ALPHALINER
Weekly Newsletter

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Analysis of the week

This article is based upon data sourced from an extensive study by the Hamburg-based OCEANS ONE management consultants.

Visit www.oceansone.de for more background information.

hypothetical 'gigamax' ships: variants with 25 and 26 rows

vessel class	B / R / T	length	breadth	depth	max teu
Megamax-23* (typical ship)	**24 / 23 / 22**	**399.00 m**	**58.60 m**	**30.60 m**	**20,000 teu**
Megamax-24* (typical ship)	**24 / 24 / 25**	**399.00 m**	**61.00 m**	**33.20 m**	**23,500 teu**
Gigamax-25	**26 / 25 / 25**	**425.00 m**	**63.30 m**	**33.20 m**	**27,140 teu**
Gigamax-25 LNG	**26 / 25 / 25**	**425.00 m**	**63.30 m**	**33.20 m**	**26,800 teu**
Gigamax-26	**26 / 26 / 25**	**425.00 m**	**66.10 m**	**33.20 m**	**28,840 teu**
Gigamax-26 LNG	**26 / 26 / 25**	**425.00 m**	**66.10 m**	**33.20 m**	**28,420 teu**

illustration: Alphaliner

This paper is an extract from the Alphaliner Weekly Newsletter, edition 2021-22.

It was originally published in May 2021.

The paper's aim is to present a short insight into the pros and cons of a 'next' generation of ultra-large container ships, tentatively dubbed 'Gigamax'.

It provides a basic analysis of the proposed ship type's performance in terms of bunker costs, slot costs, and carbon emissions.

The hypothetical 'Gigamax' is benchmarked against today's largest containerships of the 'Megamax' type.

Research and data was provided by OCEANS ONE management consultants.

Find out more at:

www.oceansone.de

www.alphaliner.com

The 'gigamax': Would a 'post-megamax' ship make any sense?

Over the past few years, megamax container vessels in the size range from 18,000 to 24,000 teu have become the 'standard' ship on many east - west mainlines, and they presently dominate the liner trade between the Far East and Europe.

Today, there are 139 of these ships in service with at least 50 more on firm order, slated for delivery within the next three years.

Fuelled by more than a decade of carrier mergers and acquisitions, which allowed shipping lines to consolidate cargo volumes into fewer services with higher capacity, container vessel growth on the main trade lanes has been relentless since the early 2000's.

Quite obviously, the main purpose of introducing bigger and bigger ships was to drive unit cost down. Factoring-in a weighted mix of capital cost, fuel cost, other operating cost, and harbour and canal dues, a large ship such as the megamax is the cheapest way of carrying a container over a long distance at sea.

The longer the distance and the fewer the number of ports served en-route, the more are large and ultra-large ships favoured in modelling transport cost. This however raises the question: Is today's 'megamax' the largest ship type we will ever see? Or will another step up in size still yield economic benefits?

Thus today, Alphaliner will be looking at the 'gigamax' a hypothetical container ship of up to 28,880 teu, and weigh the pros and cons of such a design.

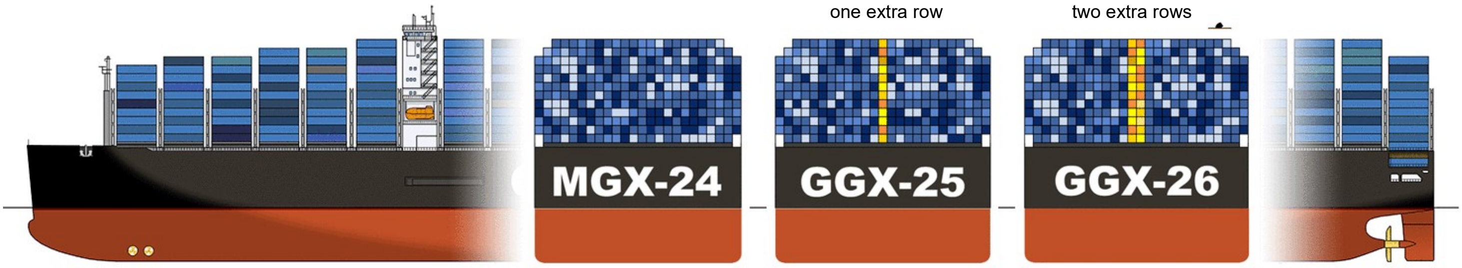
Introducing the 'gigamax' vessel of up to 28,840 teu

below: Note that Alphaliner's drawing does not show a specific 'gigamax' container vessel or a ready-to-built ship design, but is meant to serve as an illustration how such a ship *might* look like.

Bow shapes, superstructure and general arrangement might very well look different on an actual 'gigamax' ship.

Based upon the established nomenclature of 'megamax' (MGX) ships, Alphaliner refers to the hypothetical next generations of container mainliners as 'gigamax' (GGX) and 'terramax' (TRX).

GGX designs would be stretched by one hold or two forty-foot container bays over the MGX, to reach 425 m. The TRX would be lengthened by another two bays to an overall length of 454 m.



We have also opted to show the ship with a 'natural' deckload of twelve tiers vs the theoretical maximum of 13, as container ships typically carry a mix of ISO and hi-cube containers.

image: Alphaliner

In line with current type names, the number suffix then denotes the proposed ship's width in terms of container rows.

While the megamax currently exists in an MGX-23 and an MGX-24 version, the proposed gigamax has been looked at and benchmarked in its GGX-25 and GGX-26 variants. Data from OCEANS ONE has also been provided for a hypothetical TRX-26 ship.

Since this vessel with its massive length is seen as 'a step too far' for the time being, the terramax type remains outside the scope of this article.

Unit costs for a container carried over a certain distance, have been analysed for the GGX-25 and GGX-26, and compared to the existing megamaxes of today.

The analysis considers cost of ownership, bunker cost, other operating expenses, canal fees, harbour and pilotage dues, among others. It is based upon a typical real-life operating profile in the Far East - North Europe trade, on a route that includes two Suez Canal passages per round trip.

above: With a capacity of 23,992 teu, the brand new EVER ACE will soon become the world's largest container vessel.

Our hypothetical GGX-26 ship, in its conventionally powered version, can carry up to 28,840 teu.

That is a 20% intake advantage over the largest MGX-24 ship of today.

The increase is gained from a hull that is two 40 ft containers longer and two 'containers' wider.

photo: V. Tonic

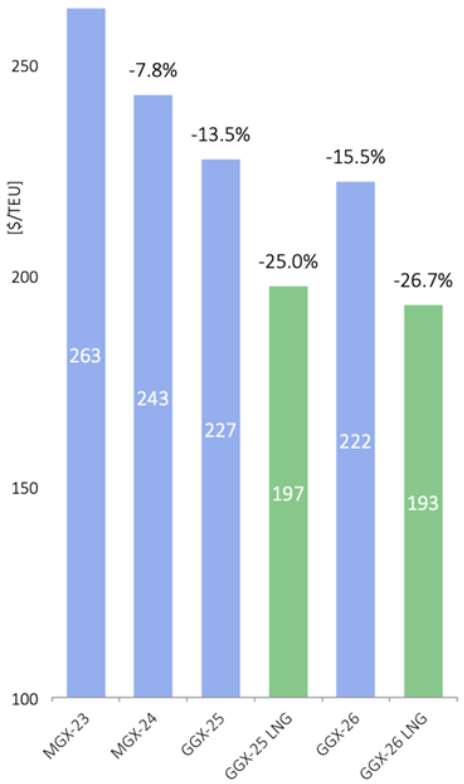
Deployment on a typical Asia-Europe service

Typically, the round trip time on a weekly Asia - Europe service is 84 days. Therefore, a weekly service will be staffed with 12 ships.

The average distance per round trip was considered with 23,900 nm and during a full round trip 12 ports are called in this comparison.

The speed draft profile is based on the average AIS speed draft profile of all operating MGX vessels currently in service.

Bunker costs per loaded teu per round trip



OCEANS ONE
MANAGEMENT CONSULTANTS

... is an independent boutique consultancy based in Hamburg, Germany, providing a dedicated and tailor made management consulting approach to ship owners of ultra large container vessels.

The company exclusively focuses on research and consultancy services around mainline container vessels of 10,000 teu or larger.

OCEANS ONE supports shipowners throughout the decision-making process of a newbuilding project, from the definition of key parameters to the delivery of the vessels and beyond.

www.oceansone.de

Consumptions and container loading capabilites have been calculated in accordance.

The greater beam of the GGX vessels inevitably leads to longer lay times due to the greater distance that has to be covered by the STS cranes for loading and unloading operations.

Slightly higher operational speed required

In order to stay on schedule, the GGX vessels have to sail slightly faster compared to their smaller sisters.

The impact of the higher consumption due to the higher speed is not insignificant and is taken into account in this comparison.

It is clear that some of the port infrastructures are not yet up to the demands of a post-megamax vessel. But the trends in the expansion of port infrastructures clearly show that the ports are adapting to ever larger ships.

Nevertheless, some ports are already able to handle larger ships than the MGX class without restrictions.

Bunker cost per loaded container

As shown in the diagram on the left side, the calculated economies of scale of bunker costs per loaded container (important: not per nominal container) show a clear tendency towards ever decreasing costs with increasing ship size, even if the steps downwards become smaller, as is usual with a regressive trend.

A quite significant step in the reduction of bunker costs can already be seen between an MGX-23 and MGX-24. The same step can be achieved when looking from an MGX-24 to a GGX-26.

Under the current conditions, it can be observed that the LNG vessels have significantly lower bunker costs despite their slightly lower container intake due to the LNG tank.

This is of course related to the current pricing conditions for marine fuels, but shows a clear advantage of LNG.

Taking into account OPEX and CAPEX

Fuel costs are a major driver in the total system cost of operating an ultra-large containership, but to get a complete overview, OPEX as well as CAPEX must also be taken into account and added up to the total slot cost per container loaded.

Here, too, the economies of scale show a clear regressive trend, even if the savings potential is lower compared to the pure bunker costs.

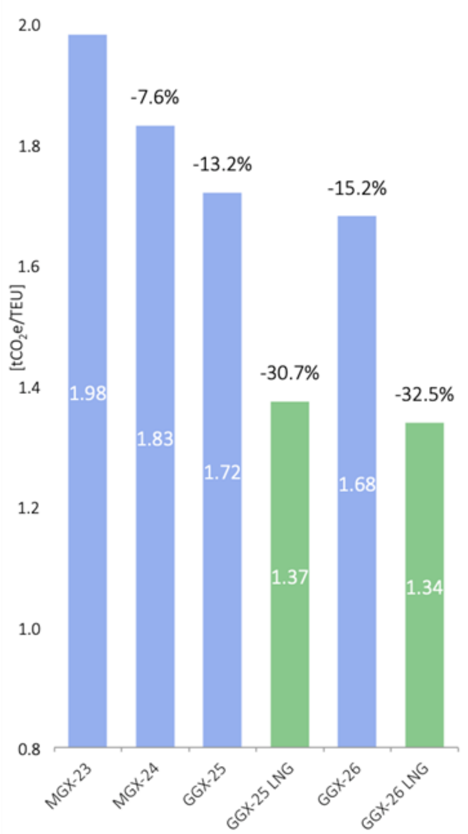
right: Compared to a typical megamax-23 ship as the baseline, a gigamax could offer a slot cost reduction of up to 15.1%. The exact savings depend upon the ships variant and its propulsion choice.

chart: OCEANS ONE

below: CO2 emissions per loaded teu and per round trip

chart: OCEANS ONE

CO2 emissions per loaded teu per round trip

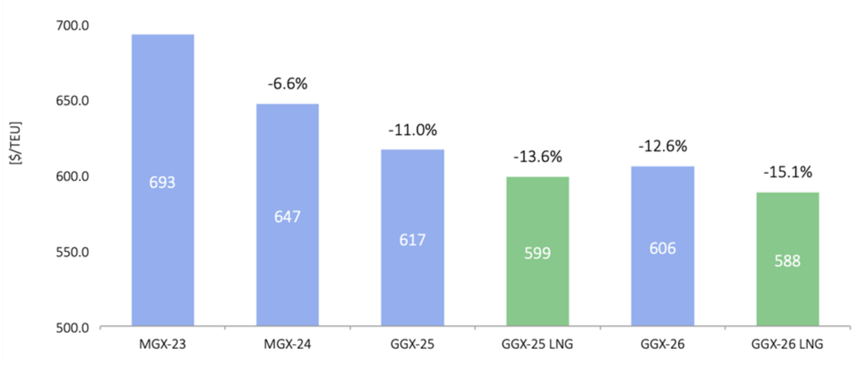


When comparing MGX-23 and MGX-24, the total saving in slot costs is about 6.6% (see diagram below).

This savings potential can be approximately doubled when comparing MGX-23 and GGX-26.

LNG as fuel is another option to reduce slot costs, although the gap becomes less significant due to the higher investment costs as well as the slightly lower container intake of an LNG-fuelled vessel.

Slot costs per loaded teu per round trip



Another point of view: emissions

In addition to the pure consideration of the business figures, there are also some environmental effects that are worth looking at.

In line with fuel consumption, specific CO2 emissions can also be reduced accordingly (see diagram left).

Even more significant is the potential of LNG as a fuel, also taking into account the often-discussed methane slip.

Compared to MGX-23 container ships, which can be considered the average of the current operating fleet, a GGX-25 or GGX-26 container ship fuelled with LNG can reduce CO2 emissions per container loaded by 30.7% or even 32.5% respectively.

Considering that the ships studied are standard ships, there is even some potential for optimisation towards the lowest possible emissions of about 10% (according to OCEANS ONE).

In summary, an optimised GGX vessel is able to reduce CO2 emissions per loaded container by about 40% or even more compared to today's average MGX fleet.

Another step up in size - is it worth taking or not?

So what are the pros and cons of the gigamax? Is this ship type the next logical step, or is it a step too far? On the next page, we have summarized advantages and disadvantages for you.

THE GIGAMAX

The pros and cons of a potential 'gigamax' container ship in the Far East-Europe Trade

Advantages

Economies of scale for the potential next generation of ultra-large container ships are still valid and further savings potential can be realised under real operating conditions when all relevant cost parameters are taken into account.

The two proposed GGX vessel types would operate with the same draught as the MGX vessels currently in service. Therefore, there are no additional draught restrictions for these vessels compared to the existing fleet and no need for further deepening of canals, waterways, fairways or berths.

Port infrastructures are partly already prepared for handling post-megamax ships, so that GGX vessels can be handled without restrictions in the same way as the currently operating MGX fleet. Other ports are planning to upgrade their infrastructure to handle GGX vessels. Therefore, there is no chicken-and-egg problem.

The emission reduction potentials go hand in hand with the lower consumption per container loaded. Much more significant are the emission reduction potentials for LNG-fuelled ships, even when methane slip is taken into account. Therefore, an LNG-fuelled GGX vessel can make a meaningful contribution to the emission reduction targets required by the IMO.

Demand for container tonnage has risen sharply in recent times and it will likely remain strong for an extended period. Therefore, larger vessels are a good way to meet the increased market demand for mainline deep-sea tonnage.

Shipping companies are always fighting for cost advantages over competitors. A 'gigamax' could therefore be an opportunity to generate an advantage in slot costs over the competition as a first mover.

Consolidation from a fragmented liner market into an arena where fewer than ten players dominate the east-west mainline trades favours large ships. A 'gigamax' vessel would just continue an already existing trend.

Disadvantages

Increasingly large container ships mean longer load and discharge times in ports. In order to maintain the same schedules as a current 20,000 teu ship, the 'gigamax' would have to rely on more capable terminals to handle the ship in a similar berthing window as current tonnage, or have a marginally higher service speed to compensate for extended port stays.

Many shipyards have built their repair infrastructure around today's ultra large container ships (ca. 400 m long) as well as VLCC tankers (ca. 60 m wide). Increasing ship length and width significantly past these dimensions will very much limit the choice of yards for routine maintenance and repair.

In terms of cargo demand, 'gigamax' ships only make sense on a selection of key routes, with long steaming distances and a limited number of calls at main ports. Much of the next decade's growth is however expected on second-tier routes rather than at the top end of the market. These could be better served by more flexible 'everywhere ships' such as 15,000 teu neo-panamax tonnage.

Some of the savings from ultra-large vessels are eaten up by the increased investments in the maritime infrastructure required to serve these ships. Some of this cost is borne by the public sector and there are signs of political and regulatory push-back against the ever-increasing size of ships.

Peak-load problems at terminals and in the port hinterland, caused by the deployment of megamax vessels, would be exacerbated by even larger ships such as the proposed 'gigamax'. In this respect, some of the scale advantage gained on the door-to-door voyage's seaborne section will be lost again in truck or rail on-carriage.

Government regulators, port authorities or insurance firms could sooner or later demand increased propulsion redundancy for ultra-large ships and mandate twin-engine, twin propeller set-ups to reduce the risk of total black outs for these jumbo vessels.

Conclusion

Joint research from Alphaliner and OCEANS ONE shows that another step up in vessel size would make economic sense on the Asia - Europe mainline trades: The hypothetical 'gigamax' in its various iterations still achieves measurable economies of scale over a typical 'megamax' ship of today.

While these savings are only moderate as such, they would add up over the ship's lifetime to give 'gigamax' operators a notable cost advantage over carriers that deploy ships in the 15,000 to 24,000 teu range. Whether the potential savings are sufficient to entice a shipping line to actually order a series of such vessels is a different story.

In a perfect world, the 'gigamax' is already feasible today. I can be built, it can be dry-docked for maintenance and it can be handled at a number of key ports. Contrary to academic research, the real world however is not perfect, but messy and chaotic. In case of the 'gigamax', operational risks and challenges may well deter shipping lines from ordering such ships.

For the time being, a 28,000+ teu ship would be limited to a very narrow set of routes, with little operational flexibility. Even in some major ports, the ship could only be handled at selected berths. The same is true for maintenance and repair, since breaking the 400 m mould severely limits the choice of shipyard to a select few that have 430 m drydocks.

Risk-averse carriers could thus very well opt to stay in known territory with 'megamax' ships. In the longer run, though, the increasing emphasis on low emissions and the expected rise in bunker (and CO_2!) price, as well as the wider availability of suitable berths, could tip the balance in favour of a next-generation of ultra large box vessels.