IBAU HAMBURG

A MEMBER OF THE HAVER® GROUP

Information

IBAU HAMBURG
Marine Cement Terminals

The IBAU HAMBURG Marine cement terminals

Terminal projection

Although cement terminals have been built for over 30 years, cement terminal design has still not reached a point of maturity. This is most clearly seen at large cement terminals with high capabilities, where capital charges can range between 12 and 35 million US Dollars.

How can such large gaps in capital charges be explained?

The gap between a 60,000 tons flat storage warehouse and a dome storage of equal size is approximately 2.5 to 3 million US Dollars. The gap between various ship unloading systems can be in some cases up to 1 million US Dollars, however, in most cases it is much smaller. One case might be restrictions to a specific terminal site that have to be overcome, for example a poor docking situation that has to be improved.

Terminals also might have different uses: one terminal might be used only for loading cement onto trucks, others also for loading cement further onto river barges, onto railway waggons or into bags.

Even when all these factors are taken into consideration there can still be a large gap of capital, which can only be explained by differences in terminal design.

For terminals with relatively low throughput and expected short life-time the focus should be on low capital investments.

For terminals with high throughput and long life-time larger investments and a focus on keeping operational and shipping costs low should be considered. As a matter of fact the applied technical solution arises from an evaluation of the specific handling costs per tonne of cement.

Operational and capital charges of a cement import terminal comprise approximately 15% of the cement price. Depending on the terminal concept and local market conditions, payback times of 2-5 years on the terminal investments are possible. In a payback calculation the investment costs for the required storage capacities and ship loading/unloading rates are essential as are time schedules and terminal logistics.

There is no terminal design applicable to all situations. Each concept has its advantages and disadvantages, which have to be weighed up carefully against one another.

First of all it is necessary to consider the question of the anticipated service life.

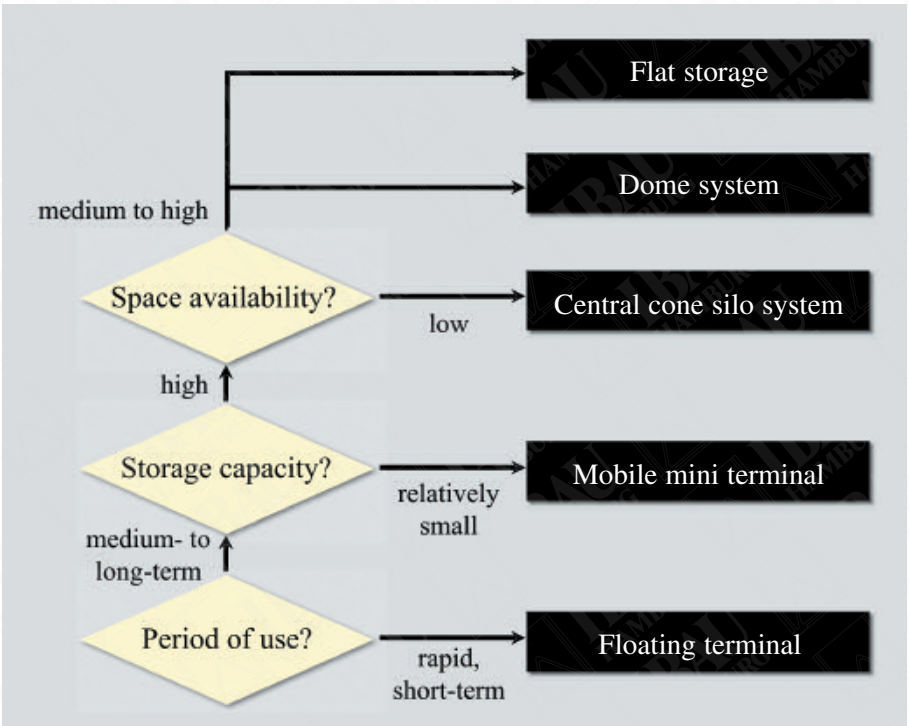
• For a rapidly available, short-term utilisation of only a few months the **floating terminal** is the most suitable technical solution.

• For medium – to long-term use with low handling capacities a **mobile mini terminal** can be advantageous.

• For medium – to long-term concepts with high handling capacities traditional **silo plants, dome systems** and **flat storage systems** come into consideration.

Each design can integrate mechanical and pneumatic equipment.

The best options have to be selected by knowing individual customer requirements and evaluating the specific handling costs per tonne of cement.



Floating terminals

Floating terminals require no shore-based buildings. The floating terminals are chartered for a short period of time, to handle temporary peak cement demand, with storage capacities of typically 5,000 to 60,000 t.
On deck of the floating terminals ship unloading systems are installed. The cargo holds can be designed as a self discharging unit. Ideally the cargo holds can be used for the storage of different type of materials like fly ash, GGBS or mixed cement. They are tied up at a dock in the entry port and can be operated without any shore facilities to handle cement and transport it directly on trucks/rail cars. With integrated packers, both bulk and bagged cement can be handled. With a floating terminal it is possible to enter a port and start operations immediately, without land lease or construction permission.

Charter costs, port fees and handling expenses might make this option unattractive.

Illustration of a floating terminal

The IBAU HAMBURG Marine cement terminals

Mini terminals

If no intermediate storage is needed a road mobile ship unloader can be used for loading cement directly onto tanker vehicles. These ship unloaders are used for cement carriers of up to 10,000 dwt for relatively low handling frequencies at several locations. Trailer-mounted mobile ship unloaders require a high degree of manoeuvrability. Starting from the transport position IBAU Mobile ship unloaders are ready for use in only 20 minutes.

Regardless of their size the ship unloaders have up to four separate screw conveyors. Vertical screw 1 picks up the material assisted by a counter-rotating outer screw. Vertical screw 2 raises the material to the conveying height required for onward transport.

Screw 3 provides the horizontal transport from the hold to the material transfer point, its highest efficiency being reached with a downward slope. A fourth screw (loading screw) loads the material directly into a silo trucks.

It is possible to traverse screw conveyors 1 to 3 so that all areas of the hold can be reached from a given position. As a result the individual screws can be tilted or rotated within fixed angles.

In conclusion, the complete unloading is made possible by the unique IBAU HAMBURG technology.

Road-mobile ship unloader in Saudi Arabia

Stationary ship unloader at Bamberg Harbour, Germany

Port-mobile ship unloader for Tong Yang Cement Corporation, Korea

Road-mobile ship unloader for Betoncem, Port of Savona, Italy

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Silo systems

Import and export terminals with central cone silos of 20,000 t capacity or more are built for long-term service.

Their great advantage lies in the fact that they require little space. In multi-compartment silos it is also possible to store different types of cement on a very small ground area. Loading equipment for vehicles – as well as mixers and packing plants – can be integrated within the silos.

Limitations to this concept are higher investments and a permanent structure.

An example is the Davenport cement export terminal of Goliath Cement in Australia with a 20,000 tons storage capacity. The installation comprises two IBAU Silos of 18 m diameter and 42 m height.

From these silos a cement carrier is loaded via 4 IBAU Pumps at a rate of 1,200 t/h. In combination with IBAU Self-unloading ships, the low operating costs and a high degree of automation make this terminal design particularly interesting for long-term capital projects.

For storage capacities of up to 2,000 tons the trend is to use steel silos, as for example in Bamberg, Germany and on Mayotte Island for Sacima Port de Longoni.

Export terminal for GOLIATH, PORTLAND CEMENT, Devonport, Australia

Marine Cement Terminal for Cement Industries (Sabah) Lahad Datu, Malaysia

The IBAU HAMBURG Marine cement terminals

Marine Cement Terminal for Cementa A.B /

HeidelbergCement Group, Malmö, Sweden

The IBAU HAMBURG Marine cement terminals

Terminal with steel silos for SACIMA, Port of Longoni, Mayotte Island, France

Cement carrier during loading at the Brunsbüttel terminal, HOLCIM, Germany

Cement import terminal for CEMEX, Pichilingue, Mexico

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Dome systems

Dome silos have become popular for storing a single type of cement.

The ground area used and the required construction time for dome silos lie between those for cone silos and flat storage systems. Separate buildings are required both for cement loading and cement packing. At some sites converted oil tanks have also proved to be useful as cement stores.

Nowadays, instead of mechanical systems, panel aeration systems are used for cement discharge.

The silo bottom consists of three aeration levels with different sectors to allow a material discharge of 400 t/h.

Only 0.16 kWh/t are required for the fully automated and nearly maintenance-free silo discharge.

This storage has the following benefits:

- Low civil-building costs with regard to the foundation soil
- Short construction time
- Low energy requirement for the silo discharge system
- Low maintenance costs
- High availability of silo volume

  Material reclaiming according to the first-in/first-out system
- Dust-free feeding and discharge

Dome silo station and rail waggon loading at LEHIGH CEMENT COMPANY

Illustration of a dome silo

GLENS FALLS LEHIGH CEMENT COMPANY
Allentown, PA, U.S.A.

Terminal Providence
U.S.A.

CEMENT TERMINAL

New dome storage silo in the Providence Cement Terminal

1 Pneumatic discharge system for a cement dome storage silo Type IB-L/MR/HR

silo diameter 42 m
silo height 34 m
silo capacity 40,000 m^3

External ring – first aeration level

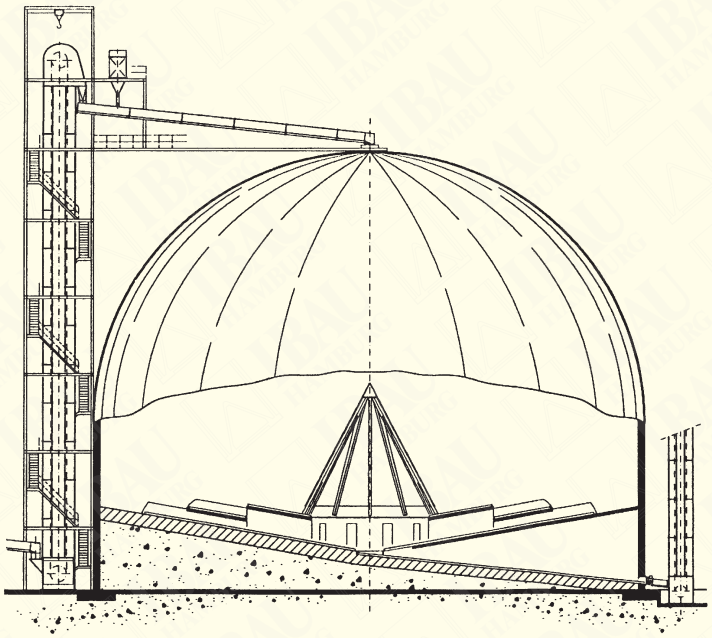
The external ring is divided up into 10 aeration sectors, each sector consisting of two aeration surfaces inclined towards each other and two radially aligned discharge fluidslides inbetween. This results in a total of 20 aeration surfaces and 10 discharge fluidslides. For material discharge the surfaces are aerated sequentially.

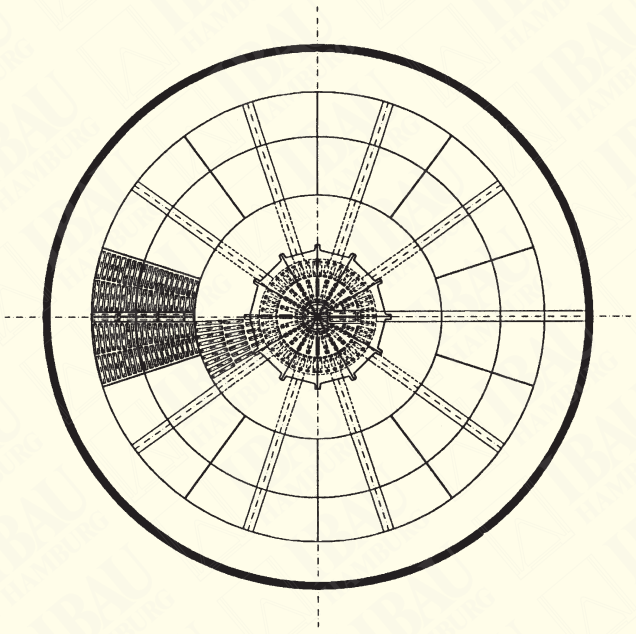
Second aeration ring

The second aerating ring (second level) is aerated using the same method as for the external ring.

Interior of silo – third aeration level

This level consists of twelve aeration sectors which are also aerated in sequence.





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Flat storage

Flat storage terminals are best suited for medium – to long-term service.

This is a low cost solution, especially when an existing warehouse can be converted into a material storage installation or if the buildings need to be used later for other purposes.

The short time required to bring about the necessary approvals and the short building times also favour this concept.

The technology that has to be integrated is the most sensible part of flat storage systems. The most common method is to use front end loaders inside the dust- tight building.

The front end loader reclaims the cement mechanically and transports it to a collecting hopper.

From the collecting hopper a vertical transport to a separate building for truck or railcar reloading is usually necessary.

The other very interesting reclaiming technology which also complies with the standards is discharge by panel aeration, such as it is used in floating terminals or dome silos.

For Antilles Cement, Puerto Rico, IBAU HAMBURG has installed a fully automated cement discharge system for the reloading of 200 t/h cement, 24 hours a day and 7 days a week.

Illustration of a

flat storage terminal

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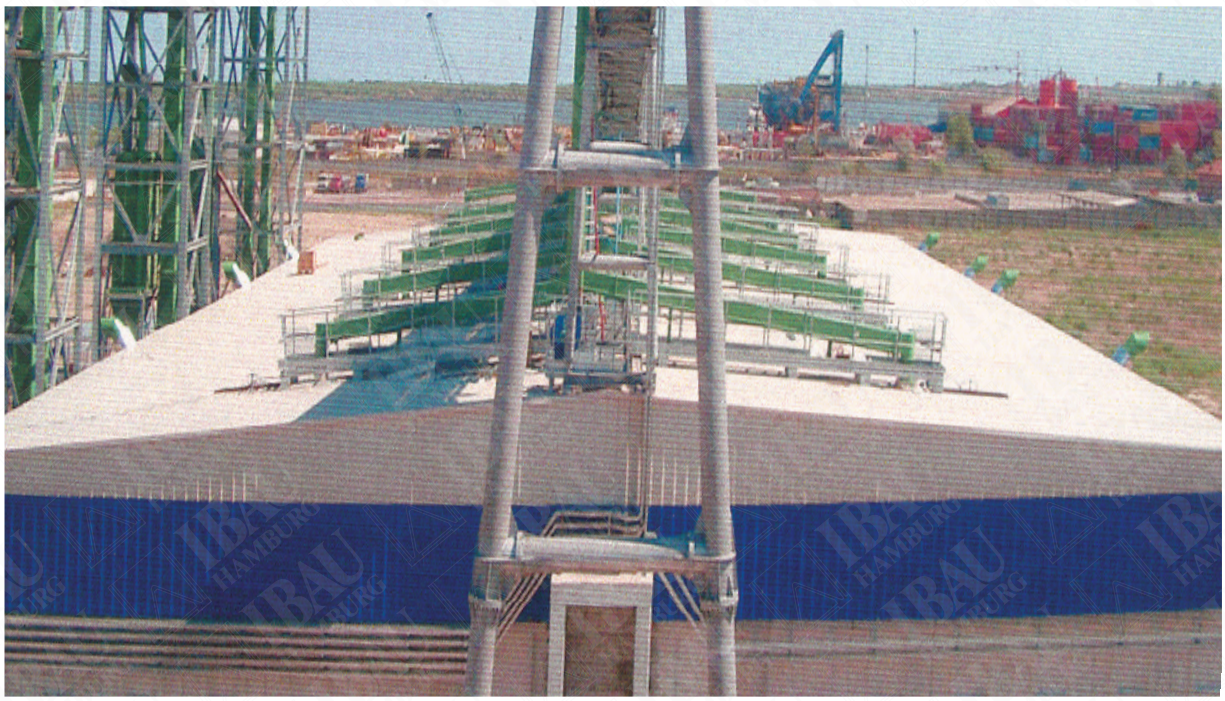
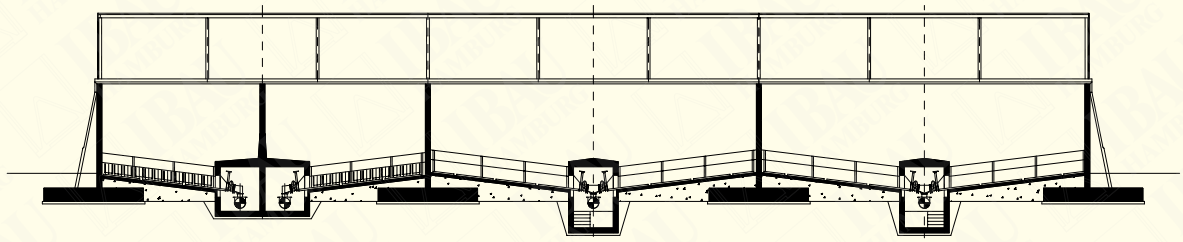
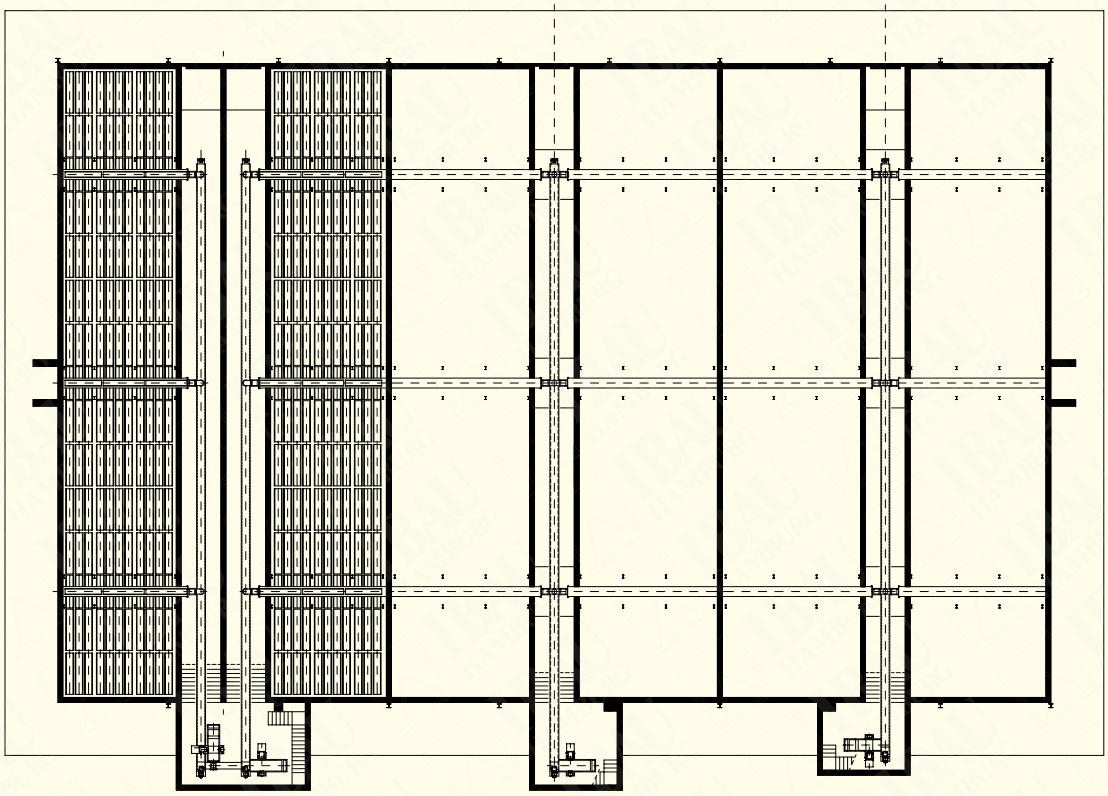
Ship unloader feeding a flat storage hall, DECIROM, Constanza, Rumania



Flat storage hall for BUZZI UNICEM spa., Ravenna, Italy





BUZZI UNICEM SPA
Casale, Italy

CEMENT TERMINAL
WITH FLAT HALL

1 Flat hall
with 4 compartments

storage capacity	22,000 t
hall length	60 m
hall width	38 m
hall height	12 m
cement filling height	8 m

2 Compartments

storage capacity	2 x 3,600 t
dimension	10 x 38 m

2 Compartments

storage capacity	2 x 7,400 t
dimension	20 x 38 m

Flat hall discharge

capacity each compartment	80-200 t/h

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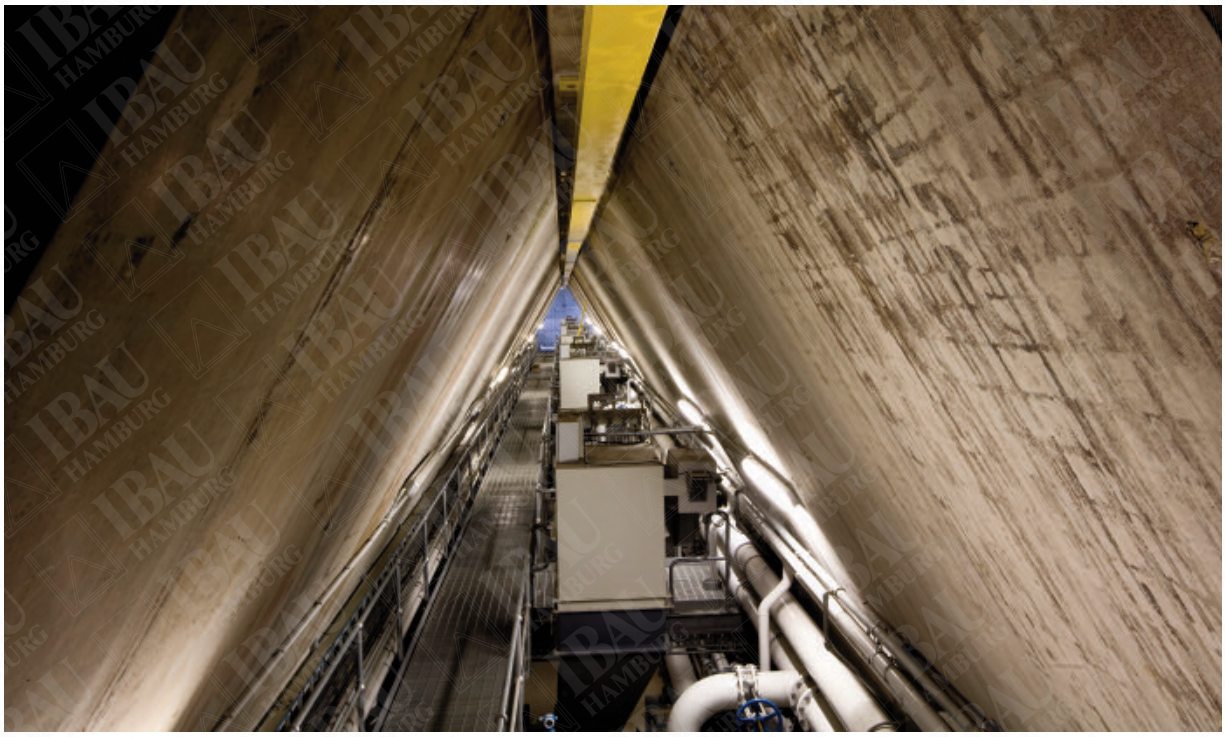

View of the tunnel between the compartments of the flat storage hall

Compartment with fluidslides installed on the bottom

Flat storage hall, Golden Bay Cement, Auckland, New Zealand

The flat storage terminal is designed for 30,000 tons of cement in a 4,750 m³ building. The partition walls for the cement hall are made of prefabricated concrete, the storage height is about 6-7m.

The floor is fully equipped with standardized fluidslides and divided into 18 sections, 6 of which always transport the cement to a horizontal screw conveyor, located in a 45 m tunnel.

From the total 3 horizontal screw conveyors the cement is lifted via vertical screws to a combined fluidslides conveyor, which transports the cement from the storage to the reloading station.

The reloading station includes 3 bulk loading lines with IBAU Simplex loaders. The floor sections can be fluidised and emptied one after the other. Pressure switches and level indicators over the complete area ensure fully automated feeding and discharge. A similar flat storage terminal was built for BUZZI Cement in Ravenna, Italy.

Flat storage	short construction time low cost solution
Dome system	less foundation work
Central cone silo system	minimum footprint low operation and labor cost
Mobile mini terminal	minimum of investment
Floating terminal	no shore facilities attractive for booming markets

Conclusion

Terminal concepts by IBAU HAMBURG are based on a variety of advanced and reliable mechanical and pneumatic system components. Existing equipment can mostly be tied-in.

Technical competence and engineering from a single source contribute to finding the most cost-effective technical solution for each project and to ensure the subsequent functioning of the entire terminal system.

IBAU HAMBURG – THE STATE-OF-THE-ART

Raw meal blending silo,
Dyckerhoff Zement / Germany

Alumina silos with bulk loading,
Qatalum, Qatar

High capacity mixing plant
HOLCIM, Antwerp / Belgium

Coal-fired power plant
Mehrum / Germany

Ship unloader on rubber tyres for Continental
Florida Materials, Port Canaveral / USA

M.V. CEMSEA and M.V. CEMSTAR selfdischarging
cement carriers for Brise Schifffahrtsges. / Germany

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