A Study of Marine Officer Manpower in Taiwan

Lee Min CHERN[*], Yang-Hong CHEN[**], Mr Chien-Hsing WU[***]

Abstract

The recent merchant fleet expansion within the shipping industry and complying with the requirement of the Port State Control (PSC) and the International Ship and Port Facility Security Code (ISPS) has resulted in an increase in the demand for merchant marine manpower. This paper aims to analyse the demand and supply of marine officer manpower in Taiwan. It is found that the current supply of marine officers can not meet the future demand. The reasons for the shortage include the reduction in the number of students of departments of navigation and marine engineering of Taiwan's Maritime universities and college, students' unwillingness to work at sea, and the rigid examination scheme for qualification. It is suggested that providing more incentives for students, improving sea-training system, and re-examining current examination scheme for marine officer qualification through the cooperation between the government, shipping companies, and maritime educational institutions are necessary to overcome these problems.

1. Introduction

Taiwan's merchant fleets are playing an important role in the world shipping industry. For container liners are concerned, among Taiwanese owned companies, Evergreen Group stands on the top four with a share of 5.1% of the world liner fleets in TEU terms. Yang-Ming and Wan Hai Lines are ranked the 17th and 21st with shares of 2.1% and 1.2% respectively. A total of 285 vessels are owned or chartered by these three companies (Table 1).

Table 1 Top 30 Container Shipping Liners

Rank	Operator	TOTAL		OWNED		CHARTERED		ORDERBOOK		
		TEU	Ships	TEU	Ships	TEU	Ships	TEU	Ships	%/existing
1	Maersk	1620587	577	698909	167	921678	410	696025	145	42,9 %
2	Mediterranean Shg Co	734150	266	516612	186	217538	80	314253	44	42,8 %
3	CMA-CGM Group	486548	241	175150	71	311398	170	381703	80	78,5 %
4	Evergreen Group	456806	151	339827	109	116979	42	203585	40	44,6 %
5	CSCL	334337	120	165565	71	168772	49	149040	20	44,6 %
6	APL	331639	104	127270	36	204369	68	120892	30	36,5 %
7	Hanjin / Senator	315153	82	69951	18	245202	64	67976	10	21,6 %
8	COSCO Container L.	311644	125	226441	100	85203	25	173829	21	55,8 %
9	NYK	301573	118	165711	39	135862	79	156766	26	52 %
10	OOCL	236789	67	145560	27	91229	40	113372	20	47,9 %
11	CSAV Group	230699	85	1585	1	229114	84	81545	17	35,3 %

[*] Junior Vice President, Evergreen Marine Corp (Taiwan) Ltd.
[**] Secretary General, Taiwan Association of Maritime Safety and Security; Associate Professor, National Taiwan Ocean University
[***] Assistant, Taiwan Association of Maritime Safety and Security

12	K Line	226160	74	110598	27	115562	47	111920	19	49,5 %
13	Hapag-Lloyd Group	221965	57	126114	26	95851	31	60950	7	27,5 %
14	Mitsui-OSK Lines	220122	71	113318	30	106804	41	113050	17	51,4 %
15	Zim	204271	88	110824	37	93447	51	72454	17	35,5 %
16	CP Ships Group	191316	79	107221	39	84095	40	34000	8	17,8 %
17	Yang Ming Line	185639	67	122187	38	63452	29	133894	30	72,1 %
18	Hamburg-S Group	185355	88	68398	22	116957	66	88672	25	47,8 %
19	Hyundai	148681	39	55254	16	93427	23	126400	20	85 %
20	Pacific Int'l Lines	134292	101	75533	64	58759	37	57958	22	43,2 %
21	Wan Hai Lines	106505	67	71122	43	35383	24	62818	15	59 %
22	UASC	68830	30	59538	24	9292	6	54400	8	79 %
23	IRIS Lines	53218	57	50668	51	2550	6	70012	15	131,6 %
24	Regional Container L.	48135	41	38642	33	9493	8	2220	2	4,6 %
25	Grimaldi (Napoli)	44049	36	39479	31	4570	5			
26	M.I.S.C.	37074	17	29170	14	7904	3	15840	2	42,7 %
27	Costa Container Lines	35796	28	4430	4	31366	24	21084	10	58,9 %
28	China Navigation Co	35617	38	14286	13	21331	25			
29	Sea Consortium	34734	49	0	0	34734	49			
30	CCNI	33799	18	0	0	33799	18			

Source: Alphaliner 2005.

*Operated fleets dated on 17 October 2005. Based on existing fleet -- TEU capacity available on board operated ships -- all figures are consolidated

Owing to that shipping companies have been expanding their fleets as a result of the booming economic activities and trade worldwide, coupled with the need to comply with the requirements of Port State Control (PSC) and the International Ship and Port Facility Security Code (ISPS), there is an increasing demand for marine officers and maritime management manpower ashore in Taiwan's maritime industry. It is known in practice most of management manpower is sourced from marine officers, who normally have served at sea for a period of time and then been transferred to work ashore, and become professional managers in maritime management field. This implies that it is very important at the first stage to have a sufficient supply of marine officers for the shipping industry.

Recently there is a worldwide phenomenon of shortage of marine officers. BIMCO (2005) indicates that in 2002, there were about 30,000 marine officers too few, a shortage of about 30% compared with the number needed, for the 10,000 or so ships of the European Union countries, and that by 2010, on a related growth rate, there is going to be a shortage of 46,000 officers. This paper aims to analyse the demand and supply of marine officers in Taiwan's shipping industry to explore whether the supply of marine officers under the current maritime education system and government policies could meet the future demand or not.

2. Manpower Demand

In order to estimate future demand for manpower in Taiwan's shipping industry, a survey was carried out in 2004 targeting on the major 16 shipping companies in Taiwan to investigate their existing number of vessels, seafarers currently employed, and vessels under construction, crews serving ashore and additional crew serving ashore required. The findings are summarised in Table 2. It is noted that chartered vessels and tug vessels are not included in this survey.

Table 2 Number of Vessels and Seafarers of 16 Major Shipping Companies in Taiwan

		Total No of Vessels	New Vessels in five years	Total No of Seafarers	Taiwanese Officers	Foreign Officers	Taiwanese Ratings	Foreign Ratings	Crew Serving Ashore	Additional Crew Serving Ashore Required
長榮	Evergreen Line	110	50	2190	807	304	648	431	573	20

陽明	Yang-Ming Line	40	21	945	290	115	288	252	80	0
萬海	Wan Hai Line	40	9	902	157	210	152	383	25	50
台灣海陸	Taiwan Maritime Transport Co Ltd	30	0	602	22	220	0	360	11	0
裕民	U-Ming Marine Transport	25	2	577	179	72	145	181	25	0
四維	Shih Wei Navigation Co., Ltd.	25	7	498	58	153	7	280	5	0
台塑	Formosa Marine	24	15	486	47	175	21	243	35	5
中鋼	China Steel Express	19	4	480	160	60	160	100	4	0
慧洋	Huai Yan	18	12	368	35	117	0	216	6	0
台航	Taiwan Line	17	5	401	96	69	106	130	2	0
益壽	First Steamship	16	2	368	6	122	9	231	12	0
新興	Sincere Navigation	16	7	353	76	70	25	182	4	0
新健	Hsin Chien Marine	15	4	308	24	104	7	173	10	0
達和	Ta-Ho Maritime	15	3	280	80	45	80	75	8	0
遠森科	Far Eastern Silo & Shipping	12	0	250	45	49	18	138	8	0
信友	Hsin Yo	9	5	177	22	49	0	106	5	0
合計		427	146	9185	2104	1934	1666	3481	813	75

As this survey only covered the major 16 Taiwan's shipping companies so the estimation of required merchant marine manpower in terms of the survey results would be expected to be less than that if total shipping companies in Taiwan were included in the survey. Following is the estimation of the demand for marine manpower for the following five years in terms of these 16 companies.

1. A total of 146 new vessels are under construction, hence about a total of 1168 (8*146) officers are required;

2. Of the existing 427 vessels, 61 vessels are owned by Hsin Ron、First steamship and Hsin Chien Marine companies. 43% of these 61 vessels employ a total of 52 Taiwanese masters and chief engineers. As for the other 366 vessels owned by the rest of 13 companies, 95% of them employ a total of 696 Taiwanese masters and chief engineers employed. Totally, 748 Taiwanese master mariners and chief engineers are employed by these 427 vessels. However, 62% of these Taiwanese master mariners and chief engineers are more than 55 years-old, and it is estimated that about 68% of them are expected to retire in the following five years. Hence, an additional 315 (748 × 62% × 68%) officers are needed to be prompted as master mariners and chief engineers.

3. Excluding the public sector and other private sectors, currently there are more than 540 marine officers serving ashore for the shipping companies. As about 30% of them are of the age more than 50, so an estimated amount of 244 officers are expected to retire after five years (pers.com). Nevertheless, Table 2 indicates that additional 75 ashore-positions are opened by Evergreen, Wan Hai and Formosa companies. Therefore a total of 319 (244+75) ashore based officers are required in five years.

4. In terms of above estimation, at least 1802 (1168 + 315 + 319) merchant marine officers are demanded by these 16 major shipping companies. As mentioned previously, the real number of merchant marine manpower demanded indeed is higher than the estimation above since Taiwan's merchant marine manpower market is bigger that that the survey represented.

3. Manpower Supply

3.1 Source of Manpower

Taiwan's two maritime universities and one college, namely National Taiwan Ocean University, Kaohsiung Marine University of Science and Technology, and China College of Marine and Commerce, are the main sources of providing national merchant marine officers for the shipping industry. However, the number of students enrolled in departments of navigation and marine engineering in these three universities and college had started to decrease between 1990 and 1997, so was t graduate/enrol rate. On average, a total of 430 students enrolled each year but only 423 students graduated during this period (Chen 2001). Furthermore, these three academic institutions in 1998 operated a total of 16 classes with a student number of 702, however, the number of class has been reduced to 14 over these years, and the student number has decreased to 672. Among those 702 students enrolled in 1998, only 505 (72%) students graduated in 2002. In 1999, a total of 665 students enrolled and 646 students graduated after 4 years. Between 2000 and 2003, the enrolled student numbers were 833, 831, 820, and 672 respectively. Though the total number enrolled each year was higher than previous years it has shown a decreasing trend.

Looking into the future, the estimated number of graduates from the navigation department of these three academic institutions between 2005 and 2007 are 275, 281 and 327 respectively (Table 3). And the estimated number of graduates from the marine engineering departments of these institutions between 2005 and 2007 are 299, 454, and 485 respectively.

In contrast with shipping companies' increasing demand for merchant marine officers, the recent decreasing number of students enrolled in relevant departments of navigation and marine engineering in Taiwan's maritime universities and colleges may cause problems for shipping companies to meet their manpower demand from domestic market.

Table 3 Graduates from Navigation Departments 2005-2007

College/University	Department	2005		2006		2007	
		No. of Class	No. of Students	No. of Class	No. of Students	No. of Class	No. of Students
National Taiwan Ocean University	Merchant Marine	2	101	2	104	2	109
	Transportation	1	67	1	46	1	52
Kaohsiung Marine University of Science and Technology	Nautical Technology (5-year Diploma)	1	40	1	40	1	43
	Nautical Technology (2-year BSc)	1	35	1	41	1	40
	Nautical Technology (4-year BSc)	0	0	0	0	1	33
China College of Marine and Commerce	Navigation (2-year Diploma)	1	32	1	50	1	50
Total Graduation			275		281		327

Source: National Taiwan Ocean University. Kaohsiung Marine University of Science and Technology, China College of Marine and Commerce 2005.

Table 4 Graduates from Marine Engineering Departments 2005-2007

College/University	Department	2005		2006		2007	
		No. of Class	No. of Students	No. of Class	No. of Students	No. of Class	No. of Students
National Taiwan Ocean University	Marine Engineering (4-year BEng)	1	22	1	28	1	38
	Marine Engineering (2-year BEng)	1	48	1	45	1	55
Kaohsiung Marine	Marine Engineering (5-year	2	88	2	91	1	48

	Diploma)						
University of Science and Technology China College of Marine and Commerce	Marine Engineering (2-year BEng)	1	49	1	50	1	49
	Marine Engineering (4-year BEng)	0	0	1	45	2	95
	Marine Engineering (2-year BEng) (Evening Program)	1	32	2	95	1	50
	Marine Engineering (4-year BEng) (Evening Program)	0	0	0	0	1	50
China College of Marine and Commerce	Marine Engineering (Diploma)	1	60	2	100	2	100
Total Graduation			299		454		485

Source: National Taiwan Ocean University. Kaohsiung Marine University of Science and Technology, China College of Marine and Commerce 2005.

3.2 Problems of manpower supply

The reasons for decreasing supply of marine officers from domestic sources to shipping companies can be discussed as follows:

1. The reduction in the number and size of classes providing navigation and marine engineering courses at the three maritime academic institutions. The reasons for the reduction are:

   i. Economic prosperity has brought in lots of job opportunities ashore. Some industries such as high-tech and service industry offer munificent salary and bonus, hence, navigation and marine engineering studies comparatively could not attract students. Consequently, it occurred to the major three maritime universities and college that enrolled new students were less than their quota planned.
   ii. Though students enrolled in departments of navigation and marine engineering, many of them transferred to other departments or other university afterward.
   iii. The percentage of graduates working for shipping companies particular at sea is quite low.
   iv. Huge amount of budget are required to comply with the needs of maritime education and training, however, in terms of the consequence discussed above, maritime universities and colleges have thought that the rate of return of such investment is low and it is not worth to invest concerning the whole development of the institute. Budgets saved from the reduction in the number or size of navigation and marine engineering classes could be used in the development of other favourable departments in the institute.

2. Students' lack of inclination for working on board of ship
   The fact that many graduates have not joined the industry has caused a waste of maritime education resource. According to a survey carried by Kuo (2003), 24.53% of 106 surveyed students expressed their willingness to work on board of ship, 18.87% of them stated that they definitely would not work on board, and 56.6% of them were not certain. Furthermore, he interviewed with surveyed students to elicit their attitudes toward being willing to work or not willing to work on board. It was found that the main reasons for unwillingness to work on board include:

   i. Shipping companies have already employed a large number of officers from Mainland China. Taiwanese officers will be replaced by them gradually in

the future. Therefore, the future working on board is hopeless;

ii. Parents or friends object to it;
iii. The wage of a marine officer is not an absolute inducement to accept the job, instead personal interest is the most important concern;
iv. Could not accommodate this occupation mentally and physically due to away from home for a long period of time;
v. Promotion is slow; and
vi. Shipping company does not generally pay attention to crew's welfare.

Those students who were not certain to work on board expressed their reasons for the attitude, these included:

i. Do not understand the career clearly;
ii. Parents object to it, they incline to work on board though;
iii. Lack of confidence to personal ability to cope with the works on board; and
iv. To work on board will be the second choice if there are better working opportunities found ashore.

3. Rigid examination system for marine officer qualification

In addition to the decreasing graduated students from departments of navigation and marine engineering of maritime universities and college, the existing examination scheme with a high threshold for graduated students to obtain qualification for a marine officer may have exacerbated the problem of shortage of marine officers. Students graduating from departments of navigation and marine engineering need to pass national examination held by the Examination Yuan to be a marine officer. The Examination Yuan institutes the marine officer examination system, including subjects, knowledge requirement, and duration of study in universities or colleges, and sea experience for each level of officers. However, the Examination Yuan's perception of the examination is quite different from the worldwide practice, which a database of examination questions is open to the public, and examination questions containing basic and professional knowledge that marine officers must be aware of are thought to be repeated in each examination. However, the Examination Yuan has persisted in maintaining a so-called high standard examination through controlling a moderate pass rate. Even though there is a large scale of database of examination questions it is not open to the public. Moreover, the same type of questions is not possibly or seldom repeatable in each examination. As a result, this has led to a fail rate of more than 65% annually (Examination Yuan 2004). For example, the results of navigational examination, as seen in Table 5, the total number of examinees did not decrease in the passed years, however, the number of passed examinees getting fewer. Compared with the pass rates of marine officer qualification in other countries, for example, 90% in UK, 100% in China, Singapore, and Panama, it appears that it is of certain difficulties to get the qualification. Accordingly, regardless of the strong demand of Taiwanese merchant marine officers from shipping companies, the complacent and conservative thinking of the Examination Yuan, which has led to a low pass rate of marine officer examination, has driven shipping companies into a corner and consequently they have sought to use foreign officers as an alternative.

Table 5 Records and Results of Navigational Examinations

	No. of examinees	Actual no. of examinees	No of Passed Examinees	Pass rate (%)	Passed No. of 1st Class Deck Officer & Marine Engineer
2002 - 1st	445	306	90	29.41	25
2002 - 2nd	637	458	145	31.65	56
2002 - 3rd	576	404	90	22.27	28
2003	1170	800	197	24.62	46
2004 - 1st	323	291	4	1.37	4
2004 - 2nd	439	403	16	3.97	13
2004 - 3rd	418	385	48	12.47	43
2004 - 4th	565	509	39	7.07	30

Source: Examination Yuan 2005.

Based on the survey carried out by this research, it is estimated that at lease 1802 merchant marine officers are demanded by Taiwan's shipping companies, however, the decreasing graduates from maritime college and universities, coupled with the low pass rate of seafarer examination owing to the rigid examination scheme, it seems difficult to meet the demand from shipping companies. According to the examination results during 2000-2004, there were only 717 first class deck officers and marine engineers passing the examination (Examination Yuan 2004). If the low pass rate is still maintained, it can be foreseen that there may be less officers than this number in the following five years. The shortage of marine officers will induce a great challenge and also a threat to shipboard safety and management.

4. Strategies and Recommendations

As marine officers in the future will normally be candidates for working in management level within shipping companies. The shortage of marine officers has impacts not only on vessels operation but also management capability of shipping companies in the future. Current problem of shortage of Taiwanese marine officer manpower may be sorted out by using foreign officers, however, as Taiwanese shipping companies are used to employ national staff to fill up vacancies in management level, so there will be a lack of shipping management staff in the future if the shortage problem can not be solved.

Accordingly, this research recommends strategies including **e**ncouraging more students studying in navigation and marine engineering studies and motivate them working on board, and reforming current examination scheme for marine officer qualification, to tackle the current problems of Taiwan's marine officers supply shortage discussed in the previous section.

4.1 Providing incentives for students to study navigation and marine engineering programme and working on board

According to Kuo's (2003) survey, more than a half of students (56.60%) surveyed were not certain if they would work on board of ship after graduation. This implies that attractive policies needed to be developed by the government, shipping companies and maritime educational institutions to motivate these students joining the industry.

To guarantee and sustain a stable supply of marine officers, Chen (2001) argues that the government and shipping companies need to actively cooperate together by providing scholarship to students. He suggests two approaches to this strategy. The first one is that shipping companies develop an 'adoption plan', with which shipping companies cooperate with the departments of navigation and marine engineering departments in maritime

universities in developing curriculum by providing industry practices and offering students opportunities to practise in or work occasionally for the companies to accumulate students' industry experience. In addition, companies provide scholarship to certain students with a contract, in which the amount of scholarship, training provision at sea and ashore, and student's obligations, for example, duration of work for the company are specified. These students will be regarded as their future employees. The rationale of this approach is that shipping companies may turn their attitude towards recruitment from passive waiting to actively contributing to the incubation of marine officers. Consequently, this approach will result in benefits that students have opportunities to gradually increase their cognition of and identification with the shipping industry and shipping companies will have good candidates for future recruitment. The second approach is that the government such as the Ministry of Transportation and Communication fully sponsor a planned number of students studying in navigation and marine engineering programme, including tuition and incidental expenses going to school even living allowance, to strengthen their willingness to engage in the shipping industry.

From the practical view, the following policies are suggested to provide incentives to attract students working for the industry.

i. In order to increase students' understanding in shipping industry, shipping companies shall arrange more interactive activities with them. For example, provide industry talk with them through a lecture, speech or seminar.
ii. Many students have a hope for looking for job opportunities ashore after working some years at sea, shipping companies could assist them to achieve through establishing a sea-shore exchange program for officers.
iii. After the implementation of the Seafarers Law and its enforcement rules, a reasonable retirement and pension scheme shall be established and implemented by shipping companies.
iv. As there are insufficient recruit of cadets so cadet training program need to be increased and revised by shipping company to meet the practical demand.

4.2 Improvement of Training Scheme

According to STCW 78/95 after taking basic courses work ashore, a marine officer need to have 12 months sea training so as to obtain the qualification. The current sea training scheme implemented by Taiwan's maritime universities include two alternatives such as '3-9' and '6-6'. Under the scheme students need to have 3 (6) months sea training during their studies and take 9(6) months training after getting the qualification of marine officer. The advantage of the former one is that students can receive training during summer break without reducing the period of studies, and if they are not willing to work at sea after graduation they are allowed to forgo the rest of 9 months training. However, the duration of 3 months sea training is so short that only short sea sailing experience that students can obtain. Moreover, due to the limit numbers of national vessels sailing short seas, there are not enough spaces for these companies to provide sea training for students. The later alternative can overcome the disadvantage of the former one, however, it may lengthen students normal study duration of 4 years. Therefore, it is suggested that maritime universities and college could restructure the course of departments of navigation and marine engineering so that students could complete courses work and 12 months sea training within four years.

Recently, a new scheme, '3-6-3' or '3-9' is implemented by the Department of Merchant

Marine at National Taiwan Ocean University. Under '3-9' scheme, the department arranges a special programme for students who have a strong intention to serve at sea after graduation. Students will be on board of ship and trained from the beginning of summer at the end of their third year to the beginning of the second semester of their fourth year. Through a special arrangement by shipping companies, students need to complete their course-work under the instruction and supervision of ship officers; in addition, an intensive one month course will be delivered while returning to campus. As a result, a total of 9 credits will be granted by taking this programme.

In fact, many shipping companies have contributed themselves to incubate marine officers by providing practice opportunities for students. Few companies, for example, Yang-Ming, provided scholarship for students. However, as male students need to serve for military for 18 months after graduation, which will disconnect the link between students and the industry. Such disconnection may indeed reduce students' willingness to work at sea. Hence, many shipping companies have expressed their concern about this and suggested substituting the current sea training system for compulsory military service. They believe this alternative will facilitate graduate students having more experience of working at sea and well understandings of the industry during this period, which may enhance students' willingness of working on board in the future.

4.3 Improvement in current examination scheme for marine officer qualification

Students graduating from navigation and marine engineering departments of maritime universities are supposed to be qualified with fundamental knowledge of being a seafarer. Acknowledging this fact, therefore, Examination Yuan has to concern about that whether maintaining a low pass rate of marine officer examination is reasonable. In addition, though the current database of examination questions is not very large, examination Yuan need to consider to release the database to the public as soon as possible to assist candidates preparing examination.

5. Conclusion

It has shown that there is a shortage of marine officer manpower in Taiwan, which may have impact on the future demand for manpower in maritime management field. The shortage has resulted from the reduction in size and classes of departments of navigation and marine engineering in Taiwan's Maritime educational institution, lack of willingness of students working on board of ship, and the rigid examination scheme for qualification. The relevant strategies recommended in this paper such as providing incentives for students understanding the industry and working on board of ship, improvement in training system and examination scheme for marine officer qualification in fact have to be implemented by the cooperation between the shipping industry, maritime education institutions and the government.

Shipping companies need to provide more incentives for students to join the industry such as adoption plan with adequate scholarship for students and providing industrial experience and knowledge for students through interactive activities with them. The government need to evaluate whether the reduction in size and classes of department of navigation and marine engineering of current maritime educational institutions is appropriate under the circumstance of manpower shortage. In addition, it needs to consider approving and

implementing the policy, the substitution of cadets training at sea for compulsory military service, as soon as possible. As for the examination scheme, re-examination of the pass rate of marine officer qualification and releasing database of examination questions to the public need to be concerned.

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