material throughout the entire concept for our production line. This is why very high availability must be ensured here in order to feed our baking lines reliably and without downtime.«

Thomas Willenborg, project engineer,
Bahlsen GmbH & Co. KG



Silo fill lines and head room drying

Bulk quantities of sugar: reliable feeding in accordance with regulations for explosion protection

The AZO solution in detail

Refurbishment of the production line was completed in several stages:

1. Sugar supply
2. Flour handling
3. Automation of small and micro quantities
4. Integrated MES concept with process control and instrumentation and visualisation system

Sugar supply

A stainless steel outdoor silo is available to store the crystal sugar. It is equipped with a filter, level indicator and an over/under pressure valve. Rupture discs are used as integral explosion protection in the upper section. The silo is fully insulated and, in the outlet area, it projects into the building. In addition, it is fitted with an electromechanical weighing device, which allows both control



Outdoor silos for storing sugar and flours



Silo head room drying and tank truck connections

»On account of the complex requirements, we were looking for a partner with innovative process engineering, hygienic plant design and pioneering process control, instrumentation and visualisation technology. We found our ideal partners in AZO and hsh – we managed to obtain everything from a single source.«

Dr. Uwe Bretschneider,
head of engineering and technology,
Bahlsen GmbH & Co. KG

Sugar grinding and shock pressure proof receiver for icing sugar

of deliveries and also accurate monitoring of the fill level.

The silo is filled using a stationary blower, which is equipped with a cooler and spark protection filter. While the silo is filled, samples are taken using a pneumatic sampler and analysed in the lab. If the delivered goods meet the specified quality, approval for release is given. After filling, the sugar silo is connected to a central silo head

room drying unit, thanks to which build-up of condensation water in the silo is avoided. A vibration bottom in the outlet area of the sugar silo allows constant product discharge and prevents funnel flow. As lumps may still occur occasionally in spite of silo head room drying, a lump breaker is installed at the silo outlet, followed by a rotary valve to provide explosion isolation. Any metal contamination after this is removed automatically

by a metal separator. Control screening is also carried out with a cyclone screener before the product is transferred to a distribution hopper. The sugar grinder is fed by a pneumatic conveying system. This section is fitted completely with integrated explosion protection. The roof of the building is additionally isolated from explosion. After the grinding process, the icing sugar is transported in a shock pressure proof receiver,

which feeds a hopper for icing sugar using mixing screws and discharge screw conveyors. The icing sugar is constantly agitated in this hopper in order to prevent formation of lumps and hardening of the product. The icing sugar is conveyed directly from this hopper to the production line.



Lump breaker at the outlet from the sugar silo



Powdered sugar hopper with agitator



Hopper for powdered sugar on load cells with discharge screw conveyor

»In our experience, operations with vacuum weighing systems create far less dust than pressure conveying systems. The reduction in dust emission on the production line has a very positive effect in the avoidance of flour dust allergies.«

Dr. Uwe Bretschneider,
head of engineering and technology,
Bahlsen GmbH & Co. KG



Product discharge from silos with metal separation

Clean handling of different types of flour with space-saving vacuum weighing systems

There are several outdoor silos in the section where flour is provided. These silos are also equipped with large-scale filters, level indicators and over/under pressure valves in the insulated silo roof. The silos project into the production building and are fitted with electromechanical weighing systems to monitor the fill level and check the delivery. Here too, samples are taken with pneumatic samplers and analysed

in the lab in order to check the delivered materials. The silo is filled from bulk tankers using a stationary pressure blower, which is fitted with a cooler and a spark protection filter. Once filled, the silo head room drying is connected in order to avoid accumulation of condensate. To ensure safe discharge, all the silos are equipped with vibration bottoms and rotary valves that dose carefully.

Connected in between are metal receivers and control screens to ensure that no contaminants get into the production line. The different types of flour stored in the silos are transported in conveying scales, which dose into the subsequent kneading machines. There are distribution hoppers at the flour silos for connecting several consumers. This means several kneading machines can

be fed simultaneously with different types of flour. Another distribution of the product flows takes place using pipe diverter valves in the conveying lines.



Pneumatic sampler



Automatic separation of metal



Cyclone screeners below the flour silos



»Operator-guided weighing with the ManDos work station makes it possible for us to deliver batch sizes between 100 and 4,000 g, weighed to the exact gram, for the kneading and mixing process. And monitored and documented reliably at that.«

Thomas Willenborg,
project engineer, Bahlens GmbH & Co. KG

Cyclone screeners below the day bins for small components

Automation of small and micro quantities

Exact dosing, complete documentation

Special components can be conveyed via several big bag discharge stations with a minimum of dust to the kneading lines. Here too, vacuum weighing systems are used that operate very efficiently and economically. For fully automatic supply of small components, a system was supplied with which the small components are weighed with great precision and then delivered to the individual

kneading lines. Several day bins are filled via a feeding hopper for bagged goods and big bag discharge stations. These hoppers are equipped with tried-and-tested filters and discharge systems. Here too, the HACCP concept is adhered throughout as control screening is conducted using cyclone screeners for all products. AZODOS® equipment doses and weighs the individual components,

which are then transported by pneumatic conveying systems at exactly the right time to the correct kneading machine.

ManDos for operator-guided weighing of micro quantities

Micro quantities, which often have a crucial effect on the overall recipe, are monitored with the aid of barcodes and weighed to the exact gram into boxes at a central

weighing station under control by the operator. These pre-weighed amounts can subsequently be transferred directly to the kneading machine at the baking lines. The ManDos system results in convenient, high-precision weighing and affords a maximum of safety and traceability. All the micro quantities used are documented and can thus be accepted into the data management as well.



Big bag discharge station for special components



AZODOS® equipment for precise weighing of small quantities



ManDos weighing station



»The systems engineering at AZO satisfies our requirements for hygienic design. The production line is easily accessible in all areas and quick-release connectors make it possible to clean easily. The surfaces and welded structures are designed in such a way that no dead space, gaps and sharp edges occur.«

Thomas Willenborg, project engineer, Bahlsen GmbH & Co. KG

Conveying scales for sugar and flour for feeding one kneading line

Clean and efficient feeding of kneading machines in batch or continuous operation

Vacuum weighing systems for sugar, flour and other ingredients

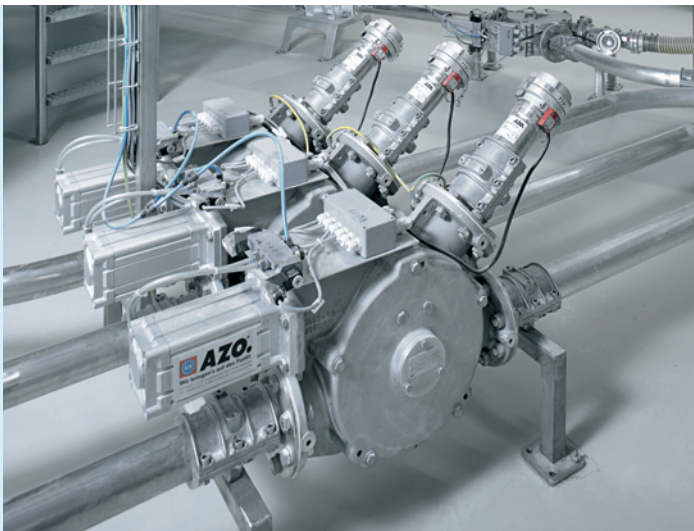
Vacuum weighing systems are used for feeding the different kneading machines and mixers with a minimum of dust. There is one set of conveying scales available each for sugar and flour at each kneading line. At some lines there are also conveying scales for other ingredients. The product is fed at the silo or at the product feeding stations via rotary valves; distribution to the individual consumers is done via pipe

diverter valves in the conveying lines. The products are dosed directly to the conveying line at the big bag discharge stations with the type DA cyclone screener. The vacuum generated with the under pressure generator conveys the product onto the conveying scales, where it is separated from the conveying air via the filter. It remains in the weighing container and is weighed there with great precision.

The filters are cleaned automatically with compressed air. Depending on the product, either the required quantity is put in the weighing container and then discharged completely into the kneading machine or mixer, or, as in the case of sugar for example, dosed from the weighing container via a dosing screw using the loss-in-weight process.

Premixing with AZO®MIXOMAT conveying scales

This system operates similarly to conveying scales, where the weighing container is simultaneously the mixing machine. A preliminary mixture is produced here from flour and wheat starch and transferred to a buffer hopper. The continuous kneading unit is now fed by a continuous, gravimetric dosing unit. The MIXOMAT has a large front door and is thus easy and quick to clean.



Pipe diverter valves to distribute product flows



Conveying scales for feeding a kneading machine with sugar



AZO®MIXOMAT conveying scale



»The process leading and visualisation system from AZO's subsidiary hsh makes it possible for us to conduct ongoing optimisation of the production line using current indicators. It provides permanent batch documentation and balancing of raw materials. This also makes planning of raw materials considerably easier.«

Thomas Willenborg, project engineer,
Bahlsen GmbH & Co. KG

Central process leading and visualisation system

Process control and visualisation system

Future-proof process automation from hsh

Kastor, the batch-oriented process leading system from the AZO subsidiary hsh-systeme für prozess-IT, is used to operate, control and monitor the extremely complex feeding system. Combined with visualisation based on standard tools, the result is a centralised process leading and visualisation system that performs a whole range of workflow controls and checks. These may involve recording data for raw material or also yield calculations.

Furthermore this centralised system provides documentation for continuous traceability of production workflows, e.g. by means of batch protocols, yield balancing and long-term archival of collected data. Above and beyond this, it allows individual configuration for access protection and absolute system security. It can be validated in compliance with GAMP and FDA guidelines.

Great functionality

- Managing and maintaining master data and production jobs
- Execution of production jobs
- Control of automatic and manual weighing units
- Operator control in the case of manual operations and interventions
- Computer-aided identification of raw materials
- End-to-end marking of all intermediate products and weighing operations
- Traceability of raw materials (lot tracking/ batch tracking)
- Monitoring of the weighing process and documentation of exceptions
- Logging and reporting
- Communication with higher-level PPC systems



All micro quantities are also documented with ManDos



Operator terminal with barcode scanner in the area for preparation of raw materials



Conclusion:

»After thorough preliminary planning over an extended time, we are now in a position after more than one year of operation to conclude that we made the right choice of partners with AZO and hsh.

AZO is an expert partner both for batch processes and for continuous processes. This has afforded us considerable advantages in feeding our baking lines in batch and continuous operation.

The process leading and visualisation system from hsh makes it possible for us to achieve ongoing optimisation of the production line using current indicators.«

Karl Reichstein, Works Manager,
Bahlsen GmbH & Co. KG Barsinghausen

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