Projection of Marine Cement Terminals

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ABSTRACT

Cement companies or traders that want to set up marine cement terminals have different options to realise a project. Terminals with relatively low throughput and expected short life-time have to focus on small capital investments. Terminals with high throughput and long lifetime consider larger investments and focus on keeping operational and shipping cost small. As a matter of fact the technical solution arises from an evaluation of the specific handling costs per tonne of cement. In the paper different marine terminal solutions of IBAU HAMBURG around the world will be presented. Included are latest projects in Europe, Africa, Asia and the Americas. The complete technology from ship unloading to packing will be described. The best options have to be selected by knowing individual customer requirements.

TERMINAL PROJECTION

Operational and capital costs of a cement import terminal comprise approximately 15% of the cement price. Depending on the terminal concept and local market conditions, pay-back times of 2-5 years on the terminal investment costs are possible. In a pay-back calculation the investment costs for the required storage capacities and ship loading/unloading rates are essential in addition to time schedule and terminal logistics. **Fig. 1** demonstrates that there is no universal terminal design. Each concept has its advantages and disadvantages, which have to be weighed up carefully against one another. First of all it is necessary to answer the question of the anticipated service life. For a rapidly available, short-term utilisation for 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 and dome systems both come into consideration as well as flat storage systems. Each concept 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.

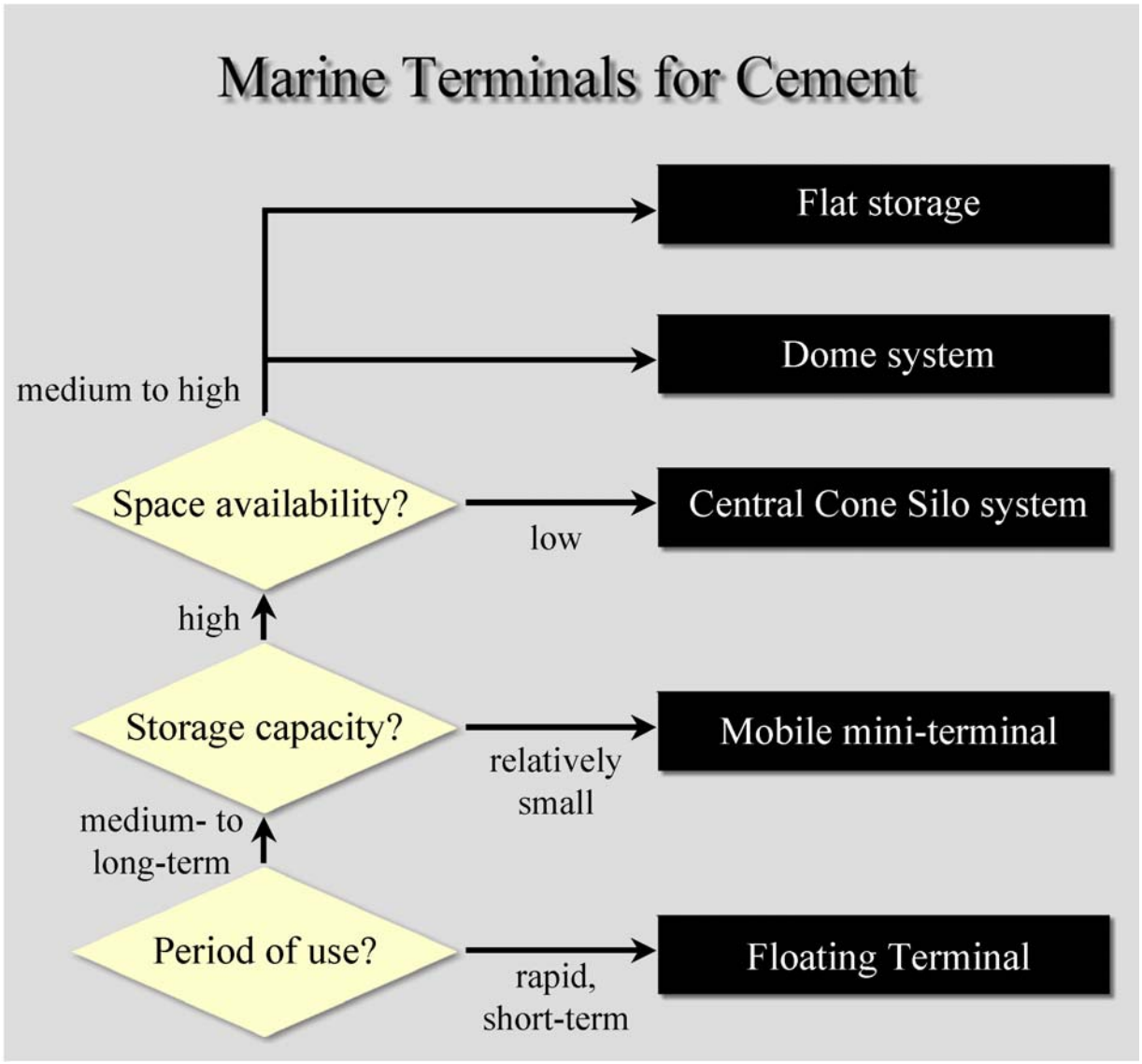
Marine Terminals for Cement
Flat storage
Dome system
medium to high
Space availability?
low
Central Cone Silo system
high
Storage capacity?
relatively small
Mobile mini-terminal
medium- to long-term
Period of use?
rapid, short-term
Floating Terminal

Fig. 1

FLOATING TERMINALS

Floating terminals require no shore-based buildings on land. The floating terminals are chartered for a short time period, to handle temporary peak cement demand, with storage capacities of typically 5,000 to 50,000 t. 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 operation immediately, without land lease and construction permission. **Fig. 2** illustrates a floating terminal installation with continuous ship unloader, pneumatic discharge equipment with panel flow aeration and downstream packing unit with direct bulk and bag reloading. Charter costs, port fees and handling expenses eventually make this option unattractive.

Fig. 2

MINI TERMINALS

lf no intermediate storage is needed a road mobile ship-unloader **(Fig. 3)** can be used for loading cement directly into tanker vehicles. These ship unloaders are used for cement carriers of up to 10000 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 operational in only 15 minutes. For permanent use ship unloaders need not to be mobile, as one example in Bamberg in Germany demonstrates. The stationery ship unloader **(Fig. 4)** for the port authority in Bamberg had to be integrated in a very narrow space and therefore can be rotated and also folded together to stay in a parking position. The ship unloader feeds either a belt system for an adjacent cement terminal, or rail cars for direct reloading.

Fig. 3

Fig. 4

SILO SYSTEMS

Import and export terminals with central cone silos of 30000 t capacities or more are built for long-term service. Their great advantage lies in the low space requirement. In multi-compartment silos it is also possible to store different types of cement on a very small ground area. Loading equipment for vehicles, and also mixers and packing plants, can be integrated within the silos. Limitations to this concept are the higher investment costs and the permanent structure. **Fig. 5** shows the Davenport cement export terminal of Goliath Cement in Australia with 20000 tons storage capacity. The installation comprises two IBAU 18m diameter silos with 42 silo height. From these silos a cement carrier is loaded via 4 IBAU pumps at a rate of 1200 t/h. In combination with IBAU self-unloading ships the low operating costs with a high degree of automation make this terminal design particularly interesting for long-term capital projects. The import terminals require no own ship unloading equipment. For storage capacities up to 2000 tons there is a trend to steel silos.

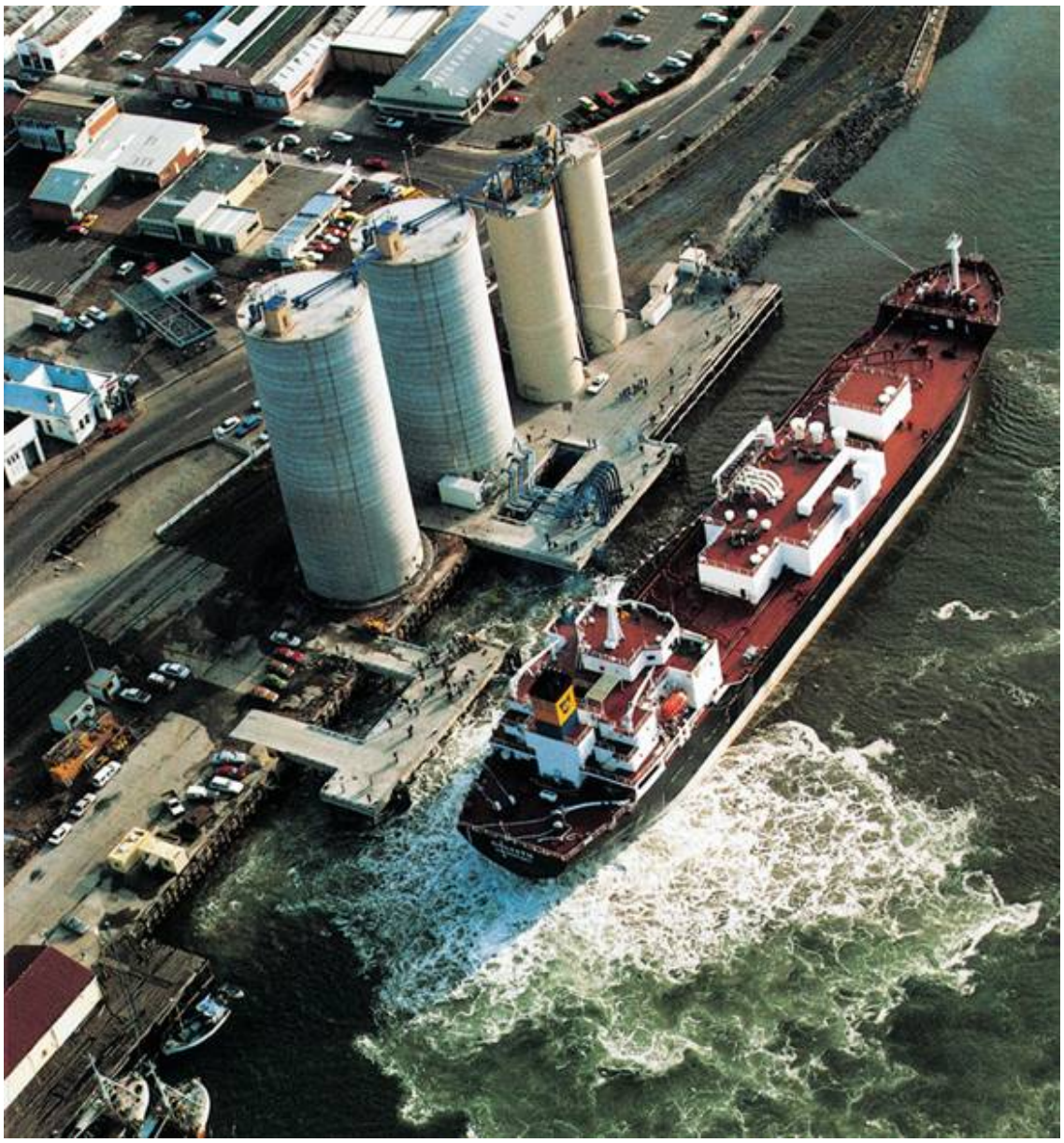

Fig. 5

DOME SYSTEMS

Dome silos have become popular for storing a single type of cement. The ground area and also the requisite construction time, lie between those for cone silos and flat storage systems. Separate buildings are required both for cement loading and for cement packing. At some sites converted oil tanks have also proved successful as cement stores. Nowadays instead of mechanical systems, panel aeration systems are used for cement discharge. IBAU HAMBURG has equipped a Dome-silo for Glenn Falls Lehigh Cement in Allentown, USA. The silo (**Fig. 6**) has 42 m diameter and a capacity of 40000 tons. The silo bottom consists of three aeration levels with different sectors to allow a discharge of 400 t/h and an emptying degree above 97%. Only 0.16 kWh/t are required for the fully automated and nearly maintenance-free silo discharge. Downstream bulk loading silos are fed via a bucket elevator.

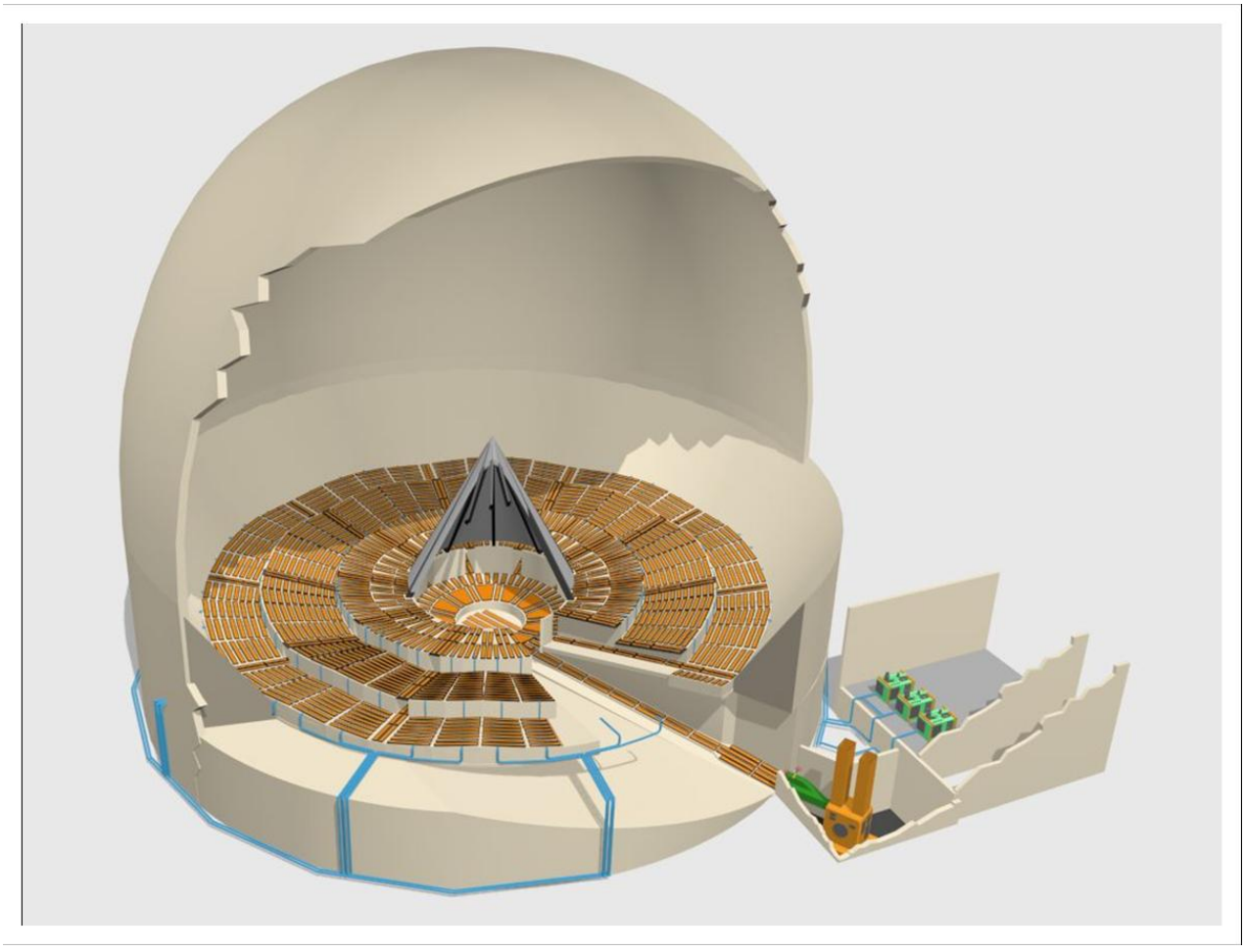

Fig. 6

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 building can be converted into a material storage installation or when the buildings later need to be used for other purposes. The short time required to obtain approval 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 simply to use front end loaders inside the dust tight building. The front end loader reclaims the cement mechanically and transports it to a collection hopper. From the collection hopper normally a vertical transport to a separate building for truck or railcar reloading is necessary. The other most 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.

Dangote Group, the main Nigerian cement importer awarded IBAU HAMBURG within the last 3 years in total 4 flat storage systems, two with high capacity ship unloaders. The first system was supplied to Dangote in 1999 for Lagos Harbour. The ship unloader can move on rails over a distance of 100 m and can unload seagoing vessels of up to 30 000 dwt. The cement is transported from the ship unloader to the storage building on two belt conveyors with lengths of 130 and 150 m. The cement is distributed in the storage building via IBAU fluidslides. In 2000 Dangote placed an order for an IBAU 600 t/h ship unloader and flat storage system for Port Harcourt (**Fig. 7**). Cement is transported from the wheel mounted ship unloader via a 130m belt conveyor, 2 vertical screw conveyors and a fluidslide system into the storage building. The total 4 flat storage systems are equipped with eight 12 spout Haver+Boecker rotary packers for a combined capacity of more than 25000 bags/h.

Fig. 7

For Antilles Cement, Costa Rica, IBAU HAMBURG has installed a fully automated cement discharge system for reloading of 200 t/h cement, 24 hours a day and 7 days a week. The flat storage terminal is designed for 30000 tons cement in a 4750 m^2 building (**Fig. 8**). The partition walls for the cement hall are made from prefabricated concrete, the storage height is about 6-7m. The floor is fully equipped with standardized fluidslides and divided into 18 sections, of which always 6 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 fluidslide conveyor, which transports the cement from the storage to the reloading station. The reloading station comprises 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 build for BUZZI Cement in Ravenna, Italy (**Fig. 9**).

Fig. 8

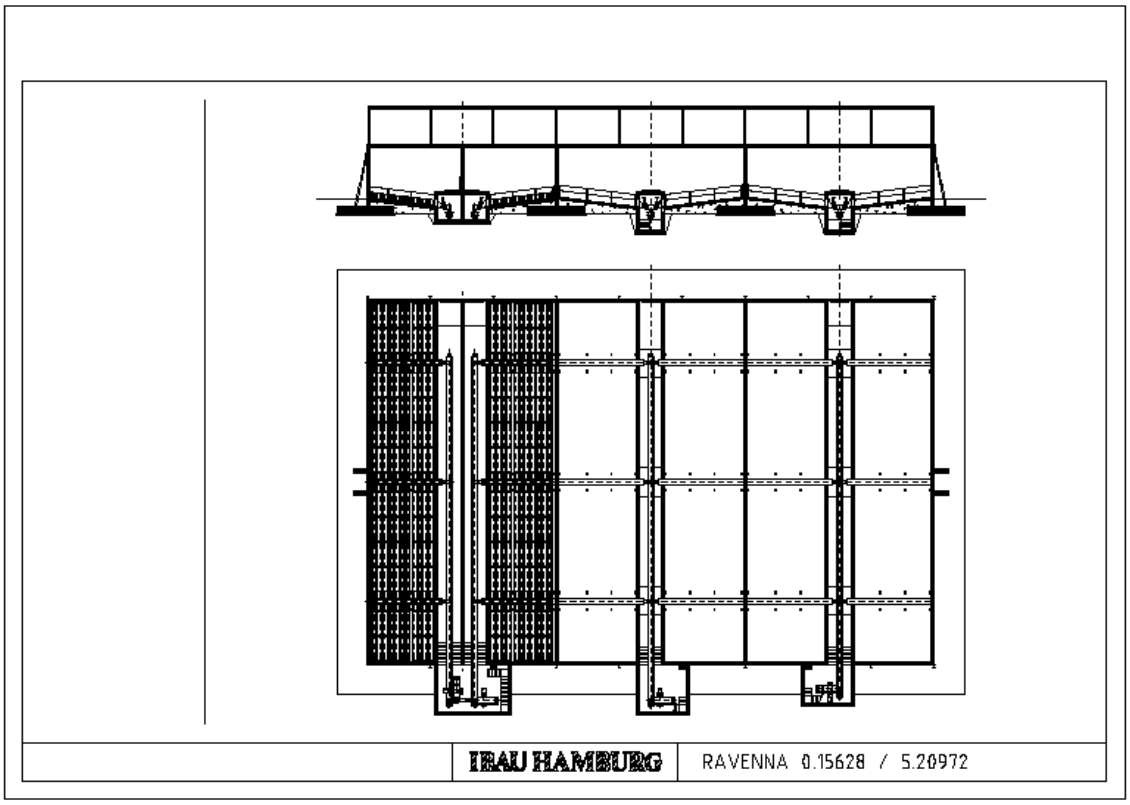

Fig. 9

CONCLUSION

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

Figures: