https://doi.org/10.53656/ped2023-6s.01

UTILIZATION OF NON-VERBAL COMMUNICATION IN THE ENGINE ROOM TRAINING – BASIC RESEARCH ON HAND SIGNALS AMONG MONOCULTURAL CREW ON BOARD

Nagisa Matsushima, Asami Shimada, Yutaka Emi
Japan Agency of Maritime Education and Training for Seafarers (Japan)

Abstract. Accidents are likely to occur in an environment where work is done with teamwork by multiple crew members due to lack of communication, especially in a multicultural environment. Therefore, if there are internationally common maritime hand signals, it would contribute to reduction of human error among multicultural crews on board. As basic research on utilization of hand signals among multicultural crew on board, we invented several common hand signals. Furthermore, as a first step in an experiment to verify the effectiveness of hand signals during teamwork operation in engine room, we conducted the experiment in a mono-cultural environment through onboard training on a training ship. Our target task was practical onboard training for main engine start-up procedure in engine room because it required a lot of multitasking and teamwork. We studied the effectiveness and improvement of use of hand signals through questionnaires and interviews conducted with cadets and onboard instructors.

Keywords: non-verbal communication; engine room training; onboard training; muti-cultural crew onboard

Introduction

There is plenty of machinery in operation in the engine room. Thus, the engine room is usually a noisy space. Then, engineering crew communicate with colleague while they are exposed to noise. Moreover, while they make full use of teamwork away from each other in engine room, communication in such circumstances would be more difficult for the engineering crew. If there are internationally common maritime hand signals, it would be a useful communication tool among multicultural and multilingual crews on board.

As it has been pointed out that English speakers use gestures more frequently than Japanese speakers (Seto 2000, pp. 65 – 77), Japanese people relatively seldom use gestures during their communication. Taking this Japanese feature into account, a survey was conducted targeting Japanese cadets who were onboard Training

Ship Seiun Maru of JMETS (Japan Agency of Maritime Education and Training for Seafarers). Accordingly, we focus upon two types of teamwork tasks. One is starting up boiler water circulation pump and the other is practical training for moving heavy objects. A survey result showed that 89% of engineering cadets consider that hand signals are effective for engine room communication.

1. Target cadets

Cadets had already experienced 6 months onboard training onboard another training ship. Therefore, they already have fundamental knowledge and skills, such as how to operate a centrifugal pump, when they embarked Training Ship Seiun Maru of JMETS to conduct 3 months onboard training. Then, one month after their embarkation, all cadets were taught hand signals, but they were not familiar with using hand signals when they were introduced to hand signals.

2. Target tasks

We focus upon two types of teamwork tasks. One is, as a main engine start-up procedure, starting up boiler water circulation pump and the other is practical training for moving heavy objects.

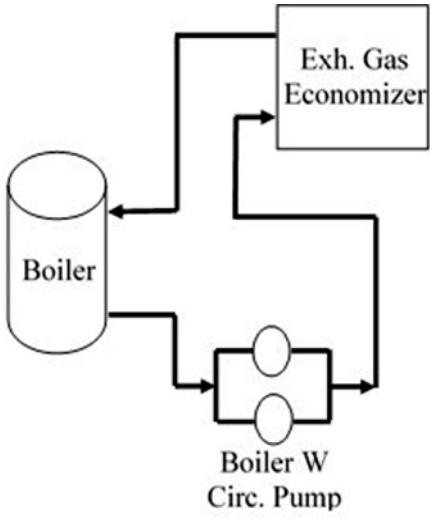

Figure 1.
Boiler water circulation line

While the main engine is running, in order to save fuel consumption with boiler, as shown in Figure 1, the boiler water circulation pump sends boiler water to the Exhaust Gas Economizer which exchanges heat energy from main engine exhaust gas to boiler water. Then, you can get steam from the exhaust gas economizer without consuming fuel in boiler. When starting the boiler water circulation pump, sudden valve operation will cause the boiler pressure to drop. Since the boiler operates automatically and intermittently, the pressure fluctuates from 0.5MPa to 0.7MPa. Therefore, we have to gradually open the discharge valve of boiler water circulation pump. Sometime, valve operation must be interrupted and the boiler pressure restored. Thus, a person who checks the pressure of boiler sends the bellow Valve operation signals to open the valves to the person who operates the discharge valves. When teamwork goes wrong, you will hear the alarm for low pressure steam on the boiler.

Valve operation signal

- Operate a lot: Raise your index finger and turn
- Operate less: Raise your little finger and turn

Practical training for moving heavy objects

Prior to main engine piston removal training, engineering cadets conduct the training for moving heavy objects to be familiarize with the use of both chain block and hoist. Engineering cadets are instructed to use hand signal for operation to move upward or downward like the bellow Hoist operation signal. And then use the valve operation signals in order to indicate amount of operation. When the heavy object and the position where the heavy object is placed are close to each other, you should operate chain block or hoist slightly by using the hand signal "operate less".

Hoist operation signal

- Upward: Turn palm up then move palm up and down
- Downward: Turn palm down then move palm up and down

3. Findings

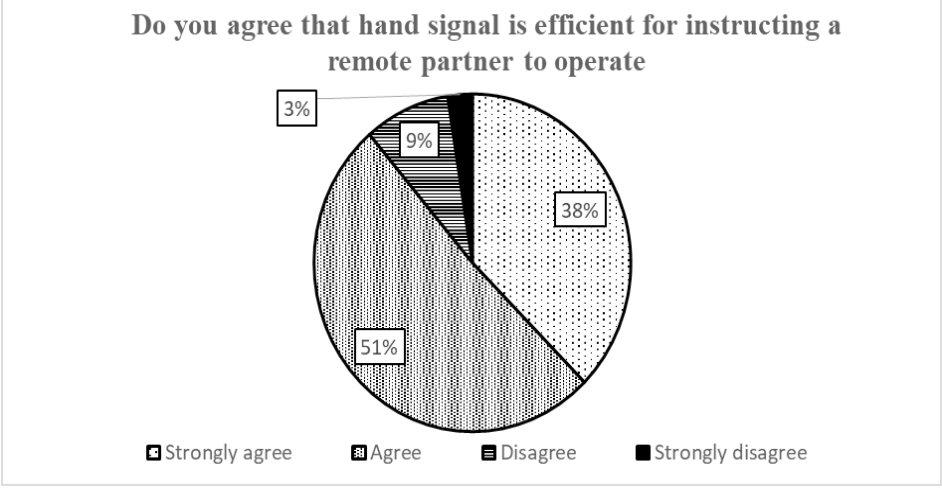

Figure 2. Effects of hand signals

As a result of the questionnaire filled in by 80 cadets and interview with onboard instructors for use of hand signal during onboard training, as shown in Figure 1 Effects for hand signals, 89% of cadets agreed that hand signals are efficient for instructing a remote partner to operate the valve.

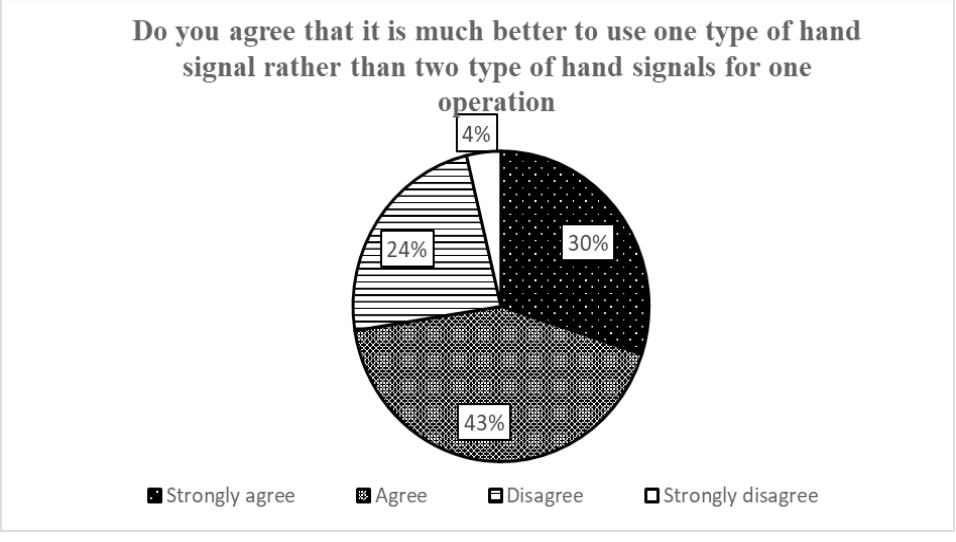

Figure 3. Two types of hand signals for one operation

As far as practical training for moving heavy objects is concerned, engine cadets have to utilize two types of hand signals. They sometimes are confused whether to use hand signal for valve (operate a lot or less) or hand signal for hoist (move up or down). Thus, as shown in Figure 2, 73% of cadets agreed that it's much better to use one type of hand signal rather than two types of hand signal for one operation. Furthermore, onboard instructors also pointed out that most of cadets spontaneously use only hand signal for hoist then rather than the one indicated by the width of the vertical movement of the hand. Therefore, engine cadets use only hand signal B during main engine piston removal training.

There are several additional comments in questionnaire out of 24 comments as follows:

Hand signal is effective when out of voice range in questionnaire free entry column (6 opinion); and

Changing indicating finger is also problematic for operation. So it's much better to use only one finger indication and only use speed of rotating.

4. Conclusions

From the questionnaire, 89% of cadets agreed that hand signal is efficient for instructing a remote partner to operate the valves for boiler water circulation pumps. Moreover, 73% of cadets agreed that use of one type of hand signal for one operation rather than two types of hand signals for one operation is preferable. Taking the above into account, the majority of cadets and all instructors agree that

hand signal is efficient to communicate with partners, especially when away from each other in engine room.

Engineering cadets have experienced onboard training on another training ship before, therefore they can distinguish the difference between with and without hand signals for teamwork operation. Taking their onboard experience into consideration, the fact that 89% of Japanese cadets who are unfamiliar with gesture-based communication recognized the effectiveness of hand signals is worthy of praise. This paper is conducted in a monocutural environment. However, we would like to verify the effect of hand signals in a multicultural environment and whether hand signals might be a useful communication tool in the engine room or not by continuing further research in the future.

REFERENCES

EMI, Y. & MURAMATSU, N., 2021. Utilization of non-verbal language in engine room training. In: A. PAZAVER, M. E. MANUEL, J. BOLMSTEN, M. KITADA, I. BARTUSEVICIENE (eds.). *Proceedings of the International Maritime Lecturers' Association. Seas of transition: setting a course for the future,* pp. 145 – 148. World Maritime University. Available from: http://dx.doi.org/10.21677/imla2021.15.

SETO, C., 2000. An empirical study of the frequency of Gesture use: potential effects of language. *Society for international education training and research*, no. 12, pp. 65 – 77. Available from: http://id.nii.ac.jp/1092/00000221/. AN10068799. [viewed 2022-08-09].

✉ **Nagisa Matsushima**
Japan agency of Maritime Education and Training for Seafarer
Yokohama-city
Kanagawa-prefecture, Japan
E-mail: matsushima-n7p1@jmets.ac.jp

Asami Shimada
Japan agency of Maritime Education and Training for Seafarer
Yokohama-city
Kanagawa-prefecture, Japan

Yutaka Emi
Japan agency of Maritime Education and Training for Seafarer
Yokohama-city
Kanagawa-prefecture, Japan