



SMART(ER) PORTS NEEDED

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Since the new millennium, global tonnage has risen across major maritime cargo sectors by 66%, with containerised activity the major demand driver as volumes have almost tripled since 2000, according to ClipperMaritime research and databases.

Containerships are getting bigger and a re-grouping of liner alliances and shipping line consolidation has occurred – all while terminals seek to improve terminal operating efficiencies, invest in capacity and keep a tight control of operating expenses.

In 2017, the Port of Antwerp confirmed that getting a container from point A to point B frequently involves more than 30 different parties, with an average of 200 interactions between them.

This simple fact justifies the need for greater efficiencies within the container shipping and ports network.

MACHINE INTELLIGENCE

Ports and terminals must carry out

container-handling automation and the development of ‘smart-port’ functionality in tandem to ensure greater use of digital information and data to support the port operations (and vessel access).

Smart ports can deliver better operational speeds and efficiencies to support cargo flows for all stakeholders by installing sensors in access channels/ waterways to gather data on tides, wind, currents, temperature, water levels and berthing availability to provide real-time navigation for ships.

More importantly, it means that the benefit of integrated information systems delivers enhanced efficiency for the vessel and cargo processes because there is a consolidated, reliable and secure flow of information available to all stakeholders.

Effective smart port development can only be achieved through the use of automated equipment and the collection and application of data for operations,

energy and environment.

Each of these areas is, of course, heavily inter-linked. Operations use energy and have a direct impact on the environment, so there will always be an overlap occurring between each area.

By collating information that can be gained through smart-port technology, better informed decisions can be made, including reductions to ship waiting times, more efficient berth use and better planning for berthing windows, which ensure that the ship has the latest information to navigate towards a berth.

The ability to reduce energy consumption and emissions through this data is also a crucial benefit to be gained.

EXERCISING OUTPUT

A smart port utilisation of automated container handling equipment can deliver improved productivity, a safer



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working environment, lower emissions and reduce operating costs, all while providing operational consistency.

Of course, automated container handling equipment is expensive, and for the high initial outlay to be worthwhile, volumes of around 1 million TEU per annum and more are needed to justify the costs. However, there are upsides to using automated container handling equipment:

- Consistency: A good crane operator can achieve 30 moves per hour in good weather at the top of their game, but automation means 30 movers per hour every time, regardless of weather, time of day or operating environment
- APMT Maasvlakte II in Rotterdam: Productivity improved by 40%
- Safety: People are removed from the cargo handling area
- Lower emissions

Three functional areas of container handling are able to be automated and can participate in a smart port's digitalisation and its flow of information:

- Quay- ship-to-shore (STS) cranes
- Container yard- quay to storage
- Gate/gate house - containers leaving/ entering the terminal

A full automated transport system for container operations also has to consist of the following:

- Use of Automated Guided Vehicles (AGVs) for horizontal transport at the quayside. Flat-bed units are loaded directly by quay cranes, which operate in an unmanned area behind the crane and then move away from the quay area, relying on buried navigational aids to ensure no collisions occur
- At a fully Automated Container Terminal (ACT), a number of Automated Stacking Cranes (ASCs) are deployed for the vertical transport tasks in the container yard by stacking containers and dispatching them via an AGV

The most common bottleneck in terms of ship service time has gravitated from the STS cranes to the horizontal transport equipment responsible for moving containers between the quay and the container yard in which ASCs will stack containers. The following horizontal equipment systems are available:

- Automated shuttle carrier (AShC): Deployed at Brisbane and also a likely addition for London Gateway. The vehicle can decouple at all points as it has its own lifting and lowering capabilities
- AGV: The conventional type of system equipment, as deployed at Hamburg

(CTA) and in Rotterdam (at the ECT facilities)

- Lift-AGV: Can decouple its load with the use of a steel rack system at the yard
- C-AGV: Utilizes cassettes or steel platforms for transporting containers, thus decoupling at all points in the terminal

For these container-handling transport systems there are important factors that need to be considered and which will impact operational effectiveness, including:

- Layout: AShCs can decouple at both the quay side operations and the yard side operations. However, they require much more space as they have to straddle the container, and this leads to fewer transfer points from which the container can be interchanged from one piece of terminal equipment to another
- Transfer point: The location and number of transfer points for equipment such as a STS crane to perform operations without being hindered by the horizontal transport carriers not delivering or retrieving containers. The two most common locations for transfer points at the quay side operations are either between the legs or the back-reach area of the ship-to-shore quay crane. The location and type of horizontal equipment deployed to serve the ship-to-shore quay cranes will, therefore, influence productivity
- Behaviour: The functionality and manoeuvrability of the equipment has an impact on productivity because either more or less units are required to maintain a set STS productivity that is demanded by the terminal operator
- Energy: The consumption of fuel is fast becoming a factor that is included in the decision-making process with respect to investment in automated equipment, with investment into hybrid, battery, super or ultracapacitors and inductive energy

WORLDWIDE CONNECTIONS

The smart-port concept and use of container terminal automation is underway in some geographic regions and still in its infancy in other locations.

There is no doubt that the number of containers moving on a global basis is going to continue to increase, with the introduction of larger ships linking key regions such as Asia, Europe and North America.

More terminals are expected to move towards automation, as the need to gain operating efficiencies will only increase,

while the over-riding cost factor will always be something that needs to be met with sufficient demand.

The development and use of smart-port technology and specialist initiatives like blockchain are items that more ports need to embrace.

In Europe, for example, Antwerp, Hamburg and Rotterdam continue to develop such smart-port initiatives, while Montreal in Canada is another port actively working to increase similar digitalised efficiencies.

There is no doubt that the use of data and information to deliver more efficient activities at a port, from the moment the ship arrives until it leaves, needs to increase. The more information available, the more better-informed decisions can be made.

While market forces will still dictate the flow of volumes, smart-port technology and use of operational automation helps to service the demand and reduce costs.

Those ports that use it and provide better data will be a more competitive option to the industry.

ABOUT THE AUTHOR

James Caldwell is Lead Consultant for London-based ClipperMaritime, a company specialising in the provision of data analysis and solutions for the port and shipping industry. He previously worked for a leading specialist maritime consultant in London and Panama, together with various country and trade lane positions for global container shipping operator, APL.

ABOUT THE ORGANIZATION

ClipperMaritime is a leading global advisory with exclusive access to the world's most comprehensive maritime cargo flows database. It offers a level of historical and real-time fundamental economic data and delivers proprietary hard data, research, analysis and solutions advisory.

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