Avoiding cement shipping problems

Introduction

Seaborne cement distribution is a complex combination of cement production and shiploading, shipping and the unloading and terminal operations. Relatively few people understand the overall requirements and the logistical factors behind them. As a result there are many problems that show at the moments were the cement production, shipping and import terminal operations interact. These problems can basically be divided into three categories.

1. Ship scheduling

   Ships have to be ordered quite some time beforehand. Even for small terminals using ships of about 5 - 10.000
   Dwt the notice time will be 4 - 6 weeks. For large bulk carriers, traveling for example between Asia and the USA the notice time can be about 10 -13 weeks. Scheduling ships therefore requires accurate forecasting of the sales of the import terminal over a substantial time frame. If this is done incorrectly the arrival of the ship can be too late, leaving the terminal empty and in a "no sales" situation. The ship can also arrive too early which means that there is not sufficient storage space for the cement cargo. Waiting days for the ship in port will be the
   result with considerable demurrage costs. But the problems do not only occur at the import terminal. An export facility will also face trouble. This can be because ships from several customers arrive at the same time to be loaded. The loading dock can be occupied by a vessel delivering coal to the cement plant. The cement plant might not have its exports in line with its production and be out of stock occasionally.

2. Ship loading and ship unloading

   The second source of problems and disputes in the interaction between terminals and ships. These problems can be too long loading and unloading times mostly caused by over optimistic estimations in combination with poor planning and organisation, often in combination with poor co-ordination between the terminal and shipping company / ships crew.

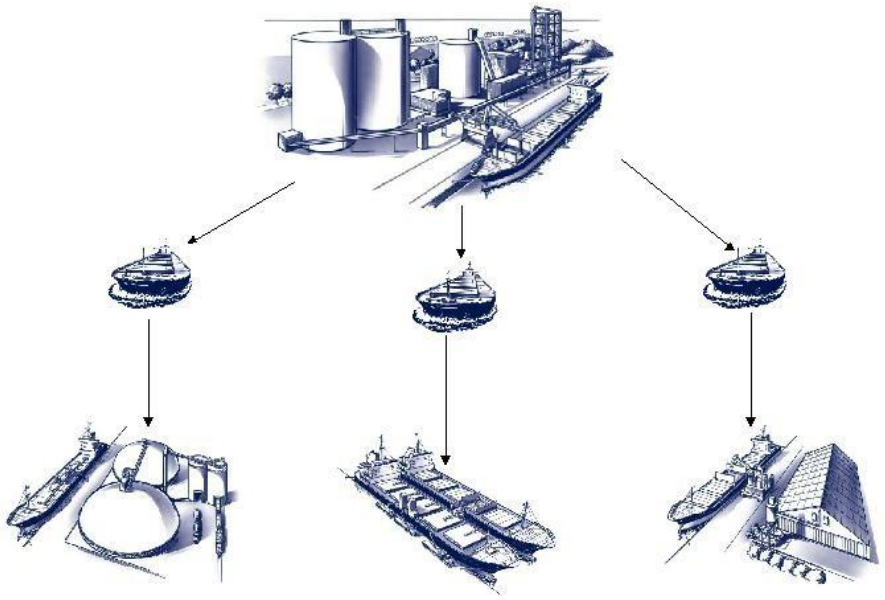
3. Damaged cement / Foreign objects

   Cement is often carried by older ships, sometimes with hatchcovers that are not completely water tight any more. When such ships enter stormy conditions the cement cargo can be damaged. Other problems can be foreign objects in the cement because of insufficient hold cleaning before loading or sometimes objects are loaded with the cement. Not only problems are caused in respect of sales of such cement but also delayed unloading operations and even damaged unloading and terminal equipment can be the result.

All above problems are common in seaborne cement distribution and are continuous causes for disputes. This is unnecessary as these problems can be prevented. This article will try to provide the background information of the interaction between shipping and loading and unloading terminals and a number of solutions how to prevent problems and disputes.

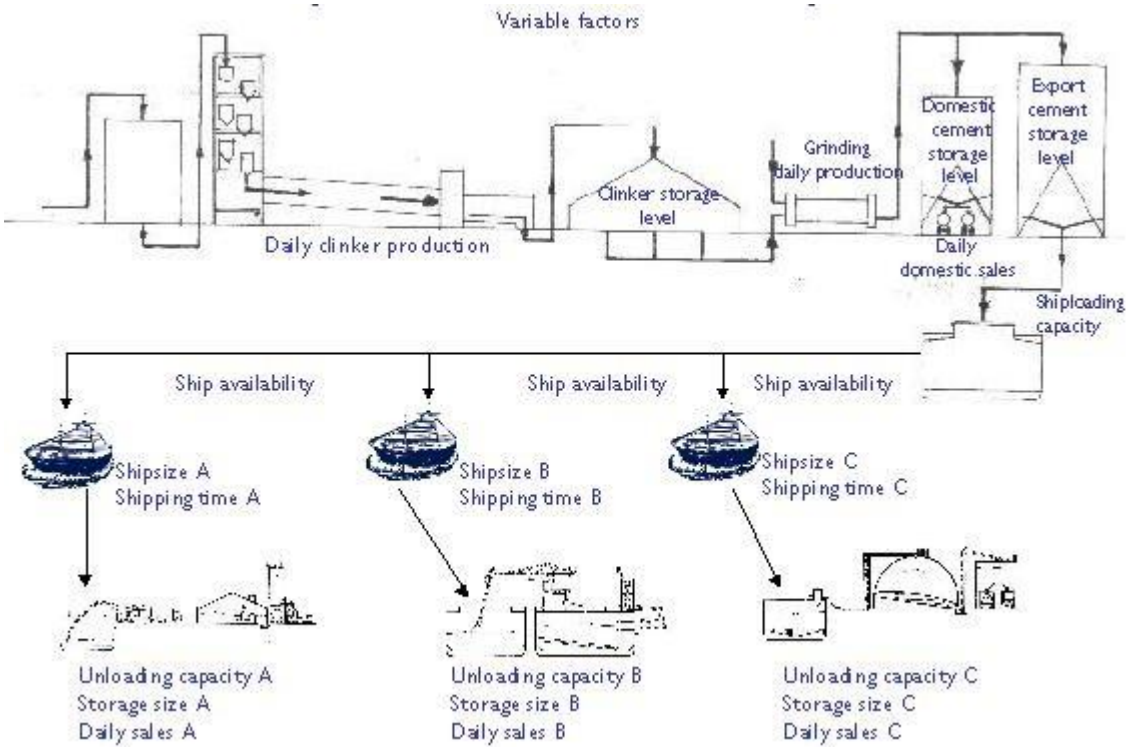
How to schedule ships properly?

Perspective of exporter



To get a ship with cement to a cement import terminal requires the following. The terminal manager has to determine when he can receive the ship. Based on sales forecasts he calculates the first day that the ship can be received at the terminal. At the required notice time he orders the cargo of cement. The shipping company then has the obligation to get a ship to the terminal as close as possible to the given date. It has to find a suitable ship that will be available in the right area close to the cement plant around the time of the required loading date. The ship has to sail to that loading port, get loaded and the sail to the import terminal. This looks quite simple but in fact it is quite difficult. We can understand this when we look at the situation through the eyes of the three parties involved. The cement producer and exporter in most cases does not sell its cement to one customer but to several. His main output will be sold in
the local area, with the surplus capacity being exported. His local sales will be regular deliveries into bulk trucks and in bags. This requires relative small finished product silos. The export sales however are irregular and in large quantities. Finished product silos are quite expensive and many export plants might have the storage capacity to load one large ship but get into trouble when several ships arrive at the same time or shortly behind each other. The situation becomes even more complicated when different customers require different qualities of cement or when the dock is used for other loading and unloading operations as well. The export manager continually has to juggle with his clinker production capacity, clinker storage size, grinding capacity, finished product storage space, domestic sales and export shipments.

Complete distribution systems - variable factors

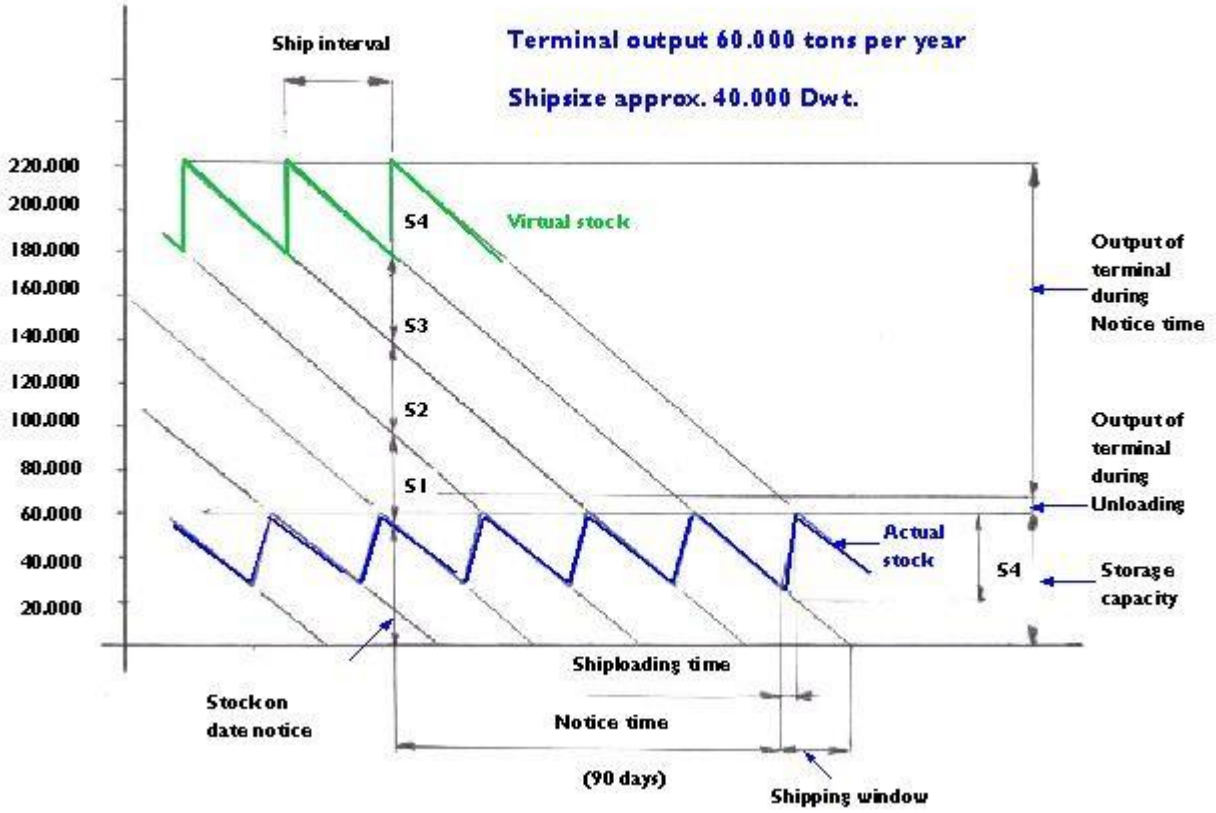


The perspective of the shipping manager does not really take above problems into account. Any waiting days at the cement export facility will be charged to the charterer. His prime concern is to minimise the (unpaid) ballast sailing days between paid cargo sailing days. He therefore has to look at the voyage before the cement voyage as well as the (expected) voyage after it. His other main concern is bunker costs. Fuel costs are a major cost factor in shipping and bunker prices can vary substantially between ports. It might be advantageous to divert a ship to bunker in a port with low prices for the Heavy Fuel Oil and Medium Diesel Oil that the ship needs. The shipping company has an obligation to deliver a cargo with cement as close as possible to the date given in the notice but most charter parties (The contract between shipping company and charterer) do not cover a time frame within the delivery has to be made and only allow the charterer to find another shipping company if the contracted shipping company is unable to deliver a cargo within a reasonable time frame. This is extremely difficult to near impossible. The charterer therefore is fully dependent on the quality and trustworthiness of the shipping company. The lack of charter parties to provide a financial incentive to the shipping company to take into account the scheduling situation of exporters and importers is a main reason for the overall problems of ship scheduling.

The manager of the import terminal has to give notice to the shipping company and exporter to order the next shipment. The notice time that has to be given is according to the charter party. The shipping window is the time between the first and last possible day of arrival of the ships at the terminal. At 3 months' notice the shipping window is quite small. However, at 6 weeks before the arrival date given in the notice, the sales forecast is far more accurate and the shipping window has become much larger. If this information is provided to the shipping company it has more freedom to select a vessel and take into account the situation at the export terminal as well.

The complexity of ship scheduling is further illustrated in the figure Import terminal logistics. A notice time of 3 months at a 600.000 tons per year throughput using 40.000 Dwt ships means that always 3 - 4 ships are on order. Whilst the actual stock in the terminal might be 50.000 tons, the virtual stock of the terminal (meaning its actual stock plus the cement cargoes already ordered) can be as high as 220.000 tons. In such situations mistakes in ship scheduling can result in ships being spaced too far apart or too close together.

Import terminal logistics

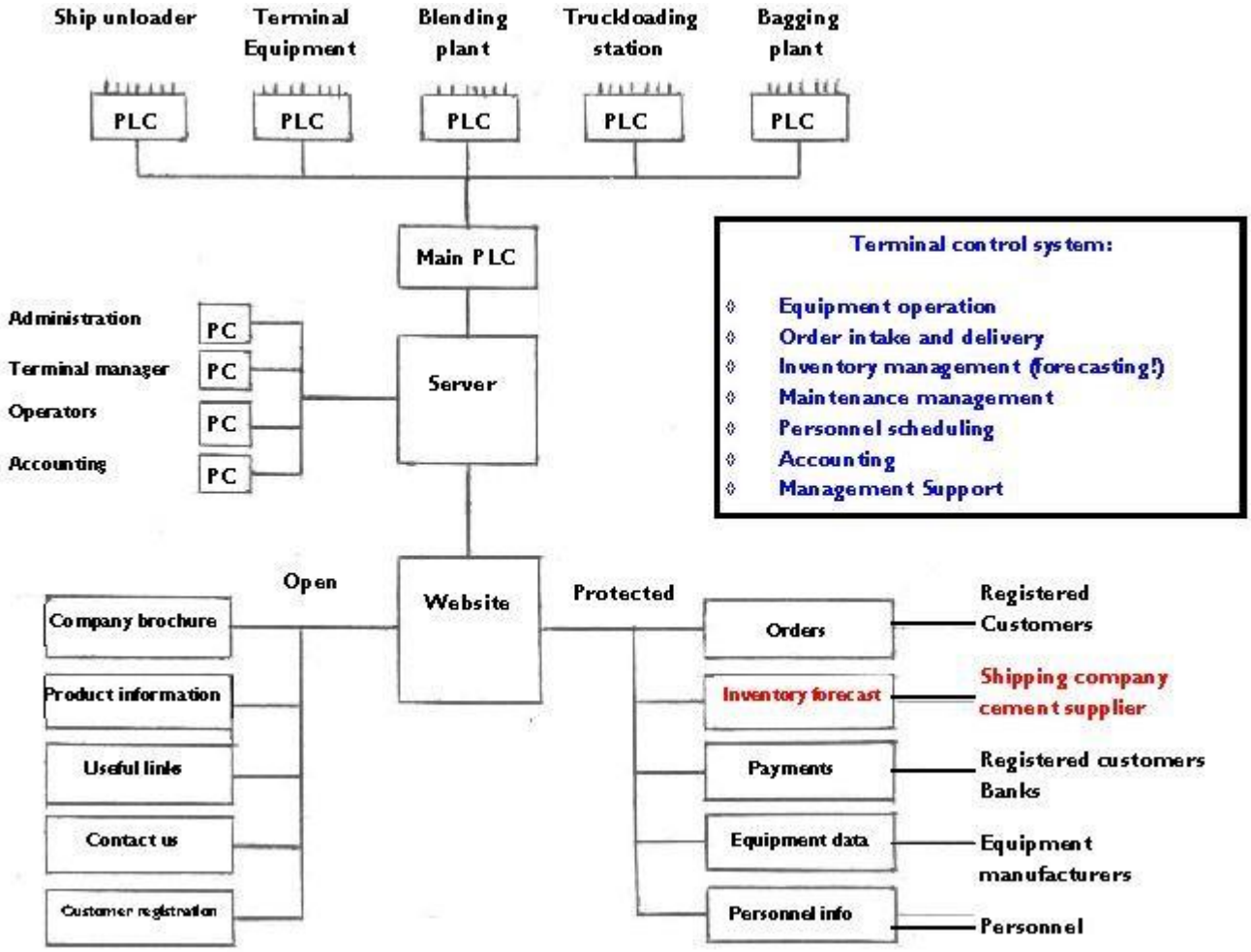


The method to improve ship scheduling is to break through the individual interests of cement exporter, shipping company and cement importer and to create a single system of supply chain management. In this system the import terminal manager does no longer order every individual ship. He contracts out to the shipping company the obligation to keep his terminal properly supplied with cement. As a basis for this the shipping company, on a constant basis, has access to the inventory level, actual and forecasted sales of the import terminal. The same situation is created with the cement supplier. The shipping company now is capable to schedule its ships in such a way that no delays are suffered in loading and unloading ports whilst the import terminal will not reach a zero stock level. This can result in considerable savings in shipping cost. The larger the storage facility of the import terminal, the larger the freedom of scheduling ships will be with a corresponding lower cost of transportation. Such a direct link makes it possible to determine the optimal combination of terminal capital cost and shipping cost.

The integration of import operation, shipping and export operations is made possible by a new generation of terminal control systems. The original terminal control systems only controlled the equipment of the terminal. The second generation, presently in use at most modern terminals combines

the PLC for equipment control with a server and several PC's. This makes it possible to combine equipment control and monitoring with administrative and accounting software. Advanced systems already include forecasting software in respect to cement sales, inventory management, ship scheduling, maintenance planning and personnel scheduling. The next generation of control systems will be also PLC-PC based but the server will act as an internet website provider as well. This website is not only a "brochure
type" website but also has an interactive section (with restricted access). Via this interactive section orders for cement can be accepted, equipment suppliers can check the performance of their equipment and ensure on time delivery of spare parts, the shipping company can check cement inventory, historic and forecasted cement sales, etc. on which the next cement shipments can be based. The terminal control system has now become part of several supply chain management systems.

Terminal control systems



Shipunloading

The second issue of interaction between terminal and shipping is the shipunloading. The shipunloading operation in some cases is a continuous source of disputes between terminal operator and shipping company. This usually is because of delays in the unloading operation causing demurrage. The question then is who is to blame for the delays. The delays have usually 3 causes. The first cause is a too optimistic time estimation of the unloading operation with a corresponding low unloading time allowance in the charter party agreement with the shipping company. A maximum capacity guarantee or even an average capacity guarantee for a shipunloader is insufficient to determine the unloading time. There are many other factors such as moving the unloader from hold to hold, the number of such movements required, final cleanup requirements, stoppages because of problems at the terminal, the ship or the shipunloader, etc.
The second cause of delay of the unloading operation is poor organisation. At many terminals, some even with years of experience, shipunloading is largely a matter of improvisation, with no preparation till the ship arrives in the port. The corresponding unloading performance will be poor. In figure 4 an overview is given of the organisation required for a shipunloading operation. Such an organisation already starts before the ship is even loaded. For older ships an even distribution of the cement cargo over the holds is an absolute requirement. For newer vessels it is possible to leave
one or more holds empty during the voyage. This can be a large advantage. When a vessel with 5 holds is able to load
the complete cement cargo in 4 holds a 20% savings is achieved on cleanup time, labour and equipment usage. What also needs to be properly defined is when the ship is considered to be empty. There is quite bit of difference between machine clean or broom clean. Sometimes the holds have to be very clean after a cement cargo, for example for a grain cargo. If the next voyage is coal or iron ore, the cleanliness of the hold after the unloading operations is much less critical.

Before the loading of the cement commerces a "clean hold" survey has to be made. This to ensure that the holds are sufficiently clean for the cement cargo. Quite obviously there should not be any foreign objects left in the holds that could damage the unloading equipment. Also the cargo carried before the cement should be checked. For example when raw sugar has been carried, the holds should be spotless as raw sugar reacts with cement. Some cement companies even do not allow cement to be carried by ships that have carried raw sugar on the previous trip. Checking the watertightness of the hatchcovers by means of a hose test should also be done before loading a cement cargo.

When the ship is loaded and on its way the shipunloading manager has to communicate with the master of the ship. From the master or first mate he needs to receive the information on the dimensions of the ship, how the cement is distributed over the holds and the sequence in which the holds have to be emptied. In many cases the holds cannot be unloaded in one go. First the top half of an aft hold has to be unloaded, than the top half of a forward one, etc. The master of the ship aims to keep the stresses in the ships hull as low as possible. The shipunloading manager has to make the master aware that the number of movements of the unloader needs to be as low as possible even when this results in higher stresses on the ships hull. Please note that it is always the Master of the ship that decides on the unloading sequence as he is responsible for the ships safety.

With the information on ship, cargo and unloading sequence the unloading manager can now make a planning of the unloading operation and determine how many shifts of unloader operators and how many shifts of cleanup crew are required and when specific equipment such as front-end loaders, etc. Is required. He also determines in which sequence he will load the storage facility of the terminal.

Before the ship arrives the unloader is parked on the dock in the position of the first hold to be unloaded. A test run is made to ensure that the complete unloading and conveying system to storage works well.

When the ship arrives custom formalities have to be done, draft marks have to be taken, the cement cargo should be checked for water damage and cement samples should be taken. At the very moment that these activities are finished and the master allows the unloading to commence the clock counting the unloading time starts to tick. The unloading manager then
has to ensure that people and equipment are available on the right moments and that a good communication is maintained with the ships crew, to open and close hatches when required, to use the ships cranes to load front-end loaders and other equipment on board, etc. Possible stoppages should be prevented and when they occur should be minimised. Preparations and good management are a key to optimal unloading operations.

The most problematic area of shipunloading is final cleanup. Some impressions of this can be found in **figures 5, 6 and 7** . In **figure 5** the first phase of cleanup is shown where a large front-end loader is used to clear areas that are
difficult to reach and to push the cement onto heaps so that the shipunloader can continue to operate on its maximum capacity as long as possible. In **figure 6** the second phase of cleanup is shown in which skid-steer loaders "sweep" the bottom of the hold and reclaim cement from behind webframes and other obstructions. The last phase of cleanup is shown in **figures 7** . In this phase manually the last cement has to be cleaned from the sides of the ship with sticks and brooms. Cleanup work is difficult and dirty and when done inefficiently can take a long time.


Large front-end loader


Skid-steer loader


Manually cleaning with sticks and brooms

When the ship is empty the unloading operations is not yet finished. The equipment used must be cleaned and maintained and an evaluation of the unloading operation must be made, not only to determine demurrage or despatch but also to see where improvements in the unloading operation are possible. To do this it is essential that a detailed logbook of the unloading operation is maintained by the unloading crew.

Damaged cement cargo

The last source of problems in the interaction between shipping and terminal operations is damaged cargo or foreign objects in the cement. Damaged cargo is caused by seawater leaking through hatchcovers. When large amounts of water enter the hold a layer of cement of 30 to 50 cm will react with it and harden out. Such a crust will break into many pieces when attempts are made to remove it. Such lumps can cause damage to unloader and other conveying equipment. Even small lumps that reach storage facility and load out silos can block equipment and outlets. Damaged cargo causes delay in unloading, loss of cement cargo, additional removal work and possible damages to the terminal. It will almost always cause a claim from the terminal operator to the shipping company.

Foreign objects in the cement can cause severe damage to shipunloader and conveying equipment.

Foreign objects can consist of pieces of steel, cloth, rope, etc. which were left in the holds before loading. A clean hold survey before loading cement is therefore always recommended. Sometimes foreign objects can be in the cement that is loaded into the holds. Also here a clean hold survey is of use, as it frees the shipping company from any claims in this respect.

Conclusion

Most problems in cement shipping occur in the interaction between shipping company and terminal operators. Ineffective planning and forecasting and communication causes problems in ship scheduling. Poor management of shipunloading operations cause most of the delays in unloading. Old and badly run bulk carriers are the major cause of damaged cement or cement with foreign objects. Virtually all such problems are management related and be prevented in relatively easy ways. With the present level of technology it is not difficult to combine the operations of cement exporter, shipping company and cement importer into one system of supply chain management. A new generation of terminal control systems with an internet based exchange system of information is on its way to support this. Shipunloading problems can be resolved with good management and a preparation for possible problems that can occur. The use of old and badly run vessels for cement transportation is a more difficult issue to tackle. Cement is not a popular cargo for shipowners because of the cleanup problems. Resolving these problems will be a big step forward in attracting newer ships to the trade. Otherwise a premium will have to be paid for the use of newer vessels.