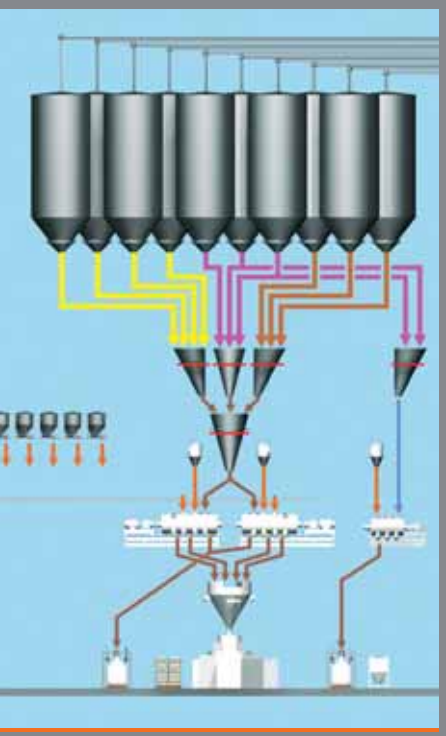
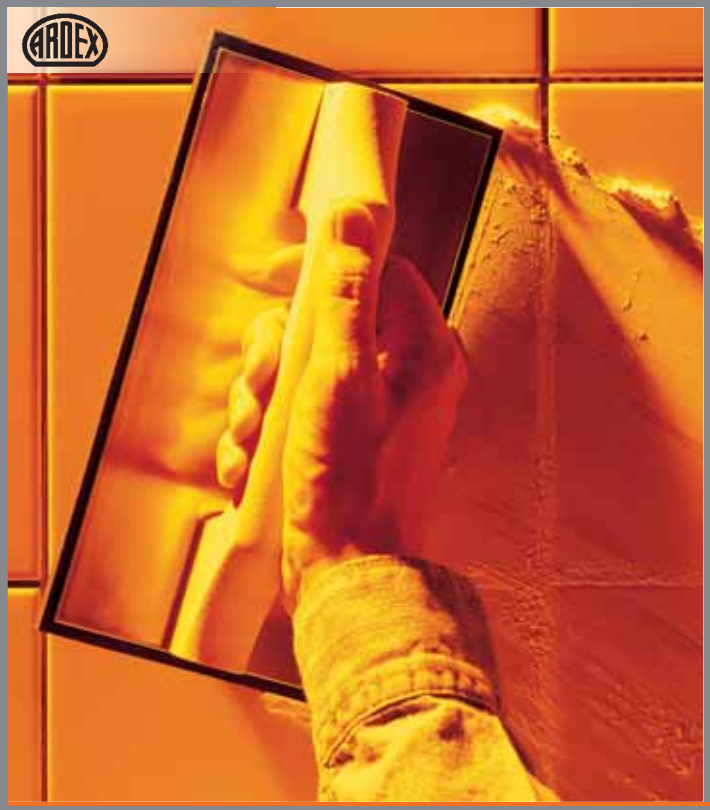
Energy-efficient automation in building chemistry:

Limitless flexibility and uncompromising quality

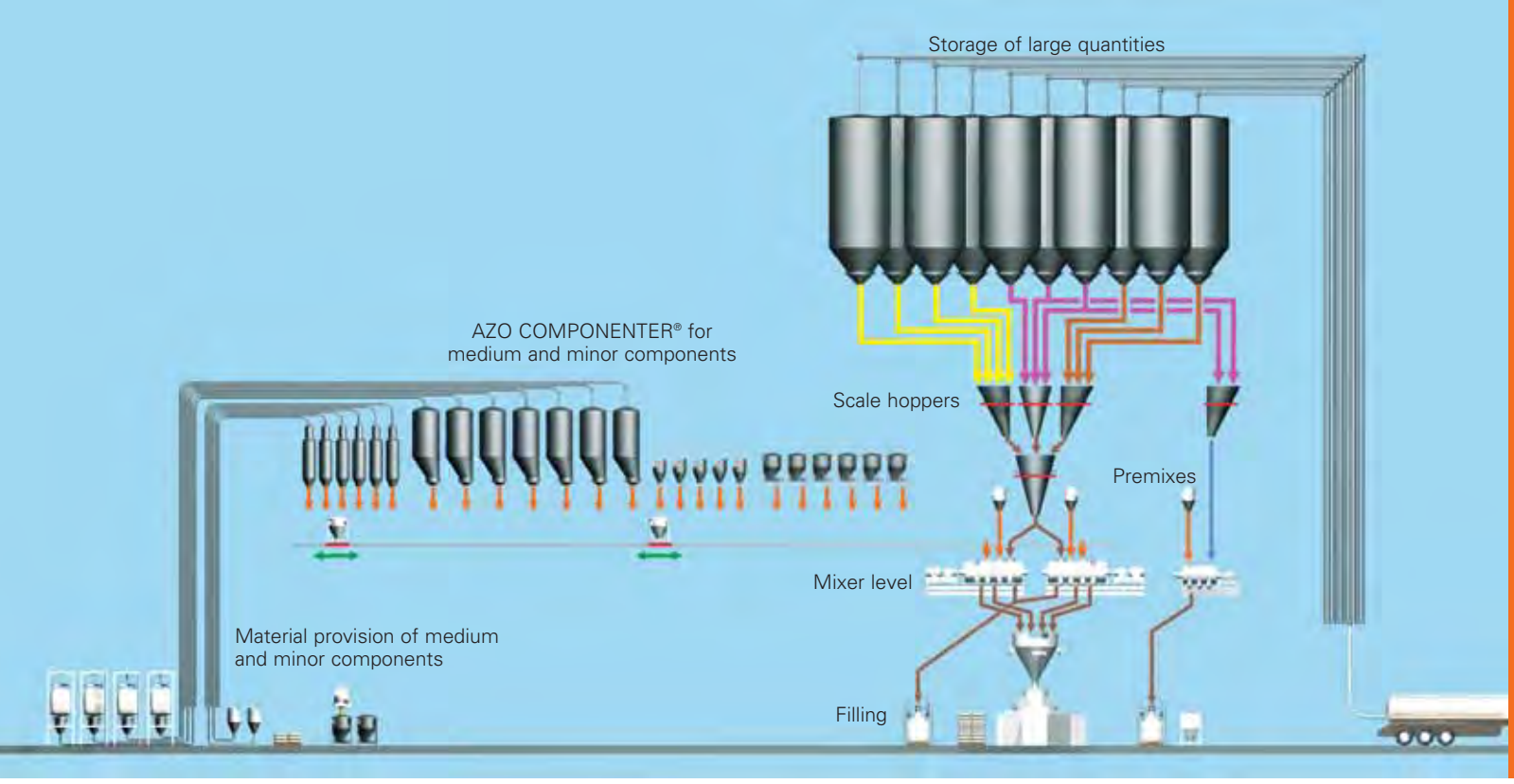
THE SOLUTION





The No. 1 in mixer feeding

AZO®



Material flow diagram

Energy-efficient automation in building chemistry:
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The customer

ARDEX has been the competence brand of the specialist trade and specialised wholesale business in the construction industry for more than 60 years now. The company has developed into a quality leader throughout the entire industry with its excellent products and highest processing quality. ARDEX manufactures a wide range of building chemical products. For building shell applications, these include concrete fillers, screeds and grouts. Alongside these, the company also manufactures tile adhesives, natural stone adhesives, tile grouts, interior wall fillers and exterior facade fillers. All products must have functions that are optimally suited to the processing methods, and must be characterised by a consistently high standard of quality.

The ARDEX Group is represented on all continents with more than 37 subsidiaries in over 50 countries. This family firm, based in the town of Witten, has long been an internationally active company and one of the world leaders in offering high-quality special building materials.

ARDEX researches and works in its Development Centre, where it applies precisely controlled research procedures in order to come up with a stream of new ideas and innovative product systems. Whether it is primers, adhesives, fillers, sealants or coatings: all the products developed by ARDEX are aimed at facilitating the work of its partners in the

Excerpt from the ARDEX product range

Overview of the task

1. **Automation of more than 50 raw materials, in particular involving the integration of medium and small components, in more than 50 recipes with up to 20 components.**
2. **The greatest possible throughput whilst maintaining the highest dosing and weighing accuracy levels.**
3. **Energy-efficient handling of large production quantities in a tower concept with vertical material flow.**
4. **Screening of all raw materials used as a control feature in order to avoid clumps causing problems when the products are used.**
5. **Maximum flexibility during product changeover by easy-to-clean systems with extremely low production downtimes**
6. **Product change without residual material when using special products and premixes.**
7. **Dust-free, ergonomic workplaces because of closed systems.**
8. **Gentle and failure-free conveying of difficult raw materials, e.g. titanium dioxide**
9. **Process transparency, production safety and documentation of all recipes with a link to the higher-level host system.**
10. **Overall system offering ease of maintenance and servicing, and offering high levels of availability with components that offer scope for future expansion.**

specialist trade, and expanding the range of creative possibilities that are available. The most important sources of inspiration, bar none, are the company's vast experence with materials and processing methods as well as continuous dialogue with customers. The high quality of ARDEX provides a safeguard against follow-on costs, of course. Thanks to their immense reliability, the systems offer the maximum processing safety at all times. This factor should not be underestimated, because it cuts out the need for complaints and unpredictable corrective measures. At the same time, it ensures that the calculations are right and that an expected profit really does turn into money in the bank. As a result, every perfectly executed job has a positive effect on the worker's reputation.

Investment targets at ARDEX

The primary investment target is product quality: ARDEX customers can rely on assured product functions at all times, such as easy, quick and efficient processing capability. Alongside this, flexibility in production is another important criterion. The new facility should enable ongoing improvements and optimisations to products, as well as straightforward production of new developments. Scope for future development should be guaranteed, as should innovative automation engineering, by the ground-breaking use of process control and visualisation technology.

Vertical tower concept

»Even during the project phase, we knew that the key to successful production lies before the actual mixing process. This is what our products' proverbial quality is founded on.«

Peter Kawka,
Works Director at ARDEX Witten

Bulk silos with filling lines and filters

Automatic raw material provision

in the required quantity and with the necessary accuracy

The AZO solution in detail

Following a detailed project study, ARDEX decided on a vertical tower concept. In this case, all raw materials are transported upwards pneumatically and are then dosed and weighed in free fall. Following this, they are supplied to the mixing and subsequent filling processes. The entire facility is divided into seven subsections:

1. Automation of large quantities
2. Handling of premixes and special products
3. Material provision of the medium components
4. AZO COMPONENTER® for automatic weighing of additives
5. Mixer level
6. Filling the finished products and premixes
7. Process control technology for process control and visualisation of the entire system

Storing, discharging and screening as well as dosing and weighing of large quantities

15 silos made from normal steel are available for storing the large quantities. These silos extend over several levels. They are loaded from silo trucks through filling lines. Monitoring and plausibility checks are carried out based on the preselection in the goods incoming section, as well as by means of sensors at the feed pipe connections. This monitoring ensures that the right products get into the intended silos. Treated compressed air is provided at stationary points in order to discharge the silo trucks. This prevents atmospheric humidity being blown into the hygroscopic products, something that would be bound to lead to clumping. In many cases, the products involved are abrasive, e.g. cement, fibrous materials, chalk, gypsum, dispersion powder and sand, and so the filling lines are equipped with spherical elbow joints. These pipes are

Spherical elbow joints in the filling lines reduce wear and thus extend the replacement intervals

Efficient screening of the raw materials with AZO cyclone screeners

Safe product outfeed via vibration bottoms and dosing screws with subsequent control screening

»For us, it was essential to screen all the raw materials we use. As well as vibration machines in the large batch area, the cyclone screeners from AZO are highly effective because of their compact design and efficiency.«

Klaus Behrendt,
Head of Corporate Engineering at ARDEX

mounted and integrated so that they can quickly be replaced using lifting equipment in the event of wear. This is done on a quarterly basis, as a precaution. All silos are equipped with large filters and level measuring systems. Depending on the products, some of the silos are designed with explosion protection in order to offer the greatest possible safety. The design of the silo outfeeds has also been adapted to the product properties. The variants range from a straightforward outlet cone to vibration bottoms and even vibration bottoms with additional aeration jets. This is ensured because all products are unloaded on a first in – first out basis. Suitably dimensioned, frequency-controlled dosing screws are used for loading the products into the scale hoppers. Both large and small quantities of various products are needed, therefore some of the screws are configured in a »piggyback« arrangement, i.e. a small screw is connected following a large one, in order to dose the small quantities. The screws have variable speed in order to allow all components to be dosed with precision. This means very high accuracies can be achieved even with large quantities, at the same time as high throughput rates. A screening machine is installed between the dosing screw and the scale in order to provide a control measure. This breaks up clumps or separates them out. The precisely weighed batches are discharged into a receiver positioned over the mixers for finished mixtures.

Dosing screw followed by ultra-precise dosing

Scale hoppers for precise weighing of large quantities

»AZO DOSITAINERS® offer the greatest possible flexibility in product changes, and amongst other benefits they allow premixes to be changed in an ideal fashion without leaving residual amounts.«

Peter Kawka,
Works Director at ARDEX Witten

AZO DOSITAINER® with integrated dosing screw as flexible product additions in the AZO COMPONENTER®

Premixes and special products
offer the greatest possible flexibility

»Our new material supply concept has removed any limits on our creative innovations, and is allowing us to optimise our recipes on an ongoing basis.«

Peter Kawka, Works Director at ARDEX Witten

Use of premixes and special products increase flexibility

Premixes are manufactured by taking various types of gypsum from the bulk silos and dosing them into the corresponding scale hopper. Here too, the dosing works by switching over between coarse and fine methods, and screening is provided as well, as a control measure. Other raw materials involved in the recipe are pre-weighed and directly added to the mixer via a feeding hopper with an integrated control screen. Once a homogenous mixture has been created, it can be filled into big bags as well as into AZO DOSITAINERS®. In the AZO COMPONENTER®, these can then be added to the further process as variable ingredients.

Scale hopper for premixes, pre-weighed raw materials are directly loaded into the mixer by means of a feeding hopper

Mixer for making the premixes and special products

Big bag discharge stations for feeding the product into the closed system without dust

»Safe raw material hadling without mix-ups in the material provision level is achieved by user guidance on monitors and barcode monitoring of all raw materials.«

Klaus Behrendt,
Head of Corporate Engineering at ARDEX

Material provision level for sacks and big bags as well as conversion from bagged goods to AZO DOSITAINER®

The material provision level is at ground level, and this is where the medium components are loaded, after having been delivered in sacks or big bags. The bagged materials are filled into feeding hoppers in a low-dust procedure, then a vacuum conveying system transports them into day silos located above the AZO COMPONENTER® with little product degradation and without dust. A coupling station allows the distribution to the relevant surge bin. Supplied big bags are docked with the big bag discharge stations giving a dustproof seal, and are then discharged. These raw materials are also transported to the day silos using pneumatic vacuum conveying systems. A separate station offers the opportunity to transfer material from sacks into the AZO DOSITAINER®. These containers with integrated dosing screw can then be loaded into the AZO COMPONENTER® as flexible ingredients. When there is a product change, the AZO DOSITAINERS® can be exchanged quickly and easily without any complicated cleaning being required. This represents a particular advantage of this system. Colours and special control additives that cannot be conveyed pneumatically are loaded by means of feeding hoppers directly above the AZO COMPONENTER®. All the ingredients provided are unloaded safely and undergo screening as a control measure using cyclone screeners. The ingredients are exactly dosed into the mobile scales of the AZO COMPONENTER®.

Day silos, equipped with vibration bottoms and rotary valves, some with cyclone screeners on their output ends

Station for transferring bagged materials into AZO DOSITAINERS®

»The AZO COMPONENTER® with exchangeable scales offers limitless flexibility in the area of automatic additive provision. Maximum dosing accuracies of control additives are a unique selling point that sets us apart from the international competition.«

Peter Kawka,
Works Director at ARDEX Witten

AZODOS® units allows to weigh accurately the minor components into the mobile scale

AZO COMPONENTER®: highest accuracy in assembling the minor and medium components

»At the start of the project, we looked for a company that offered strength in small quantity dosing. In AZO, we found a partner which could integrate all components in the automation process. Hardly any of AZO's competitors had the confidence to offer automation in colour and control additives. However, the AZODOS® systems accomplish this task, and it is by no means an easy one, to our complete satisfaction.«

Klaus Behrendt, Head of Corporate Engineering at ARDEX

The AZO COMPONENTER® is equipped with two moveable scales which move to the corresponding dosing points according to the recipe. Once there, a dustproof connection is established and an aspiration unit is connected automatically. Now, the ingredients can be dosed exactly into the scales that are configured as containers. Trickle protection slide valves prevent any subsequent leakage out of the dosing points. Control additives and colours have to be added with great precision, therefore AZODOS® dosing units are used as negative scales in this area. These have a smaller weighing range than the mobile scales, and are therefore capable

The hopper of the mobile scale can be replaced when there is a product change

Automatic docking of the mobile scale hopper with the aspiration system

Feeding hopper directly over the mixers for manual additions

of weighing small product quantities very exactly. Once a recipe has been processed and all the ingredients are in the mobile scale, the scale moves over a discharge station. The docking device and the patented docking collar establish a dustproof connection, and the entire batch is discharged into the mixer for finished mixtures that is located underneath. In order to save time during product changes, the containers can be removed from the mobile scales and replaced by freshly cleaned ones. This means there are no delays, since production can continue immediately.

Mixer level

Two horizontal mixers are available for making the finished mixtures, and there is another mixer for the premixes that is in a similar configuration. Feeding hoppers directly over the mixer offer the opportunity for manual addition. This can be used for adjusting the batch after a sample has been taken. Here too, the overall concept ticks all the boxes in terms of flexibility.

Two horizontal shaft mixers for manufacturing standard products, right: a mixer for premixes and special products

Filling machine for containers and big bags

Filling in sacks, containers or big bags:
Flexibility through to the end

»Close dialogue between the Project Planning and Production departments in ARDEX with the AZO engineers led to a concept that is optimally tailored to our needs. It offers great benefits that will enable us to continue growing, as we are freed from capacity restrictions.«

Peter Kawka, Works Director at ARDEX Witten

As with product intake, a very wide range of packaging types is also possible when filling. For example, the finished mixtures can be filled into sacks and stored by means of a fully automatic bagging and palletising machine. Furthermore, it is possible to fill containers and big bags using corresponding filling stations.

Automatic bagging and palletising machine

Many Ardex products are filled into sacks

»For us, it was particularly important to have one partner for the entire project to cover the process engineering and the control engineering. A clear division of responsibilities between AZO and hsh allowed our production to be optimally linked to the MES and host system.«

Peter Kawka,
Works Director at ARDEX Witten

Process control and visualisation technology – overview of the complete system

Process control and visualisation technology
with the highest quality

Operators have an overview of the entire production from the central control station. The clear process visualisation gives the user information about the current status of production at all times. For example, fill levels, parameters or the mixer status can be viewed at a glance. It is possible to work without interfaces because of the link to the host computer. Operators in production have access to clearly designed, colour monitors which provide them with precise instructions on which products have to be filled, and where. A barcode system prevents mix-ups occurring here. Furthermore, operator terminals provide the opportunity to intervene in the automatic process. For example, it is possible to switch from the automatic process to a semiautomatic process or to an individual control process. Corresponding logs are printed out, allowing the recipe documentation to be kept in order. This also applies to the consignment notes and labels, etc. It is only the optimum interplay between process engineering and control engineering that offers the highest level of production safety and transparency, as well as delivering documentation for all goods produced.

Operator terminals in production

3006 1104 GB

Conclusion:

»In terms of energy efficiency, the new facility in Witten has set the bar to a new level for our global plants. The modular approach to both process and control engineering will become a worldwide standard for us.«

Peter Kawka, Works Director at ARDEX Witten

Klaus Behrendt, Head of Corporate Engineering and
Peter Kawka, the Works Director, were our discussion partners at ARDEX in Witten

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