

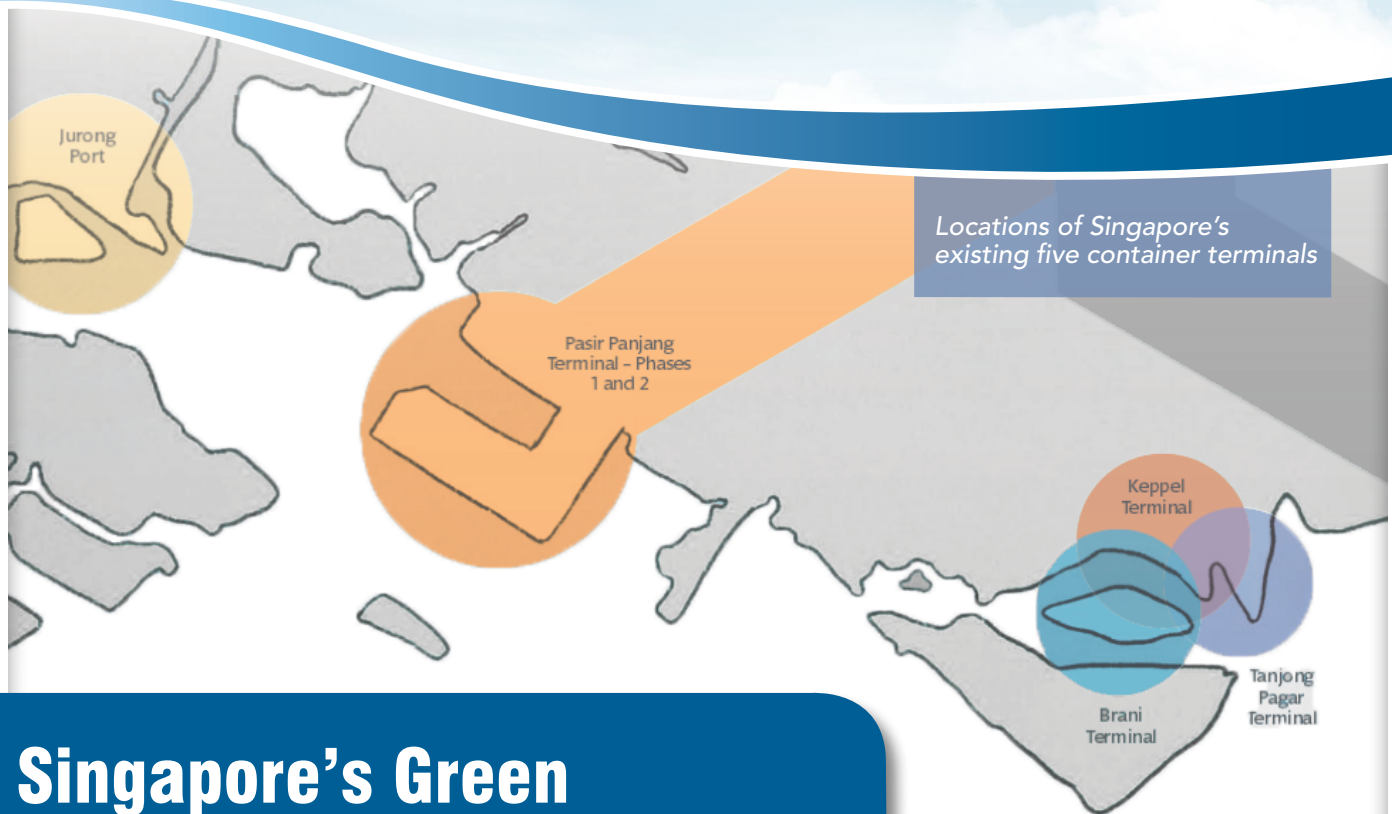
ASIA'S PORTS OF THE FUTURE



For many Asian states, economic prosperity is inextricably linked to the ability to attract and process maritime trade. However many ports in the region are insufficiently equipped to process the number of vessels and cargo due to rapidly increasing volumes, thereby diverting trade routes and bottlenecking economic development. Consequently, the race is on for Asia's ports to expand their capacity and cargo handling efficiency in order to become the location of choice for the world's largest shipping lines. **This competition is driving significant innovation in the methods of port planning and operations, with several "world firsts" currently in development.**

To provide examples of this innovation, we take a look at three leading examples from Southeast Asia's most modern ports, *Hong Kong*, *Singapore* and *Indonesia's* newest port, Teluk Lamong in Surabaya, East Java.





Locations of Singapore's existing five container terminals

Singapore's Green Port Developments

In land strapped Singapore, PSA Singapore Terminals operates a total of 57 berths at its five container terminals located across the island state. Given their close proximity and single parent company, these ports operate as one seamless and integrated facility handling, on average, 60 ships and 91,000 containers every day.

60



91,000



Of these locations, Pasir Panjang Terminal is PSA's most advanced terminal. It is equipped with berths up to **16 metres deep** and with quay cranes able to reach across 23 rows of containers to accommodate the world's largest container ships.¹ At present, Pasir Panjang Terminal is in phase three of four of an expansion and will be **fully operational by the end of 2017**, when it will bring Singapore's total handling capacity to 50 million containers a year.²

Fast Fact: In 2014, PSA handled 33.5 million containers. If lined end-to-end, that is enough to encircle the globe four times.³

¹ <https://www.singaporepsa.com/our-business/terminals>

² <http://www.channelnewsasia.com/news/business/singapore/how-singapore-s-port/1796336.html>

³ <http://www.channelnewsasia.com/news/business/singapore/how-singapore-s-port/1796336.html>

The New Tuas Mega Port

Despite the ongoing development at Pasir Panjang, PSA is already planning to develop a new mega port that will consolidate and replace the operations of the four existing locations. Named Tuas Port, this \$8 billion investment will be located on the west side of the island and when fully completed, will be able to handle an incredible

65 million twenty-foot equivalent units (TEUs) per annum.⁴

Its key features will include the use of automated machinery and green energy systems to improve efficiency and environmental sustainability.

In order to prepare the location to accommodate the new port and vessels, current works include the construction of an **8.6km quay wall**, reclaiming about **300 hectares of land** and dredging deeper navigational channels so the harbour can accommodate larger vessels. In order to protect the environment during this development, a containment bund is also being built so that materials from the dredging works do not pollute the surrounding area. Much of the dredged material will also be recycled into reclamation filling as a sustainable development initiative for a greener port in Singapore.⁵

Fast Fact: In June 2015, the Port of Singapore was voted the best seaport in Asia at the 2015 Asia Freight, Logistics and Supply Chain (AFLAS) awards. Notably this is the 27th time the port has won the award.⁶

**NEW
TUAS
PORT**

⁴ http://www.joc.com/port-news/asian-ports/port-singapore/southern-asian-hub-ports-invest-bigger-future_20140519.html

⁵ <http://business.asiaone.com/news/journey-towards-greener-port>

⁶ <http://business.asiaone.com/news/port-singapore-voted-best-seaport-asia-27th-time#sthash.O1cNDkEm.dpuf>

Upgrading Jurong Port

Jurong Port is currently being upgraded and in doing so, will become *the world's first 'green port'*.

THE WORLD'S
FIRST



The berths, which were first built in the 1960s, currently have a total area of 2.4 hectares and a draft of only 10m. As part of the port's plan to improve productivity

and capacity, the berths will be deepened to a 18.8m draft in order to handle larger vessels of up to **70,000 tonnes**, while the storage area will be increased by almost 30% to 3.1 hectares.⁷

What makes the construction plan so "green"?

Concrete from the existing berths and yards will be cut up,



Crushed & Recycled
for use in the upgrades.

Pre-cast beams and slabs are also being used to remove the need for substantial frameworks. Furthermore, certified green construction materials, including green cement, green steel mesh and green reinforcement bars, will also help to reduce the carbon footprint of the project.⁸ In addition to this, the port is also set to have the largest port-based solar panel facility in the world, with **more than 95,000m² of warehouse roof space** to be fitted with panels. This USD \$30m system is expected to generate 10 megawatts of electricity at its peak capacity, which is enough to power **2,800 units** of 4-room apartment annually. The electricity generated will be used by Jurong Port, with excess electricity being channelled into the Singapore power grid for other users. Installation of the panels is expected to be completed by December 2015.⁹



This project is testimony to our ongoing efforts to promote environmental sustainability,"
said Jurong Port's CEO Ooi Boon Hoe.

"The project will help promote Singapore as a hub for green energy generation."¹⁰



⁷ <http://www.portstrategy.com/news101/environment/singapore-goes-green>

⁸ <http://www.portstrategy.com/news101/environment/singapore-goes-green>

⁹ <http://www.portstrategy.com/news101/environment/singapore-goes-green>

¹⁰ <http://www.straitstimes.com/business/jurong-port-to-top-world-ports-in-solar-energy-generation>

Hong Kong's Port Automation Advantage and Future Development

The **Kwai Tsing Port** is located in the north-western part of Hong Kong's harbour, which is home to nine container terminals owned by 5 private operators.

Between them are 24 berths, with about **7694 metres of deep water frontage** and a total handling capacity of about 20 million TEUs (20-foot equivalent units), which helped positioned it as the world's busiest port for many years.¹¹

But in addition to the sheer size of the port, another key factor in Hong Kong's long-term success was its rapid shift to automation. Several of the indispensable solutions that have enabled Hong Kong port to out-perform its regional neighbours include:

1 Terminal Management System

To handle the millions of containers that pass through Kwai Tsing port, each terminal operator has their own separate terminal management systems, specially designed for their individual operating environment in Hong Kong. This integrates terminal activities including gate, yard and vessel operations, in addition to providing a real-time common database to monitor and optimise terminal operations.

2 Electronic Data Interchange Technology (EDI)

EDI enables accurate information links between shipping lines and terminal operators. Since originally being introduced in 1988, the scope of Hong Kong's EDI has been progressively extended to provide higher levels of functionality in regards to data exchange and coordination for docking and transit.

3 Barge Operations

With the growth in economic production in Southern China, Hong Kong reacted by developing a specialist Barge Centre in 1998. Then in order to handle the growth in demand, a Barge Identity Card system was introduced to automate and simplify the identity authentication process.

4 Gate Automation

Kwai Tsing Port was an early adopter of gate automation technology, which sped up the transit and tractors and containers. This was then further enhanced by the introduction of common smart-card based tractor identity cards, which meant that drivers only needed one card to access the five separate terminals.¹²

¹¹ <http://www.gov.hk/en/about/abouthk/factsheets/docs/port.pdf>

¹² <http://www.hkctoa.com/technology>

Yet despite these technological advantages, Hong Kong is in danger of losing its competitive advantage to lower-cost neighbours in the region. Just a glance at the most recent statistics show a gradual yet protracted decline in cargo volumes over the last couple of months.¹³ In response to this trend, the Government commissioned a study on the strategic development plan for Hong Kong port to 2030 which concluded that, "all buffers at [Kwai Tsing container terminals] will be lost in the coming years if some capacity is not added".¹⁴

The pressure is on, given that Hong Kong already operates one of the most modern container ports in the world and has very limited room for expansion.

Commenting on the dilemma, **Jessie Chung**, *Chairman of the Hong Kong Container Terminal Operators Association* suggests the following:

The container operator industry has already invested in infrastructure, equipment and human resources to increase efficiency and handling capacity. However, for these investments to have a real impact, the government must urgently implement the key recommendations of their own studies. Among the eight recommended measures, two which can easily be implemented and will be effective in improving handling capacity are: increasing the number of barge berths and integration of land around the terminals."¹⁵

Ms Judy Tong and **Prof. Hong Yan** of the *Department of Logistics and Maritime Studies at The Hong Kong Polytechnic University* add:

Existing Kwai Tsing container terminal infrastructure requires expansion (not relocation) for continuous terminal development, include wider deck width and more robust terminal design to cope with higher levels of technology and automation for quay side operation, such as tandemplifting which is already becoming common in other terminals. A standalone terminal (CT 10) somewhere far away from the existing terminals in Kwai Chung and Tsing Yi should be avoided as it shall prohibit intension interaction with the existing facility. CT 10 should be considered to be built with minimal driving time and distance from Kwai Tsing terminals."¹⁶

Consequently, according to the trends and recommendations from industry experts, Hong Kong urgently needs to expand and modernise its port capabilities if it is to retain its status as one of Asia's busiest ports.

¹³ http://www.porttechnology.org/news/hong_kongs_container_volumes_plummet

¹⁴ <http://www.pdc.gov.hk/docs/ES%20Eng%20%2828.11.2014%29.pdf>

¹⁵ <http://www.scmp.com/comment/insight-opinion/article/1778695/future-hong-kongs-container-port-industry-jeopardy>

¹⁶ http://www.icms.polyu.edu.hk/ICMS_Policy_Research/Container_Terminal_10_in_Hong_Kong_Over_Capacity_or_Sustainable_Strategy.pdf

Indonesia's First Semi-Automatic Port

In early 2015, Indonesia completed the massive construction project of Teluk Lamong Terminal, located in Surabaya, East Java. The new port, which began operations in March 2015, has a capacity of **1.6 million twenty-foot equivalent units (TEUs)**, **10.3 million tons of dry bulk** and has been constructed to ease operations at the country's second-largest port, Tanjung Perak in Surabaya.¹⁷

1.6 million twenty-foot equivalent units (TEUs)

10.3 million tons of dry bulk



Speaking about the project, **Djarwo Surjanto, Director of PT Pelabuhan Indonesia III** explained that Teluk Lamong is Indonesia's first semi-automatic port.

Semi-automatic means everything is controlled from the control room. It is not for show, but for safety. Trucks and cranes are everywhere on the field, and it may hit many people running back and forth. It reduces human contact, as well as extortions," he explained.



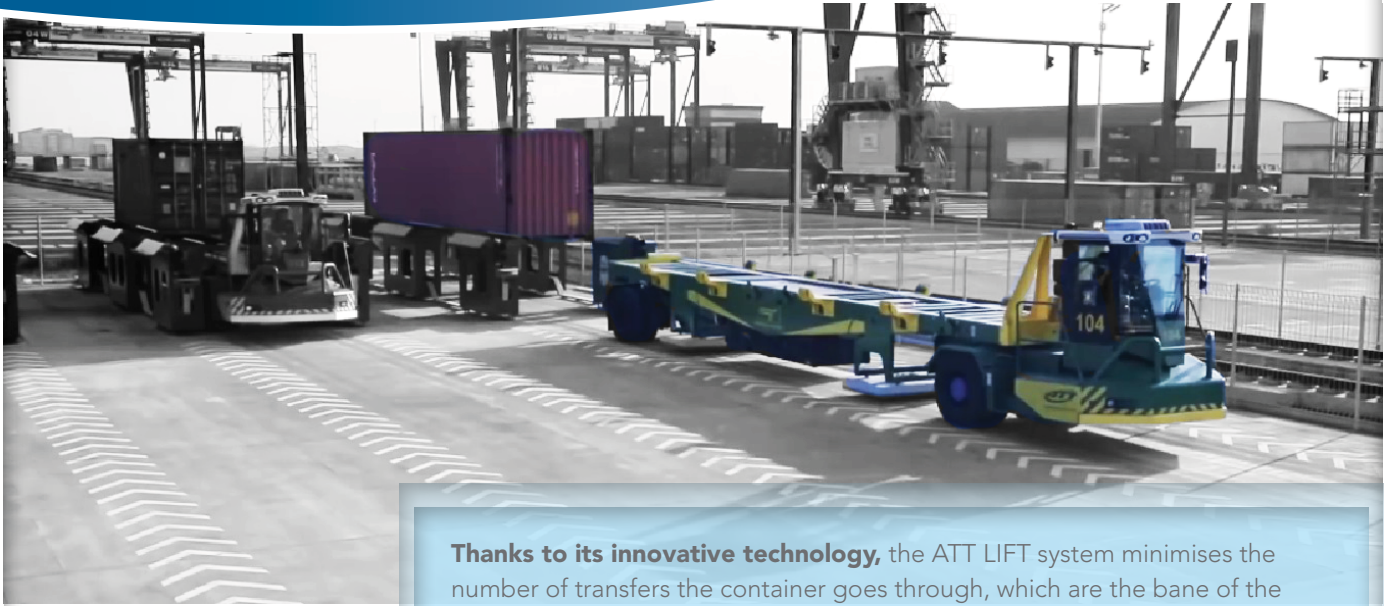
Another benefit of utilising this sophisticated technology is to reduce dwell time and increase productivity the of the port. Several of the technologies that make this possible are outlined below:

Automated Container Handling System

Teluk Lamong is equipped with state of the art Automotive Terminal Trailer Docking Stations. These operate a "hands free" system, whereby containers can be transferred from Automotive Terminal Trailer LIFT vehicles (ATT LIFT) to docking stations entirely automatically, before they are removed by dock cranes.



¹⁷ <http://www.thejakartapost.com/news/2015/02/06/teluk-lamongs-international-terminal-operate-next-month.html>



Thanks to its innovative technology, the ATT LIFT system minimises the number of transfers the container goes through, which are the bane of the logistics chain, since cost and time requirements grow with the use of each new piece of handling equipment. Then with their automatic guiding systems used for moving in and out of the docking station, the vehicles makes it possible to place and remove containers quickly and safely.

Optimised Terminal Operating System and Automatic Stacking Cranes

Realtime Business Solutions (RBS) were selected to supply the new terminal operating system (TOS) for *strategic planning* and *equipment execution* within the terminal. Of the solutions available, the TOPX Advance system was chosen. Then to compliment the TOS, Konecranes were selected to provide the container handling equipment including:

10

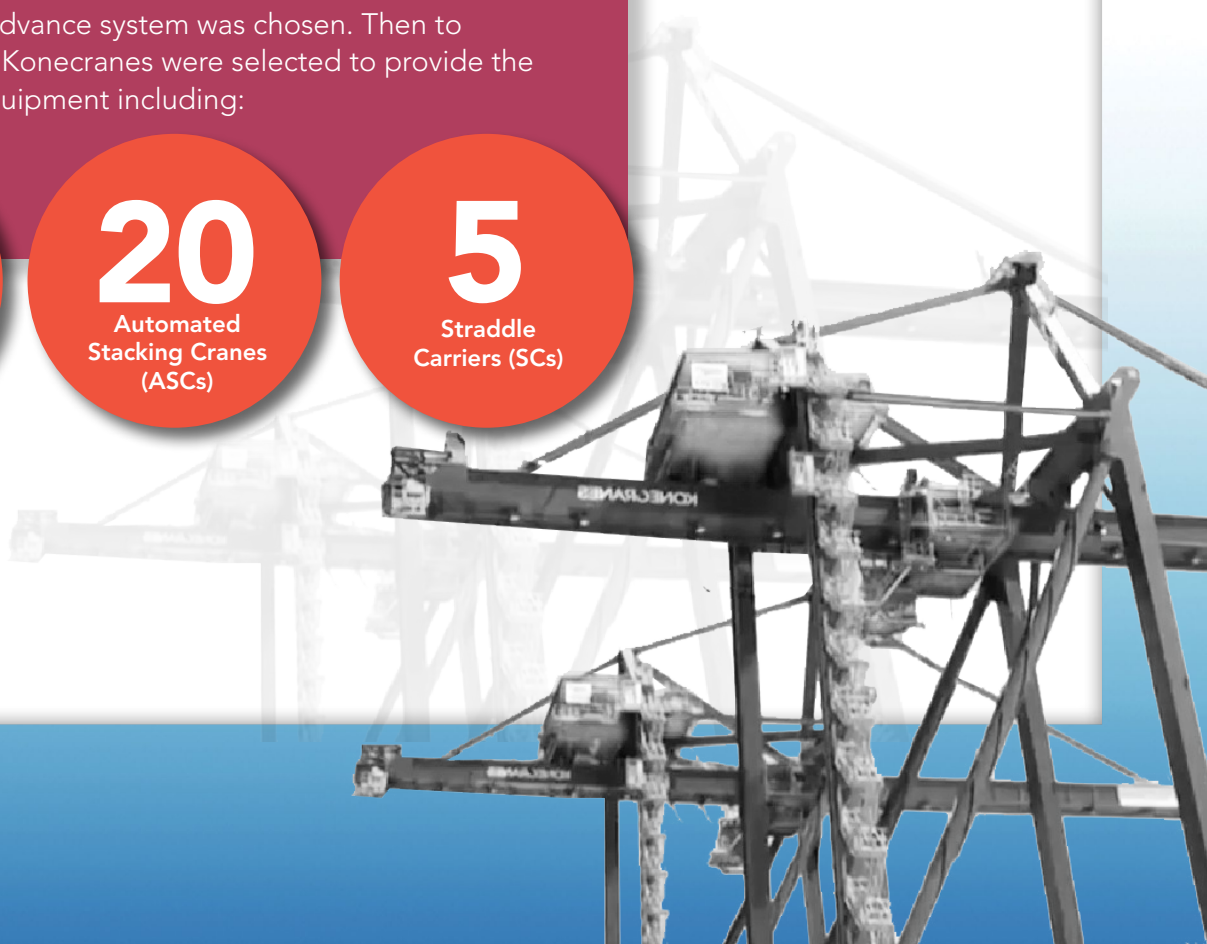
Ship-to-Shore
(STS) cranes

20

Automated
Stacking Cranes
(ASCs)

5

Straddle
Carriers (SCs)



“According to RBS,

TOPX - Advance features a unique optimisation dispatch and management function for ASCs. It applies dynamic working ranges to avoid deadlock scenarios, supports dual cranes per stack to increase efficiency, and implements automatic housekeeping moves for vessel loading to reduce waiting time and provide real time crane status management.”¹⁸

Together, RBS and Konecranes have worked together to develop an automated solution for Teluk Lamong. The first ASCs were erected in March 2015 and since they are not equipped with a cabin or a driver, the TOPX - Advance system is the key to executing tasks that would have otherwise been handled by a human operator.

Konecranes adds that Lamong Bay Terminal's automated container-handling system incorporates a wide range of technological improvements, including stronger redundancy throughout the design, an improved remote operating station (ROS) and graphical user interface (GUI).¹⁹

Environmentally Sustainable Port Operations

The cutting edge solutions at Teluk Lamong have also been designed to be environmentally sustainable. For example, the ASCs to STS cranes are powered by electricity rather than diesel. Notably, this electricity is generated by a nearby gas power plant built especially for the port.²⁰

In the case of the ATTs and SCs, although they run on diesel, they have a EURO 4 emission standard making them amongst the most environmental friendly vehicles of their kind. Then regarding the container trucks, only trucks with liquid natural gas fuel are allowed to enter the terminal premises.²¹

Indonesia's Next-Generation Container Terminal

“Lamong Bay Terminal is the next generation container terminal” said, Mr. Prasetyadi, President Director, Terminal Teluk Lamong. “Thanks to the reliability, productivity, predictability and safety provided by our Konecranes automated container handling system, we will provide our shipping line customers with uninterrupted, reliable container flow. This will be the key to build up business success in Indonesia and South-East Asia.”

¹⁸ <http://www.rbs-emea.com/2015/07/case-study-automation-solution-with-rbs-tops/>

¹⁹ http://www.porttechnology.org/news/konecranes_automates_indonesian_giant

²⁰ <http://en.metrotvnews.com/read/2015/05/22/128834/teluk-lamong-terminal-environment-friendly-and-state-of-the-art-port>

²¹ <http://en.metrotvnews.com/read/2015/05/22/128834/teluk-lamong-terminal-environment-friendly-and-state-of-the-art-port>

²² http://www.porttechnology.org/news/konecranes_automates_indonesian_giant



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