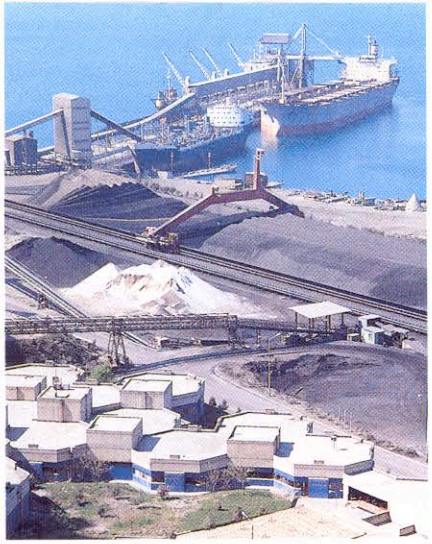


Effective exports

by Ad Ligthart, Cement Distribution Consultants

At the recent Cemtech Monaco conference, this paper, on managing cement exports successfully, was presented by the author. When deciding whether exporting is a viable option, two key questions are posed; is there a market and is exporting cement economical? These considerations are examined here and it is concluded that exporting need not just be limited to those plants with their own port and large storage and shiploading facilities. As long as 'effective planning' is implemented, even landlocked plants can efficiently export their surplus.

Cement exporting is not only limited to large purpose-built plants with their own (deep-water) port. In principle, most plants have the capability to export, even ones at a sizeable distance from sea. The production capacity of a cement plant is rarely ever completely in balance with the demand of its local market. Especially when a new kiln line is commissioned there will be a situation that production capacity will substantially exceed local demand for several years. Also economic downturns can create such a situation. In such cases it makes sense to sell cement (even at a substantially lower price) outside the local market area. In many cases this means exporting. Exporting in an over-capacity situation makes sense because of the following reasons:

- better use of plant capacity (lower operational cost per tonne)
- every export dollar earned above marginal costs adds to the bottom line
- exports generate foreign currency that can be used to pay back foreign debts.

However, even though it makes sense to export, there are two questions that need to be answered positively before exports really can be considered. The first question 'Is there a market?' is the most difficult one. This article limits itself to seaborne bulk cement trade. In 2000 approximately 70Mt was traded this way. Of this quantity, roughly 40Mt is traded over long shipping distances to about 76 terminals (that are capable of receiving general bulk carriers of 25,000dwt or larger). Almost half of these terminals are in the USA. Approximately 30Mt is distributed regionally (by self-discharging ships and small general bulk carriers) to roughly 105 relatively small terminals. On top of this, approximately 28Mt is shipped by sea domestically worldwide, mostly by self-unloading ships.

These numbers sound reasonably high but actually the international cement market is quite restricted. About 75-80 per cent of world cement trade is controlled by the large multinational cement groups. When a plant wanting to export is part of such a group, the trading company of that group will usually arrange to trade the surplus capacity to group markets that have a shortage or will find another export destination. For independent cement plants it is much more difficult to be able to find a suitable market for their cement.

Importers rely heavily on their cement suppliers. Interruptions in cement supply might put them out of business. Therefore, a relationship of trust needs to exist between importer and exporter and it takes time to develop such relationships. As the number of independent import terminals is relatively small and many of them have long-term relationships with their suppliers, it is difficult for newcomers to break into this part of the export market. Apart from the problem of finding a customer there is also the problem of meeting his requirements. He might want a cement quality that is different than the cement produced for the local market. Another important issue is that in most cases the cement will need to be certified by an authority accepted by the country of the export destination.

Figure 1: a typical situation of a cement plant designed for large-scale exports, located on a (deep water) port

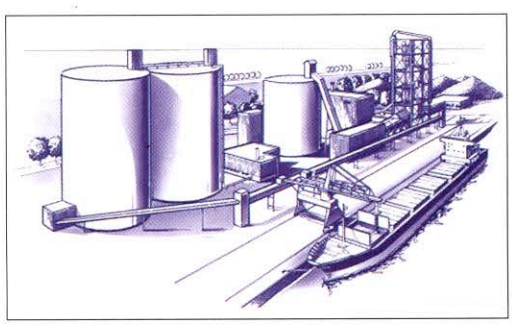
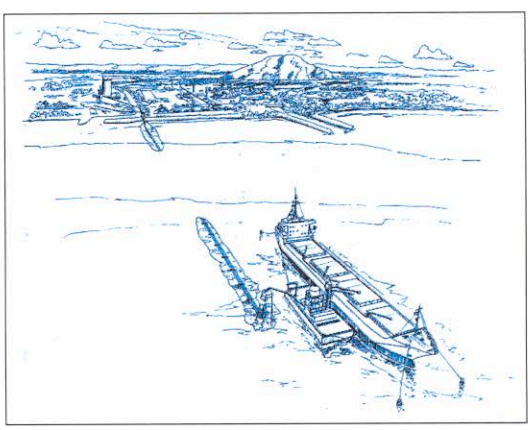


Figure 2: to export cement sometimes a port is not even required. A new development is a floating shiploading facility supplied by an undersea pipeline.



The second question is if exporting cement is economical. In general this will be the case if the FOB price of the cement is higher than the operational costs to produce the cement plus the transportation and loading costs. As a customer who buys and imports the cement is interested in the CIF price only, the achievable FOB price will be the CIF price that a competitor is able to offer minus the shipping cost to the customer. The shipping cost therefore is the main factor in determining if exports are economical. The other important factor is the transportation and ship loading costs.

Types of export operations

The cost of transportation of cement to the ship and loading it will be very dependent on the actual location of the plant in relation to the sea. In general, three types of export operations can be defined.

Export facility at the cement plant

This is the case when a cement plant is located on the seaside and has its own port. In most cases this port is used to receive coal and ship out cement and clinker. Such cement plants in general are purpose-built to export cement and have the suitable large storage capacity and high capacity shiploading systems for efficient export operations.

For cement plants that do not have their own port there is a new development, which is called an offshore loading facility. This consists of a (sheltered) mooring area for the seagoing ships, a floating ship loading system and an undersea pipeline between plant and loading system.

Inland cement plant with export facility in port

In this situation the cement plant is located at a distance from the port. The cement is transported either by truck, train or barge to the loading terminal in the port which consists of a storage facility and loading system.

Inland cement plant without export facility

It is possible to export without an export facility. The cement is then transported to the port by bulk trucks or barge and directly loaded into the ship.

This is a method which requires very little capital. However, a storage facility of suitable size is required at the cement plant as well as a very sizeable number of trucks or barges to transport the cement to the ship at an acceptable rate.

Export logistics

Quite often companies that are planning to export cement look only at their own export facility in respect to the operational logistics. Such a simplified picture is shown in Figure 5. In this situation the plant has a fixed production capacity, which is put into a buffer storage, from which domestic sales are provided on a daily basis and export sales on an intermittent basis. Export sales are made to customers A, B and C. When we only look at operational logistics in this limited way, just trying to load ships as quickly as possible on the date they come in, substantial problems will occur. The worst case situation will be when a ship from each customer arrives at the same moment. In case customers A, B and C each have a ship of 25,000t cargo capacity and the average loading rate is 7500tpd, 10 continuous loading days would be required. This not only causes considerable demurrage but it is questionable if the storage capacity of the terminal will be sufficient for this. The required minimal storage capacity is then the total of ship sizes A, B and C plus the daily domestic sales over the 10 loading days minus the production capacity of the plant over the 10 loading days. If the domestic sales are 4000tpd and the production capacity of the plant is 6000tpd, the required buffer storage would be 55,000t.

The situation that large ships have to wait a substantial time at a cement export facility to be loaded is not only unacceptable from a demurrage point of view but also there is a risk that, because of the delay, the import terminal of customer A, B or C might run out of cement.

The simple model shown in Figure 5 also has no answer to complications such as different types of cement for domestic and export sales, for seasonal changes and so on.

It is possible to prevent or minimise ship waiting days. Export terminals can have storage facilities that are actually

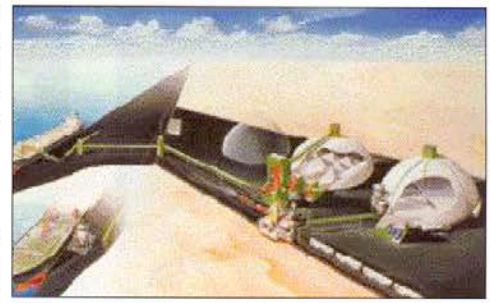
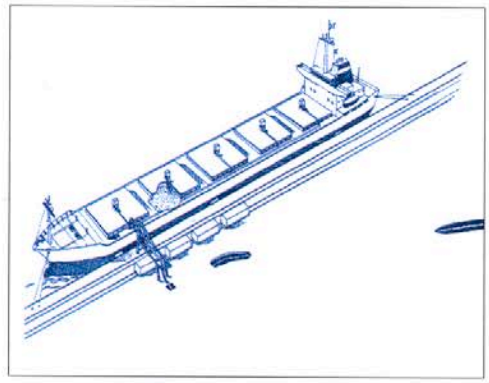


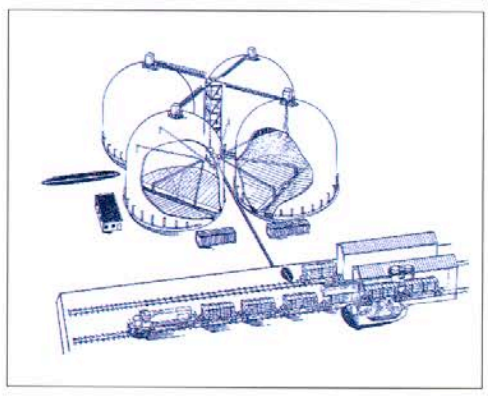
Figure 3: the new Saudi Cement export terminal in the port of Dhahran is located 50km from the cement plant and can handle both clinker and cement and is supplied by trains and trucks

Table 1: example

	30 day voyage	15 day voyage
Deadweight (t)	26,500	26,500
Fuel (t)	1200	600
Freshwater (t)	100	60
Other consumables (t)	20	15
Cargo capacity (t)	25,180	25,825

Figure 4: a cement export facility designed to export cement from several plants and receive cement from railway hopper cars from plants as far as 500km away





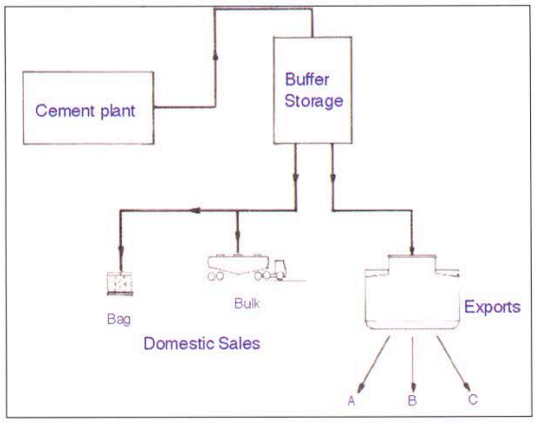


Figure 5: when export logistics are limited to the export facility only, there is a risk ships from different customers will arrive

smaller than the largest ship that they have to load. Capital and operational costs of export facilities can be minimised without sacrificing overall export capability. The way to achieve this is to use overall distribution logistics and continuous planning.

Overall distribution logistics takes into account the operation of the import terminals of the customers, the shipping, as well as the export facility operations. As Figure 6 shows this is a far more complex model. The model for a single cement plant that supplies the domestic market with one type of cement in bulk and bags and exports a second type of cement to three different customers already has over 25 variable factors. Co-ordination between importers, shipping companies and exporter is often fairly crude. The importers have an annual contract of a cement supply, which usually specifies a minimum and maximum possible quantity that will be purchased. They will usually give a month notice or so for a ship to be loaded at the port facility. At that moment the exporter has to arrange that he has sufficient cement of the right quality on the moment that the ship arrives. The shipping company then has to arrange that a ship will arrive at the plant as close as possible to that date. If several customers give notice at the same time, a problem will occur that even with a month to go will be difficult to resolve.

It is possible to prevent these situations by better communication between importers, exporters and shipping companies with a planning system based on forecasts of six months to a year ahead which are daily updated with actual information.

The basis for such a planning system can be a relatively simple spreadsheet that consists of a section for each import operation, sections for shipping and one section for the export facility. These sections interact.

The basis for the whole cement distribution operation are the sales of the import facilities. The way in which these sales trigger the order for the next ship with cement is shown in Figure 7. The graph shows the quantity of cement in the storage facility. The middle line shows on the left side of the actual date the actual quantity of cement in the storage. On the right side the line represents the forecasted quantity in the storage facility. A forecast is almost never fully accurate but in most cases it will be known within which boundaries the accuracy of the forecast will be. This is shown in the lines above and below the forecast. The upper line represents the quantity of cement in stock at the maximum deviation when sales are lower than forecasted. The bottom line shows the stock at maximum deviation when sales are higher than forecasted. The horizontal line is the size of the storage facility.

An import terminal must never run out of cement. Therefore the latest date that the ship with cement can arrive is the date where zero stock is reached at maximum possible sales. The earliest possible date that the ship can arrive is when the storage facility can hold its cargo capacity. As it will take time to unload the ship the vessel actually can arrive earlier (see Figure 7). The time it can arrive earlier is equal to the required unloading time of the ship.

What we can see from the graph is that the shipsize is extremely important in respect to the earliest date that the ship can arrive at the terminal. For example, a terminal that has weekly sales of about 5000t will be able to receive a ship of 30,000t a week earlier than a ship with 35,000t of cement.

Figure 8 shows the basic spreadsheet calculation behind this graph. The spreadsheet is based on a forecast but is updated every day with the actual figures. The spreadsheet shows the period within which the terminal needs to receive its next shipment.

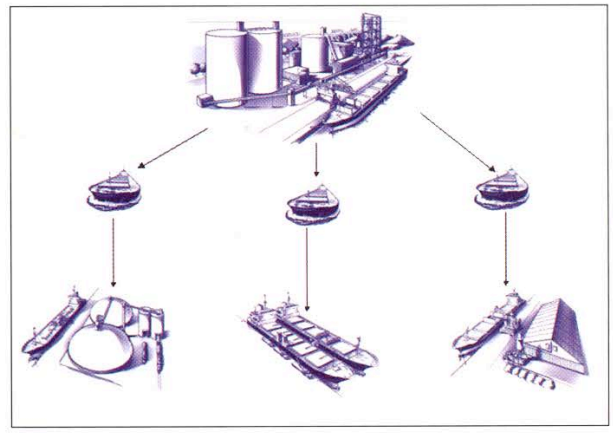
Shipping also has a number of variables. These can best be identified by reviewing a typical voyage of a bulk carrier of approximately 35,000dwt.

The deviation time between longest and shortest shipping time is 12 days. We can see that from the moment the ship is being loaded at the cement export facility the possible deviation in the shipping time is quite small. The largest deviation can occur when finding a suitable ship and directing it to the cement export facility and the possible waiting time at the cement export facility. This waiting time can be caused because another ship is being loaded or because the required quantity of cement is not yet available. When an import terminal does not give an order for a fixed quantity on a fixed date but allows a range of ship sizes within a corresponding range of arrival times it will be possible to eliminate

Table 2: typical voyage of a bulk carrier of approximately 35,000dwt

Locating a ship and directing it to cement export facility	*20-25 days*
Waiting time at cement export facility	*0-4 days*
Loading time at cement export facility	*4-5 days*
Sailing time to import terminal	*15-16 days*
Unloading time	*4-5 days*
Shipping time	*43-55 days*

Figure 6a: export management needs to take into account the complete distribution system



waiting times at the cement export facility and reduce the deviation time to locate a suitable vessel, as a much larger selection of ships will be available and with that, more optimal scheduling is possible.

The size of ship will influence the loading, sailing and unloading time. Therefore the actual length of the overall shipping time will have to be considered for each available vessel. The arrival time of the ship at the cement export facility is based on a forecast. The shipping manager has to check daily if the time frame for the forecasted ship arrival still corresponds with the required time frame within which the ship has to be loaded to be in time to supply the import facility.

In respect to ship size one remark needs to be made. Many people confuse the deadweight (dwt) capacity of a ship with its cargo capacity. This is not correct. The deadweight capacity is the overall carrying capacity of the ship, which is not only the cargo capacity, but also the weight of fuel, fresh water and other consumables that are carried. On a long trip more fuel is required than on a short trip. On a long trip there fore the cargo capacity will be less than on a short trip.

Export facility operations

When the operations manager of the export facility has a knowledge of the timeframes within which his customers need to receive their cement and has a knowledge of the range of ships that would be available to supply them, he can not only schedule the ships in such a way that waiting time is eliminated but also schedule that the required quantity of each type of cement is available on time.

Although the clinker production of the cement plant will be quite constant, the manager can influence the capacity of the grinding plant and with that make an optimal use of clinker and cement storage spaces. He might be able to produce and store bagged cement in quiet days and reduce or stop bagging when shiploading operations are taking place.

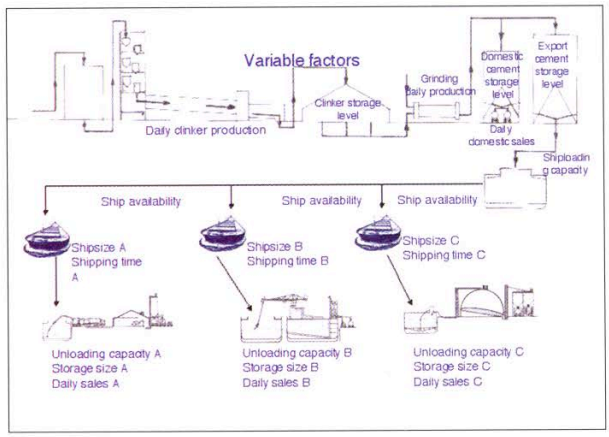


Figure 6b: variable factors in a complete distribution system

Figure 7: import terminal logistics

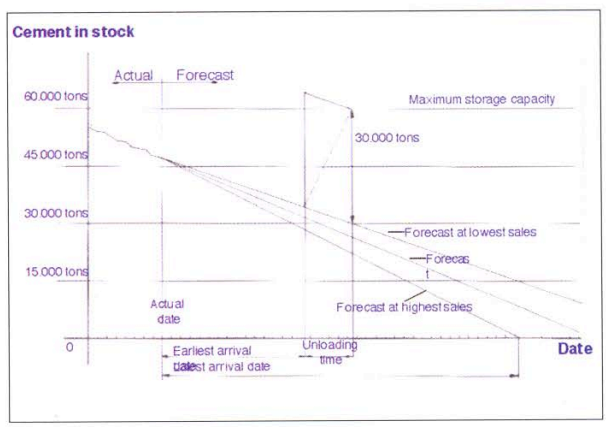


Figure 8: part of a large distribution spreadsheet in which the time frame within which the next ship must arrive is determined

Inventory / Ship scheduling Terminal A					Storage size	60.000 tons
					Scheduled ship size	35.000 tons
					Unloading capacity	7.500 tons per day
Date	Daily sales	YTD sales	Actual inventory	Actual unloaded quantity	Ship schedule	Scheduled inventory
13-09-01	942	183.262	38.241			38.241
14-09-01	923	184.185	37.318			37.318
15-09-01	362	184.547	36.956			36.956
16-09-01	0	184.547	36.956			36.956
17-09-01	892	185.439	36.064			36.064
18-09-01	900	186.339	35.164			35.164
19-09-01	900	187.239	34.264			34.264
20-09-01	900	188.139	33.364			33.364
21-09-01	900	189.039	32.464			32.464
22-09-01	450	189.489	32.014			32.014
23-09-01	0	189.489	32.014			32.014
24-09-01	900	190.389	31.114			31.114
25-09-01	900	191.289	30.214			30.214
26-09-01	900	192.189	29.314			29.314
27-09-01	900	193.089	28.414			28.414
28-09-01	900	193.989	27.514			27.514
29-09-01	450	194.439	27.064			27.064
30-09-01	0	194.439	27.064			27.064
01-10-01	900	195.339	26.164			26.164
02-10-01	900	196.239	25.264			25.264
03-10-01	900	197.139	24.364			24.364
04-10-01	900	198.039	23.464		7.500	30.964
05-10-01	900	198.939	22.564		7.500	37.564
06-10-01	450	199.389	22.114		7.500	44.614
07-10-01	0	199.389	22.114		7.500	52.114
08-10-01	900	200.289	21.214			51.214
09-10-01	900	201.189	20.314			50.314
10-10-01	900	202.089	19.414			49.414
11-10-01	900	202.989	18.514			48.514
12-10-01	900	203.889	17.614			47.614
13-10-01	450	204.339	17.164			47.164

Figure 8 shows the spreadsheet that the operations manager can use to plan his production, storage and deliveries based on the scheduled ship arrivals.

The individual spreadsheets shown here are only a small part of overall planning software. An important part of the program assists with forecasting. The program both forecasts and builds up an actual history as it is daily updated with actual figures. The program learns. It is capable to compare previous forecasts with the actual figures. It is capable to recognise seasonal influences. The program allows various possible schedules to be compared. Day by day it shows the manager the freedom and limitations within which he has to schedule his activities.

Conclusion

Many cement plants, during their lifetime, will be in a situation of having surplus production capacity for some time. It might be advantageous to export this surplus quantity. Exporting cement is not limited to plants which have their own port and large storage and ship loading facilities. It is surprising how even landlocked cement plants, using very simple means, can export their cement by ship.

To export cement effectively the complete cement distribution system, including import facilities, shipping and export facility, is considered. This allows for effective planning in which optimal use is made of storage facilities and equipment and in which ship demurrages and shortages of cement are prevented. A complete distribution system has many variables. With specific planning software that is capable to forecast key parameters on daily updated information, the export manager has an important tool to optimise his operations. Such software also can assist in developing distribution systems and designing the storage and handling facilities. ❐