The Panamax challenge

Introduction

The current developments in the shipping industry have the capability to cause some substantial changes in long distance cement transportation. This cement transportation at present is almost entirely done by handysize and handymax bulk carriers. Cement transportation in Panamax size vessels is still rare. At present there are only two "super terminals" (Holcim, Globalplex, LA and Lafarge, Charleston, SC) in the USA that can receive this size of ship. The large capital investment required for these terminals means that they were only economically viable at very high annual throughputs. However, the shipping prices for Panamax size vessels have dropped enormously whilst handysize and handymax prices have been holding. At present the daily bulk carrier spot earnings for the Panamax size ships have dropped substantially below these of the smaller handysize and handymax ships. Under present conditions it is highly attractive to use Panamax ships. This would mean that terminals that are designed to receive Handymax vessels will need to be upgraded. The question is if the present situation will last long enough to make such upgrades worthwhile. This article will try to answer this question by looking at the present and foreseeable shipping situation and corresponding price differences between Panamax and handysize ships. It will also look at the difficulties of using Panamax size vessels and what would be required to upgrade existing terminals.

Figure 1 A typical Handymax vessel

Bulk freight rates have fallen.

In the last six months Panamax daily spot earnings have dropped from around US$ 9.000 per day to close to US$ 4.000 (November 2001). For handymax vessels the corresponding earnings dropped from about US$ 8.500 to US$ 7.000. The large drop in earnings for Panamax ships is caused by a stagnation in volumes due to the economical downturn, combined with a glut of new-buildings. In the last years of the past century there was a situation of economic boom and low prices for new-building ships shipowners decided to go for big vessels. A staggering amount of these ships are now being delivered. Approx. 75 Panamax's were delivered in 2000 and approx. 130 in 2001. This represents about 20% of the fleet! Another 60 Panamaxes are still on order for 2002-2003. Only about 20 Panamaxes were scrapped in 2001.

The situation is different for handysize vessels. Of this size about 100 ships were scrapped in 2001 whilst the number of delivered new-buildings was about 40. Also for the coming two years more vessels are scheduled to be scrapped than new-buildings delivered. Meanwhile the market volume for these ships has remained fairly steady. For handymax vessels the situation is different again. In the upper dead-weight range (above 50.000 Dwt) there is pressure because of the low Panamax rates. Also most new-buildings are in this upper dead-weight range. In the lower and midsize handymax range the market is holding and size limitations of ports and terminals prevent competition from the larger ships.

Panamax size vessels depend heavily on the long distance transportation of the major bulks (i.e. coal, ore, and grain). The coal markets in volume actually increased but there has been a change to short haul trade so that the ton-mile volume did not increase. With the downturn in the economy the demand for steel and with that the transportation of ore has decreased. Also grain cargo has decreased in volume. The change to short haul trade for coal has been beneficial for the handymax and handysize markets and the Black Sea area, India and Africa have also provided good trading volumes for these ships.

A recovery of the Panamax market is only possible if the world-wide economical situation improves, in combination with substantial scrapping of the older vessels. Given the rather spectacular difference between available cargo and available shipping capacity this will take some time.

Dimensions (Approx.)			
	Handysize	Handymax	Panamax
	25/40.000 Dwt	40/55.000 Dwt	60/75.000 Dwt
Length	180 m / 590 ft	180 m / 590 ft	180 m / 590 ft
Beam	26 m / 85 ft	30 m / 100 ft	32 m / 106 ft
Draft	10,6 m / 35 ft	12 m / 40 ft	180 m / 590 ft
Holds	4 - 5	5 - 7	13,5 – 6,8

Calculating the transportation cost

The daily spot earning rates of bulk carriers are an important factor determining the overall transportation cost. However, there are several other factors as well. To get a good impression of the actual transportation cost using different size of vessels it is required to make a calculation taking into account all factors. An example of such a calculation is provided in table 2 . Here the difference between a Handymax and a Panamax vessel is calculated on a voyage between a loading port in South East Asia and a discharge port on the East Coast of the USA.

In table 2 daily earning rates of US$ 4.200 for the Panamax vessel and US$ 6.900 for the handymax vessel have been used. Based on this the transportation cost per ton is calculated for both alternatives. In reality it works the other way around. Based on a negotiated transportation price per ton the earnings per day of the vessel are calculated.

The calculation shows the cost factors that determine the overall cost difference between Panamax and handymax size vessels. The calculation starts by determining the actual cargo size that each ship can take. The size of a ship is expressed by its "Deadweight" (Dwt) capacity. This is the total weight that a ship can carry and this total weight is not just cargo but also the fuel, fresh water and other provisions that are on board. These quantities can vary. On a short voyage a smaller amount of fuel and provisions will be required than on a long voyage. Large ships of course burn more fuel per day than smaller vessels. By calculating the amounts of fuel and other provisions required for a trip and deducting those from the Deadweight capacity we obtain the cargo capacity for that voyage.

The overall voyage time is the most important cost factor. The voyage time consists of the following:

- Sailing time to loading port

  This is the time that the ship needs to sail (in ballast) from the port where it has discharged it last cargo, to the port where it has to pick up its cement cargo. In the calculation 3 ballast sailing days have been included for both ship sizes.

- Mooring time at loading port

  This is the time required to enter the port from open sea and might include time sailing upriver, delays for tide movements, etc as well as the time to moor the ship, finalise customs formalities etc. For both ship sizes six hours has been assumed.

Fig. 3a , Simple export facilities can be the most easily expanded. Thai exporters have no problem to load any size of bulk carrier.

- Loading time

This is the time required to load the ship and can be calculated by dividing the cargo capacity by the average loading capacity. The average loading capacity is determined by the maximum capacity of the shiploading system, its efficiency, the actual hours per day that the loading system is used, etc. Loading systems, in general, have an average loading capacity, which is largely the same, irrespective of the ship size. For both ship sizes the same average loading rate has been used. It will be clear that it will take substantially longer to load a Panamax vessel than a Handymax.

- Unmooring time.

  This is the time for finalising custom formalities, draft surveys, actual unmooring and time to sail to open sea. It has been assumed that this is the same for both vessels.

- Sailing time

  This is the time required to sail from loading port to discharge port and can be calculated by dividing the distance between the ports (in nautical miles) by the speed of the ship (in "knots", i.e. nautical miles per hour).

- Extra sailing time

  Extra sailing time might be incurred by bad weather, the time required to cross the Panama Canal, etc. The shipping company, based on experience, estimates this. It has been assumed the same for both vessels in the calculation.

- Mooring time discharge port

  This time is defined identically as the mooring time at the loading port.

- Unloading time

  The unloading time can be calculated by dividing the cargo capacity by the average unloading capacity. The average unloading capacity is determined by the capacity of the shipunloading system and the overall unloading efficiency. In this example we have assumed that the shipunloading system is designed to handle Handymax vessels but has the capacity to unload Panamax vessels although at a lower efficiency rate. The efficiency rates that are given here seem to be quite low, but actually are quite real. Please note that this is not only the efficiency factor of the shipunloading system but also the actual operating hours of port labour per day and, most important, final cleanup efficiency. It will be clear that it takes very substantially more time to unload the Panamax vessel.

- Unmooring time discharge port

  The unmooring time for the discharge port is defined the same way as the unmooring time for the loading port.

The total trip time is the sum of above. A Panamax ship will have a voyage duration of 65 days. The Handymax vessel takes about 58 days for the same voyage.

During the voyage a ship consumes fuel. During the sailing days its main engine burns heavy fuel oil (IFO). During all days of the voyage its diesel generators are running. These run on diesel oil (MDO). Based on the total voyage time, the actual sailing time and the daily fuel consumption of main engine and generators we can calculate the total fuel consumption of the voyage.

Based on the total voyage time, the fuel consumption and fuel costs, and specific voyage costs (port fees, canal fees, insurance, commissions, etc) the total voyage costs can be calculated for both ship sizes. By dividing the total voyage costs by the cargo volume the transportation costs per ton are obtained. For the calculated example (a voyage from Southeast Asia to the east coast of the USA through the Panama canal) the cost per ton would be US$ 20,84 by Handymax ship and US$ 12,08 for the Panamax one. Using the Panamax size vessel would save US$ 8,76 per tonne! Making a similar calculation for a trip from Southeast Asia to the west coast of the USA the freight cost using a Handymax vessel would be US$ 14,31. Using a Panamax vessel would have a cost of US$ 8,63 per tonne, a saving of US$ 5,68 per tonne. Large import terminals in the USA on average import 400.000 / 500.000 tons per year. For West Coast terminals the savings in transportation costs could be around US$ 2,8 million per year. For East Coast terminals receiving their cement from Southeast Asia the savings could be over US$ 4 million per year.

A word of caution needs to be made here. The transportation cost calculation made here is based on the average daily earning rates in November 2001. These rates can vary depending on market conditions for specific trade routes. Such market conditions are the available cargo volumes on that route and their direction, the number of available vessels, etc. The results of the calculation therefore should not be taken literally. However, they do show the savings potential that Panamax size ships can offer.

Using Panamax ships – problems and solutions

Is it practically possible to use Panamax ships? Almost all large cement terminals in the world are designed to receive handymax vessels. They typically have a storage volume of about 60.000 metric tonnes. The shipunloaders of these terminals have an unloading arm with sufficient reach for Handymax vessels and a typical maximum unloading capacity between 400 and 800 tonnes per hour. Panamax ships, carrying about 65.000 tonnes of cement present three major problems to these terminals.

1) Draft

A Panamax ship has a draft of approx. 13,5 metres (15 feet) versus approx. 12 metres (40 feet) for a Handymax vessel. If only a draft of 12 metres is available at the terminal, the following solutions could be possible.

- Dredging to reach 1,5 metres (5 feet) extra draft.
- Topping off the vessels. It might be possible to offload 10.000 / 12.000 tonnes of the vessel into barges (using grabs) in a deeper part of the port or river entrance. Offloading cement by grabs already has been done at the Mississippi river delta in the USA and the Rhine delta in Europe. With about 12.000 tonnes offloaded the Panamax ship would have the available draft of 12 metres. The barges can be used as temporary storage and unloaded later.
- Use Panamax ships but only partially loaded. In the current situation with daily earning rates for Panamax being lower than Handymax vessels a Panamax vessel loaded with about 50.000 tonnes cement (12 m. draft) would still represent a saving of about US$ 4,00 per tonne between Southeast Asia and the US West coast and about US$ 6,-- per tonne when sailing to the US East coast compared to handymax vessels
- Splitting cargos. When a terminal with a draft restriction of 12 metres (40 feet) can find a partner terminal with a larger available draft which is more or less on the same transportation route, the cargo can be split between both terminals. This also resolves the storage problem.

2) Shipunloading

Most terminals that have a shipunloader suitable to unload Handymax vessels will be able to unload Panamax ships as well. Panamax ships in general have good ballast capabilities and will not rise higher above the dock than Handymax vessels when nearly empty. The shipunloaders will be able to reach the bottom of the hold. The problem however, is that these shipunloaders cannot reach fully into the sides and corners of the Panamax holds and a lot of work has to be done by large front-end loaders to bring the cement from these areas within reach of the unloading arm. This reduces the unloading efficiency. The key problem however, is final cleanup. Final cleanup is the manual cleaning of the ships holds. By means of brooms, sticks and spades the cement that is stuck behind frames, ladders, etc. has to be removed. For handymax size ships this is already very trouble some. For Panamax size vessels the problem becomes massive. As much as several hundred tonnes of cement can remain in the ship, which cannot be reached by front-end loaders or other mechanical equipment and has to be removed manually. The problem is aggravated by the fact that Panamax ships carry a lot of grain cargos, which requires very clean holds. Unloading cement from Panamax ships represents a substantial larger effort compared to handymax vessels, but it can be done. A rough estimate for the extra costs for unloading and cleanup would be approx. US$ 1,50 per tonne.

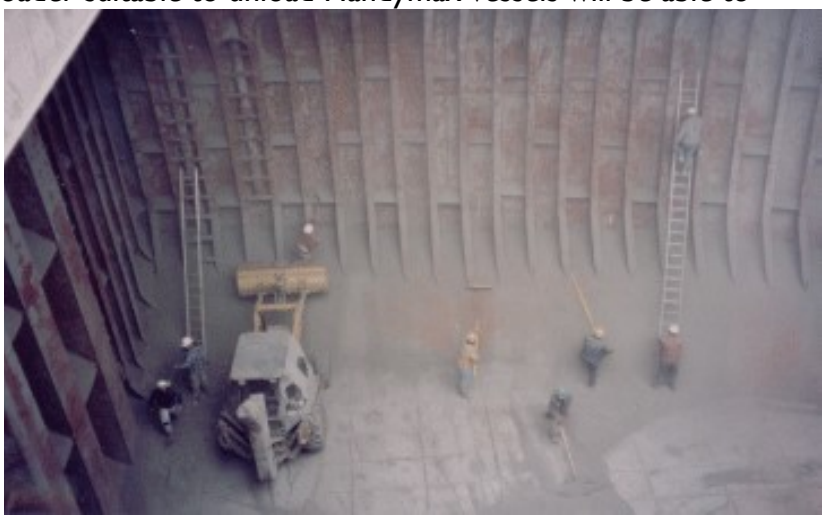

Figure 2 Final cleanup. For Handymax ships already a dirty and difficult job, for Panama ships a massive problem.

3) Storage

A typical large terminal will have a storage facility of approx. 60.000 tonnes capacity. This is insufficient to receive shipments of about 65.000 tonnes. When receiving cement from Asia a terminal on the US West Coast would typically need a storage facility of 75-85 thousand tonnes to cope with the possible deviation in ship arrivals of these large vessels. On the East Coast this requirement would be about 80-90 thousand tonnes of storage capacity. Where do we find the additional required storage space of 15-30 thousand tonnes? For a quick solution, it is best to look around the port to see if a warehouse is available that can be used. Another option would be to build a prefabricated (temporary) warehouse. Some people might argue that the capital costs and high operational costs of such an additional flat storage facility might be higher than the savings on transportation costs, especially as the present low Panamax rates won't last forever. This assumption is not correct however. The capital and operational costs for such an additional storage can actually be quite low. When reviewing the logistics of using the additional storage facility in combination with the shipping it becomes clear that it acts as a buffer with only a very small actual throughput. Only when the first Panamax ship arrives the additional storage facility will be largely filled. When the next ship arrives the main storage facility of 60.000 tonnes will be empty. The complete cargo will go into the main storage facility and will go directly to the bulk truck loading station during the unloading days. Less than 10% of the throughput of the terminal will pass through the additional buffer storage on an annual basis. This means that this storage can be simple and fitted with low cost loading and reclaim equipment. With the present shipping cost the additional storage facility could be earned back in as little as six months.

What about the long run?

The present situation with daily earning rates of Panamax vessels being lower than Handymax and handysize ones is a distortion. It is caused by the general poor economic situation in the shipping markets in combination with a glut of Panamax new buildings. It can be expected that the economy will recover and with that the earning rates of the Panamax vessels will go up again. It will probably take a year or so before this will happen. The very high number of Panamax new buildings however, has created a shift of available tonnage. This shift will have a longer lasting effect. It can be expected that when the economy recovers the Panamax daily earning rates will rise again above handymax size rates as is normal. However, the earnings probably will not rise very much above handymax rates and this might stay for quite some time. With the better transportation economy that these larger vessels have, it can be expected that these vessels will offer a substantial saving in transportation costs for cement shipping world-wide compared to handysize and handymax vessels for a number of years to come. Before the flow of new buildings started, average earning rates for Panamax ships were about US$ 12.000 per day versus US$ 8.000 for Handymax vessels, Panamax size vessels then already saved about US$ 2,-- per tonne over handymax vessels between Asia and US West cast and about US$ 3,-- between Asia and US East Coast. At present these differences are three times that much. For the coming years the differences will be somewhere in between.

At present it is highly interesting for existing large terminals world-wide to study if it is worthwhile to upgrade themselves from receiving handymax vessels to Panamax size ships. As mentioned, increasing the storage capacity can probably be achieved at a low capital cost (if sufficient space is available) and with little operational expenses. The key will be if dock and shipunloading system need upgrading. An extra consideration is that at a daily rate of US$ 4,200 per day it does not matter very much if a ship stays 6 or 10 days in port for unloading. If the rates in time would go back to US$ 10.000 / 12.000 per day, four extra unloading days will mean a substantial additional cost.

Of course the use of larger ships affects not only import terminals. The shiploading facilities of cement plants that export will need to upgrade as well. Cement export plants that do not have that capability might loose their competitiveness. It is a strange issue that those export facilities that have improvised and simple facilities will have the least trouble to upgrade. The best example are the Thai cement companies that load ships directly from bulk trucks or directly from barges with the ship anchored midstream. Even a vessel of 100.000 Dwt was loaded at an average rate exceeding 10.000 tons per day just using bulk trucks. The same applies to import terminals. Those who have poor docking facilities and had to use floating unloading equipment now find out they can unload larger vessels at almost no extra cost. We can expect that the design of cement terminals will be very interesting again in the coming years.

Fig. 3b, Simple export facilities can be the most easily expanded. Thai exporters have no problem to load any size of bulk carrier.