Bringing in the best of engineering
Leader’s Column

- HIT’s Managing Director examines how changes in the industry, such as mega-vessels, pose challenges to the terminal

HIT Update

- The task of moving two new quay cranes under Stonecutters Bridge exemplifies the innovate approach of CHT and HIT’s Engineering Departments
- HIT begins works on the installation of remote control operator booths for its fleet of rail-mounted gantry cranes
- The process of getting a crane license at HIT is examined
- HIT’s Apprenticeship Programme helps train the next generation of port workers
- Gerry Yim, HIT’s MD and HPH Trust’s CEO, speaks about the opportunities and challenges that lie ahead

Focus Stories

- MOL steps up its presence in the region with the consolidation of its head office in Hong Kong
- ZPMC discusses the crane industry and how the company has grown over the years
Staying Ahead of the Game

On an unassuming morning in mid-November 2012 the CMA CGM Marco Polo pulled in at HIT for what was ostensibly just another day at work – the thing that made this day different was the size of the vessel: at 16,020 TEU it is the largest containership in the world.

As the size of mega-vessels continues to increase, the number of ports that are able to service them shrinks. The Marco Polo has a length of almost 400 metres and a width of over 53 metres, placing it at the vanguard of the war shipping lines are waging against the rising cost of fuel by selecting fewer ports where it will call based on a number of factors including water depth, the approaching channel, and the capabilities of the container terminal.

The “trend” of deploying these fuel efficient mega-vessels is increasingly becoming the norm, in what is arguably the biggest shake up the industry has seen since the containerisation of ocean freight itself, and thrown a challenge to terminal operators.

HIT and its sister terminals, in Kwai Chung and Yantian, are already preferred ports-of-call for mega-vessels. Not only are they physically capable of servicing mega-vessels but because their technical expertise, operational efficiency, state-of-the-art IT systems, and skilled workforce allow these vessels to achieve the fast turnarounds they require in order to offset the time lost due to slow steaming.

This is a challenge HIT is well-prepared to meet. We have an impressive average of 27,000 daily container movements and continually improve upon our own productivity. A good example is the recent call of the Wan Hai 603 where HIT clocked a record 45.1 moves per crane per hour.

Other initiatives you will read about in this edition of HIT News is the progress of our remote control rail-mounted gantry cranes project as well as the engineering teams’ innovative approach to handle the arrival of two new quay cranes at COSCO-HIT Terminals, part of a quay upgrade programme enhancing its ability to handle mega-vessels.

With even larger vessels set to come on-stream next year HIT will continue to stay a step ahead of the game and charge forward.
Quay cranes are one of the most essential pieces of equipment for any terminal operator, moving containers from the ship to the shore and vice versa. They are large machines weighing in the vicinity of 1,500 tonnes and have a lifespan of around 35 years. When new cranes are ordered it is a task that requires many months of preparation and coordination.

COSCO-HIT Terminals (CHT) in Hong Kong embarked on a quay upgrade programme in 2011 that included the purchase of two new quay cranes capable of handling the increased stacking height and number of rows across of the new generation of mega-vessels. However, there was one technical problem: standing at around 80 metres (with the boom down) the cranes are too tall to pass underneath Stonecutters Bridge, completed in 2009, which spans across the entrance to Rambler Channel where the Kwai Tsing port is located. The clearance height under the bridge is 68.5 metres.

To overcome this challenge, CHT and HIT’s Engineering Departments worked closely with crane manufacturer ZPMC to carry out a complex plan that involved the lowering of the cranes’ A-frames in an anchorage area in Hong Kong waters enabling them to pass under Stonecutters Bridge and enter the terminal area before having their A-frames re-erected.
ready for operation. With the A-frames lowered the cranes stood at a height of 67.5 metres above sea level. The arrival of these two cranes marked the first time that any terminal operator in Hong Kong ordered new cranes since the bridge was completed.

The project began in August 2011 when CHT signed a contract with ZPMC and HIT’s Engineering Department took up the project management role given the large number of quay cranes in its care and its extensive experience in handling the procurement and receipt of new quay cranes.

“After the contract was signed ZPMC started working on the design and we flew to Shanghai to have our first review meeting in September of last year,” said Jason Chan, Manager – Cranes Maintenance at HIT. He continued, “In the meeting they gave us a project schedule showing key dates, including when they would start the commissioning process, when they would start the manufacturing process, when they would start erecting the cranes, and when the cranes would be delivered. The schedule was reviewed in all of our meetings with them,” said Jason.

“The other major issue that we discussed in the meetings with ZPMC was the design of the crane itself. ZPMC gave us all the mechanical, structural and electrical drawings of the cranes, and we discussed the designs based on our experience with our existing cranes. ZPMC have their own standard design as they have been producing cranes for a long time, but from a terminal operator’s point of view we have our own preferences based on our own experiences and our normal maintenance and operational practices. As such, some ZPMC design features had to be adjusted to cater to our particular application.”

One example of a design feature that CHT and HIT’s Engineering Departments chose to alter was the way the crane’s “snag load protection” functions. Snag load protection stops crane operation if the spreader – the moving platform that lowers onto a container and locks onto it – gets stuck. Snag load protection absorbs the sudden load created in such situations and prevents
accidents, damage to the crane structure and spreader, and broken hoist ropes. Under CHT and HIT’s stringent safety procedures, all of their quay cranes use two stages of protection, an added safety feature that was requested for the new CHT cranes.

CHT and HIT’s Engineering Departments also requested modifications to the lifting capacity restrictions at the cranes’ furthest outreach, a feature common with HIT cranes. The quay cranes ordered by CHT have a lifting capacity of 60 tonnes which is, by default, capped at a certain outreach. However, given the large number of mega-vessels calling in Hong Kong, CHT and HIT’s Engineering Departments requested that ZPMC design the cranes without such restrictions so that the cranes can lift 60 tonnes even at the furthest distance of the boom arm. CHT and HIT’s Engineering Departments also requested the cranes be designed with an increased lifting height of 45 metres.

The final design of the crane was confirmed in November 2011 after which the crane fabrication and construction process was ready to begin. CHT and HIT’s Engineering Departments continued to have monthly meetings with ZPMC in Shanghai until the arrival of the cranes.

“The most important thing we looked at in those meetings was the progress of the cranes. Every time we went to Shanghai for a meeting we visited ZPMC’s manufacturing based on Changxing Island. Afterwards we returned to their offices to discuss issues that we found in the manufacturing and ZPMC raised difficulties and concerns that they had,” Jason said.

Production on the cranes was completed in May 2012. It took four days to ship them to Hong Kong and they arrived outside the port on 4 June. The process of lowering the A-frame took three days.

“The lowering of the frame basically involves collapsing it. The seaside A-frame is supported by a backstay and a forestay. There is a pin holding the backstay in place and once it was removed the backstay became moveable and the A-frame could be lowered using the force of gravity. The same pulley system was later used to erect the A-frame,” said Jason.

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After the two new quay cranes were in position at CHT, the cranes they were replacing needed to be relocated to different berths at HIT. The relocation process involved three older cranes

With the A-frame lowered the ZPMC vessel passed under the Stonecutters Bridge and made its way to Terminal 9 where the A-frames of the cranes were re-erected. After the A-frames were re-hoisted the next step involved removing the “sea fastenings” of the booms from the cranes. The sea fastenings were used to support the booms and protect them from damage during the voyage from Shanghai to Hong Kong. Once the sea fastenings were cut off, the cranes’ own spreaders were then used to lower the fastenings to the quay. After this, both cranes had their boom raised in order to not interfere with the passage of vessels when they were shipped across Rambler Channel to Terminal 8.
and took place immediately after the new cranes were in place. This fairly straightforward final step was complicated by Severe Tropical Storm Talim which was passing by Hong Kong.

“It was June 18th, I still remember the day clearly. During the loading and offloading process the worst thing we could have encountered was a typhoon as it makes for a very dangerous situation. Of course, we had prepared a number of contingency plans for this very scenario. For every single day of the process starting from the arrival of the new quay cranes we had a separate contingency plan. But we did not expect that we would have to execute them!”

Although Talim did not hit Hong Kong directly, it passed close enough for the Hong Kong Observatory to raise Strong Wind Signal Number 3, triggering a contingency plan which involved speeding up the crane relocation procedure. As the typhoon neared Hong Kong, ZPMC’s team has just loaded two older quay cranes from CHT onto a vessel and berthed at Terminal 7. The original plan involved offloading one of the quay cranes and loading on another, instead after offloading one crane to Terminal 7 they immediately went to Terminal 9 to offload the second quay crane in order to empty the ship before the typhoon arrived.

“If the typhoon had hit Hong Kong and the cranes were still on the ship the process could have been more complicated. CHT, HIT and ZPMC staff worked together around the clock to unload those two cranes as quickly as they could. The typhoon didn’t hit in the end, but Signal Number 3 was hoisted and we still had to get ready for the worst-case scenario. It was a very good real-life training experience for us.”
Rail-Mounted Gantry Cranes (RMGCs) were first introduced at HIT in 1995 as part of a HK$1.5 billion investment in a Productivity Plus Programme (3P) designed to improve ship and yard capabilities.

HIT installed six RMGC blocks each with four cranes allowing for rapid container handling, higher stacking and more efficient use of the limited land space at the terminal.

Herman Chiu, Senior Manager – Terminal Development, Hutchison Ports South China, explained that as part of 3P the cranes were only one aspect of many different modifications at the terminal aimed at improving efficiency and customer service levels across the board. Other 3P initiatives included revised gate procedures, installation of a private paging network for the scheduling of internal vehicles, and enhancement of computer links for sharing information both internally and with clients.

The RMGCs are some of the most advanced cranes in the world as they are highly automated, meaning the cranes are capable to search and shuffle containers according to instructions received from the terminal operating system. As an operational safety measure, HIT puts an operator in the cab to perform an important step, i.e. the operator is responsible for placing the containers on the chassis and vice versa. HIT remains the only terminal operator in Hong Kong to have implemented these cranes.

Three remote control stations were the next logical step and as Herman pointed out they were timed to coincide with the cranes’ refurbishment. “The cranes have been in operations for 15 years and it’s time for them to undergo a major refurbishment and upgrade. This was the perfect opportunity for us.”

Herman explained that this project is not only about installing remote control stations, but equally about the work on the automatic control system of the.
cranes. To date there are three cranes connected to remote control stations located next to the Control Centre in the main tower on HIT’s Terminal 4.

Speaking about the timeline for the completion of the project Herman said, “This project is not that simple. We have to take the cranes out of commission one at a time. The length of time they are out of service will shorten as we proceed. We spent more time on the first crane which took three to four months. But working on one crane doesn’t involve its interaction with neighbouring cranes in the same block and ensuring that they integrate well into the overall system. Completing the first block of four cranes will be a great milestone and the remaining five blocks will be much easier as we will simply duplicate the process.”

Once all six blocks are connected to remote control stations the work on integrating them with nGen and other auto-identification systems such as the new RFID-on-tractor system will begin. Herman said this would take place in the third quarter of 2013. “We want to get the remote control stations working first and only then focus on nGen integration which will involve a long transition period.

“The workflow is exactly the same as before because we have not yet integrated the system with nGen. The only difference at the moment is that the crane operators have been taken out of the cabs and put in an office. When they are in the cabs there’s in-cab computers that provide them instructions and these computers have now been moved to the remote control centre.” At the final stage of the project, these computers will be removed as nGen will then take over the job selection process in the RMGC area.

Already in these early stages of the project productivity gains are obvious, Herman said, giving the example of the loading and unloading of containers from the chassis. “The reason is that we have CCTV cameras on the four corners of the spreader so the operator can see the corner casting rather than looking down at it from a height of 20 metres above. They now have a much closer view.”
Learning the Ropes

Cranes form the heart of front line operations at a container terminal like HIT where there are many different types including quay cranes, bridge cranes, harbour cranes, rubber-tyred gantry cranes, front loader cranes, reach stacker cranes and rail-mounted gantry cranes. Each of these cranes requires skilled operators as the speed and accuracy with which they can move containers around the terminal directly affect both productivity and safety levels.

HIT’s in-house training for its crane operators covers not only the handling of the equipment itself, but equally the safe handling of containers. The training team consists of several different types of trainers, including Training Officers and Instructors. Each of the seven types of cranes at HIT requires a different skill set and a different license.

The Government of Hong Kong’s Labour Department has given HIT the authority to issue licenses to operators it has trained so the entire process from initial training to final certification can be done in-house allowing HIT’s Operations Department to monitor the process every step of the way and ensure the highest levels of quality.

Furthermore, the Occupational Safety and Health Council (OSHC) provide training courses for the trainers to ensure they are up to date with the latest industry changes and practices. In fact, HIT’s trainers have achieved such strong results that they have even trained operators for other terminals in the HPH worldwide network of port operations.

All new trainees must be at least 18 years old and all of the crane training procedures follow a similar set of steps: an initial period of practical and theoretical training; a test halfway through the training course; completion of the training; and a final test followed by issuing of a license and a further period of on-job training.

Non-cargo handling training courses are also provided for Engineering staff who need to repair and test damaged cranes. This two-day course covers non-cargo handling operations, teaching the technicians how to move the crane and the spreader.
HIT Apprenticeship Programme

HIT has a number of programmes in place to encourage and train its next generation of port workers, among these is the HIT Apprenticeship Programme which gives applicants exposure to different sections of its Engineering Department and allows them to experience exactly what working in this field is like.

HIT began recruiting potential apprentices for the current intake in March 2012, visiting the Vocational Training Council (VTC) and giving a presentation, followed-up by two site visits, one for teachers and one for students, giving them a better insight into the working environment of the Engineering Department. Thirty applicants were interviewed and from this a group of 11 was culled.

Apprenticeship applicants need to have completed the Basic Craft Certificate Programme with one year of study in VTC’s mechanical engineering or electrical engineering courses, as well as having a keen interest in the port and logistics industry.

The 11 teenage apprentices work five days a week followed by one additional day of theoretical study, providing them with both the practical and theoretical knowledge needed for a successful career in the ports industry.

The apprenticeships last between three and four years, depending on each applicant’s academic achievements at the VTC and their progress at HIT. VTC inspectors come to HIT to visit the apprentices and follow-up on their progress around three times a year. In addition to this, their supervisors at HIT conduct monthly performance reviews as well as providing guidance and identifying areas where improvement is needed in regards to safety, technical and other issues.

For the first 26–30 months of their apprenticeship, the students rotate between different sections of HIT’s Engineering Department, learning mechanical and electrical skills as well as crane and facilities maintenance. For the final 10–18 months they train in a fixed section in order to hone their skills in their chosen area of work. Upon completing the programme the apprentices will be given priority for permanent positions that open at HIT.

Two of the apprentices currently in the programme are Man Shuen Tai and Shum Tsz Yeung. Man Shuen Tai, an Electrical Engineering graduate noted that the yard area was far safer than he had imagined. Shum Tsz Yeung, a Mechanical Engineering major, said the staff at HIT have provided him with tips and advice that was not taught in his classes and the experience has left him with a positive impression about the prospects of working in this industry. And this is what the programme is all about: acquiring and developing the talent that will make-up the next generation of Hong Kong’s logistics workforce.
Gerry Yim is Chief Executive Officer of Hutchison Port Holdings Management, the trustee-manager of Hutchison Port Holdings Trust (HPH Trust) and Managing Director of Hongkong International Terminals, a member of HPH Trust.

Together with HIT, port assets under the HPH Trust include Yantian International Container Terminals (YICT) in Shenzhen and COSCO-HIT Terminals (CHT) in Hong Kong.

Prior to his latest appointment guiding the Trust’s strategic development, Gerry held a number of senior management positions in the HPH network of ports including Managing Director of the Africa, Middle East and Americas division.

“Working for the Trust brings with it a different set of challenges because the logistics industry in the Pearl River Delta has changed a lot over the years. In addition to managing the business on a day-to-day basis I also have a fiduciary responsibility to HPH Trust unitholders,” Gerry said.

He added that HPH Trust ports are at a stage in their history that provides him with both an opportunity and a challenge. He explained, “Manufacturing in southern China today has evolved into a new phase compared to 10 years ago. It is moving from a low-cost manufacturing base towards high-value added manufacturing. This means that the logistics industry in the region is also changing day-by-day. Looking at Hong Kong, the role that the port will play in the future presents an interesting challenge for us.”

Gerry elaborated, “We need to focus on improving business volume, i.e. throughput, at Trust ports within the new parameters under the current economic environment and changing industry dynamics.” To do this, Gerry and his team will make sure that customers are satisfied and that the Trust delivers good financial returns to unitholders.

“The three major portfolio assets under the Trust – HIT, CHT and YICT – together with the ancillary businesses are constantly under the spotlight as we have to report our business results every quarter. The Trust ports have been very efficient in the past and the expectation from unitholders is that they will continue to improve both in terms of cost-efficiency and business scope.”

Gerry sees many benefits arise from the creation and listing of HPH Trust. He said, “Having a separate listed structure means we have more focused expansion plans. We consider our own capex and investment programmes in the context of a particular region.”

He noted that at the same time, as part of the HPH global network of port operations, the Trust is able to leverage on HPH’s global resources, management support and customer relationships.
Japanese transport company Mitsui O.S.K. Lines and HIT have a long-standing relationship that traces back two-and-a-half decades. Today an average of 13 MOL vessels call every week at the terminal and MOL has chosen HIT’s IT department to host its data outside of the US.

“Centralisation always makes sense for an organisation, but after the 2008~2009 crisis we thought it was important to all be in the same office enabling us to make fast decisions. The external environment was changing so quickly and we wanted to be prepared,” Konishi said.

In 2012 MOL stepped-up the consolidation of its headquarters functions to its Hong Kong office underlying the group’s long-standing commitment to the city as a maritime hub. “It’s been a phased move that started over 20 years ago and accelerated in the last five years. We now have only a small group of about 10 people in the Tokyo office,” Konishi said.

Today the Hong Kong office has over 150 staff members and includes MOL departments such as trade management, network planning, chartering and accounting.

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But why was Hong Kong chosen over Tokyo as the location consolidating these departments? Konishi explained: “In the 70s and 80s Japan was the centre of trading in Asia, but this gradually shifted south. In many ways, Hong Kong was the ideal location to supplement Tokyo. Over the last ten years we gradually added more departments to Hong Kong and completed the move.

“In 2009 most liner companies, ourselves included, suffered huge loses. The most important thing we needed to do was keep our shipping network in touch with the market, and Hong Kong is by far the best place to make those decisions. It is still one of the most important maritime hubs in the world and many of our customers either have offices in Hong Kong or visit every year.”

Speaking about general trends impacting the industry, Konishi pointed to growing vessel sizes, adding that in early 2013 MOL will add five 14,000 TEU vessels to its network. MOL also has two 8,600 TEU vessels on order.

“How to make the best use of those new additions is one of the key decisions we will have to make. Traditionally, these big ships are deployed on Asia-Europe because those are the trade lanes where the benefits of scale can be maximised. Intra-Asia trade is also growing, so we will continue to look for opportunities in Asia to deploy ships. So far the biggest intra-Asia ship is Panamax, so we will try to find opportunities for some of the larger ships.”
A key concern for the company is running its ships in an environmentally-friendly manner. In addition to its fleet of 115 containerships carrying 419,000 TEU total capacity, it also has one of the world’s largest bulkship fleets – 392 dry bulkships; 200 tankers; 69 LNG carriers; 128 car carriers – as well as ferry, domestic transportation and tugboat operations.

The green programme extends to all these vessels. For example, in June of 2012 the group took delivery of the *Emerald Ace*, a hybrid car carrier which reduces its CO₂ emissions through the use of new technology. This includes lithium-ion batteries that are charged using solar power generation systems while at sea. The ship then uses this power when at berth, allowing for the diesel power generators to be completely shut off.

MOL plans to reduce the CO₂, NOx and SOx emissions across all its operations. MOL’s emissions goals and progress are published online as part of a new marketing campaign that also includes detailed information about its percentage of on-time performance, safety and other goals.

“I think more and more customers want transparency in the services we provide. So far general feedback has been very positive and it helps to know what customer’s priorities are. Every time I see a customer I get some new insight.”
**HIT News talks to ZPMC the world’s leading manufacturer of heavy-duty port equipment**

Chinese state-holding heavy equipment manufacturer Shanghai Zhenhua Heavy Industries Company (also known as ZPMC), which is listed on the Shanghai Stock Exchange, was founded in 1992 and has since become one of the largest heavy-duty equipment manufacturers in the world. The company is headquartered in Shanghai and has eight production bases, chief among them the base at Changxing Island in Shanghai where two quay cranes recently purchased by COSCO-HIT were made.

ZPMC has a long-established relationship with Hutchison Port Holdings and its network of ports (HPH) and since 2001 has provided it with hundreds of cranes,
including quay cranes, rubber-tyred gantry cranes and rail-mounted gantry cranes

Speaking to Hit News Celilia Shen, General Manager for Port Machinery Management Department of ZPMC said, “Hit and ZPMC have a long-term partnership as we have provided them with many cranes over the years, and we have learnt from each other as Hit has a very strong Engineering Department.” Hit was the first container terminal operation that ZPMC had extensive cooperation with in the production of cranes.

Each crane ordered by a container terminal will have its own specific set of requirements, but as ZPMC pointed out there are several common steps the process usually follows. After a contract is signed, plans are drawn up covering all technical and mechanical aspects of the crane. When the plans have been reviewed and approved the heavy-duty work starts and the major components are ordered. This is followed by the fabrication, erection, commissioning and testing of the crane. Once these steps are completed the crane is loaded onto a custom-built ZPMC vessel and shipped to the customer where it is off-loaded and tested again. ZPMC staff and crew are also available following the handover of the crane for after-sales service and maintenance.

The last step is an important one, as ZPMC has begun to grow into a services-oriented company. ZPMC’s Customer Service Department has grown to around 1000 staff that oversee after-sales services, perform outsourced maintenance, and fit spare parts for customers around the world at ports, shipyards and steel mills.

“When a crane is offloaded at a customer's terminal, we will send a team of engineers to oversee the commissioning and testing until the handover. After the handover, we will provide on-site service and maintenance if requested by the customer. As we manufacture the cranes, we have more knowledge and experience with them than other companies,” Shen said.

ZPMC owns its own fleet of 26 ships ranging from 60,000 DWT to 100,000 DWT allowing it to deliver its products around the world. Asked about the reasons for developing their own fleet, Shen said, “We believe that it is critical to use a vessel specially designed for the transportation of cranes. It is also important to have a well-trained working team and captain. There are other benefits such as being able to guarantee on-time delivery and giving us the ability to adjust our schedule to meet customers' needs. We have faced problems before with shipping companies that postpone delivery which affects our agreements with customers.”

According to ZPMC its share of the international crane market is over 70 per cent with the company fabricating more than 300 quay cranes and 500 rubber-tyred gantry cranes every year. The company has expanded its steel fabrication capabilities over the past five years and moved into other areas, including bridge making, floating cranes, pipelay vessels, offshore oil drilling platforms and offshore windfarm installation platforms and vessels.

ZPMC also has two in-house design teams, one focused on cranes the other on new equipment, with a total of 1800 staff. The design teams have been responsible for many new developments at the company in recent years including an automated terminal system, tandem-lift quay cranes for two forty-foot containers, and a rubber-tyred gantry crane energy saving system. ZPMC also plans to focus on customers services as an area for expansion. Shen added, “We plan to establish regional service centres in different areas that will provide after-sales service, training, consulting, maintenance, spare parts, and so on. We hope that this can be a new area of development for the company.”
World's Largest Containership
Calls at HIT

HIT’s position as a preferred port-of-call for mega-vessels was strengthened with the arrival of the CMA CGM Marco Polo – the world’s largest containership – on the morning of 13 November. The 16,020 TEU vessel docked at berths 8 and 9 where in excess of 1300 containers were moved.

The Marco Polo belongs to the French transport giant CMA CGM and is 396 metres long (approximately the length of four standard soccer fields) and 53.6 metres wide. It was built by Daewoo Shipbuilding and Marine Engineering in South Korea.

The vessel is operating on the French Asia Line connecting Asia and Northern Europe. The vessel started its maiden voyage on 7 November and after departing HIT it continued the route to call at Chiwan, Yantian, Port Kelang, Tanger, Southampton, Hamburg, Bremerhaven, Rotterdam, Zeebrugge, Le Havre, Malta, Khor Al Fakkan, Jebel Ali and Ningbo.

The Marco Polo is named after the Venetian merchant who extensively travelled Asia in the 13th century and was instrumental in introducing Europeans to the continent. The Marco Polo is one of three vessels that CMA CGM ordered, the remaining two are scheduled to be delivered in 2013, and CMA CGM plans to also name them after great explorers.