How I Became a Marine Engineer

Through the university route – considered the quickest and least painful

Though I graduated with a degree in Marine Engineering in 1970, I honestly could not call myself a marine engineer till about six years later. For as one of my English classmate criticised me one day (when I asked what to him was a stupid question), “What do you know about engineering?” I could only answer, “Nothing, that’s why I am here!” I hope my students whom I taught at the Singapore Polytechnic during 1971 to 1975 did not feel short changed!

Indeed, how could I call myself a marine engineer when out my three years at the University of Newcastle-upon-Tyne, the whole Marine Engineering curriculum contained only ONE subject, “Marine Engineering” which was taught to us and only during the final year of the course? That subject was delivered in about 30 one-hour lectures plus another 30 hours of coursework on marine engineering topics! Naval Architecture was the only other marine related subject. The rest of the course was what mechanical engineering students undergo and it would be more accurate to describe my course as “Mechanical Engineering with Marine Option”.

During the course, my only other exposure to marine was 6 weeks of industrial attachment at Harland & Wolff Shipyard in Belfast in Northern Ireland in 1968. The training was boring doing workshop practice. I still do not know why I needed to file a round bar into a square bar when lathes and milling machines were already invented AND found in most ships! However, I left with fond memories of Northern Ireland and the Irish and still could not understand the “Troubles” between the Catholics and Protestants.

By the way, the Marine Engineering Department then comprised just three persons: one professor (Professor Chambers), one lecturer (a Mr. Jones) and one secretary (a Mrs Dicks). It was reputed to be “one of the best in the World”. I cannot confirm that but it was certainly one of the smallest! Our class was 13 strong: 3 Singaporeans (David Chen, Tay Kiong Pang and I), 1 Israeli, 3 Englishmen, 1 Scott, 1 Irish, 1 Greek and 3 Norwegians.

During the 30 lectures, the focus of the Professor and Lecturer was on what topics we should know about rather than what the topic is. Thus the lecture on marine engines told us that we should know about high-, medium- and low speed marine engines. And what are those items? As students, it was our job to find the answers! And when I asked, “What must we know in each topic to prepare for the examination?” the answer was, “Everything!” It was quite clear that we will not be spoon-fed and I learned to educate myself. Most of my 3rd year was spent in the library, reading the transactions and journals of the Institute of Marine Engineers, the North East Coast Institution of Engineers & Shipbuilders (NECIES), the Royal Institute of Naval Architects and the Society of Marine Engineers and Naval Architects. To make sure that I did not miss anything important, I also read a lot of articles published in marine magazines e.g. The Motor Ship. Thus, when one asks, “What did you read instead of “study” at the university?” he is correct, for that’s what we do!

Through reading, I came to know about engines, boilers, auxiliaries, generators, ships, propellers and shafting, marine fuels and marine problems e.g. shaft vibration, corrosion and machinery failures. And through attending technical talks organised by the NECIES and listening to the answers to the questions raised by the audience, I began to understand in some depth what I read.

Through my teachers in industry – who are every ready to teach willing learners

When I understood what marine engineers at sea were required to do to keep the ship going, I could not help feeling that I was half trained. I knew the theory but not the practice. I decided to get the practical experience I needed by undergoing some of the practical classes with my students and through practitioners in industry.

Basic Fire Fighting Course at PSA

Fortunately, my boss (Mr. M.K. DasGupta) at the Singapore Polytechnic was very supportive of my need for practical training. Shortly after I joined the Poly in 1971, he put me on the basic fire fighting course at PSA with the returning engineer cadets. (A few of them thought I was a new student and fortunately for them, they did not try to rag me!) I still remember the funny feeling when I jumped from the top of a cherry picker into nothing! The

friction break harness was the only device that broke my fall. I did not know that it was a form of bungee jumping till this sport became popular in 1979, a good eight years later. The smoke house experience taught me that one has a very slim chance of surviving a fire at sea unless one knows ALL the escape routes from one's engine room. And I was glad to be put to the test by my Chief Engineer (a Mr. McDonnell) on the Cardigan Bay (more details later).

Attachment to Jurong Shipyard

When I joined the Poly, the late Mr. Low Guan Onn was the Chairman of the Board. He was also the MD of Jurong Shipyard. Through him, I got attached (nowadays called "internship") to his new building yard in Pulau Samulun. To reach the yard on time, it meant catching the first bus from my home (in "Kangkar") at 5.45am. I did that on my first day and arrived at the gate at 7.30am to find that I was late! "Yard starts work at 7.30am" meant what it said i.e. you would have changed into your overalls and be at your designated spot doing your morning exercise to the accompaniment of the music piped through the public address system! It was not what I assumed i.e. arrive at 7.30, eat breakfast, do my toilet, change and then begin work. This was my first culture shock in a Japanese-run yard. Beginning the day with a company-wide exercise is a good idea to copy and there are at least 4 good reasons for doing so.

As most of us nap during our long bus ride to work, the 5 minutes of simple stretching do wake us up properly thus improving safety. This obvious reason came almost immediately. The other 3 reasons came to me 5 year later, in 1976, when I spent 4 months at IHI Kure Yard. Since each employee has a designated spot, each leader knows at a glance who is late or missing without the need for a roll call. That same glance ensures that each manager would start work on time too! Starting work together also sends this subtle message, "We are family and we start work together." To me, the most important benefit is that it provides an opportunity for each leader e.g. the CEO to announce his most important message of the day e.g. "We made money and the bonus for this year is 3.5 months", "NOL is visiting us today, please give our guests your full cooperation". Such announcements are more effective and economical than emails, posters, banners and other mass communication devices! Toh Ho Tay saw the good sense of this ritual and implemented the morning exercise when he was in charge of Atlantis Shipyard.

I learned a lot at JSL. Practical knowledge of Freedom vessels machinery systems came from Mr. Chew Yam Puay an engineer and Mr. Huan his foreman. Yam Puay was born in Penang, studied in Taiwan and joined JSL on graduation. He has been with JSL ever since! Huan had some technical education, spoke good Hokkien and poor English but very fluent "engineering". I also learned that Singapore paid a lot of "tuition" money to the Japanese – royalty fee for the use of the first series of Freedom vessels and having to buy every item (including nuts and bolts and mattresses) that goes into the ships! I also noted that though the yard was declared "new", not all the yard facilities and equipment supplied by IHI were new. The lesson learnt is that one should be wary of "aid" given by one country to another.

Specialising in Marine Automation

In the late 60s and early 70s, the in thing in the marine world was to automate ships to the extent that engine rooms could be unmanned. I also saw the need to specialise and decided to focus on marine automation. The first thing was to learn what it was all about. Collecting another paper qualification would not help and I decided against doing another degree or a PhD. I opted to learn through attachments to industry. Funding came from a UNDP/UNESCO scholarship. The Singapore Polytechnic gave me a year off to do it in exchange for a further 2 year bond (my first bond was 5 years).

In September 1972, I began by going to Sidcup in the UK to A.C.E (which does not seem to exist anymore!) to discover how a process could be controlled using pneumatics. I discovered the flapper nozzle mechanism – the "heart" of all pneumatic process control devices. I learned how this device worked with other bits and pieces like bellows, diaphragms, springs and levers, devices such as sensors, transmitters, controllers, valve positioners and actuators to control the temperature, pressure, level and flow of fluids and gases that kept an engine running automatically. And I was able to make a few devices when I set up the Instrumentation and Control Lab at the Singapore Polytechnic out of scavenged parts. Our Government at that time had very little money! The parts came from equipment scrapped by companies and we are indebted to Mr. Wong Liang Feng in particular. He was the

Maintenance Manager at Mobil's refinery and he went the extra mile to give us what he could. Parts that could not be used were sectioned to reveal the internal mechanisms.

My next stop was to Swan Hunter's Walker Yard to see the installation of pneumatic control systems on board ships that were being built. I picked up skills in fabricating and running copper tubing. The most valuable lesson learned was during commissioning when the controllers were tuned. I also learned from "Fred" (one of the yard foremen) that Chinese girls are better than English girls. He explained, "The meat nearer the bone is tastier". The other memory of Walker Yard was being shouted at by a worker, "Hey! Do you still live in trees?" I felt offended and retorted with, "When you were learning how to make fire, we were already eating roast chicken!" Luckily Fred was with me to calm things down before we came to blows.

After being exposed to the hardware, I decided to devote time at Lloyds Register in London where I was given access to plans of several UMS ships. By studying the plans and by referring to the rules for the UMS notation and through pointers from Mr. D Gray (then Head of Dept), I acquired an overview of what control systems and arrangements were needed to be able to operate an unmanned engine room.

I then crossed over to Nuremberg in Germany to be with Siemens to study its Siematic N system, an electronic main engine control system. I learned how a transistor works and about OR, AND, NOR and NAND gates and the devices from which they were made such as adders, counters and amplifiers. That helped me understand an electronic control system at block diagram level stage. I must confess that my understanding of electronic control had remained stuck at that entry stage till today because I could not "see" what went on in an electronic circuit. I can understand most mechanical mechanisms e.g. a mechanical clock because I can see the movements. With electronics, I see only blinking lights!

I was in Siemens for 6 weeks and I remember the gourmet food at lunch. I could not drink at all (one drop of alcohol could give me a hangover!) then and could only watch with amazement at the amount of wine the others consumed. I still wonder today how the Germans could get back to work after such lunches. The other fond memory was of German food. I stayed in one of 6 rooms above a pub where I dined every night. The menu was in German and owner spoke no English. I decided to start at the beginning and 42 days later, I sampled ALL items. In the process I discovered "eisbein" (pork knuckles braised in sauerkraut) which I still enjoy.

From Germany, I proceeded to Oslo for my attachment with DNV. My purpose was to understand control systems used for the handling (loading, transport and unloading) of LNG. The processes are complicated by the need to load LNG at -160 deg C into pipes and tanks that are initially at room temperature. And I learned how it was done safely from Mr. Bulukin who headed the automation department. He was a colourful character with a dangerous hobby – gliding. Sadly, not long after I left Norway, he died when his glider crashed. My fond memory of Norway was working flexi-time during summer. I chose to start at 6.00 am and end my work day at 2.00pm leaving me till at least 10pm to sail, visit the museums, explore Oslo, go orienteering and take long walks. Working was hence fun because everyday felt like a weekend!

"Cadetship" on Cardigan Bay

The last leg of my marine automation training was at sea and the best I had. With help from Mr. Jack Thomas, Chief Superintendent Engineer of Ocean Fleets Singapore Office, I got to sail on a UMS ship. I sailed from Southampton via the Cape to Port Klang and then home. The Suez Canal was closed then. The Cardigan Bay, a container ship powered by twin Foster Wheeler boilers and 40,000 shaft hp propellers cruised at 33 knots and took 19 days. I later found out that it was designed to be a troop ship in times of war and the cost of the extra speed, power and strengthening (one could run under deck around the ship) was paid for by the British Government. I was not surprised to learn that the ship was subsequently scrapped when oil prices went up. The twin boilers were burning 300 tons of fuel every 24 hours! And one of the deck officers was kept busy moving bunkers to maintain ship stability.

Looking over the bow was like riding on a speed boat! But I was not on board for the joy ride. I told the Chief Engineer, “I want to understand every automatic system installed on your UMS ship by the time we reach Singapore”. He replied, “Welcome and help yourself” and showed me where the machinery manuals were kept. The manuals occupied one cabin! I borrowed a few, lugged them to my cabin and read all day and night. That night, the Captain complained of the glare from my reading light that affected his navigation! My blinds were not drawn properly. The next day, I wandered to just about everywhere in the engine room and elsewhere (e.g. the fin stabilisers) on the ship.

After 24 hours, the Chief Engineer tactfully said to me, “I like your enthusiasm to learn and you are welcome to explore. However, it will make me more comfortable if you know how to get out of here (the engine room) by the shortest route. Let’s meet here tomorrow at the same time and I will find out what you know.”

I remembered the fire fighting course I attended at PSA and immediately understood. I suspended my quest for automation knowledge and practised my escapes from several locations in the engine room using the nearest gangway and exit door. The next day, I thanked the Chief Engineer for thinking of my safety. After the tests, I probably knew the ship better than most (as they were mostly not in the ER, this was a UMS ship remember?)

I certainly did know the ship better than anybody else by the time I reached Singapore for I read all the manuals and traced all the control systems fitted. I filled a notebook with sketches and notes and they became my main source of reference for my instrumentation and control lectures. I also learned what happened during day work by tagging along with all the engineers. One of the tasks was to clear the boiler super-heater stacks of soot using soot blowers and to my surprise, operated manually. The 2nd Engineer explained that the automatic control failed. I studied the problem and discovered that the command signal was made to go through many loops and interlocks. I could see no rationale for this other than the supplier wanting to sell more pneumatic sequential control valves and after sales services by making the system so complicated that the customer would not dare to tinkle with the maze of copper tubing! I suggested re-routing the signal to make the system work as intended i.e. to make the 12 soot blower lances pierce into the pipe stacks one at a time while releasing steam to knock out the soot that had accumulated on the pipe surfaces. The 2nd Engineer agreed to my suggestion saying, “why not? I got nothing to lose”. He took some lengths of copper tubes, fabricated a couple of joints, removed the unnecessary joints and hooked up the new joints in accordance with my instructions. He then turned on the air supply to the “re-wired” control system and the steam, hit “Start” and it did. The 2nd Engineer thereafter told me, “Whatever you need to know about my engine room, just ask”.

Attachment to Keppel Shipyard

During April 1974, I was attached to the Automation Department of Keppel Shipyard through the good office of the late Mr. Chua Chor Teck. He was MD of Keppel Shipyard as well as Chairman of the Singapore Polytechnic Board of Governors. He wanted me to share what I knew about marine automation with his technicians while I gain the practical experience I needed. I conducted classes on the shop floor during lull times. At other times, I watched how instruments and control devices were repaired and coached by Mr. Edward Lee, the engineer in charge of the section and his “boys” like Seng, Tham and “Fei Chee Yoke”.

A common difficulty encountered in the repair of automation equipment was the absence of equipment manuals or when available were in a language that we could not understand e.g. Russian. The labels on the equipment were typically missing or defaced. Thus most of the time, the only information we got from the Superintendent was just a lead like “the boiler control system was not working, please repair”. With that, Edward and I often had to figure out the function of each of the devices removed from the ship to the workshop. Here I was able to add value by shortening the time taken to establish their identities for I had by this time seen a large and wide variety of instrumentation and control devices. The “boys” also found it useful when I shared with them the operating principles of the devices.

At the end of the attachment, it was decided that my “lectures” and guidance were useful and I was given a retainer to continue my relationship with Keppel Shipyard.

Establishment of the Singapore Polytechnic Instrumentation & Control Laboratory

In the 1970s, Singapore was being rapidly transformed into an industrialised nation. The need for technicians who understand automatic control using pneumatics, hydraulics and electronics (and later on computers) became pressing. To address this need, Instrumentation and Control was introduced as a subject to all engineering students at the Poly. I was tasked to set up the Instrumentation and Control Laboratory as a common facility. I started from scratch – a bare workshop space and as indicated earlier, very little money from our Government. The money was used to set up the infrastructure comprising some basic instruments and control equipments, benches and chairs, an air compressor, compressed air supply piping, electrical wiring and water piping. The rest of the laboratory equipment used for the 50 experiments developed came from parts that were cannibalised from condemned equipment. Parts that could not be used were sectioned to reveal the internal mechanisms and used as teaching aids. Most of the donations came from Mobil and Keppel Shipyard. We also received some items from Shell, Esso, SMC Pneumatics and Yokogawa.

I am proud to claim that one of the key changes I made was to require every marine engineering student to learn through the experiments. Each student was required to work independently instead of as a member of a group so that none could get away as “passenger”. To understand the learning point e.g. how to hook up a float to give a high level alarm, the student had to figure out what to do with the help from instructions and information given in the instruction sheets and WITHOUT my help. He was allowed to repeat the experiment till he felt confident to ask me for a one-shot on-the-spot oral test. My test could be to ask the student to (using the level alarm example) to hook up the circuit for a low level alarm. Through the demonstration, I would grade the student according to how he hooked up the circuit, his explanation for what he did and whether he complied with safety requirements. To me, the best part of the process was that other students in the laboratory could witness the test and listen to the questions and answers that followed. In other words, I allowed them to copy! This stems from my belief that copying is the most efficient way to learn and in fact common practice in industry; except that they disguise what they do by calling it, “reverse engineering”, “benchmarking” and similar euphemisms.

The catch I had for a student who wanted to be tested on the experiment that he just witnessed was that he had to answer a different question e.g. to hook up two floats to provide a high level alarm and a low level alarm. And I would give any student who was able to do this without prior practice a good score!

The other innovation I implemented was to require every student to produce a one page handout of an instrument e.g. a pressure, level, flow, temperature sensor, transmitter, controller etc. I would provide the product brochure and the student had to make a sketch of the instrument with explanatory notes on how it works. I believed that each student would understand at least the instrument that he was assigned to. The result was that my class of 160 students covered a very wide variety of instruments and I hope that they all benefited from the exercise.

Secondment to Neptune Orient Lines

I have a M.Sc in Shipbuilding and have built shipyards and ships on paper as part of my project work. I have seen a lot of ships, sailed in three but never built any. I certainly lacked the practical knowledge of building a ship. The opportunity to be involved in building one came in 1976. NOL was in an expansion mode, had ordered a lot of ships and needed superintendents. Mr. Soe Aung was then NOL’s Technical Manager and at the same time a member of the Singapore Polytechnic Board of Governors. I sounded him out of my need for practical shipbuilding experience and he was quick to see a win-win solution. Again, through the support of my Head of Department, Mr. M K DasGupta, a 12 month secondment to NOL was arranged.

Thus on 1 April 1976 (a Thursday), I joined NOL’s Fleet Management Department, Newbuilding Section. The next day Soe Aung called his number two, Mr. “Waterloo” Cheong Fook Kuen instructing him to arrange for me to leave for Japan and to meet him on Sunday. Getting the air ticket on short notice was not a problem. Possessing a passport that had expired was the problem. Fortunately, Personnel Manager Chong Ah Fatt had excellent connections with the Immigration Department and I got mine renewed within 12 hours and on 4 April I flew to Tokyo armed with the technical specifications for two container ships

(Neptune Pearl and Neptune Coral) to be quoted by IHI. The hull, machinery and electrical specifications came in 3 volumes filling a stack of A4 sheets to about 10 cm thick. I read them all during the 6 hour flight. The guy seating next to me was suitable impressed. He thought I was mugging for an exam on arrival!

It was my first trip to Japan and at a time when Japan was Number One in shipbuilding. I had studied Japanese shipbuilding methods and shipyards for my master degree at Newcastle and I wanted to discover for myself the answer to this question: “In 1976, the Japanese yard worker is paid at least 3 times the Singapore worker and yet Japan could build ships faster and cheaper than Singapore – Why?”

The first part of the answer was in their technical specifications. They could describe the ships they offered to build in detail – right down to the number of spare washers and fuses! We thought everything we needed was covered BUT much to our chagrin, the main engine (a Sulzer 12RND90M – 1st engine of this series made by IHI Aioi Engine Works, with an output of 42,000 HP with bore cooled cylinder liners) would come without an engine indicator! Toh Ho Tay could not believe it and put forward such a convincing argument that IHI “surrendered” to our appeal.

The second part of the answer came during the technical discussions. At 8pm on the night before we were to sign the contract with IHI, Kee Ah Bah wanted the switchboard modified so that more maintenance room for an adjacent machinery item was made available. The IHI engineers were most unhappy with what to me (the rookie) was a simple request. On hearing their explanations I could emphasize with the Japanese for what we asked for was a substantial design change to the engine room! However, Soe Aung insisted on the need for the change before we adjourned for dinner. I enjoyed the dinner and I was sure the IHI engineers did not. We parted at about 11pm. We went to bed. They must have worked overnight otherwise how could they present us, at 9am the next morning, a new set of engine room drawings? Simply amazing! For one must remember that computers were NOT common in 1976. Apple appeared only in 1977. IHI had a computer centre equipped with mainframes but I did not see a single computer terminal elsewhere in their offices. I do wonder whether our designers could match their IHI counterparts today with desktops at least 1,000 times more powerful than their predecessors.

> Here’s an anecdote I cannot help sharing for it still amuses me every time I think about Soe Aung’s caution made to me before dinner, “When the host ask what we like for dessert, please ask for anything except water melon”. It became plain to me when I saw the price tag for a water melon in the supermarket – 10,000 yen! We in Singapore got no water melon industry to protect and hence could enjoy a water melon for $3.

Getting to dinner that evening was also one incident I could not forget. We were chauffeured for almost one hour to cover about 500 metres up one road, did a U-turn and then back that same road for about 400 metres to the restaurant. Had we knew earlier, we would have asked our hosts to walk across the road and get to eat in 5 minutes! Though I understood the need to observe protocol, I thought the length the Japanese would go to was mind boggling.

Not long after contract signing, we began to receive regular parcels of detail plans for Hull 1020 issued to us for approval. I remembered “1020” because Tan Hood Kim, one of the drivers at NOL came around to collect our 4D bets and I won (for the first time in my life) $250. I also learned a lot about ship machinery systems from Kee Ah Bah especially on arrangements that must be provided so that the key equipment items could be maintained at sea. Kee Ah Bah was and still is second to none when it comes to details. Nothing escaped his scrutiny and I thanked goodness that he checked my work. I am a big picture person and I am indebted to Kee Ah Bah for picking up some of the errors I missed! Without him, I would be that “idiot” whenever those marine engineers who sailed on Neptune Pearl and Neptune Coral cursed, “Whoever approved the plan for our ship must be an idiot!”

I also discovered that it was possible for a person to produce hand written text that could surpass (because the hand writings were so beautiful) typed text. The only other person who could write so beautifully was probably Paul Soh, one of my students. Sadly, he died young of diabetes. My wife who served as our Secretary at our site office in IHI Kure often

lamented on the need to type when Kee Ah Bah's handwritten drafts were so pleasant to behold!

Let me return to my quest to discover the secrets of Japanese supremacy in shipbuilding in the 1970s.

It was an IHI requirement that all our comments and changes must be submitted by an agreed date after which no further change was allowed. Till that date, we could have any number of iterations to the plan approval process as we need. IHI explained that changes after the cut off date would affect their overall building schedule and hence promised delivery dates. I think this requirement made good sense for it meant that decisions on the final design must be made and it instilled discipline on both parties to meet datelines. It also meant that the ship could be built first on paper where changes could be cheaply incorporated. Thus, for a typical new building, it could take 12 months for plan approval and planning and just 6 months to build the ship. Yards that build with only the basic plans approved run a far higher risk of cost escalation due to rework and waste.

The output of detail planning was a set of schedules used like musical scores to orchestrate the outputs of yard personnel affected and we as owner representatives. And one way to really upset the Japanese is to be the cause of a delay! What I liked about the schedules was that no activity was planned for weekends. Weekends were set aside for contingency. And during my 4 months at IHI Kure as an Owner Superintendent, I worked only one weekend.

> By the way, Mr. C N Watson once asked whether I would join him at Sembawang. I refused without hesitation. He laughed when I explained, "you guys work 364.5 days a year. I will have no time for golf!"

The one weekend I worked at IHI Kure was to inspect the funnel before painting. The inspection was scheduled on the Friday just before that weekend. Before I could examine the surfaces, it suddenly rained and the surfaces sanded down to SA2.5 were not protected. The yard needed the Saturday to rework and I agreed return to do the re-inspection. Again it rained! The supervisor asked if I was willing to come in on Sunday. I was willing, turned up at the agreed time and found that funnel painted. The next day, I complained to the QC Supervisor just to make a point and was prepared to forget about it as a funnel was not an important ship structure. To my surprise, at lunch time that day, the Yard Manager turned up at our site office to make a personal apology and informed me that the work team would remove the paint, invite me to do the inspection and then when I am satisfied, paint the funnel again. He explained that the foreman had instructed the supervisor to proceed with the painting on the assumption that I would not turn up for the inspection. It seemed that the foreman was at one time seconded to JSL and his experience with owner superintendents was that they would not work on weekends!

As indicated earlier, I was deployed to IHI Kure for 4 months (from July to Nov 1976) as a member of a team of NOL superintendents for the construction of Neptune Pearl and Coral. The team initially comprised Lim Boon Heng, Toh Ho Tay and I. As building activities ramped up, Kee Ah Bah, RN Saxena and Peter Flyint joined us as reinforcements. And closed to sea trials, we had the benefit of Capt Ezekiel, First Officer Daniel Ng, Chief Engineer Chia Che Kiang and 2nd Engineer Tan Seng Kong. I am indebted to ALL named for they taught me more about shipbuilding than all my previous studies and attachment to shipyards!

Another group of people I was indebted to was the shipyard people starting from the Yard Manager (forgot his name). When I confided in him that I was not a permanent NOL employee but was in fact a teacher, he asked what he could do to help me. I requested for unrestricted access to all parts of the yard and his permission to take all the pictures that would be useful to illustrate my lectures and to interview whoever I needed to understand the rationale for the practices of his yard. He granted all my requests by providing me with a special armband. With that, I went everywhere, took at least 1,000 slides and spoke to a cross section of yard people.

I discovered how the Japanese could build ships faster and cheaper than Singapore with workers who were paid at least 3 times more than our yard workers.

The short answer is that the Japanese (those at IHI Kure Yard) practised what the Americans and British preached (in our text books and their technical papers). The long answer is, the Japanese:

- Institutionalised TQM (Total Quality Management) with the CEO taking the lead. He personally inspected all sections weekly to verify improvements made (or claimed) by his people. They did strive for 3Z (zero accident, zero defect and zero loss) while others dismissed as "impossible".
- All employees (organised into squads) were empowered to make improvements and devote an hour (Tuesdays from 1 to 2 pm) to work on a common theme like "is there a better way to improve their own area of work?" For those keen on the details, do read, "Kaizen" by M. Imai.
- Employee education level was high and the workers I interacted with could read the drawings issued to them. They were very productive individually e.g. a welder could simultaneously handle 9 gravity welding sets while our best welder at JSL could handle only 4.
- All levels of management did their PDCA (Plan – Do – Check – Action) thoroughly without taking short cuts. And their plans were communicated to all persons affected.
- Built the largest block that their crane could lift and completed more than 50% of outfitting work, safely on the ground and before the block assembly stage.
- Demonstrated again and again how to get a job done "right first time". Coordination among trades must have been excellent for rework caused by one trade on another was an exception rather than the rule. For example, after a block is painted with the final coat, there was no burn marks on the outer shell because brackets and anchor points for pipes and cable trays were already installed before the final coat of paint was applied. And the final coat covered to all areas except for about 300mm from the edge where a butt joint to another block would be made.

Till today in 2010, I have yet to know of any shipyard in the World that could match what the Japanese did in the 1970s!

I still hold these fond memories:

1. When the Yard QC told me that a job was ready for inspection, it was ready.
2. I had a hard time finding a defect when it was my turn to do an inspection. Defects if any were already corrected by the worker, his supervisor and the Yard QC. In other words, they have all done their own inspections before us.
3. Any dispute about a defect was resolved objectively by consulting the yard's documented workmanship standard.
4. The 36 hour sea trial for Neptune Pearl was conducted without a hitch.

Regrettably, NONE of the above was achieved at the Jurong Shipyard (also managed by IHI) where I was assigned to for the rest of my secondment to NOL to look after the construction of Neptune Tourmaline and Orchid Palmstar.

I must also say that the Japanese were not perfect and this was revealed through my interviews with the workers and my observations. Their seniority system did stifle the young and bright. Their life long employment policy meant having to support a lot of dead wood. High pay did not mean a high standard of living when the cost of living in Japan was high. To give you an indication, in 1976, it was 1Yen to 1 Cent. My overseas allowance including rent was $4,000 per month i.e. 3 times my salary! Mr. Harada, the QA Engineer assigned to our ships one day told me that he just paid up his 6 million yen housing loan. When I congratulated him, he clarified that the loan was for the land only. He had to ask for a 2nd multi million yen loan to pay for the construction of his house! As he was already in his late 40s, I asked how he would service the loan. He replied, "My son"! The house when completed would be smaller than 60 square metres - about the size of a 3-room HDB flat. (The cost of housing in Singapore has risen to a ridiculous high. Already, it will take a lifetime of salaried work to pay for your housing loan. I do hope that you would never "progress" to having to need two lifetimes of work to pay for the roof over your head!)

Neptune Pearl was christened by our MD's wife, Mrs Goh Chok Tong. Coincidentally, "Kure" in Japanese is "Goh" in Chinese. At the end of my four months in Japan, my wife and I took a short holiday in Nara, Kyoto, Mount Aso and Tokyo. There was a road side sale of crockery in Kyoto when we were there and I lugged away at least 30 kg of Japanese crockery to furnish my new home in Ghim Moh. I had no problem with excess baggage for I was coming home by ship. We embarked on Neptune Pearl in Tokyo for our trip home calling at Hong Kong and Kaohsiung along the way. Being a first timer to Hong Kong, I did the must try thing – eat dim sum. We found a restaurant near the port, the dim sum was so-so and the service of so-bad! In Kaoshiung (also for the first time), I did the must do thing in Taiwan i.e. buy pirated books. I left with 4kg of engineering handbooks. The journey home was smooth and I did not miss the chance to learn from Chia Che Kiang and see for myself the condition of the tank tops. I can confirm that Chia Che Kiang's engine room is the 5S (housekeeping) benchmark for engine rooms. Han (forgot his full name) was our cook and I would recommend his creations to anyone who missed Singapore food.

Conclusions

The route I took i.e. via the university to become a marine engineer was the easiest when compared to the apprenticeship and polytechnic routes. Like most Singaporeans in the 1960s, I was too poor to afford a university education. I was indeed lucky to be supported by a scholarship. To me the greatest benefit of my education abroad was learning to be independent, to survive on little and to rely on myself due to the absence of spoon-feeding by my teachers. I acquired much knowledge through reading, research, observation and practice. However, the conversion of knowledge into understanding was mostly derived through the people I met. I am indebted to all of them for their generosity and patience in answering my questions and putting up with me!

I do wish that all mariners are as lucky as I have been in my becoming a marine engineer!

Cheng Huang Leng
July 2010

Cheng Huang Leng graduated from Newcastle University UK with a B.Sc with 1st Class Honours in Marine Engineering in 1970 and a M.Sc in Shipbuilding in 1971 also from the same university. He was a Colombo Plan scholar and was deployed to the Singapore Polytechnic in 1971. He held various positions from Lecturer to Head of Marine Engineering division to Deputy Principal till the end of 1989. He was award the Public Administration Medal (Bronze) for his contributions. He left in 1990 to join Singapore Technologies as its Director for Quality and Management Development. Cheng Huang Leng retired in 2000 to pursue his personal interests – reading, travelling and golfing whenever his not looking after his grandchildren.

During his working life, he served as a grass-root community member and was recognised with a PBM. He also served in organisations such as the Professional Engineers Board, Institute of Marine Engineers UK, Society of Naval Architects and Marine Engineers, Singapore. For his service to SNAMES, he was conferred an Honorary Member in 2013.