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. 1 Mar. 2019

# HKJB & HKIMT Activities

## STEM x Ship Design Competition

In preparing the next generation for the rapid development of the modern world, the education on science, technology, engineering and mathematics are being promoted in primary and secondary schools to prepare them for the future. Hong Kong being an important International Maritime Centre, our next generation should be introduced to this industry. We had, therefore, integrating our promotion activities with STEM to raise the interests of the students for the injection of new blood and energy into this industry.

The Maritime and Aviation Training Fund had sponsored HK$176,250 to the STEM x Ship Design Competition for the students in the primary and secondary schools. It was organised by The Hong Kong Institute of Marine Technology (HKIMT) and co-organised jointly with Association of I.T. Leaders in Education (AITLE), Microsoft, Hong Kong Education City Limited (HKEdCity), the Hong Kong Polytechnic University Department of Mechanical Engineering, the Inno Space of Hong Kong Productivity Council and the Yuen Long Merchants Association Secondary School. Many thanks to AITLE for their coordination efforts, 150 students from 19 primary schools and 19 secondary schools were registered to the Competition. We were also very grateful to Microsoft and Minecraft Software for their generosity in sponsoring the software used in the competition.

The Competition started with the Launching Ceremony at the Hong Kong Maritime Museum on 24 November 2018 during Hong Kong Maritime Week. An Introduction on Basic Ship Design was presented by Dr. Peter Lai. It was followed by a tour to the museum where the developments of the maritime industry in Hong Kong were explained. To prepare the students for the competition, half-day workshops on Ship Design, Minecraft Software and 3-D Printing were organised for the primary school and secondary school students.

A Ship Design Workshop was organized on 23 January 2019 in The Hong Kong Polytechnic University. The workshop was intended to explain to the students the basic principles of the ship design. Dr. Peter Lai, Mr. Matthew Shu, Mr. Ian Fung and Mr. Sam Kwan were the speakers on the subject. On 23 Feb 2019, a Minecraft Workshop was also conducted at Hong Kong Education City Limited.

On 6 April 2019, a 3D Printing Workshop was organised in Inno Space of the Hong Kong Productivity Council. During this workshop, students were given the opportunities to see the latest innovative technology on 3D printing. The workshop was intended to give the students an insight into the current technological developments of 3D printing and prompted them of the possible future developments that are worthy of their exploration.

In the next three months, the students will be required to submit a PowerPoint presentation to introduce the design of their ships and a 3-min video for their Ships designed using Minecraft software in early May 2019. They will also be required to present their design together with their 3D printed products to the Judging Panel in the morning of 13 July 2019 in The Hong Kong Polytechnic University. It will be followed by the Closing and Award Ceremony in the afternoon.

*Launching Ceremony on 24 Nov 2018*

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*Ship Design Workshop on 23 Jan 2019*

*Minecraft Workshop on 23 Feb 2019*

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*3D Printing Workshop on 5 April 2019*

*(Reported by Dr. K.S. Fung)*

## Maritime Career Planning Programme for Secondary School 2018-19

The Maritime Career Planning Programme 2018-19 was jointly organized with the Tuen Mun and Yuen Long District Secondary School Heads Association, MPPF and HKIMT for secondary school students studying in S.5 and S.6. Through a series career talks and activities within the programme, students were introduced to the different job opportunities/requirement and career paths to work on local vessels, ocean going vessels, shipyards, ship management companies, port authority and the supporting shipping related financial/legal/businesses.

With the whole hearted supports from the Principals and teachers, 15 students from five secondary schools joined the programme. Many thanks to our members, seven activities were organized for the programme. These activities would be held mainly on Saturday morning starting from September 2018 to August 2019. On completion of the programme, students were required to give a brief summary to their fellow school mates during their school assembly.

The schedule of the programme is shown in the table below:

| **Date** | **Activity and Talk on Related Career/Training Opportunities** |
|---|---|
| 06-Oct-18<br><br>(completed) | Opening Ceremony at MSTI<br><br>Speaker : Mr. Jimmy Ng (Hon Treasurer, HKIMT) on Civil Servant – Maritime Job opportunities in various Department<br><br>Speaker : Mr. Charles Wong (MSTI) on Education/Training in MSTI |

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|---|---|
| 26-Jan-19<br><br>(completed) | Visit Marine Department / Vessel Traffic Centre / Maritime Rescue Coordination Centre<br><br>Speaker : Dr. Leung Solange Kit Ling (Hong Kong University SPACE) on Introduce Job Opportunity on Yacht and Cruise Ship<br><br>Speaker : Capt Marso Law (MPPF) on Deck Officer / Marine Engineer Officer |
| 09-Mar-19<br><br>(completed) | Visit Hongkong United Dockyards Limited (HUD)<br><br>Mr. Leslie Lee (HUD) on Introduction to Hongkong United Dockyards Ltd.<br><br>Dr. Peter Lai (RINA) on Naval Architect |
| 16-Mar-19<br><br>(completed) | Cruise Ship visit – Celebrity Millennium |
| 27-Apr-19 | visit HK Maritime Museum (tentative)<br><br>Shipping Management Company and Maritime Lawyer |
| 22-Jun-19 | Sea Cadet Day Camp<br><br>Sea Experience |
| June/July-19 | Brief Summary by participating students at their School Assemblies |

*Launching Ceremony at MSTI on 6 October 2018*

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*Visit Marine Department / Vessel Traffic Centre / Maritime Rescue Coordination Centre on 26 Jan 2019*

*Visit Hongkong United Dockyards Limited on 9 Mar 2019*

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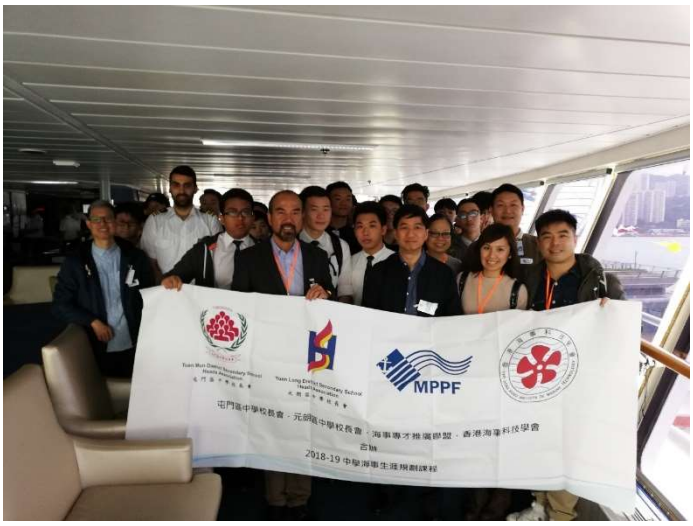
*Cruise Ship visit – Celebrity Millennium on 16 Mar 2019*



*(Reported by Dr. K.S. Fung)*

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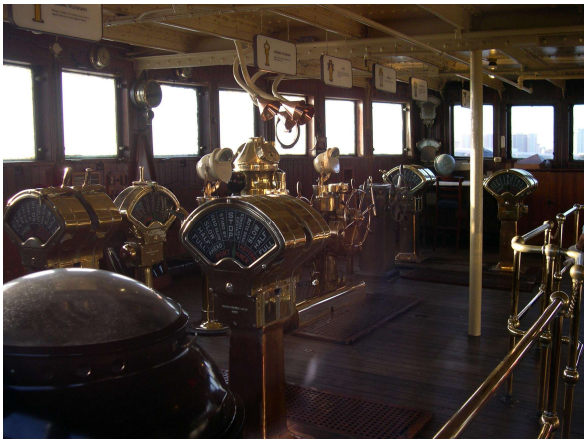
# Members' Corner

## Developments of Marine Engine Control Systems

With the rapid development of fossil fuel engines during the second world war, more and more of these engines were being used in marine propulsion. In the 40's, marine diesel engines for propulsion were running between 100 and 800rpm. Vessels using these engines were usually sailing at around 10 knots. Engines were not controlled directly from the wheelhouse. An engine telegraph was installed in the wheelhouse and in the machinery space respectively to serve as a communication device for the operators in the wheelhouse and in machinery space to communicate with each other for the control of an engine.

Both the engine and wheelhouse telegraphs had a lever and an indicator. The lever on one telegraph was connected with the indicator on another telegraph through the use of steel wires. When the lever on the telegraph moved, the indicator on the paired-up telegraph moved and rung at the same time to warn the operators that an action had been requested.

"Stop" and "Finished with Engine" were marked in the middle of the telegraph for the stopping and shutting-down of an engine. "Full", Half", "Slow", "Dead Slow" were marked on the fore side (ahead) and rear side (astern) of the telegraph. The telegraph could not tell the engine operator precisely what RPM the engine should run. Instead, it was only an indication to show an engine operator to adjust the RPM of an engine according to a predetermined scale. The telegraph was originally intended to be used for all types of engines with different "maximum continuous ratings (MCR)". Therefore, the RPM for different marks on the telegraph had to be determined after the system was installed. These RPMs should be clearly marked at close proximity to the telegraph for an operator to see. The values associated with "Full", Half", "Slow", "Dead Slow" were not obtained directly by dividing the maximum engine RPM by four. The efficiency of propeller and the critical speeds of an engine would have deciding effects to the setting of the speed for each of the ahead and astern marks on the telegraph.



*RMS Queen Mary wheelhouse bridge engine telegraphs (photo copied from www.Wikipedia.org)*

It was easy to understand that all engine operations involved human actions and they all needed some time to response and complete the operation. An engine could not run up to speed immediately to avoid damaging the engine. Therefore, it took longer time to running up an engine than to slowing down after a telegraph command was given. In view of the development of engine communication systems, these engine telegraphs were no long in use today. They could only be seen in the museum now.

In the 60's, marine diesel engines were able to run up to 2000rpm and had higher power. They also had lighter weight and smaller size. These engines were particularly attractive to be used on small and medium size high-speed crafts because of these features. The use of engine telegraph was found to be too slow to meet the demand for the day to day operation of these vessels. A push-pull engine control system was then adopted to control the engine speed directly. The push-pull levers on the control system were connected directly to the engine speed control system through the use of steel rods. The rods were encased in metallic sheaths to protect them from external interferences.

*Typical twin engines push-pull control head (photo copied from Kobelt Manufacturing Co. Ltd website)*

However, the use of push-pull lever control system was limited by the length of the steel control rod and the number of bends it. As the length of the steel rod in the sheath increased, there would be a corresponding increase in the number of bends as it passed through the hull structure. The length and bends would increase the frictional force exert on the steel rod thus making it difficult to operate and control. It turned out that large vessel over 60 meters in length, pneumatic and hydraulic control engine telegraphs would be adopted for the control of their engines in lieu of the push-pull lever control system.

The design and construction of pneumatic and hydraulic control systems were complicated. These systems had many lengthy pipelines, components and joints. The pipelines, components and joints were liable to leaks and break-downs resulting in the improper functioning and failure of the control system. In view of these draw-backs, pneumatic and hydraulic control systems had a fairly short life in the history of marine engine control systems. They were replaced by electronic systems in the 90's.

Electronic engine control systems were easy to install and maintain. They were very flexibility and scalability to suit the needs of vessels of all sizes. Instead of running long lengths of steel wires, rods, levers, joints and pulleys, shipbuilders were only required to lay small diameter electric cables from the wheelhouse to the engine room control station. Unlike the mechanical, pneumatic or hydraulic systems, the backlash in electronic systems did not exist.

For an electronically controlled engine, the electronic signal could be sent directly to the engine control system. Ignition, fuel injection timing and quantity were controlled electronically. Undoubtedly, such system had a higher fuel efficiency and better emission control capabilities. Electronic control systems had many merits over mechanical, pneumatic and hydraulic control systems. However, their ability to withstand high temperatures should not be overlooked. For the proper functioning of electronic control systems, engine room temperature should be maintained at a level well below the maximum design operating temperature of the electronic components. Shipbuilders always insulated the wire and electronic components used in the

*Typical electronic control system (copied from Xtremachineuk/Wikipedia.org)*

system in the engine room to avoid system failure!

The development of engine speed control systems had come a long way. Their developments were mainly due to necessity more than anything else. Who knew what laid ahead? We could only wait and see!

*(Submitted by Ir Chan Moon-chung)*

## HKJB & HKIMT Coming Activities

| Date | Event |
|---|---|
| 20 April 2019 | Visit to Hong Kong Maritime Museum and seminar on the Marine Profession |
| 20 June 2019 | HKJB and HKIMT Joint Chairman Cocktail |
| 22 June 2019 | Dragon Boat Racing at Government Dockyard |

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http://www.hkimt.org.hk/publication.html.

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