I BAU HAMBURG

Your efficient partner for modern and effective bulk material handling

PLANT DESIGN - ENGINEERING - EPC-CONTRACTING

CEMENT - THERMAL POWER - MINERALS

Central Cone Silos

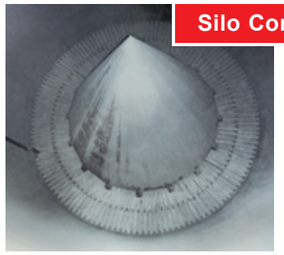
Single silos.
Ring silos.
Multicompart-
ment silos.
From 2 to
22 chambers,
diameters:
14 to 27 m.

EPC-Contracting

Piling.
Civil works.
Steel structure,
supply/erection.
Electrical/
mechanical
supply and
erection.

Marine Cement Terminals

Floating
terminals.
Mini terminals.
Silo systems.
Dome systems.
Flat storage
terminals.



Silo Conversions

Economic
modifications
with advanced
cutting-edge
technology.

Cement Carriers

Advanced
technology for
self-discharging
Cement Carriers
including the
Midship tunnel.

Components

The key for
a well
functioning plant:
Components,
all made
to measure.

Ship Unloaders

Stationary or
mobile types:
From the
5,000 class
up to the
60,000 class.

Spare Parts

High stock
availability:
Just-in-time
supply
of spare parts.
After-sales
Service.

☏ + 49 (0) 40 36 13 090

www.ibauhamburg.de

info@ibauhamburg.de

12/15/Mixing Plants

I BAU HAMBURG

IBAU HAMBURG

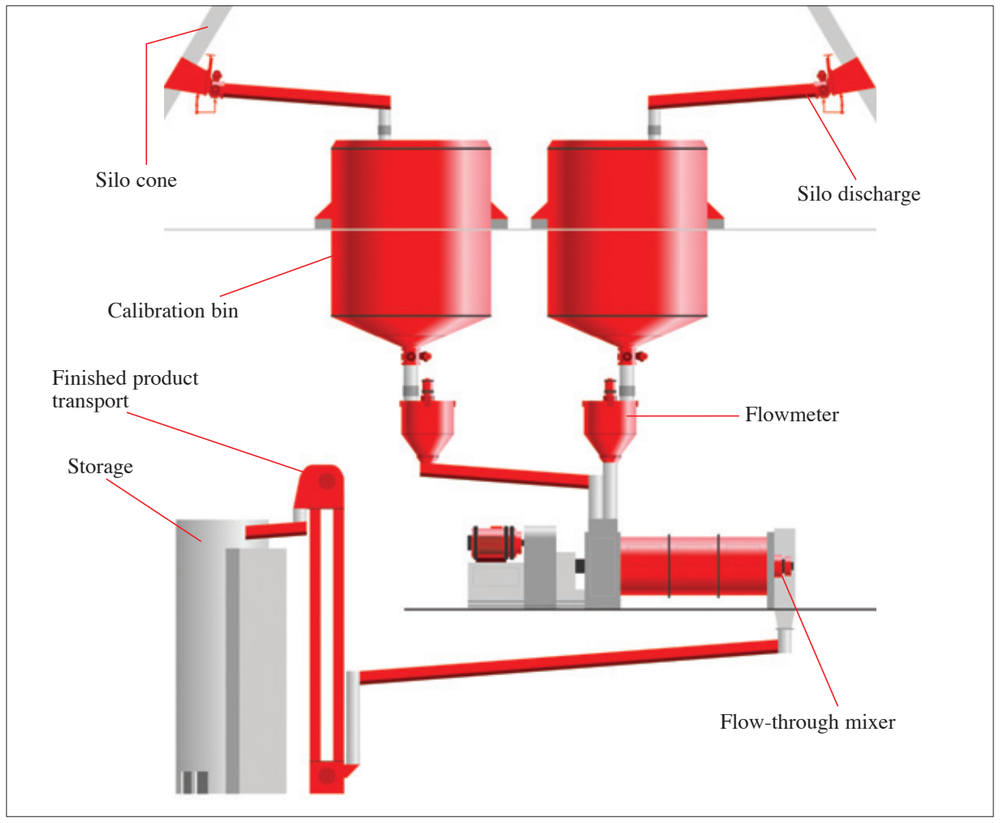
Mixing Plants for the Cement Industry

A HAVER & BOECKER Company

Continuous mixing system

For the mass cement production with 2-3 main components and with different degrees of grindability it is advisable to perform a separate grinding of the components with the subsequent mixing in flow-through mixers so that the grain size distribution of the individual components can be influenced separately. Often the basic materials such as fly ash are already available in the required fineness, and joint grinding with clinker only consumes unnecessary energy. Accordingly, the use of flow-through mixers provides for a swift amortisation, additionally allowing an increase of the grinding output of the cement mills and thus increasing the plant capacity compared with the joint grinding.

Continuous mixing systems require storage silos for the basic materials and the finished products generally with the same storage capacity as for the joint grinding. The mixing plant is often incorporated in a multi-compartment silo and consists of a flow-through mixer as the heart of the system, the silo discharge, the calibration bin and the flowmeter for the dosing of components, which are otherwise located upstream of the joint grinding system. A continuous mixing plant is completed by the transport of the finished product to the storage silos. Continuous mixers are designed for throughputs of > 250 m^3/h to 450 m^3/h for the production of standard cements with fewer main components. It is possible to change recipes more quickly than with the joint grinding, but are being also virtually limited to the different mass proportions of the main components.

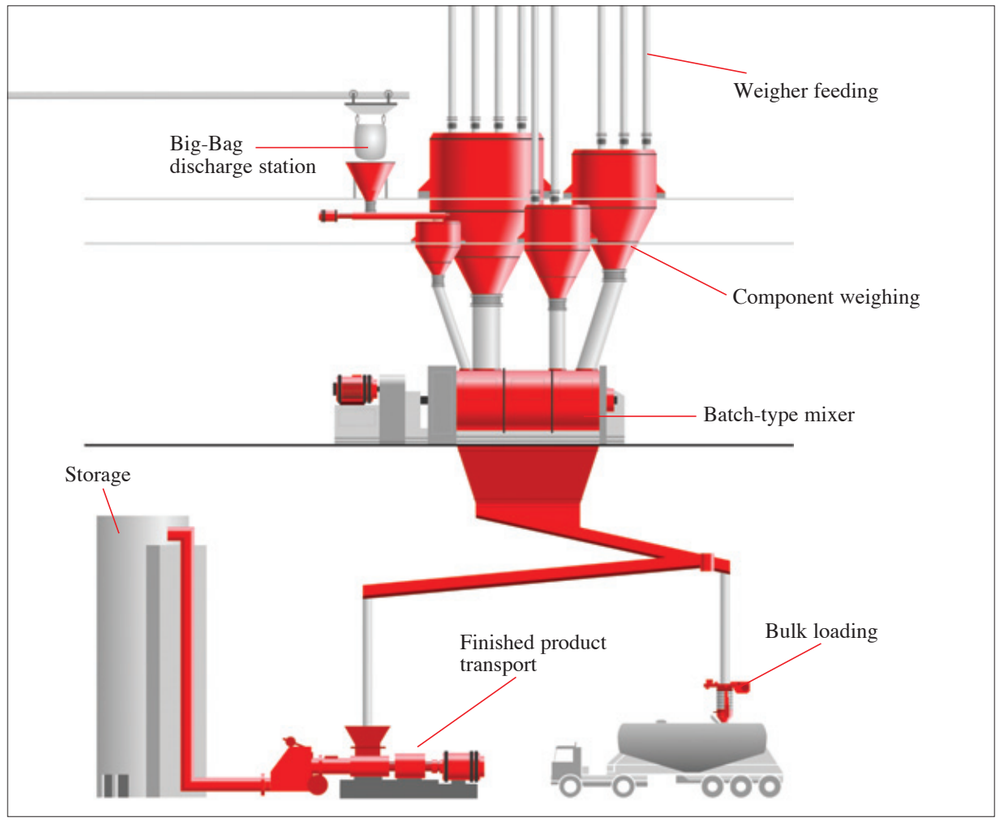


Continuous mixing system

Discontinuous mixing system

Discontinuous mixing systems are used for the production of special cements with a large number of main and secondary components and/or frequent product changes. The basic components for the finished products either come from a separate grinding or are specifically produced in other processes and delivered separately. Discontinuous mixing systems provide for the production of specific recipes "just-in-time". The mixing plant consists of the component weighing by the dosing control, with Big-Bag discharge stations being frequently used for small components, a batch-type mixer as the heart of the plant as well as the downstream finished product transport system respectively the bulk loading station.

Processing virtually any number of components with frequent recipe changes places high demands on the mixer, the mixer feeding and the discharge system as well as the plant control. When using discontinuous mixing processes with changing recipes it is important to supply the mixer with all components from the weighing bins with precise timing and to also reduce the mixer discharge time to a minimum. Here the aim is to achieve the longest possible mixing time within a specified batch time in order to reach a high mixing quality. The throughputs with batch-type mixers are max. 165 m^3/h, with the mixing quality being better than with continuous systems and frequent fully automatic product changes being the norm.



Discontinuous mixing system

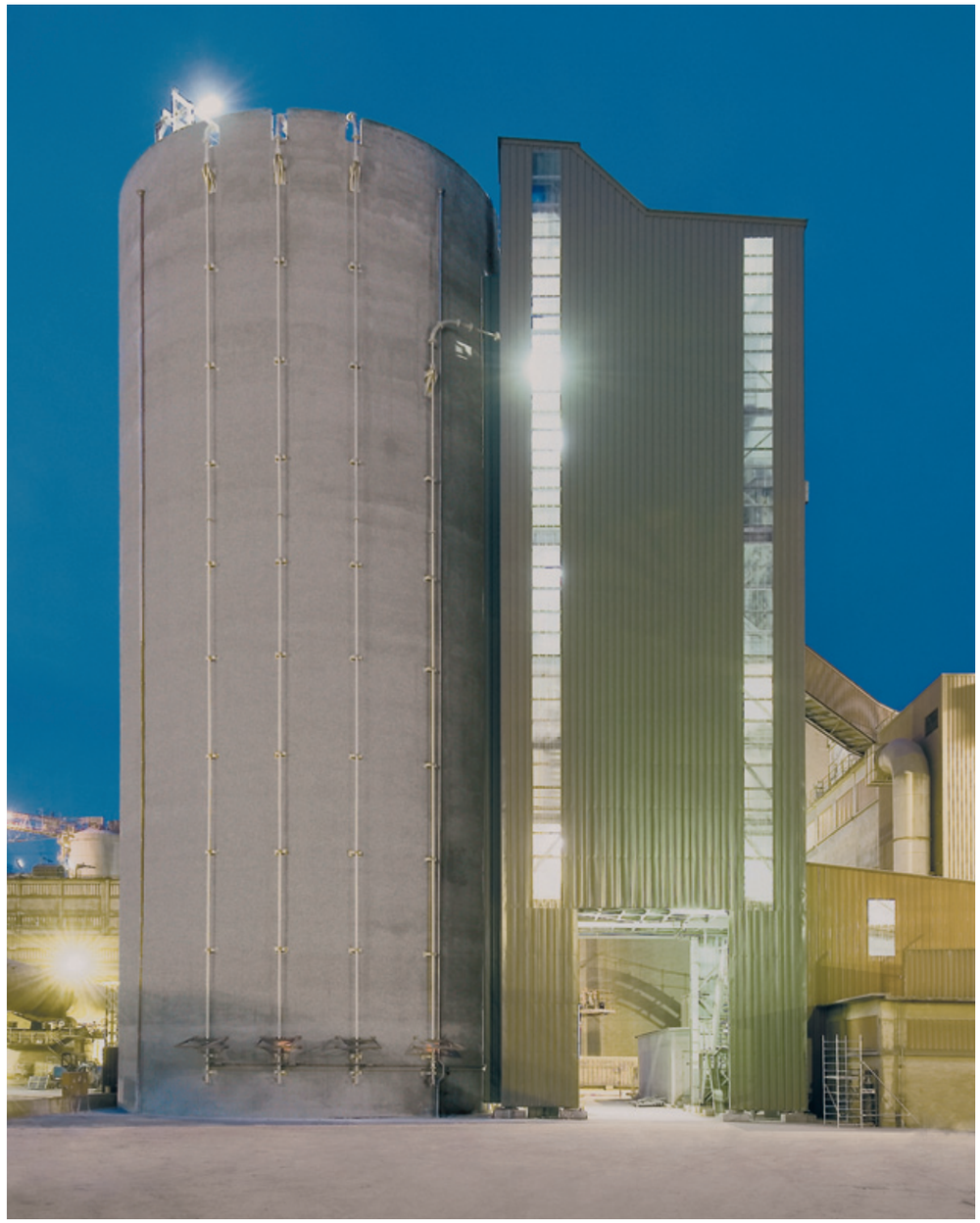
The IBAU HAMBURG Mixing Plants for the Cement Industry

Continuous mixing system

The throughput performance of a flow-through mixer is determined by its net volume, which amounts to about 50% of its gross volume, and by the dwell time in the mixer. The average dwell time in the mixer is in practice approximately one minute. The dwell time necessary to achieve a specified mixing quality is determined by mixing tests or using empirical values for similar products. Achieving an exact mixing ratio depends on the accuracy of the continuous component dosing control system. For this purpose flowmeters are used in conjunction with weighing bins and combined with a silo discharge system including flow-control gates. The weighing bins are used for the calibration of the system, which is fully automatic.

With flowmeters it is possible to achieve accuracies of 99.9% for the component mixing ratio. The flow-control gates at the outlets allow a controlled silo discharge with a constant internal silo pressure. The flow-control gates under the weighing bins are used for quantity flow control. It is the system coordination that decides the quality achieved by a continuous mixing system and less the mixer itself, which is not subject to such high requirements. If the dwell time in the mixer is sufficient, there will be no problem in complying with the required mixing quality of the few different components. Compared with modern vertical mills with joint grinding of the main components in the grinding chamber, the mixing effect in the flow-through mixer is considerably greater with a more or less identical dwell time, thanks to the mixing effect achieved and the absence of airstream demixing.

Silo discharge with IBAU Flow-control gate



Continuous mixing plant

The IBAU HAMBURG Mixing Plants for the Cement Industry

Continuous mixing system

Calibration bin with flowmeter

Single-shaft flow-through mixer

	IB-DM 2500	IB-DM 3000	IB-DM 4500	IB-DM 6000	IB-DM 8000	IB-DM 10000	IB-DM 12500	IB-DM 15000
Throughput m^3/h at 1 min. dwell time	75	90	135	180	240	300	375	450
Gross volume m^3	2,5	3,0	4,5	6,0	8,0	10,0	12,5	15,0
Net volume m^3	1,25	1,5	2,25	3,0	4,0	5,0	6,25	7,5
Required power kW	45	55	75	90	110	132	132	160

Table 1: The performance data for IBAU HAMBURG flow-through mixers.

The flow-through mixer operates according to the principle of centrifugal mixing and unlike conventional twin-shaft compulsory mixers, is designed as a high-speed single-shaft mixer and achieves a high mixing capacity with very small volumes.

Eight sizes are available. The net volumes range from 1.25 to 7.5 m^3 and provide for throughputs between 75 and 450 m^3/h, corresponding to a dwell time in each case of 1 minute.

The relevant driving powers range between 45 to 160 kW, corresponding to specific driving powers of 0.35 kWh/m^3 with the largest size and 0.6 kWh/m^3 with the smallest size.

The mixing tools in the mixer are adjustable and can be set according to each requirement. Flow-through mixers are generally used to produce Portland mixed cements with 2-3 main components. This involves for example slag or blast-furnace slag cements, pozzolane or fly ash cements and simple Portland composite cements according to EN 197-1 and comparable standards and types of cement.

The addition of calcium sulphate and other secondary components as well as cement additives generally already takes place when grinding the clinker as the continuous mixing system cannot be economically designed for that.

Continuous mixing systems however allow an easy adjustment of the quantities of the main components, e.g. when producing blast-furnace slag cement CEM III/A to C, Portland fly ash cement CEM II/A-P or B-P and similar. The proportions of ingredients are calibrated using the individual weighing bins for the components. With the IBAU system the proportions of ingredients can be automatically changed by adjusting the flow-control gates at the outlet of the weighing bins.

Weir for the regulation of the filling level

The mill changeover otherwise required with joint grinding is not required here. This means that continuous mixing systems offer an economical alternative to joint grinding and that the finished products can be produced in line with market conditions.

The capital expenditure for a continuous mixing system is relatively low. All components required for the dosing also have to be provided for a joint grinding.

The only equipment additionally required are the flow-through mixer and downstream transport for the finished products. With the silo system the options are more flexible than with

The IBAU HAMBURG Mixing Plants for the Cement Industry

Continuous mixing system

Interior view IBAU Flow-through mixer

the joint grinding. There are no longer lengthy transport routes for the finished products from the grinding plant to the storage silos.

All basic products such as ground Portland clinker, blast-furnace slag or fly ash are stored separately.

The finished products are also stored separately; in this regard IBAU offers multicompartment silos designed as concrete structures with 3 to 10 chambers depending on the number of product combinations and different types of cement.

The flow-through mixer can be easily incorporated in the multicompartment silo. Either IBAU Pumps or dosing slides with bucket elevators can be used to transport the finished product within the large-volume silo.

Loading equipment for bulk loading can also be incorporated in the silo or with large silos, complete packing plants.

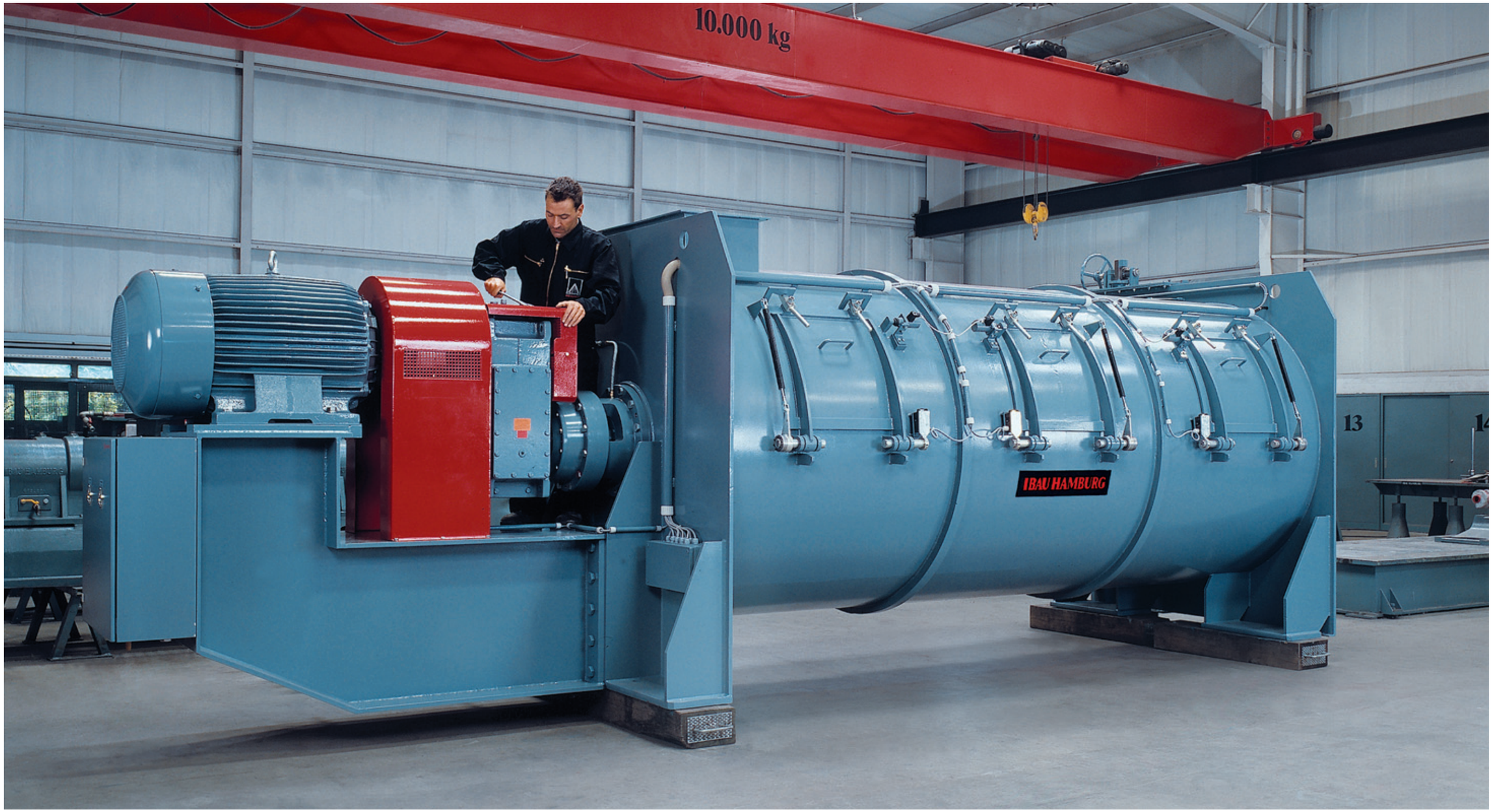
With existing storage silos the mixing plant can be housed in a separate building. Here numerous versions are possible and are already existing.

IBAU HAMBURG offers customers a project support so they can make use of existing storage facilities and to adapt to the requirements for the cement types to be produced in the best possible way.

Storage of components and finished products

The IBAU HAMBURG Mixing Plants for the Cement Industry

Continuous mixing system



Assembley of an IBAU Flow-through mixer

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

A discontinuous mixing system allows not only standard cements to be produced but also virtually any number of specific cements such as composite or special cements from a large number of main and secondary components. Here the individual components are added to weighing bins and discharged into the mixer step by step.
3-4 weighing bins are normally used for discontinuous mixing systems, with a precision weighing system for micro components and additives. The size of the weighing bins depends on the size of the mixer. The mixing cycle of a batch-type mixer consists of the filling time, mixing time and discharge time of the mixer. Mixer down times are avoided entirely if feeding and weighing of the next batch is already carried out during the mixing time.

State-of-the-art microprocessor-controlled electronics are used for automated weighing and dosing. Normally up to 100 recipes and processes are defined and stored. The quality of all production batches can be monitored and documented. This makes it possible to produce special cement recipes according to requirements, for example slag cements with a blast-furnace slag cement content according to the weather conditions to ensure uniform hydration heat in both summer and winter as well as an identical setting behaviour. Special cements for high-performance concrete are a growth market. They are made possible by specific additives and can only be produced economically with the discontinuous mixing process.

Feeding of up to 4 weighing bins for a batch-type mixing plant

High-capacity batch-type mixing plant

Big-Bag discharge station with integrated dosing

Single-shaft-batch-type mixer

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

Interior view of a batch-type mixer

Like the flow-through mixer, the single-shaft-batch-type mixer from IBAU HAMBURG operates according to the principle of centrifugal mixing. The mixing tools are interchangeable and are mounted on a rotating shaft. Up to 3 high-speed agitators mounted at the side ensure micro-mixing of even the smallest components.

There are 5 sizes ranging from a gross volume of 2.5 to 8.9 m^3 and throughputs from 47.5 to 165 m^3/h and drive ratings from 45 to 110 kW, depending on the size of the mixer and mixing time with specific driving powers from 0.67 kWh/m^3 with the largest size and 0.95 kWh/m^3 with the smallest size.

The possible mixing quality depends on the specified mixer geometry, the existing installed parts and the speed as well as on the dwell time of the components in the mixer. With mixing times of 70-80 seconds and mixer filling and discharge times of 20 seconds each, mixer batch times of approx. 30 batches per hour are possible. This means that with the IBAU IB-DM 8000 featuring a net volume of 6.6 m^3 a maximum throughput of some 200 m^3/h can be achieved. To determine the mixing quality, an IBAU Mixer is operated at nominal load, generally corresponding to a filling degree of 75%.

The IBAU Mixer is equipped as a standard with two drop bottom doors for fast discharge times. The doors are operated by a toggle lever system that ensures absolute tightness during mixer operation due to self-locking.

In the case of frequent product changes and high product quality great importance is given to the de-dusting and venting equipment for the mixer and mixer post bin. Separate filters on the silos and the weighing bins, as well as separate material feedback systems ensure that product types are kept completely separate from each other.

Bulk loading with Simplex loader and loading chute

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

Selection criteria for different types of mixing systems

Feature	Discontinuous mixing systems	Continuous mixing systems
Number of components	Any requested number	2 - 3 (more than 3 components must be premixed)
Recipe changes	Possible at short notice	Recipes must not be changed for a certain period of time
Throughput	30 t/h - 200 t/h	> 200 t/h - 500 t/h
Equipment requirements	Simple dosing, high requirements on the mixer	Accurate continuous dosing (weighing bin necessary), low requirements on the mixer

The plant structure for discontinuous mixing systems largely depends on the mixer and the weighing bins. Material is fed to the weighing bins from the storage silos with flow-control gates either directly over short distances or via fluidslides installed in between to cover lengthy distances from the more remote silos to the weighing bins.

Microcomponents and additives are supplied to the mixer via a Big-Bag station and a downstream precision weighing system. IBAU Pumps are used to convey the mixed products from the mixer post bin to the finished product silos. A direct bulk loading is also possible. Dispatch of the finished products is via efficient loading equipment with capacities of up to 250 t/h.

Given the large number of components and finished products with discontinuous mixing systems, multicompartment silos with a multicompartment silo design for 20 silo cells and more are generally used for storage. The size of the individual silo cells mostly range between 100 and 3000 t, with the complete storage capacity being in the order of 1500 to 10,000 t. Silo feeding is performed directly via the company's own grinding plants and can additionally be carried out with 1-2 pneumatic pressure vessel car discharge systems with capacities up to 120 t/h. With multicompartment silos the mixing plant and dispatch system are incorporated in the silo. IBAU HAMBURG has built a range of multicompartment mixing silos with a design that has been adapted to the individual requirements and/or the local circumstances.

IBAU HAMBURG has launched a special plant concept featuring structural steel offering an alternative to conventional multicompartment silos built as concrete structures. This is particularly relevant when extensive silo capacities are already available for the main components. The plant is built entirely of structural steel, and the silo cells for the secondary components and finished products are equipped with a discharge cone, which is equipped with pneumatic aeration systems. The plant concept is largely modular in structure and allows a fast construction and subsequent extension thanks to a simple incorporation of the plant.

Such plants are designed for annual capacities of approx. 150,000 t of special cements and special binding products.

	IB-M 2500	IB-M 3000	IB-M 4500	IB-M 6000	IB-M 8000
Throughput m^3/h at 25 mixing cycles/h	47,5	57,5	85	115	165
Gross volume m^3	2,5	3,0	4,5	6,2	8,9
Net volume m^3	1,9	2,3	3,4	4,6	6,6
Required power kW	45	55	75	90	110

Table 2: Technical data batch-type mixer

Finished product transport with IBAU Screw pump

The IBAU HAMBURG Mixing Plants for the Cement Industry

Continuous mixing system

Continuous mixing plant, LAFARGE CIMENTS, Martres, France

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

Clinker grinding plant with multicompartment silo and mixing plant, Holcim (France) S.A., Val de Seine

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

Discontinuous mixing plant, HOLCIM, Antwerp, Belgium

The IBAU HAMBURG Mixing Plants for the Cement Industry

Discontinuous mixing system

Multicompartment silo with integrated batch-type mixing system, SPENNER ZEMENT, Erwitte, Germany

Multicompartment silo plant with integrated batch-type mixing system, LAFARGE ZEMENT, Karsdorf, Germany