Enhancing container terminal productivity: A co-maker approach between carriers and operators

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Introduction

Ongoing globalisation and the subsequent outsourcing of production to low cost countries have led to a steep increase in container volumes. According to research carried out by Drewry Shipping Consultants the global container volume has grown on average 10.5% year-on-year in the period between 1995 and 2004. Traffic to and from the Far East grew 12.7% over the same period. The response from carriers to this increase in demand was obvious; huge new-building programmes have been initiated. Based on the latest information sourced from BRS-Alphaliner, the overall order book equals 55.7% of the current container carrying capacity employed. A large part of this is so-called super post-panamax vessels with a capacity above 5,000 TEU.

Consequently, container terminal operators are faced with the challenge to provide the same degree of turn-around time to these large vessels as they offer to smaller ones. In a terminal landscape that is currently characterised by a lack of real expansion possibilities, especially in North-West Europe, the present key issue is how to improve and optimise the turn-around time of large vessels in a "static" production environment.

Handling capacity at a container terminal is driven by two parameters, one within the span of control of a terminal and one outside. The quantity and quality of hardware and the level of staff training can be controlled by a terminal, the stowage composition of a container vessel and landside based cargo arrival/departure patterns cannot. Especially by managing these external parameters further synergies can be reached.

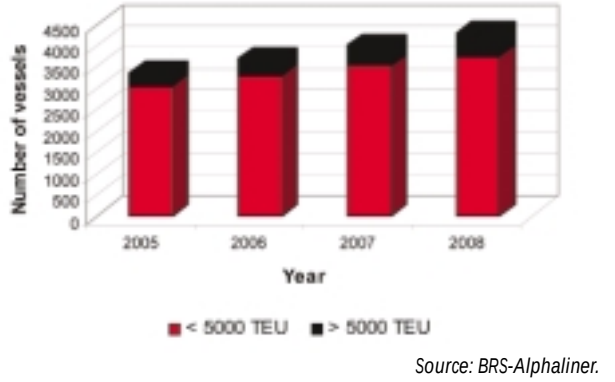
This paper highlights the interaction between the two parameters and illustrates how a co-maker approach between carriers and terminal operators can result in higher production, utilising existing capacity more effectively. It emphasises the need for better process coordination and information exchange to reduce idle production time.

Terminal productivity: A thin line between capability and deliverability

Further steps in economies of scale by employing larger vessels will see a radical shift in the way ships are handled. The characteristics of a standard 8,000+ TEU vessel, with a length of 334 metres, a width of 42.8 metres and a 14 metres draught, put an operational challenge on container terminals. Larger call sizes, exchanges between 3,000 and 4,000 containers are becoming the standard, and subsequent demand for higher crane and berth productivity stimulate terminal operators to develop new and enhance existing working procedures to meet these requirements. Given the very capital intense nature of liner shipping, main priority will be given to the minimising port time. This will lead to the need of generating productivity levels going far beyond the current standards.

The first response of container terminal operators to this was to invest in new hardware such as gantry cranes, stacking yard equipment and (semi) automated production solutions. The development of the Altenwerder Terminal in Hamburg and the design of the Euromax Terminal in Rotterdam are examples of this.

It is obvious that hardware investments have their limits both in terms of technical and economic aspects. A further increase in gantry crane productivity only makes sense when this productivity can be used effectively. Idle time and planning constraints often show a large difference between the technical capability and the effective deliverability of a gantry crane. This is an area when productivity gains can be made rather easily through better coordination between the vessel and the terminal. Examples of this will be discussed later. New working methods like dual cycling, tandem lift and twin-lift operations can only improve handling productivity when the vessel stow plan supports these methods. The synchronisation of stow plan design/quality and crane allocation/lifting methods is a promising area for further production gains.



Source: BRS-Alphaliner.

Figure 1. Cellular fleet composition.

Figure 2. OOCL Shenzen at Altenwerder Terminal in Hamburg.

Productivity co-maker approach: The way to success?

It is obvious that both parties in the container handling process have objectives in common:

Carrier	Terminal operator
• Berth upon arrival	• Planned and scheduled arrivals
• Maximise productivity on the ship	• Maximise berth productivity
• Minimise port time	• Minimise berth occupancy

A carrier by all means wants to minimise the port time of a vessel as much as possible. Time is money and large post-panamax vessels cost between US$ 40,000 and US$ 50,000 a day. The same objective is shared by the terminal operator. A reduction in port time results in more handling capacity becoming available to serve other vessels. However reality is often showing the opposite. Delays due to adverse weather conditions and congestion encountered in other ports cause non-adherence to agreed berthing windows. These situations require flexibility and creativity from terminal operators to get the vessel in and out as quickly as possible.

Since ocean transportation has always been subject to the conditions mentioned above, the focus must be on good planning and communications between carrier and operators.

A well planned terminal process can be broken down in three types of operations:

- Vessel related;
- Cargo related; and
- Connection related.

Vessel related operations

The pre-planning of this type of operation is based on good communication between the carrier, his agent and the terminal operator. Deviations from the berthing window caused by delays need to be communicated promptly in order to re-plan the allocation of terminal resources like gantry cranes and gangs. As such an optimal start of operations coincides with shift changes. A well designed stow plan enables the terminal operator to achieve high productivity levels on all the holds of the vessel and an optimal allocation of gantry cranes. Dual cycling, handling a load and discharge container within the same lift cycle, is particularly sensitive to the quality of the stow plan.

High volumes of re-stows and poorly distributed discharge cargo on board the vessel and last minute shipments of empty containers often cause a steep drop in (effective) crane productivity.

Cargo related operations

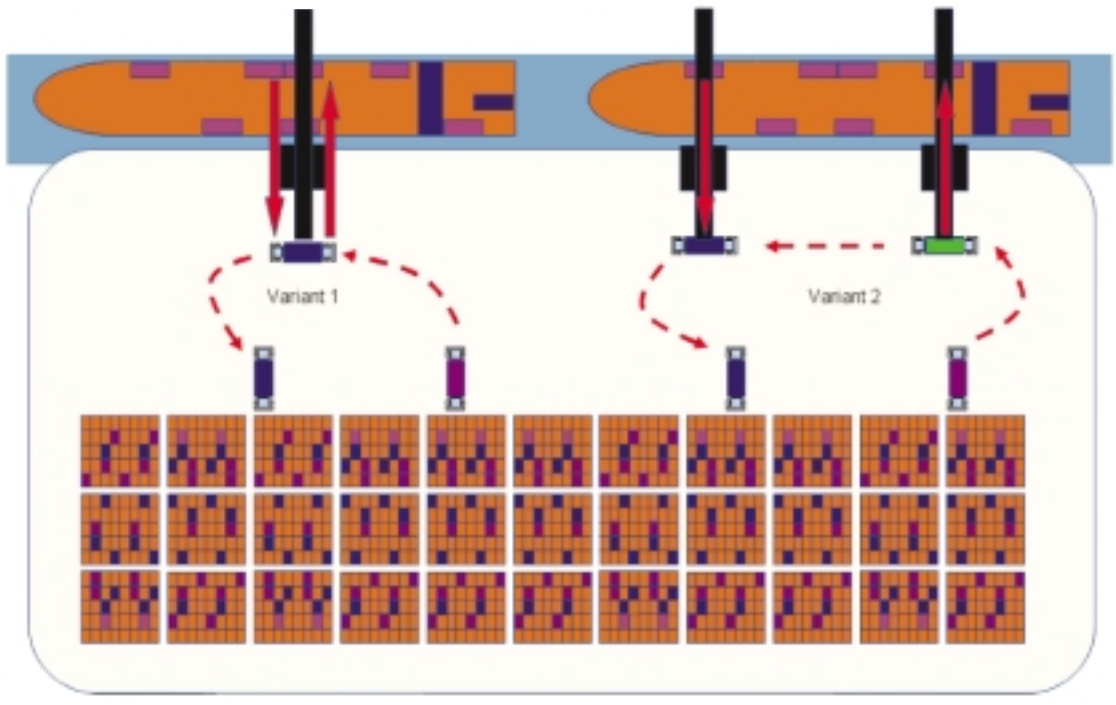
The volume of cargo to be discharged in a port is described in the import manifest as well as in the load lists of the previous ports. Timely availability of this information is crucial to pre-plan the vessel and to assign yard storage space. In case preceding ports are skipped last minute and cargo is relayed over another port of discharge this puts even more pressure on clear communication between carrier and operator on volumes to be expected.

The operational nature of export cargo differs completely from import cargo. The latter arrives in a huge quantity on board a vessel and is delivered in a fragmented way using a storage yard as buffer. Export cargo needs to be surrounded by a strict frame work outlining the cut-off of both physical availability in the stack and finished customs procedures. A 24 hour deadline before the vessel's arrival will enable a terminal to organise an export stack in such a way that load operations can be optimised in terms of speed and efficiency (crane split).

Connection related operations

A container terminal incorporates three main activities:

- Loading and discharging of (deep sea) vessels (seaside);
- Storage of containers (stack); and
- Receipt and distribution of containers from and over different (connecting) modes of transport (landside).



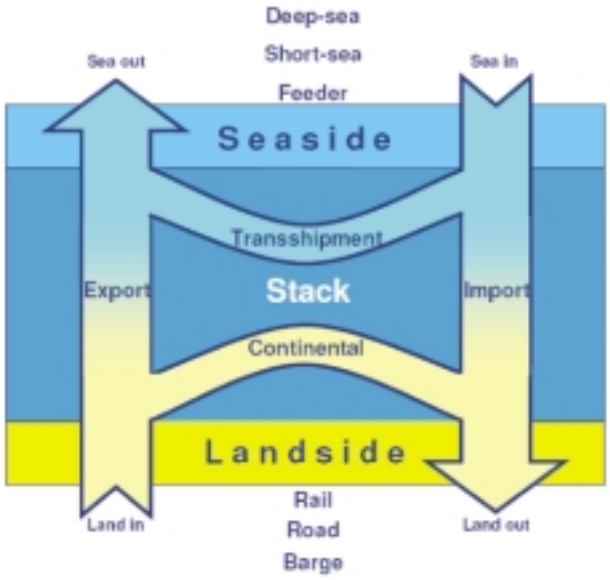
Source: Center for Maritime Economics and Logistics (MEL).

Figure 3. Dual Cycling.

Each container manipulation consists of an order to move, the physical movement and the associated data being a release from the carrier and the customs. In view of dwell time management, a terminal strives for the shortest possible time a container has to spend at a terminal. Pre-advice on the connecting modality and when the box will be physically moved is important to control the effective use of yard space. It is the latter that frequently causes bottle neck situations. Although various methods exist to keep the container stack below its saturation level, like reduction in free time and moving containers to off-dock depots, larger call sizes will put more pressure on the available yard space. A swift evacuation, especially of import containers outside the terminal environment, relieves this pressure considerably. Timely information on connecting modalities will enable terminals to plan stack locations and resources more effectively.

Conclusion

The true management and optimisation of container vessel loading and discharging processes will go beyond the approaches we have seen so far. The technical terminal aspects, like crane design and automation, play an important role; however a bridge needs to be built between these aspects and process management. Existing terminal facilities can only be optimised when all users contribute to this process by timely information exchange and sharing. The large increase in cellular tonnage in the next years coupled with only a modest expansion of terminal capacity in North-West Europe will accelerate this approach even further. The carriers ask for fast turn-around times irrespective of vessel size, while the terminal operators look for operations that can be planned and scheduled in order to deliver production. In an environment that is characterised by improved supply chain visibility through internet based "track and trace" systems, more emphasis must be placed on the procedural and data interchange part to boost terminal productivity. It will be obvious that in the framework showed above, the carriers and terminal operators must cooperate to reach these joint objectives.



Source: Center for Maritime Economics and Logistics (MEL).

Figure 4. Terminal activities.

ABOUT THE AUTHOR

Martin Ilmer joined the Center of Maritime Economics and Logistics (MEL) at the Erasmus University in Rotterdam in 2003, following a career at P&O Containers and P&O Nedlloyd. He holds a master's degree in Maritime Economics and Logistics and lectures maritime logistics.

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