Practice and Research of Maritime Education and Training aided by Engine Room Simulator based on "Eligibility Appraisal"

Huang Jia-Liang[1], *Cai Zhen-Xiong*[2], *Yang Guo-Hao*[3]

Abstract

Using computer simulation, engine room simulator (ERS) is a kind of new technology plant which is economical, safe and highly efficient to teach and train modern engineers, International Maritime Organization (IMO) has already adopted it as one of mandatory requirements, and given detail specifications of general performance standards and suggestive standards of ERS. At the same time, the maritime education and training project (MET) of IMO proposes that maritime education should be performed in real or at least simulating environment. Obviously, with the improvement of the automation of modern engine room, the comprehensive training of automatic engine room to marine engineers appears even more necessary. Designed and organized carefully, we can fully utilize the advantage of ERS. In addition, preset operating condition and fault conveniently in advance, and analyze, and solve the problem. It is useful to improve the comprehensive ability of seafarers.

Key words: Maritime education and training (MET); Engine room simulator (ERS); Marine engineering; Eligibility appraisal; Practical teaching

To train qualified crew, to meet the demands of marine transport, "the International Convention on Standards of Training, Certification and Watchkeeping for the Seafarers" (STCW Convention), issued by International Maritime Organization (IMO) was amended it several times. The 1995 amendments to the Convention entered into force in 1997, and then had been implemented in August. The standards for training in Simulators is mandatory required, the STCW 78/95 Convention provides that engine room simulator(ERS) can simulate the operation of the equipment in ships, achieve the practical level of required goals of the training, and include such equipment per-

[1] associate professor (Jimei University), PhD candidate (Dalian Maritime University).
[2] professor, dean of Marine Engineering Institute, Jimei University, e-mail: czxw@vip.sina.com
[3] professor, vice-president of Jimei University

formance, limitations and possible errors. To meet the performance requirements on the simulator —"the controllable operating environment, the level of real physical, behavioral truth, abnormal situation of simulation", STCW 78/95 requests that engine room simulator must have adequate emulation environment, so that the trainees can receive training and can demonstrate the required target skills, which can help trainees to improve ship operation which is the capacity for rapid reaction and safe operation capability that the sailors must have.

Seaman is the subjective factor in safe navigation. Crew's competency standard, according to the generally accepted international standards listed in the STCW 78/95 Convention, is the standard or level of knowledge, comprehension, technique proficiency which required normally when carrying out the related duties on board. Ocean ship engine room simulator can emulate with modern whole container ships as mother ship, and can real-time physics emulate the entire process of marine systems and equipment as core as computer system and as base as physical processes modeling, adopting the real-time computer simulation technology, multi-media technology and automatic control technology. The simulation has the same functional operations plate and operational interface as the real ship and has similar training environment as the real ship engine room.

According to relevant requirements of simulator training and assessment in the STCW 78/95 Convention and the requirements in the "Marine Seafarers Certificate of Competency Examination, Assessment and Certification Rules" issued by the People's Republic of China promulgated Maritime Safety Authority(China MSA), the crew which apply the applications for certificates of competency, must participate in the corresponding professional training, and must pass competency assessment before participating in the appropriate theoretical examination. It may reflect the actual regarding degree for the crew's operation ability in "the Convention" and "the Rules" from this requirement.

1. The Requirements for Teaching in the "Eligibility Appraisal" Criterion

1.1. Requirements for Teaching Content

The training aim established by the marine major (undergraduate) in the "Ordinary College Undergraduate Catalog and Professional Profile" issued by the Ministry of Education(MOE, China) promulgated is —Marine Engineering: bring up the senior technical talent which has mechanical principles and engineer systems knowledge, and can be engaged in manipulation of marine engineering, ship power plant mainte-

nance and repair supervisor and the construction work in the marine transportation and other institutions, and has third or fourth engineer of qualification in the similar ships. Meanwhile, it must cover complement requirement of training, certification and watchkeeping for the ship crew ruled by the STCW 78/95 Convention in the training objectives of marine engineering professional. The content of each assessment projects in "Eligibility Appraisal" criterion must be executed by interrelated content of "the Seafarers Examination and Evaluate Outline" issued by China MSA, which establishes specific requirements, standards and procedures for the each assessment of the project.

According to the requirements of "Eligibility Appraisal" standards, the engine room simulator teaching content is divided into three projects: (1) manipulation and management of ship main engine and control system; (2) the control and management of paralysis ship renewed power and each power system; (3) the operation and management of ship power plant. While students in each class (30 persons) are divided into A, B and C groups, each group has one and a half days to complete the training project in turn. During the training process, in the fifth day, A, B, C-group online paralysis ship starts depart from port and manipulating examination of the finished engine to put in the port.

Evidently, through the normal teaching, the guiding ideology of engine room simulator training helps the students to fully meet the "Eligibility Appraisal" norms and related contents. Meanwhile, students can understand the automation equipments of modern ship's engine room and its daily operations management, and have a popular perception for the organic links between the entire power plant equipment and control system. In order to fully meet the needs of the STCW 78/95 provisions of the convention "Suitable Assessment of the Project" and "Continuing to Demonstrate Proficiency", as well as the requirements of "Power Station Automation training" and "Automation System Training" and the corresponding of "Engine Room Simulator Training Evaluation Norms" which ordained by China MSA.

1.2. The Request of Teaching Methods and Means

The "Eligibility Appraisal" norms integrate the practice of teaching courses of some courses such as the "Marine Diesel Engine", "Ship Auxiliary", "Marine Engineer Maintenance and Repair" and "Marine Power Plant Technology Management" as the assessment projects for the "Power Equipment Disassembly and Assembly" and the "Motivation Equipment Operations"; and the practice of teaching courses of the "Ships Electrical Equipment and Systems", "Ship Power Station and Automatic Devices", etc, can combine as a project of the "Ship Power Plant Operations". They indicate the requirements, which relate to the professional marine engineering courses which integrated use of experimental capacity by the "Eligibility Appraisal".

In "Eligibility Appraisal" norms, students not only need to master the principles of equipment related engine room simulator assessment project, but also need to master

the structure and get involved for the corresponding operation skillfully. Meanwhile, students should have an integrated operation, maintenance and management capabilities of equipment on ship engine room. Therefore, the new requirements for the simulator practice teaching methods and means of teaching have been put forward. That is through using modern teaching methods and fully utilizing all types of simulators to improve the theory and practical skills of the students.

1.3. The Request Equipment of Teaching

At the "Eligibility Appraisal" norms, the simulator for marine engineers to assess projects must meet simulation equipment operation training requirements which were in charged by the STCW 78/95 Convention and the Chinese authorities in charge of the ship electromechanical. An operational training content contains the five module systems, namely: ship power station operating systems, main propulsion power plant operating systems, ship auxiliary equipments operating systems; teachers assess evaluation system, power supply devices. Within this total, the ship power stations operating system includes diesel generators, power stations and ship load components, etc; Main propulsion system is composed of the power plant and marine diesel engine services for the mainframe's power system components; Ship auxiliary equipment operating system operated by the auxiliary boiler control, oily-water separator operational control, fuel / lube oil lightering / decontamination / separator operational control, the sewage treatment plant operational control, ballast water and fire control operation, the fresh water generator operational control components; The teacher evaluation system mainly contains the fault settings or parameters settings platform by teacher, assess performance appraisal system management platform and the self-checking function device components; The UPS offers the electric power supply to device uninterrupted.

With the rapid development of modern marine engineering technology and Internet network, a large number of engineers need to adapt the training requirements of the modern ship engine room highly automated management skills. Develop and research ocean ship offshore virtual network operation simulator training platform which based on 3D virtual reality simulation technology and powerful Internet technologies, and which has an advanced international level and reveal the true these five systems on the simulator module operation, control, status and parameters, sound and light alarm function, etc, in order to achieve practical operation visualization training. The practical operation training systems displayed can visualize practical operation training and test far way or spot via the Internet or local operating platform to implement the main propulsion power plant control system. The virtual platform offers the simulation effects of the manipulation results. By the Internet, it can rapidly and efficiently learn and intercommunicate to realize the ship electromechanical equipment operation training for students' simulating operations.

2. Reforms and Practice of Teaching System

2.1. Course Setting

In order to achieve the training aims of the marine engineering undergraduate course and meet the vocation development needs, a frame round of advanced engineering education should be required to draw in the course system and embody the marine professional characteristics and the post requirements in the teaching content, optimizing and regrouping the course system in order to better formulate the teaching outline of the engine room simulator practical operation. Teaching contents mainly include the three items: the manipulation and management of the main propulsion power plants and the controlling system, the manipulation and management of the paralysis ship propulsion power and all power system, the manipulation and management of the ship power station. The chief engineer training also includes: the manipulation and management of the step by step remote control system, the manipulation and management of the shaft power generation, the manipulation and management of the engine room concentrating monitoring and the grouping extend and the alarming system, the fault analysis and eliminating of the main engine and diesel generator and the main switchboard and so on.

In addition to the practice operation of the engine room simulator, the foremost importance needs the students understanding and digesting. Teaching practice demonstrates that the training time of the engine room simulator better include to the simulator laboratory after the students studying the professional courses and finishing the training of the "Marine Engineering Automation Engine Room".

2.2. Teaching Mode

Course teaching is the fundamental way to the aim. In the teaching process sufficiently exerting the students' main function and the teachers' leading function, as well as the engine room simulator's function, giving the students more independent operational opportunities to simulate the ship operation, raising the student's interest in learning at the same time improving the student's integration ability and diathesis of analyzing and solving the problems.

Marine engineering students have more opportunities to the international shipping market and more market demand. In order to enhance the marine engineering students' international competition, the engine room simulator training courses gradually boost bilinguals(i.e. English-Chinese)teaching, the aim not only provides a real engine room operation environment but also enhances the teaching effect of the professional English.

2.3. The Supervision of Teaching Quality

According to the requirements of the STCW 78/95 Convention and the marine education teaching outline established by the ministry of communications(MOC, China) and the practical operation evaluating outline issued by China MSA, authorizing the integrated engine room simulator practical operation instructor, establishing the integrated teaching management system documents, including the experiment teaching plan, the experiment teaching task book, using register of the large-scale teaching laboratory equipment, the laboratory log, the graded standards of the experiment practical operation and so on.

Assure that the whole process of the practice teaching is under the control, a scientific and canonical system needs to be established to evaluate the practice teaching quality. Formulating the strict teaching plan to each of the practice teaching step and reasonably arranging every practical operation, establishing the process inspection and the results examination. Strengthening the examination means and consummating the examination procedures and bringing the students practice teaching into the normal achievement management in order to enhance the students understanding of the practice teaching significance and continuously improve the teaching quality of the engine room simulator practical operation.

We should build and use a dynamic students competence appraisal system to accurately appraise students' competence, fully develop the competence of human resource, improve productivity and provide a new appreciation chance for the development of enterprise so as to fully use and utilize students' labor resource, and make students management more scientific, standard and modernized.

3. Conclusions

It is essential to accelerate the growth of seafaring personnel to satisfy the need of the high automation of Engine Room and none-lifetime employment of seamen, thus, all kinds of modern training means emerge. Engine room simulator is one of them. The newly incremental contents of the STCW 78/95 Convention are to stimulate the studying motivation which different levels, functions and subjects are required to achieve. That is to say, trainees should demonstrate competence before holding a post on board. The eligibility can be developed by means of approved ERS training as appropriated.

In a word, to achieve the request of the engine room simulator teaching mode and teaching content based on "Eligibility Appraisal" criterion, the key is establishing the cultivating mode adapting to the knowledge economy times, the marine profession training pay attention to incarnation of the international currency and the position pertinence and the law regulations, strengthening in training the marine students' pa-

triotism, management capacity, foreign language proficiency, emergency ability and practical operation capability. Through the engine room simulator practical teaching and integrated training about evaluating items based on "Eligibility Appraisal" criterion, improving the students' ability of the fault analyzing and eliminating, and the students' ability of the modern ships' marine engineering management.

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