eMARINA
The quarterly newsletter of
The Hong Kong Joint Branch of The Royal Institution of Naval Architects
and The Institute of Marine Engineering, Science and Technology,
and The Hong Kong Institute of Marine Technology
皇家造船師學會暨輪機工程及海事科技學會香港聯合分會
及香港海事科技學會季刊
Vol. 4 December 2019

HKJB & HKIMT Activities

Technical Visit to ABB Engineering (Shanghai) Ltd.

HKJB, HKIMT and HKIE-MMNC jointly organised a technical visit to ABB Engineering (Shanghai) Ltd. (hereafter known as ABB Shanghai) at Shanghai Pudong Kangqiao Industrial Zone on 6th December 2019.

The parent company of ABB Shanghai is ABB. It was a company formed in 1988 in Zurich, Switzerland. ABB Shanghai was formed in 1999. It is a wholly owned subsidiary of ABB and employs over 2000 workers. The industrial complex of ABB Shanghai is huge and occupies an area of 100,000m^2. Its production and office areas cover a totally area of 72,000m^2. ABB Shanghai is ABB's key local enterprises and a major manufacturing/ engineering base for industrial robots and systems (Robotics and Motion division), instrumentation (Industrial Automation division), substation automation systems (Power Grids division), and analytical systems (Industrial Automation division). ABB Shanghai is one of the ABB local companies which ranking continues to be included in the top 100 China's electric enterprises from 2008 to 2016.

ABB Jiangjin Turbo Systems Co Ltd. (a branch company of ABB Shanghai) was the host to receive us during this visit. We arrived at the ABB facilities at Shanghai early in the morning. President of ABB Jiangjin Turbo Systems Co Ltd. - Mr Allan Wang gave us an overview introduction to his company. It was followed by two informative and mind broadening presentations by his colleagues Mr. Bill Hu and Mr. Ming Liu who gave us a presentation on "Low Emission, De-carbonization and Digitalization for Shipping" and "ABB Marine Product and Technology" respectively. Through these two presentations, we understood the future trends of marine ship energy and ship management technologies. Through the use of technologies on low emission, decarbonisation, electric propulsion and the digital management system, management companies and ship's crew were able to optimize the performance

of theirs ships at all times. We were then invited to visit three of their major facilities: ABB Turbocharging Workshop, ABB Robotics and Motion Centre and ABB Marine & Ports Centre.

In the ABB Turbocharging Workshop, various types of turbochargers for 500kW to 80MW diesel and gas engines were displayed. We were able to see the internals of some of these turbochargers under servicing at close quarters. With the well-organized workshop layout, no wonder that the workshop could manage to service 200,000+ turbochargers installed on different applications from all over the world.

ABB Robotics and Motion Centre is ABB's global robotics headquarters and is also an important robotics research and development and production centre for the group. The centre has many advanced robot production lines for the automotive, foundry, metal fabrication, plastics, packaging and electronic industries. At the same time, they also delivered robotics solutions to meet these enterprises' day to day operations. We were invited to see the robot production lines on a special overhead walkway above the centre. The details of the operations were explained by their engineering staff along the way. It was a very mind broadening experience!

From the start, ABB had defined itself as a technology leader in driving the digital transformation in the industries. Within ABB Marine & Ports, the ABB Ability Collaborative Operation Centre was responsible for receiving data gathered by the monitoring sensors on ships via satellite. Through the use of the ABB Ability Tekomar XPERT, ABB's experts were able to remotely analyse equipment performances and carried out trouble-shooting. Maintenance plans were then worked out accordingly for the ships. This centre worked in conjunction with other centres in Norway, Finland, Italy, Singapore, USA and Netherlands to provide a worldwide coverage and support to their fleet of sea-going vessels on a 24-hour and 7-day basis. We had this valuable opportunity to see how they monitored their fleet and provided the necessary support to their ships during our visit to their control room in the centre.

After the visit, ABB Shanghai hosted a lunch in a decent restaurant close by. We continued our discussions and exchanging views on the latest development of the marine engineering, science and technology over lunch. All the participants found this visit to be a valuable and mind broadening experience. We were all very grateful to Mr Allan Wang, Mr Henry Xu, Mr Bill Hu, Mr Ming Liu, Mr Rex Han, Ms Alina Xie, Mr Justin Ding and their team for arranging this technical visit. We were all very impressed by their organisational capabilities and their clear and precise explanations during our visit to ABB Turbocharging, ABB Marine & Ports and ABB Robotics and Motion. We certainly wished that all our members will be able to come and visit them in the years to come!

(Reported by Leslie LEE)

Technical Seminar on Hybrid Propulsion System

The 20th Marintec China was concluded on 6th December 2019 which also marked its service for the 40th year to the maritime industry. Undoubtedly, Marintec is an important portal in connecting all sectors in the International Maritime Industry.

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As a part of the Maritime Industry, HKIE MMNC Division, HKJB and HKIMT delegates participated in this biennial event and tried to find out what were available and on offer in the world market today for the shipping industry. There were 2,200 exhibitors from over 30 countries occupying booths allocated in some 90,000m^2 of space spreading out in 8 exhibition halls. All kinds of manufacturing and servicing companies in the supply chain of the maritime industry could be found exhibiting their product or services in the Marintec.

One of these exhibitors was Caterpillar, which booth was located in the N1 Hall. As a world renown engine manufacturer and power system designer, Caterpillar's booth attracted a large number of visitors. Like all others, the company also took every opportunity in this exhibition to show case their latest developments and products. A technical seminar was conducted by Mr. Michael Qiao (who is a member of HKJB Committee) of the company to highlight their latest power technologies and shared with us their customers' success stories. This seminar was specifically organized for the Hong Kong delegates to provide an in-depth understanding of their new propulsion system for our delegates. Mr. Ernest CHAN, Mr. TANG Kwong Fai, Mr. Leslie LEE, and Mr. Albert LO from the institutes attended this seminar.

With the different types and design of diesel engines, generators, thrusters, electrical and control systems used in harbour tugs and offshore support vessels today, Caterpillar has successfully integrated these various products in a Hybrid Propulsion System for application in these vessels to optimize their engine performances under all operating conditions.

For most harbour tugs and offshore support vessels, full power operations and towing of heavy loads are infrequent. Most of the time, these vessels are either on light towing, standby, position-keeping or manoeuvring duties. Conventional diesel-mechanic propulsion systems that can operate most efficiently in the former operations failed to deliver the same efficiency when the vessel operates under the latter operations. To address this problem, Caterpillar's Hybrid Propulsion System provides an answer!

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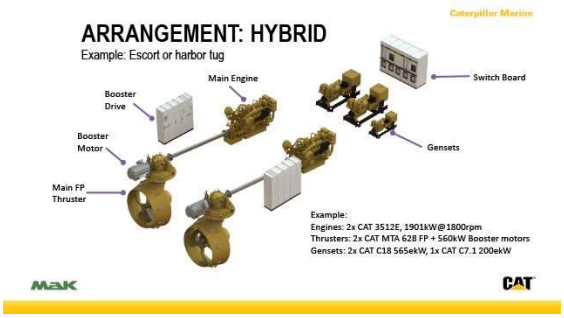
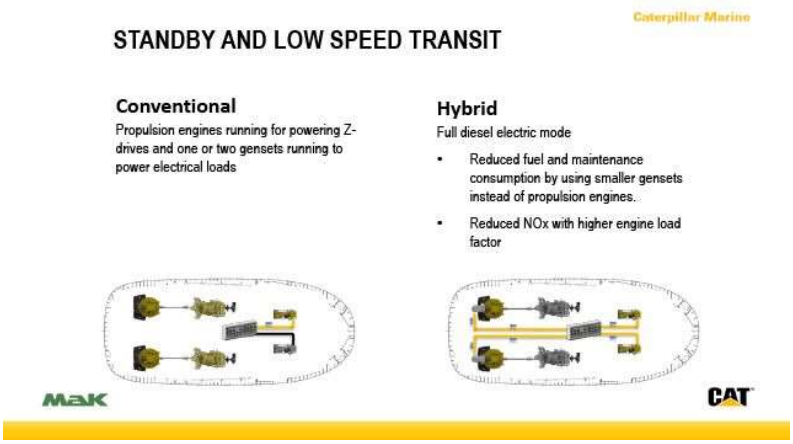


For a conventional diesel-mechanic system, the main engines and generators are separate entities responsible to carrying out different functions of the vessel. The diesel-mechanic system is responsible for propelling the vessel while the generators provide electricity and power to operate the auxiliary machineries, navigational, lighting and hydraulic systems for the safe operation and working of the vessel. Caterpillar's Hybrid Propulsion System consists of a smaller and lower rating main engines, two slightly larger diesel-electric generators, electric booster motors and thrusters. The system permits the diesel-mechanic system and the diesel-electric system to complement each other during various modes of operation of the vessel. The following explains in detail how these diesel-mechanic and diesel-electric systems are integrated to work separately or together in different modes of operation as compared to a conventional diesel-mechanic system.

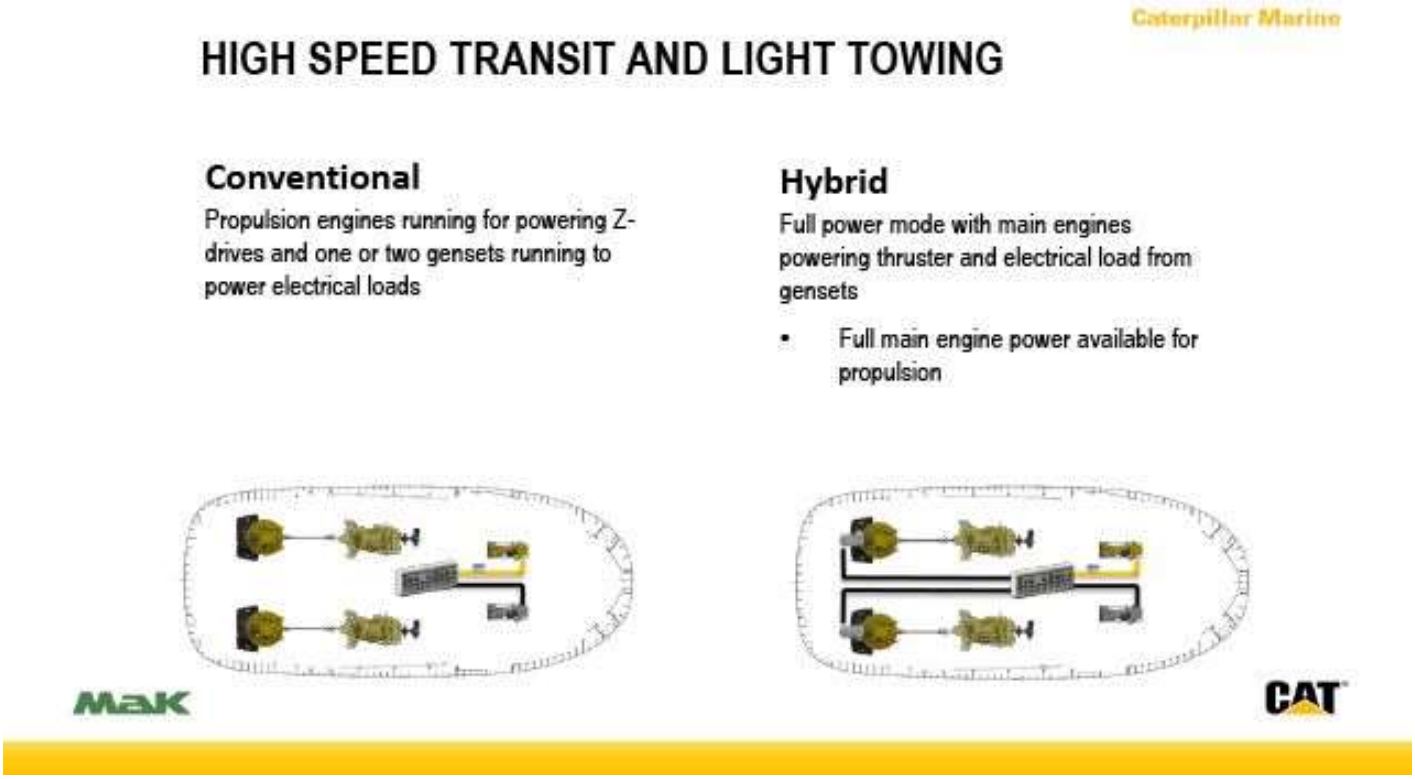
Standby & Low-Speed Transit Mode

In the standby and slow speed transit operating modes, the Hybrid Propulsion System deploys the diesel-electric generators to power the electric booster motors to drive the thrusters in the propulsion of the vessel. The main engines are not required to operate under these conditions thereby reducing fuel consumption and the maintenance of the main engines. Under this condition, the diesel-electric generators are operating at a higher load. Therefore, they have a higher fuel efficiency and a lower NOx emissions level.



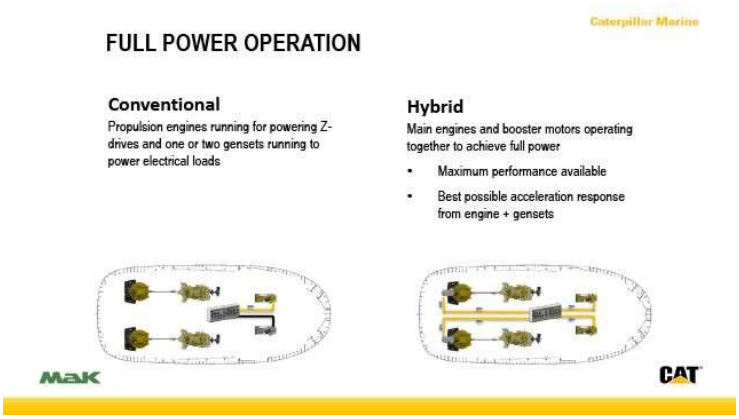
High-Speed Transit & Light Towing Mode

During the high-speed transit and light towing mode, the Hybrid Propulsion System operates the diesel main engine under full power to drive the thrusters and the generators only provide electric power to the auxiliary machineries, navigational, lighting and hydraulic systems for the safe operation and working of the vessel.



Full-Power Operation and towing a heavy object

For full power operation and the towing of heavy objects, the Hybrid Propulsion System combines the power from the main engines and the booster motors to work together to drive the thrusters to propel the vessel at the required speed and also supplying the electrical load demands.



In summary, the use of the Hybrid Propulsion System will have the following advantages. It will reduce fuel consumption by using smaller generators to carry out the standby or position-keeping and manoeuvring operations. The fuel savings can be as much as 50 percent. Reducing the running hours of the main engines also prolong the period between maintenance of these engines thereby reducing the maintenance costs. The extensive use of the generators will minimize the downtime of the vessel during the maintenance of

these generators because the relatively smaller generators can be replaced and serviced and tested in the workshop ashore. The main engines or booster motors can be used to power the thrusters. These are additional redundancies that will maintain the services in times of engine break down. Running the boosters at very slow speeds provide finer control of the propeller speed thereby improving manoeuverability of the vessel. This is especially important when the vessel is using fixed pitched propellers. The high-torque boosters have faster response time. This will improve the overall response of the main engines when the RPM is increased. Higher average engine load results in a complete combustion of fuel and a higher combustion temperature thereby reducing NOx emissions. This is especially true to the generators in the Hybrid Propulsion System as they are nearly always running at full load all the time.

CASE STUDY: HARBOUR DOCKING AND TOWING, HOUSTON, TEXAS

A notable example on the use of the Hybrid Propulsion System was the Harbour Docking and Towing of Houston, Texas, USA. They were seeking a propulsion solution for two of their new tugboats that will operate in Lake Charles, Louisiana. The Caterpillar team entered the vessel requirements, operational and resistance profiles, propulsion system data and power generation/conversion information into Caterpillar's tailor-made software "Cat Select" which was a new performance and efficiency evaluation tool for the comparison of propulsion systems and came up with the following results:

Vessel Requirements	**Operational Profile**
Minimum of 80 metric tons of thrust	4,000 operating hours per year
Minimum of 12 knots of free running speed	50% in standby or position-keeping mode
ABS, no ice	35% in transit mode (70% at 6 knots and 30% at 11 knots)
Meet U.S. EPA regulations for January 1, 2018	15% in towing or ship-assist mode (65% at 5 knots/30-ton thrust, 30% at 2 knots/60-ton thrust and 5% at 0 knots/80-ton thrust)

Using this data, Cat Select generated a report showing the differences in utilization, fuel consumption and the total cost between a conventional diesel-mechanic system and a Hybrid Propulsion System.

Although the initial cost of the Hybrid Propulsion System is slightly higher (about 5 percent), the anticipated savings in fuel and maintenance over time should more than outweigh the upfront investment. The Cat Select tool estimates that Harbour Docking and Towing will reduce its annual costs by 6 percent when choosing the Cat Hybrid Propulsion System instead of the conventional diesel-mechanic system.

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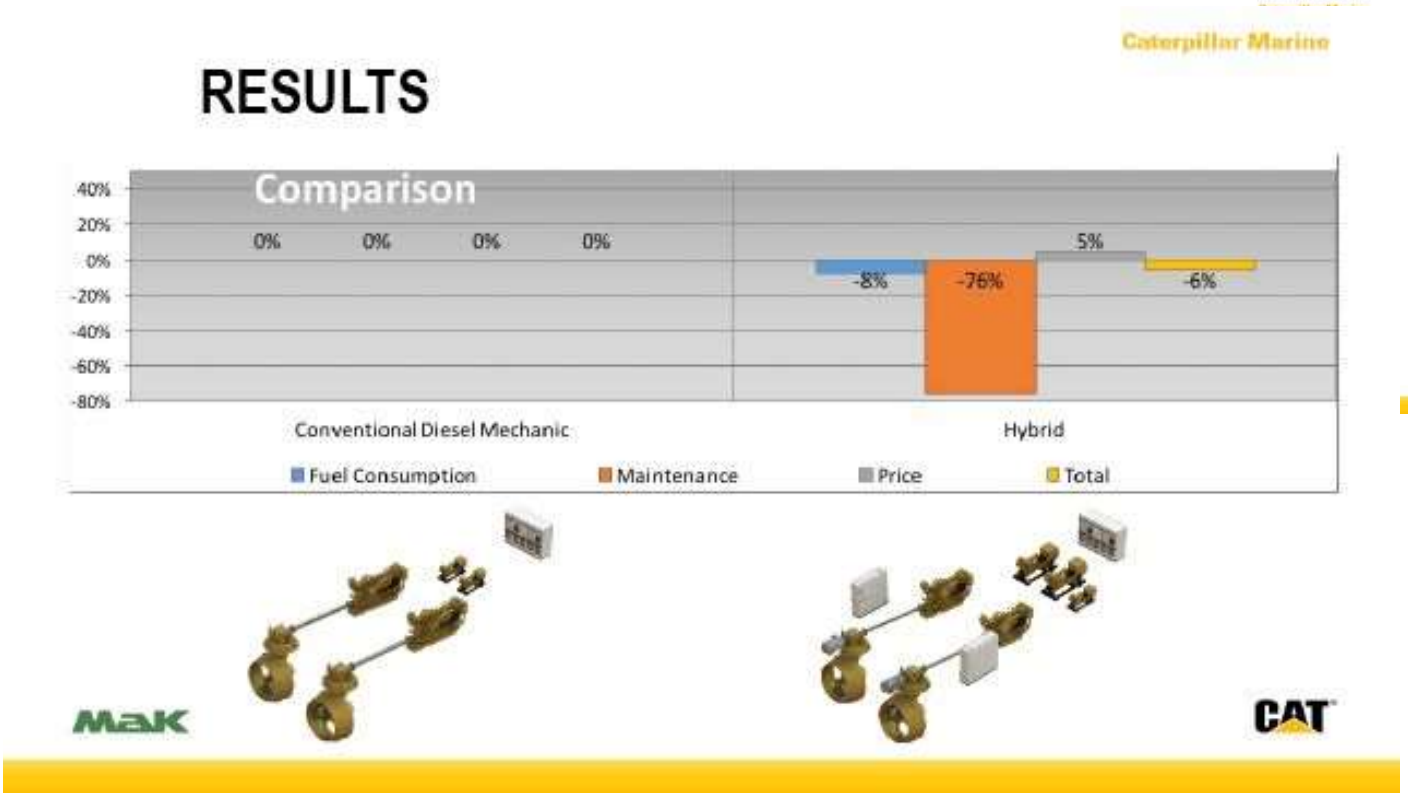

At the end of the presentation, members had an in-depth discussion about the engine/motor speed control, mode switching procedures, application of battery etc. which enabled us to understand the system better. HKJB Past Chairman Mr. Ernest W K Chan presented a souvenir to Mr. Michael Qiao on behalf of the delegation of HKIE MMNC, HKJB and HKIMT for organizing the seminar.

(Reported by Leslie Lee and Michael Qiao)

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2019 HKJB and HKIMT Annual Ball

The annual ball of the HKJB and HKIMT was held at the Grand Ball Room, Kowloon Shangri-La Hotel, Kowloon on 22nd November, 2019. Unlike any annual ball organized previously, this was particularly worrying to the organizers. The turmoil in Hong Kong since June was getting worse every week. Violence and mass demonstrations occurred in the streets close to the hotel area only a few days before the event. The ball organizing committee and the table sponsors were all worried about the safety of the guests and availability of transport to the guests before and after the event. It was noted that violence came with the crowd! If no one initiate any mass demonstrations on the mobile network, nothing seemed to be happening on that day and/or on particular areas.

Taking note of this particular trend, the organizing committee monitored the development every day during the week prior to the annual ball. The organizing committee had considered the options whether to postpone or cancel the event. Given the preparation needed by the hotel, postponement was not an option. The event could only be cancelled if the inevitable did occurred. The committee also decided to minimize the number of persons involved in the proceedings of the event. This year, the pipers from the Hong Kong Sea Cadet were not sponsored to lead the Ball Chairmen and VIPs into the banquet hall. All table sponsors and individual participants were requested to register their cell phone numbers with the organizing committee. If the inevitable occurred, all participants could be notified immediately about the cancellation of the event a few hours before its opening.

Fortunately, nothing happened in Hong Kong on that night. The Annual Ball went ahead as planned! A total of 364 guests and members filled all 37 tables. The turnout rate was 95% which was far higher than expected under the circumstances.

The Ball Chairman led the VIPs into the banquet hall at 7:30 p.m. The Chairman of HKIMT – Mr. Matthew B. T. SHU, HKJB – Ir Eric W.C. LEE and the Guest of Honour – Mr. Bjorn Hojgaard, Chairman of Hong Kong Shipowners Association Limited (HKSOA) gave their speeches to welcome all sponsors, members and guests for their support to this annual ball. Mr. Matthew warned that the sea is still rough to the local and global shipping industries and reiterates that HKIMT will continue to dedicating its efforts in grooming the younger generations in Hong Kong and promoting the sea career in the Shipping Industry as a career path. Ir Eric LEE explained the roles and tasks of The Royal Institution of Naval Architects & The Institute of Marine Engineers, Sciences and Technology in their efforts in promoting the maritime career to the younger generations during this year. The Guest of Honor – Mr. Hojgaard shared with his humourous views to the IMO latest environmental NOx regulations and implementation plan from the practical mariner and ship owner's / manager's perspectives.

The Ball Chairman – Ir Nelson Yu then presented the souvenirs to the Activity Sponsors and Financial Sponsors on behalf of organizing institutes. In response, all participants gave their applause to the Annual Ball Organizing Committee for their efforts under this difficult time to make the ball materialized this year. After the committee members of the two institutes toasted to the guests, the dinner was served and the ball began.

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The ball had a live-band, Philip and Star Band & Singers whose music filled the ball room with popular dancing music and songs throughout the night. J. Motion Dance Academy warmed the floor with their led-light Butterfly dance and the Cancan Cabaret dance. The floor was heated up further by inviting guests to join the Cancan dancers. The lucky draw followed immediately after the performances and dancing. Guests could leave the ball earlier before the MTR closed at 10:30 p.m. Four coaches were also arranged to take guests home on four separate routes at around 11:00 p.m. The ball came to a close before 12:00 p.m. instead of the usual closing time at 1:00 a.m. Despite the shorter time allocated to this event, everyone had a wonderful and enjoyable night together to relieve their tensions that were accumulated in their work and also the stresses imposed on them since June.

(Reported by Ir Albert W.S. LO)

A Note of Thanks to Supporters

The 2019 Annual Ball Organizing Committee expressed their sincere and heartfelt thanks to the following Activity, Financial, Display, Table & Gift Sponsors for their generosities in sponsoring, donating money and gifts to the annual ball this year.

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2019 HKIMT/HKJB Annual Ball

Reception

Opening

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HKSOA Chairman, Mr. Bjorn Hojgaard

Ball Orgaqnizing Committee Chairman, Mr. Nelson Yu

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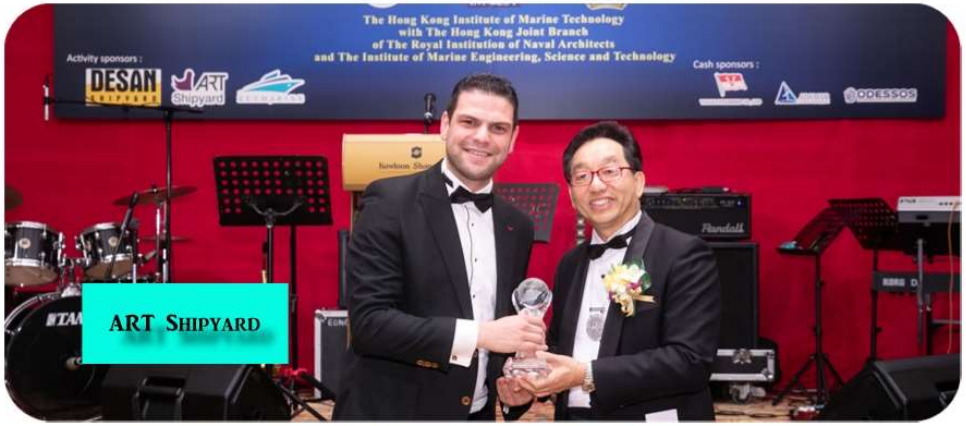

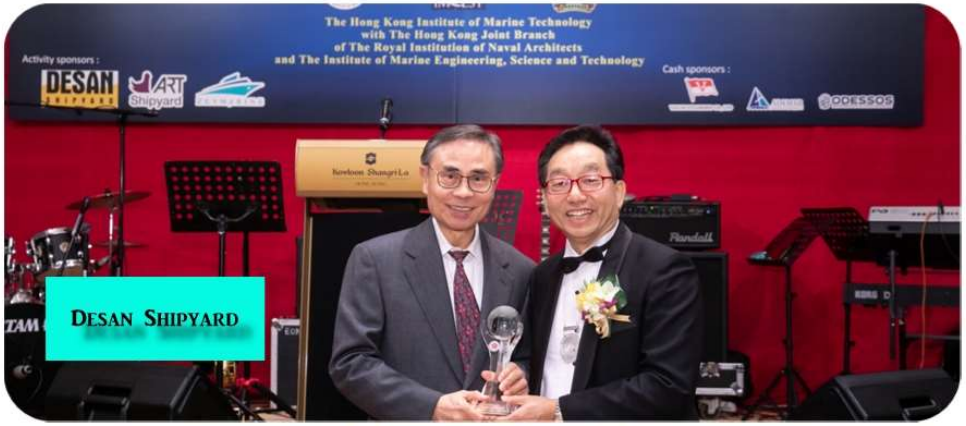

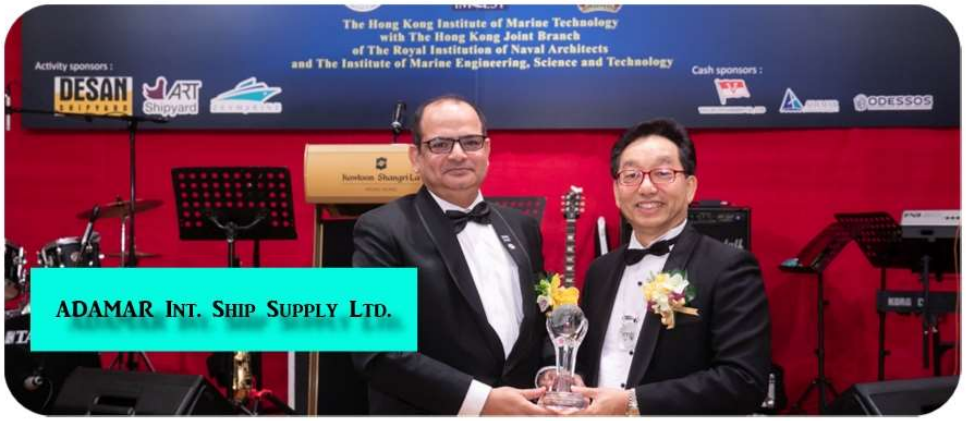

Toasts

The Hong Kong Institute of Marine Technology
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Butterfly & Cancan Dances

The Floor

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