

Cargo Handling and Equipment Supply in Mega-Ports

As the name implies, “mega-ports” suggests modern terminals with multiple STS cranes and a myriad of other pieces of handling and servicing equipment.

Mega-ports have followed on from the massive increase in trade that the world has seen over recent decades. This prompted ship owners and operators to look for ever increasing economies of scale – the advent of the new era of “Mega container vessels” of course, but this has also resulted in a *mega-challenge*” for ports, terminals and their suppliers.

Coupled with uncertainties brought about by the Covid-19 Pandemic the industry has been overwhelmed to an extent as it was already facing a set of complex challenges such as;

- De-carbonisation
- Helping vessels meet their emissions targets
- Just in Time Deliveries
- Productivity increases
- Re-skilling the workforce to deal with emerging and innovative technologies

Disruption in trade, brought about by the pandemic has made investment decisions even more difficult. Port and terminal operators are sometimes faced with having to invest in new plant and equipment with an ROI (return on investment) that has a longer duration than the concessional rights to run the terminal (if not their own) that they have been awarded by the port authority or owners.

Those investment decisions are further complicated by the nature of today’s market and the solutions being offered. A new STS crane to service the new breed of mega-carrier, such as the MSC “Gulsun” class is altogether a different prospect to what might have been specified and purchased just a decade ago.

To service a vessel with 24 teu across and 12 below and 12 on deck requires a lift-height approaching the best part of 60 metres, a boom of 80 metres and hoist and trolley speeds far in excess of anything required before. This consequently increases the costs significantly and creates a major headache for the operator and the maintenance teams.

Of course, solutions exist, semi or full automation to assist the operator, or even remote operations from the control room. Sophisticated sensor networks in the machine itself monitoring all the potential failure points, gearbox, drives, hoist, gantry and trolley motors etc Even “intelligent” hydraulic hoses that can tell the maintenance team when they are about to fail.

Solutions though, also bring their own challenges. Does the intelligence system in the crane interface with the terminals? Is there a requirement to install expensive middleware? Are the data sets compatible? Can the maintenance team understand

the data provided so they can make the appropriate interventions? The suppliers of course tell us all this is possible, and of course it is, but can you get all this from your OEM supplier or do you need multiple layers of solutions to make it all work, and better still improve your productivity and reduce your maintenance and whole of life costs for the equipment.

Faster, higher, stronger, longer generally means increased cost. Machine learning development and the greater use of AI in services such as “predictive maintenance” will certainly help. The use of such intelligence to “augment” the operation will also lead to productivity improvements, but generally at greater cost.

Of course, this all requires new skills from the planning, operations and maintenance teams and a new way of thinking from the procurement team. Companies can no longer work in silos, the whole team need to be thinking as one, and that includes the IT department.

Suppliers need to adapt too, they need to be much more closely integrated with the end-user and try to understand exactly what it is that will be the right solution for that purchaser who may well be spending \$10m or more on one piece of equipment.

In some terminals it is simply not possible to install these new STS cranes, or even automated yard equipment. So “retrofit” solutions are necessary, i.e. heightening existing STS cranes to be able to take larger vessels but still operate within the confines of the available apron space and the quay loadings under the crane rails. One important factor that gets over-looked is that you simply cannot keep throwing more cranes into the vessel operation as you are unable to get them all working together in the available length of the vessel and the hold configuration.

Getting the containers on and off the vessel is one thing but there has to be an effective solution on the land side, both in the yard and the interface with the road and rail side. Not much point in discharging containers at 35 + per hour per crane and then you have a bottleneck in the stacking yard or a 4 km queue of lorries waiting to collect (especially if they have come for “just in time” cargo).

So “total” solution is the name of the game and each component part of the system must work in harmony. The piece -meal approach of buying different pieces of handling equipment and trying to make them all work together is a thing of the past.

Total “whole of life” solutions are also important. What is the life cycle of the equipment expected to be given the trade levels you are handling now and what they are expected to be as volumes will inevitably start increasing again once we are through the pandemic? They have already started increasing in China, but much will depend on the economic recovery in the rest of the world. Coupled with that is the move to more “resilient” supply chains that can react more quickly and be less affected by disruption on a global scale.

These all make decisions difficult, so innovation and technological solutions to today's challenges will continue to develop. Ports themselves are becoming "smart" by the use of such technology, sensor networks throughout the port, the hinterland and the equipment played out in real time (or even in digital twins) offer serious advantages. Data collaboration through Port Call Optimisation (PCO) and Collaborative Decision Making unite the key entities together and will assist terminals become more efficient and enable vessels to meet their emissions targets.

Further, ports need to think about their own carbon footprint and the move to electrification in their purchasing decisions.

The challenge of Covid-19 has made suppliers think differently too. They are now investing serious money and time into "remote-commissioning", remote surveys and maintenance (some are looking at augmented reality to help on-site engineers be supported by experts thousands of miles away). Drone inspections of hard to reach structures (STS Cranes can be up to 100 meters high) are becoming commonplace.

"SMART" components are appearing to help engineers predict when maintenance or swap-out is required rather than suffer unexpected down-time. Coupled with the greater efficiency gained from ever more intelligent equipment, maybe you don't have to purchase the same amount of yard equipment today to achieve a greater throughput than you did yesterday.

What the new normal will be, we will realise in time, but the signs are already there, and we have touched upon many of them here. The future is in the hands of those who embrace the emerging and developing technologies and factor those considerations into the way they look at their operations, the expected and future cargo flows and the equipment they need to realise their full potential.

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