How terminals can tackle mega-ships

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The evolution of the containership over the past two decades has allowed shipping lines to pursue economies of scale that reduce the cost per slot (at equivalent utilisation levels) to all time lows.

The capacity of the largest container ships, per decade, over the last 20 years has increased by over 135%, this is manifested in the current 19,224 TEU world's biggest ship, which was only 8,160 TEU in 2006. However, the length of these vessels has only increased by 14% from 347m to 400m in the same period.

As seen in Figure 1, from only 2006 to today we have witnessed an increase in width from 17 rows wide to 23 and an overall stacking height increase from 15 to 18. This continued growth in capacity that is derived more from width and stacking height on board comes with some implications for the port operators where these vessels are calling. With the entry of the +18,000 TEU vessels on many trade lanes, we have witnessed a general upsizing of the other trade lanes as the existing vessels cascade downward where possible. The overall result of this for port operators is that there is significant increased pressure for performance, both for their customers and for their shareholders.

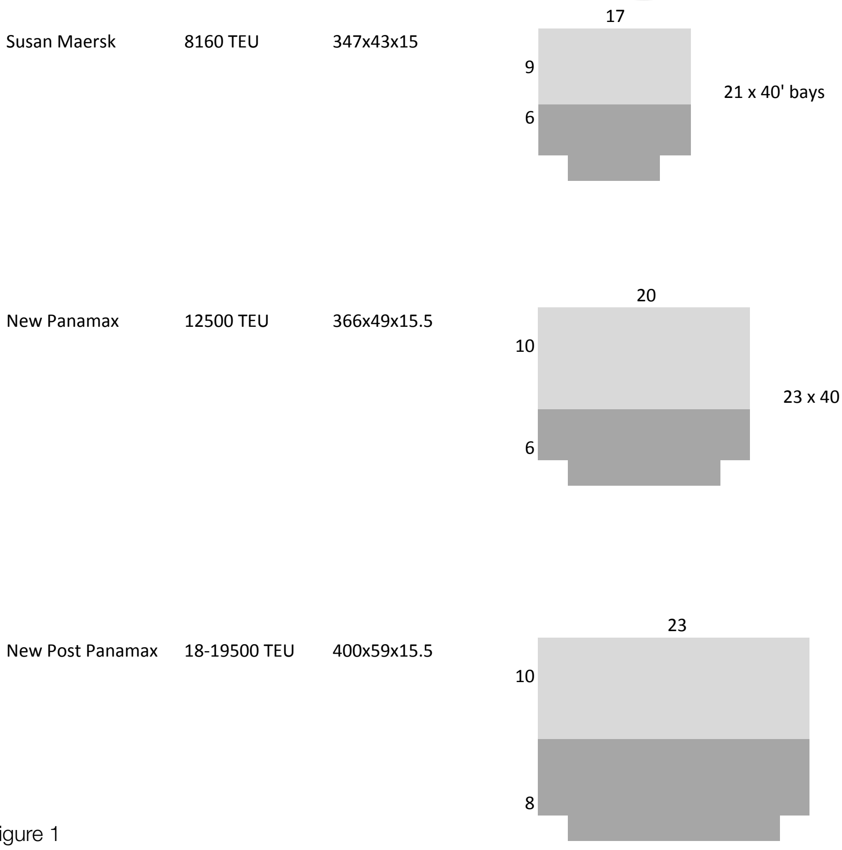

Figure 1

Productivity

Deeper holds, higher stacking, and wider hatches have noticeable negative impacts on crane productivity. Sometimes, however, good stowage planning from liner operations departments can offset this negative impact by reducing the wasted movement of cranes as they service a vessel. What this means is that at the same time that lines are, rightly, insisting on increased productivity, they are introducing innovations targeted toward economies of scale at the expense of productivity.

Taking a real example of network upsizing at a major terminal along the Asia Europe trade lane, the impact that these larger vessels have on peak activity levels is clear to see. The terminal in question has a balanced gateway and transshipment ratio and can be extrapolated to either business model easily.

In Figure 2, we can see the peaks and valleys of both before the network upsizing exercise and afterwards. While the actual peak activity level, as measured in required berth moves per hour, is higher in the before scenario, the average activity level and frequency of those peaks is statistically significantly higher in the after scenario.

Figure 3 has the summary of the overall shift in vessel activity from the old network to the new network and while the average required BMPH prior to the network upsizing was 92, it is 33% higher after the planned upsizing of 5 out of 11 vessels and their related move counts.

However, with real differences comes the percentage of time that the terminal is required to perform above average and even above 80% of max requirements. The increase in these KPI's is dramatic. Furthermore, the median and standard deviation of the requirements are higher and greater, meaning that the performance levels required by the customers are higher in the upsized network AND the swings between average performance requirements and the peaks and valleys have gotten larger.

Peak problems

Peaks add a burden to the yard and the requirements for servicing truckers. The standard container yard capacity formula is heavily dependent on dwell time and peak occupancy. For example; a yard with 1,000 TEU slots can handle a maximum of 365,000 TEU per year (with one day ageing and a 0% transshipment ratio), or the same

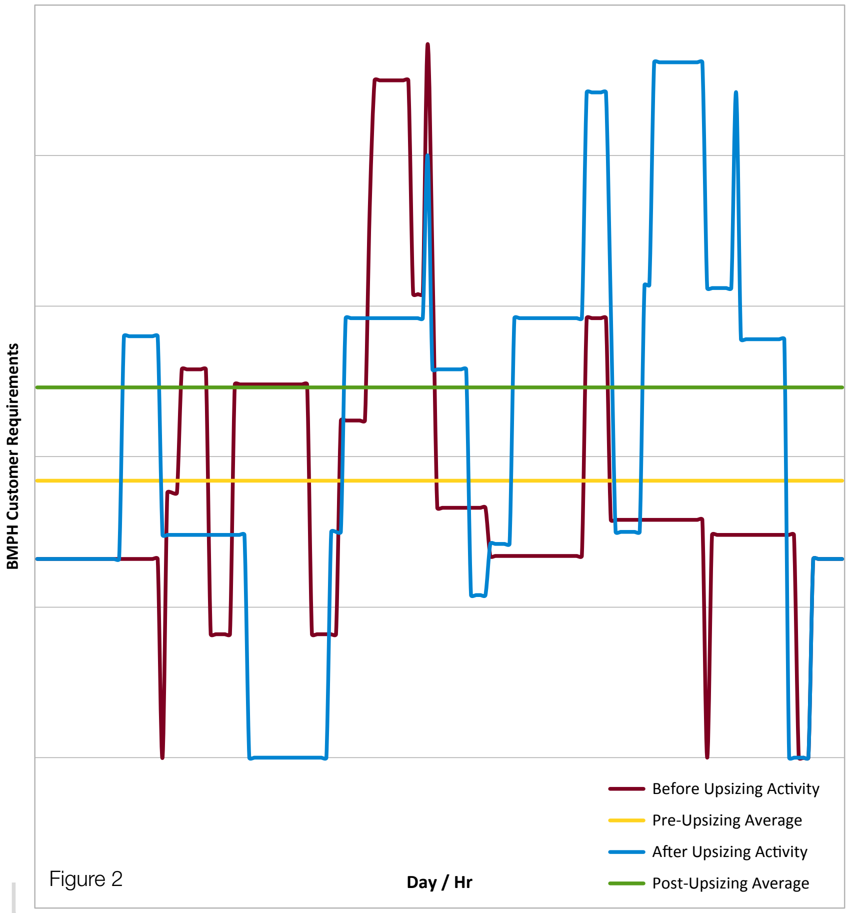

Figure 2

	Before	After	Delta
Peak BMPH required	237	231	-3%
Average BMPH required	92	123	+33%
% of time required to perform above average	28%	51%	+82%
% of time required to perform at 80% of max	5%	11%	+120%
Performance requirement standard deviation	45	64	+42%
Performance requirement median	74	129	+74%

Figure 3

yard can handle only 280,769 TEU per-year under the same assumptions, but with a peak factor of 30%. This is a reduction of 20% capacity simply due to peaks. Any increase in peak handling equals a reduction in yard capacity and equals wasted assets in between those peaks. This reduction in capacity is the direct impact we see that network upsizing has on port container yard investments.

Peaks have further significant operational and financial implications on ports and the supply chains that these increasingly large vessels are being used on. Because operational manning can be either a fixed or variable cost depending on the labour situation at a port, it is easier to focus here on capital requirements when examining the financial impacts from this change in scenarios.

Cranes typically have a financial lifespan of 25 years for depreciation and ROIC calculations. If a port were to have purchased state-of-the-art cranes only 10 years ago to ensure they could handle the largest container vessels on the water, they would have to have upgrade this superstructure drastically only 40% into the lifespan. An upgrade of this equipment would require at least 4, but more likely, 6, new cranes. This requirement would add anywhere between US$30m-45m in CAPEX to the business and saddling the annual Net Profit with an additional $1.2m-2.2m in depreciation.

Lower cost alternatives like raising and extending cranes are available, but also require significant investment to be capitalised, and furthermore, these solutions add complexity to current operations and equipment risk where these modifications are made. Cranes are not the only additional CAPEX requirements these larger vessels have added to the ports they call at. Deeper channels and berths require dredging, additional yard space, additional yard equipment, and, in some cases, additional quay strengthening for the larger and heavier cranes all require large CAPEX outlays that can run into the hundreds of millions of dollars. The impact these expenses have on the ROI of a port investment is substantial, and unfortunately for ports along the trade lanes these large vessel ply the only guarantee is that without these investments, the port or terminal will find itself irrelevant.

Conclusion

As vessels continue to increase in size, as can be seen with MOL's recent order of several 20,150 TEU vessels, port investments will continue to be required. In order to keep a balanced business ecosystem, however, lines (or alliances) and port stakeholders are going to have to begin working together to find new methods of supporting these investments.

Concepts like berth productivity incentives, guaranteed capacity contracts, long term guaranteed volumes, and other win/win arrangements must become more common. Ports cannot invest massive amounts of capital resources only to have their customer shift away before the payback period has been reached. At the same time, shipping lines and their alliances cannot accept poor performance from ports that fritter away the benefits achieved by the economy of scale derived by these large vessels.

About the author

Peter Ford is a highly accomplished executive with a successful record of improving business results through strategy development and successful execution. Peter currently utilises his specialties in strategy development, strategy execution, executive leadership, operations, union behavior, efficiency, cost cutting, LEAN, and Six Sigma as an independent consultant delivering value to organisations worldwide. Until recently, Peter was the Global Chief Operating Officer for the Gulftainer Group of companies where he led the team toward its highest historical results and was responsible for the negotiations that allowed Gulftainer to expand its footprint into Port Canaveral, FL. Peter has also worked with the AP Moller-Maersk group and has also completed a number of management and leadership courses at esteemed schools including: Harvard University, the University of Michigan, the University of Phoenix (MBA) and the United States Merchant Marine Academy (Bs).

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