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# PLURILINGUALISM – THE WAY TO BETTER COMMUNICATION ON BOARD?

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## **Abstract**

*The aim of the paper is to raise awareness of the rich linguistic diversity of today's world and of Europe in particular and to emphasize the necessity for maritime students to learn more languages. English is the lingua franca in the maritime sector; however, plurilingual skills and competences are of the greatest importance for the international maritime community. Today crews are mainly multilingual and multiethnic; consequently, the understanding of other languages and cultures will enhance individual well-being and ensure effective communication. In April-May 2013 Intermar Learning Modules were piloted at the Lithuanian Maritime Academy. Modules contained blended Intercomprehension task-based learning materials, many set in a maritime context. The issues connected with plurilingualism as well as the results of the piloting are given and analyzed in the paper.*

**Keywords:** *plurilingualism, linguistic diversity, Intercomprehension strategies, blended learning, task-based learning*

## **Introduction**

The rich linguistic diversity of today's world and of Europe in particular is the main reason why people should learn and start learning more languages. With the expansion of the European Union from "the Iberian Peninsula to the Scandinavian, from the Atlantics to the Balkans [...], trends of economic globalization and societal internationalization made it inevitable for Europeans to speak foreign languages to be able to understand each other" [8].

The European Union is committed to safeguarding the linguistic diversity within Europe and promoting knowledge of languages, encouraging all citizens to be multilingual, with the long-term objective that every EU citizen has practical skills in at least two foreign languages [10]. A Eurobarometer survey in 2005 revealed that 56% of Europeans, apart from their mother tongue, could speak another language, 28% could speak at least two foreign languages and 11% could speak at least three languages. It also showed that EU citizens generally supported the Commission's multilingualism policies [9].

Statistics show that after Chinese, English is the second most popular language in the world. Current estimates suggest that about one-and-a-half billion people speak English; that is one quarter of all people on earth [5]. More than 470 million people speak English as their first language; the rest speak English as a second or foreign language for their professional or personal lives [6]. English is also the language adopted for communication in the maritime area. Hence, good knowledge of English is vital for maritime professionals.

However, it is understandable, that the knowledge or at least understanding of other languages is very important for maritime professionals as well. Due to the specific requirements of their jobs they come into frequent contact with different languages both at sea and on shore. Seafarers are also required to live, communicate and work with colleagues from diverse cultural backgrounds; therefore plurilingual strategies and skills are of much relevance for the maritime community.

Nowadays, in addition to Maritime English which is universally taught in maritime and naval academies, there is a growing trend in Europe to integrate more languages in the formal syllabi of the aforementioned educational establishments. For example, Maritime English is compulsory for all five study programs currently taught at the Lithuanian Maritime Academy, i.e. Marine Navigation, Marine Engineering, Port and Shipping Management, Finances of Port and Shipping Companies, Maritime Transport Logistics Technologies. In addition to English, students training according to the latter three study programs can select one of the three following languages, namely German, Russian or Spanish. As can be noticed these languages belong to different language families.

It is impossible to speak "all the languages in the world, or even all the European languages" but, nevertheless, "the learning [of] at least two foreign languages may open unsuspected doors to a larger

number of idioms” and; besides, “there are innovative approaches to language learning that may help to extend the scope of individuals’ competencies” [2].

The object of the research is plurilingualism and maritime community.

The aim of the research is to analyze the importance of plurilingual skills and competences for maritime students and seafaring community as a whole.

The tasks of the research are:

1. to analyze the impact that the linguistic diversity has on people’s attitudes towards foreign languages and language learning in general;
2. to analyze the issues connected with plurilingualism in today’s Europe;
3. to analyze the relevance of INTERMAR task-based learning materials to the development of students’ abilities to use Intercomprehension strategies and, consequently, plurilingual comprehension skills on the example of the LMA experiences.

The methods of the research include scientific literature analysis and document analysis.

## **Linguistic Diversity and Maritime Community**

There are between six thousand and seven thousand languages in the world today which are spoken by around seven billion people. The world’s top ten languages include Chinese, English, Hindi, Spanish, Russian, Bengali, Arabic, Portuguese, Japanese and German, in that order [12].

Most European languages, some Middle-Eastern languages and Indian languages are related to each other. They belong to the large Indo-European family of languages. Although these languages may look and sound completely different from each other, in fact, their grammar and vocabulary are similar in many ways.

The Indo-European languages can be divided into the following main groups: Germanic (including English, German, Dutch, Swedish, Danish, Norwegian and Icelandic, among others); Romance (the languages which are descended from Latin, for example Spanish, French, Italian, Portuguese and Romanian, among others); Slavic (for example Russian, Ukrainian, Belarusian, Polish, Czech, Slovak, Slovenian, Serbian, Croatian, Macedonian, Bulgarian and others); Baltic (including Lithuanian and Latvian); Indo-Iranian (for example Hindi, Farsi); Greek, etc. [15]. Finnish, Hungarian and Estonian are members of a different language family.

Languages reflect the cultural and identity differences between people, but at the same time, allow them to understand each other; people who speak several languages can integrate more quickly into another country either they intend to study or work there and enter more easily into contact with other cultures [1].

Languages are in constant contact with each other, thus they affect each other in many ways. English borrows words and expressions from many other languages, European languages are now borrowing many words from English [11]. For example, in accordance with D. Crystal’s point of view: “English speakers have always adopted a welcoming attitude towards loan-words. English is a vacuum-cleaner of a language, readily sucking in words from whichever other languages it meets [...]; because of this, although English is historically a Germanic language, the bulk of its vocabulary is not – it is largely Classical/Romance in origin” [7].

Many people think that it’s possible to speak only one language, but actually at least half of the population in the world are bilingual or plurilingual, i.e. they speak two or more languages [11]. The mother tongue is the language which a person knows best and uses most; however, some people are ‘perfect bilinguals or plurilinguals’ and can speak two and even more languages equally well.

Plurilingualism brings many benefits: it enhances the thinking processes, increases creativity, fosters contacts and better relationships with other people and their cultures. Plurilingualism also entails economic advantages; it is much easier to find a job for those who can speak several languages, and multilingual companies have a better competitive edge comparing with monolingual ones [11].

Respect for other languages and cultures has been a desired image for the Council of Europe for many years [8]. The first European Union document which stressed the importance of plurilingualism and emphasized the necessity for intercultural understanding was the 1995 *White Paper on Education and Training*. It states: “Proficiency in several Community languages has become a precondition if citizens of the European Union are to benefit from the occupational and personal opportunities open to them in the border-free Single Market. This language proficiency must be backed up by the ability to adapt to working and living environments characterised by different cultures” [3].

The European Union, “due to its national diversity, [...] is a unique environment for the development of plurilingualism and multiculturalism, because nowhere in the world one can find so many

different national identities, gathered under the roof of one entity” [1]. According to G. Willem “plurilingualism in a continent like Europe should be the norm rather than the exception” [16].

“Plurilingualism is [also] a goal set by the Common European Framework of References (CEFR)” [8]. The CEFR describes plurilingualism as an approach “emphasiz[ing] the fact that as an individual person’s experience of language in its cultural contexts expands, from the language of the home to that of society at large and then to the languages of other peoples (whether learnt at school or college, or by direct experience), he or she does not keep these languages and cultures in strictly separated mental compartments, but rather builds up a communicative competence to which all knowledge and experience of language contributes and in which languages interrelate and interact” [4].

The Special Eurobarometer 386 survey was carried out by TNS Opinion & Social network in February-March 2012. It was commissioned by the Directorate-General Education and Culture, Directorate-General for Translation and Directorate-General for Interpretation. The study examined EU citizens’ language skills, attitudes towards learning or improving foreign languages, perceptions of the most useful languages, etc.

The survey revealed that the majority of the respondents in twenty-six Member States agree that everyone in the EU should be able to speak at least two languages in addition to their mother tongue. According to the survey 54% of the respondents can hold a conversation in at least one additional language other than their mother tongue, 25% of the respondents can speak at least two additional languages and 10% are conversant in at least three languages.

The five most popular languages among Europeans are English (38%), French (12%) and German (11%), followed by Spanish (7%) and Russian (5%) [10]. Two thirds of Europeans, i.e. 67% of the respondents, consider English is one of the two most useful languages [10]. The study also confirmed that in order to conquer new markets, find a better job, travel more people want to learn more languages.

Hence, it is necessary to emphasize that “the defence of plurilingualism and the respect for linguistic diversity is not contrary to the learning of English, as a language [the importance of which] is undoubtedly essential in our globalised world” [2]. English is ranked as the most popular second language in the world, and “certainly amongst young people, there is an ever-increasing desire and need to use English as a means of communicating with peers who speak a different language” [13]. After all, “over the last hundred years, English has come to be spoken by more people in more places than ever before [...], one in four of the world’s population” speak English [7].

All these facts are very important for maritime students and seafaring community as a whole. Effective communication on board is vital and depends on a number of factors, such as the ability to adapt to various situations, intercultural awareness, language skills and competences, etc. English is the lingua franca in the maritime sector; however, plurilingual strategies and skills are of the greatest importance for the international maritime community. Today crews are mainly multilingual and multiethnic so seafarers have to live and work in a diverse cultural and ethnic environment. Consequently, the understanding of other languages and cultures will enhance individual well-being and ensure effective communication. Thus, it can be concluded, that enhancing competences in Maritime English while facilitating plurilingual skills and strategies will inevitably result in improved communication and, as a consequence, greater levels of safety on board ship [14].

Innovative practices in learning foreign languages within a maritime context are offered by the INTERMAR course. By developing Intercomprehension (IC) skills, INTERMAR aspires to provide maritime professionals with IC strategies that assist language learning. The concept of IC which is aimed at the development of plurilingualism entered the field of language learning in the 1990s.

“In linguistic terms Intercomprehension may be described as a form of ‘natural’ communication where everyone speaks their own language and, at the same time, is able to understand their interlocutor/s” [13]. IC is “the process of co-constructing meaning in intercultural/interlinguistic contexts”, the development of which will lead to the ability to understand, to a certain extent, one or several languages, by using existing communicative competences, i.e. plurilingual skills from personal life experiences [2]. In other words, IC might be considered a natural form of communication, based on mutual cross-linguistic comprehension.

The innovative aspect of IC consists in the idea of being able to understand another language despite never having learnt it before [2]. It is a well-known fact that speakers of related languages, for example Germanic or Romance languages, can quite often understand one another. This natural ability may be transferred to the context of formal language learning in order to quickly and effectively develop plurilingual skills and competences [14].

By the way, “the IC approach is not only used for the development of receptive skills within languages of the same family – Romance, Germanic and Slavonic languages – but also for negotiating

borders between language families” [13]. As a matter of fact, “IC is a natural process, which has been accepted by all those who travel around the world and by those who live in border regions” [2].

Intercomprehension may be viewed as an educational goal in itself, though it can also be used as a starting point, a trigger or a tool for language learning [13]. That makes this approach even more attractive.

The Intercomprehension approach to language learning also raises awareness of cross-cultural issues since it gives better understanding not only of other languages but of other cultures as well, which results in better human relationships. “In plurilingual interactions, the commitment of both speakers to the success of communication is vital and involves attention, tolerance, and respect, which are the main factors of intercultural communication”; consequently, “by respecting language diversity, [...] IC creates intercultural awareness and is, in its very essence, an open door to cooperation between speakers of different languages” [2].

In April-May 2013 INTERMAR Learning Modules were piloted at the Lithuanian Maritime Academy. Modules contained blended task-based learning materials, focused on themes relevant to maritime students. The results of the piloting are given and analyzed further.

### **INTERMAR in the Light of the Lithuanian Maritime Academy Experiences**

Forty-five students took part in piloting the INTERMAR materials at the Lithuanian Maritime Academy. They were divided into three groups, fifteen students in each group. These students were trained according to the following study programs: Marine Navigation, Finances of Port and Shipping Companies, Maritime Transport Logistics Technologies.

The course comprised three compulsory modules, i.e. Icebreaker, Intercultural Awareness, Interproduction (12 hours in total), which had to be completed with two of the other modules, i.e. Maritime English (20 hours), Romance Languages, Germanic Languages, Baltic Languages and Russian (28 hours each). The students of the Lithuanian Maritime Academy had selected the Maritime English Module, the Romance Languages Module and the Germanic Languages Module to work with.

Blended learning which involved a combination of online and face-to-face teaching was used. Such combination of face-to-face instruction and online learning provided opportunities to extend learning beyond the classroom and make more use of valuable contact time. Students worked in their own time, studied at their own pace, shared ideas and opinions. Teachers monitored their progress, gave learning tips, set discussion topics and provided feedback outside the classroom.

The receptive skills of A1 - A2 foreign language proficiency levels in accordance with the Common European Framework of Reference (CEFR) were discussed during face-to-face classroom hours.

In general, LMA students welcomed the concept of Intercomprehension which is, in fact, aimed at the development of plurilingualism. The ability to understand different languages seemed quite attractive to them. Apart from Lithuanian, all students had been studying English as a second language at secondary school. Most of them had been studying German, Spanish, Russian or French as either a third or fourth language at school. It should be noted that these languages belong to different language families. More than 65% of students were studying German or Russian in addition to Maritime English at the time when the INTERMAR materials were being piloted at the Lithuanian Maritime Academy.

Let's now consider each specific Language Module:

The Icebreaker activities were real fun for students. They were enthusiastically planning the route, buying provisions for their voyage, checking websites to find out weather forecasts, looking for familiar words in different languages. Most of them chose Palma de Mallorca in Spain as their destination. All these tasks and activities involved students in teamwork, promoted discussion and conversation.

The Interproduction activity inspired students with the idea to present not only themselves, but also their educational institution, their native city and their country in such a way that young people from different countries could find it a real amusement. As a result, they created a dynamic, motivating and memorable, animated PowerPoint presentation.

As regards the activities of the Maritime English Module, they are appropriate to Maritime Education and Training (MET) aims. Moreover, some tasks and activities perfectly meet the learning objectives of the Maritime English syllabus at the Lithuanian Maritime Academy which is compiled in compliance with the International Maritime Organization (IMO) requirements as well as the International Convention on Standards of Training and Certification of Watchkeeping for Seafarers (STCW) requirements.

The Intercultural Awareness Module is of great value to maritime students. Seafarers and today's business people working in port and shipping companies which are engaged in international trade and

finance come into frequent contact with different languages. Seafarers are also required to live, communicate and work with colleagues from diverse cultural backgrounds. Therefore an understanding of other languages and cultures will foster better human relationships and in general enhance the well-being of seafarers [14]. Thus, the aforementioned module gives maritime students essential skills and techniques they will need to ensure they can work effectively with colleagues the world over.

It is worth noting that actually all scenarios of the Intercultural Awareness Module are well adapted to learning needs of LMA nautical students as they have the similar unit in the content of the Maritime English syllabus, i.e. “Cross-Cultural Issues Affecting Team Work at Sea”.

The scenarios of the Romance Languages Module and the Germanic Languages Module engaged students in motivating and enjoyable tasks. The task-based learning materials of the above-mentioned modules provided students with the chance to try to use languages in an authentic way, developed their ability to successfully use IC strategies.

Most of all students liked “ERASMUS Planning” activities, “Hiking” tasks and activities, “Karaoke Song Contest”; many of them really admired Italian and Spanish music.

It should be noted, though, that tasks and activities at B1 - B2 level proved to be too complicated for most students. This actually was an obstacle to further progress. Consequently, more activities at A1 level are desirable for the given modules. A few students also mentioned that the INTERMAR materials were not attractive enough with regard to their layout and design. It should be taken into account that nowadays there are plenty of attractive audio-visual materials for those who would like to study languages. Thus, more colourful illustrations, photographs, visual effects and sound should be added to make the materials more appealing to students.

Assessment tools included Learning Portfolios that showed students’ progress, reflected their metacognitive processes, personal styles and motivations [14]. Each specific Language Module contained formative and summative tests. These assessment tools allowed to evaluate students’ acquisition of IC competences and to assess proficiency of the material as well.

To sum up, INTERMAR task-based learning materials:

- stimulate discussion and debate;
- raise awareness of cross-cultural issues;
- enhance competence in Maritime English;
- develop abilities to use IC strategies and, consequently, develop plurilingual comprehension skills;
- encourage students to try to communicate in different languages seeking and revealing grammar, vocabulary and pronunciation similarities among related languages.

## Conclusions

After Chinese, English is the second most widely-spoken language in the world with a total of 470 million native speakers. English has official or special status in at least seventy-five countries with a total population of two billion people. One out of four of the world’s population speak English to some level of competence. Demand from the other three quarters is constantly increasing. English is the language adopted for communication in the maritime area; therefore good knowledge of English is extremely important for maritime professionals.

However, the rich linguistic diversity of today’s world and of Europe in particular should also be taken into account, so the importance of learning more languages should not be underestimated. That concerns, first of all, maritime students and international seafaring community as a whole. Developing abilities to use Intercomprehension strategies and, consequently, plurilingual comprehension skills INTERMAR task-based learning materials encourage students to try to understand different languages, thus pave the way for learning other languages.

## References

1. Bejenaru, L. Plurilingualism – Priority in Promoting Equality of Changes. In: Engineering for Rural Development. Proceedings of the 11<sup>th</sup> International Scientific Conference (Jelgava, Latvia, May 24-25, 2012, Latvian University of Agriculture), Vol. 11, 2012, pp. 614-618. Available (accessed on 12.06.2014): [http://tf.llu.lv/conference/proceedings2012/Papers/109\\_Bejenaru\\_L.pdf](http://tf.llu.lv/conference/proceedings2012/Papers/109_Bejenaru_L.pdf)
2. Capucho, M. F. Intercomprehension – Language Tools for Intercultural Communication. In: Redefining Community in Intercultural Context RCIC’12. Proceedings of the 2<sup>nd</sup> International



- Conference (Brasov, Romania, June 14-16, 2012, Henri Coanda Air Force Academy), 2012, pp. 9-18. Available (accessed on 12.06.2014): [http://www.afahc.ro/Simpozion/simpozion\\_12/Plenary%20Session/Capucho.pdf](http://www.afahc.ro/Simpozion/simpozion_12/Plenary%20Session/Capucho.pdf)
3. Commission of the European Communities. White Paper on Education and Training. Teaching and Learning: Towards the Learning Society. Brussels, 1995. Available (accessed on 12.06.2014): [http://aei.pitt.edu/1132/1/education\\_train\\_wp\\_COM\\_95\\_590.pdf](http://aei.pitt.edu/1132/1/education_train_wp_COM_95_590.pdf)
4. Council of Europe. Common European Framework of Reference for Languages: Learning, teaching, assessment. Cambridge: Cambridge University Press, 2001.
5. Crystal, D. The Cambridge Encyclopaedia of the English Language. Cambridge: Cambridge University Press, 2003.
6. Crystal, D. English as a Global Language. Cambridge: Cambridge University Press, 2003.
7. Crystal, D. Emerging Englishes. English Teaching Professional, Issue 14, 2000, pp. 3-6.
8. Dombi, J. European Language Policy on Plurilingualism and Intercultural Communication. Bulletin of the Transilvania University of Brasov, Series IV: Philology and Cultural Studies, Vol. 3 (52), 2010, pp. 163-166. Available (accessed on 12.06.2014): [http://webbut.unitbv.ro/bu2010/Series%20IV/BULETIN%20IV%20PDF/LANGUAGE%20AND%20LINGUISTICS/25\\_Dombi.pdf](http://webbut.unitbv.ro/bu2010/Series%20IV/BULETIN%20IV%20PDF/LANGUAGE%20AND%20LINGUISTICS/25_Dombi.pdf).
9. European Commission. Europeans and their Languages – Special Eurobarometer. Brussels, 2006. Available (accessed on 12.06.2014): [http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_243\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_243_en.pdf)
10. European Commission. Europeans and their Languages – Special Eurobarometer 386. Brussels, 2012. Available (accessed on 12.06.2014): [http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_386\\_sum\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_386_sum_en.pdf)
11. European Day of Languages. Available (accessed on 17.03.2014): [http://www.coe.int/t/dg4/linguistic/JEL\\_en.asp](http://www.coe.int/t/dg4/linguistic/JEL_en.asp)
12. Jakeman, V., McDowell, C. Insight into IELTS Extra with Answers. Cambridge: Cambridge University Press, 2003.
13. Noble, A., Hemming, E. INTERMAR: Intercomprehension at Sea. In: International Maritime Lecturers' Association (IMLA). Proceedings of the International Maritime English Conference IMEC 24 (Yangon, Myanmar, October 1-4, 2012, Myanmar Maritime University & Uniteam Marine, Myanmar), Vol. 24, 2012, pp. 193-196. Available (accessed on 12.06.2014): [http://www.imla.co/sites/default/files/p2-p7\\_pimec24proceedings.pdf](http://www.imla.co/sites/default/files/p2-p7_pimec24proceedings.pdf)
14. Presentation of Intermar Course. Available (accessed 17.03.2014): <http://www.intermar.ax>
15. Swan, M., Walter, C. The Cambridge English Course. Cambridge: Cambridge University Press, 1996.
16. Willems, G. M. Language Teacher Education Policy Promoting Linguistic Diversity and Intercultural Communication. Strasbourg: Council of Europe, 2002. Available (accessed 12.06.2014): [www.coe.int/t/dg4/linguistic/Source/WillemsENG.pdf](http://www.coe.int/t/dg4/linguistic/Source/WillemsENG.pdf)

# VIBRATIONS DURING TRANSITION THROUGH RESONANCE

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## Abstract

*This paper study changes of forced rectilinear oscillation amplitudes during going over resonance, if frequency of excitation force with constant amplitude is linear variable. Using Lagrange's method of variation of constants the equation of motion is found in the form of integral equations. Using numerical integration, the amplitude of oscillations is calculates depending on frequency of excitation force. The results show that conclusions of research of transition process, published in the middle of last century and are still uncritically republished, are incorrect. Explanation is found for a significant increase of the oscillation amplitude before stopping, what is observed in practice.*

**Keywords:** *amplitude, excitation force, oscillation, resonance*

## Introduction

The periodical forces in various equipments of modern machinery as often as not have frequency, large than resonant frequency. Therefore, during start time and stop time, as well as during times of changes of movements speed, is necessary to go over resonance [1; 2; 4; 6]. It is important to know, how amplitudes of vibrations will changes during going over resonance. This problem has been studied in the middle of the last century [7; 8]. However, results in the master's thesis [6], where torsional oscillations during transition process was researched by digital simulation, were different from those described in the works [1; 6]. This article attempts to explore the problem. The aim of article is to shed light on changes of the oscillation amplitude, if frequency of excitation force is linearly variable, in the systems with one degree of freedom of movement.

## Mathematical model of oscillation system

The mechanical system with one degree of motions freedom is examined. Differential equation of motion may be drawn in the form:

$$m\ddot{x} + \mu\dot{x} + c x = F_0 \sin[(p_0 + \alpha t)t] \quad (1)$$

Introduce nomenclatures:

$$\frac{\mu}{m} = 2n; \quad \frac{c}{m} = k^2; \quad \frac{F_0}{m} = h.$$

Then differential equation of motion is:

$$\ddot{x} + 2n\dot{x} + k^2 x = h \sin[(p_0 + \alpha t)t] \quad (2)$$

## Solution of differential equation

We look for solution of differential equation (2) by Lagrange's method of variation of constants [5]:

$$x = C_1(t) \cdot x_1 + C_2(t) \cdot x_2 \quad (3)$$

1)

Here :  $x_1 = e^{-nt} \cos k_1 t; \quad x_2 = e^{-nt} \sin k_1 t; \quad k_1 = \sqrt{k^2 - n^2};$

$$\dot{C}_1(t) = -\frac{x_2 \cdot h \sin[(p_0 + \alpha t)t]}{W(x_1; x_2)} ; \quad \dot{C}_2(t) = \frac{x_1 \cdot h \sin[(p_0 + \alpha t)t]}{W(x_1; x_2)} .$$

Vronski determinant

$$W(x_1; x_2) = \begin{vmatrix} x_1 & x_2 \\ \dot{x}_1 & \dot{x}_2 \end{vmatrix} .$$

$x_1$  and  $x_2$  derivatives:

$$\dot{x}_1 = -e^{-nt} (n \cos k_1 t + k_1 \sin k_1 t) \quad , \quad \dot{x}_2 = -e^{-nt} (n \sin k_1 t - k_1 \cos k_1 t) .$$

Thereby  $W(x_1; x_2) = x_1 \cdot \dot{x}_2 - x_2 \cdot \dot{x}_1 = k_1 e^{-2nt}$

and  $\dot{C}_1(t) = -e^{nt} \sin k_1 t \cdot \sin[(p_0 + \alpha t)t] \cdot h/k_1$

$$C_1 = -h/k_1 \int_0^t e^{n\tau} \sin k_1 \tau \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau$$

$$\dot{C}_2(t) = e^{nt} \cos k_1 t \cdot \sin[(p_0 + \alpha t)t] \cdot h/k_1$$

$$C_2 = h/k_1 \int_0^t e^{n\tau} \cos k_1 \tau \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau$$

2) Insert expressions  $C_1$  and  $C_2$  into formula (3). Then

$$\begin{aligned} x &= -\frac{h}{k_1} \left\{ \int_0^t e^{n\tau} \sin k_1 \tau \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau \right\} \cdot e^{-nt} \cos k_1 t + \\ &+ \frac{h}{k_1} \left\{ \int_0^t e^{n\tau} \cos k_1 \tau \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau \right\} \cdot e^{-nt} \sin k_1 t = \\ &= \frac{h}{k_1} \int_0^t e^{-n(t-\tau)} \sin k_1 (t-\tau) \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau . \end{aligned}$$

3) So

$$\frac{x}{\delta_{st}} = \frac{k^2}{k_1} \int_0^t e^{-n(t-\tau)} \sin k_1 (t-\tau) \cdot \sin[(p_0 + \alpha \tau)\tau] d\tau .$$

Introduce non-dimensional nomenclatures:

$$t^* = k \cdot t ; n^* = \frac{n}{k} ; k_1^* = \frac{k_1}{k} = \sqrt{1 - (n^*)^2} ;$$

$$\tau^* = k \cdot \tau ; p^* = \frac{p}{k} ; p_0^* = \frac{p_0}{k} ; \alpha^* = \frac{\alpha}{k^2} .$$

Denote  $p^* = p_0^* + \alpha^* \tau^*$  .

Then

$$\frac{x}{\delta_{st}} = \frac{1}{k_1^*} \int_0^{t^*} e^{-n^*(t^*-\tau^*)} \sin k_1^* (t^*-\tau^*) \cdot \sin(p^* \tau^*) \cdot d\tau^* \quad (4)$$

4) From the formula (4), by numerical integration [3], we find the relationships between  $p^*$  and increase of amplitude  $x/\delta_{st}$ . Figure 1 shows graphs of the calculations by formula (4) results for  $p_0^* = 0$ ,  $n^* = 0$ ,  $\alpha^* = 0.016$ .

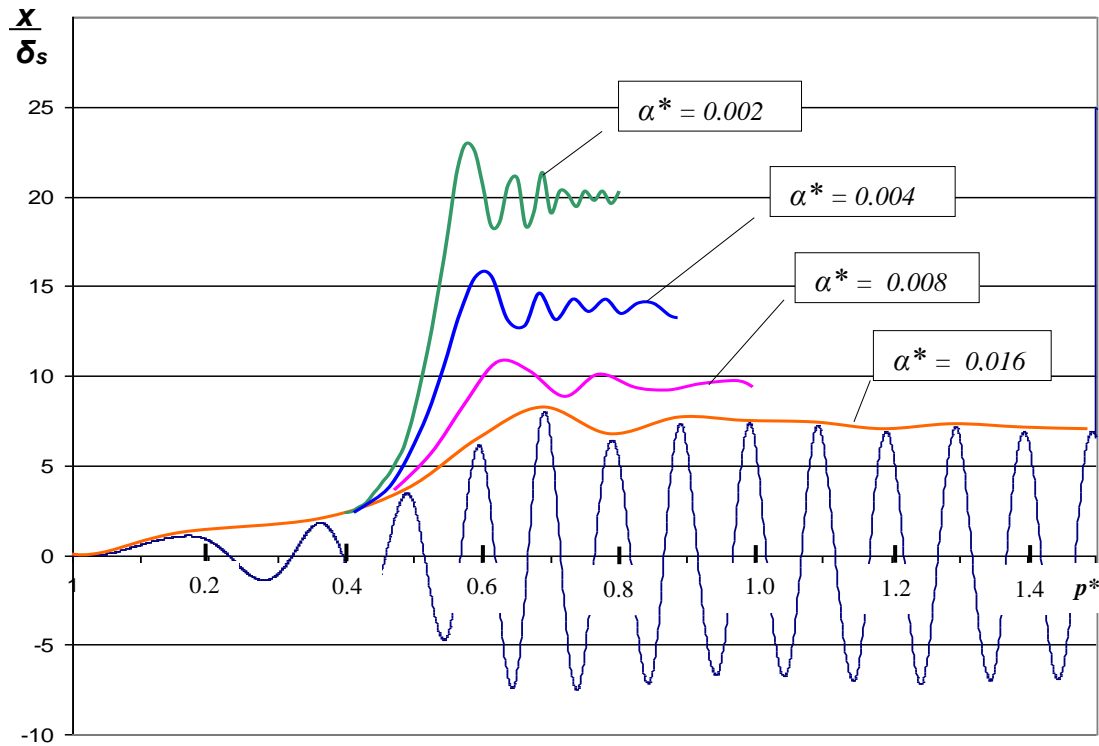


Figure 1. Graphs of the relationships between vibration amplitude increases and relative frequency of excitation force if  $n^* = 0$ .

5) Figures 2 and 3 shows the same as Figure 1, but the observed damping with  $n^* = 0.01$  and  $n^* = 0.1$ .

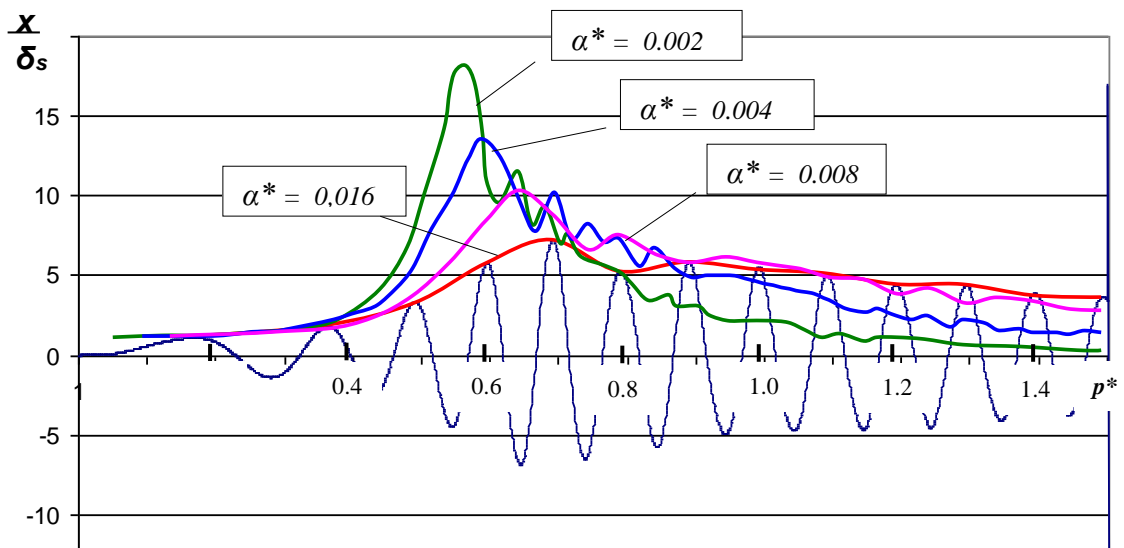


Figure 2. Graphs of the relationships between vibration amplitude increases and relative frequency of excitation force if  $n^* = 0.01$ .

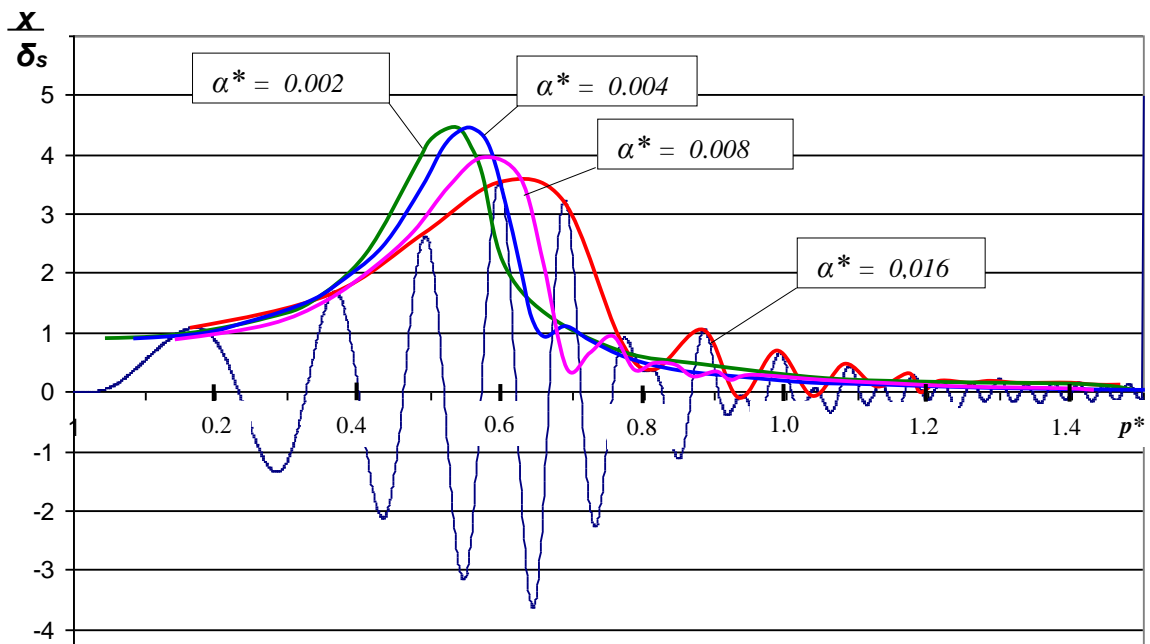


Figure 3. Graphs of the relationships between vibration amplitude increases and relative frequency of excitation force if  $n^* = 0.1$ .

Figure 4 shows graphs of the calculation by formula (4) results for  $p_0^* = 0.5$ ,  $n^* = 0.01$

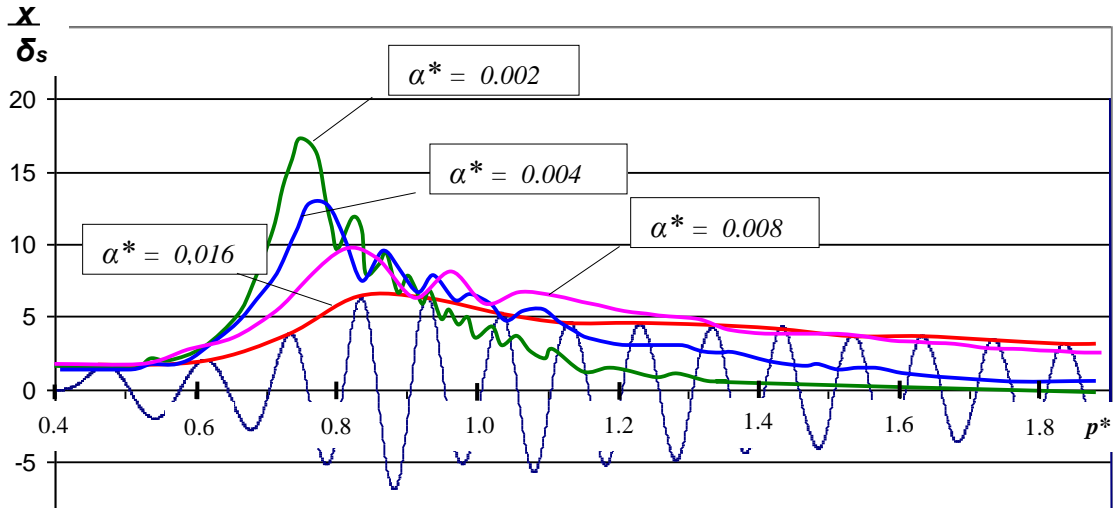


Figure 4. Graphs of the calculation by formula (4) results for  $p_0^* = 0.5$ ,  $n^* = 0.01$ .

Figures 5 and 6 shows graphs of the calculation by formula (4) results, when the non-dimensional frequency of excitation force decreases from 1.6 to 0 for  $n^* = 0.01$  and for  $n^* = 0.1$ .

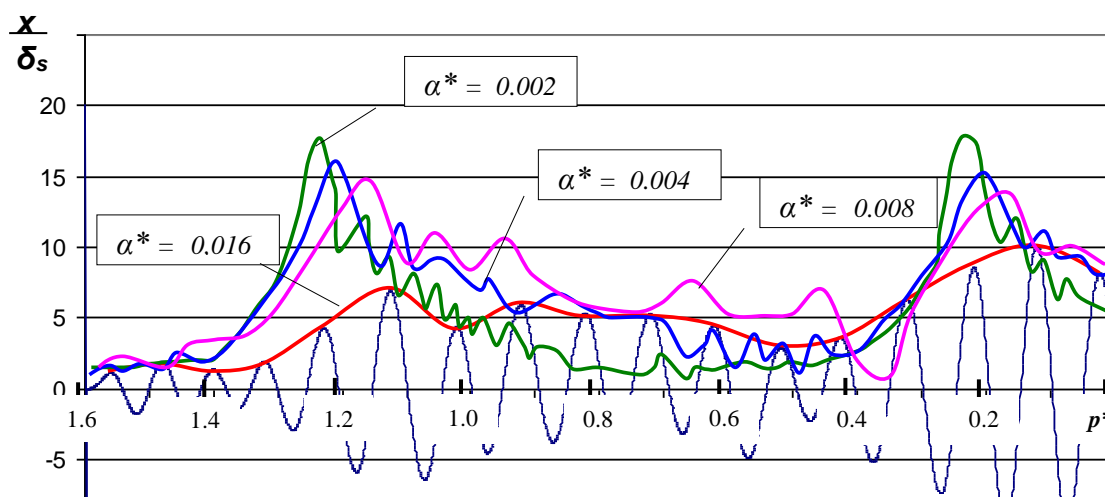


Figure 5. Graphs of the calculation by formula (4) results for  $p_{0}^*= 1.6$  ,  $n^* = 0.01$  .

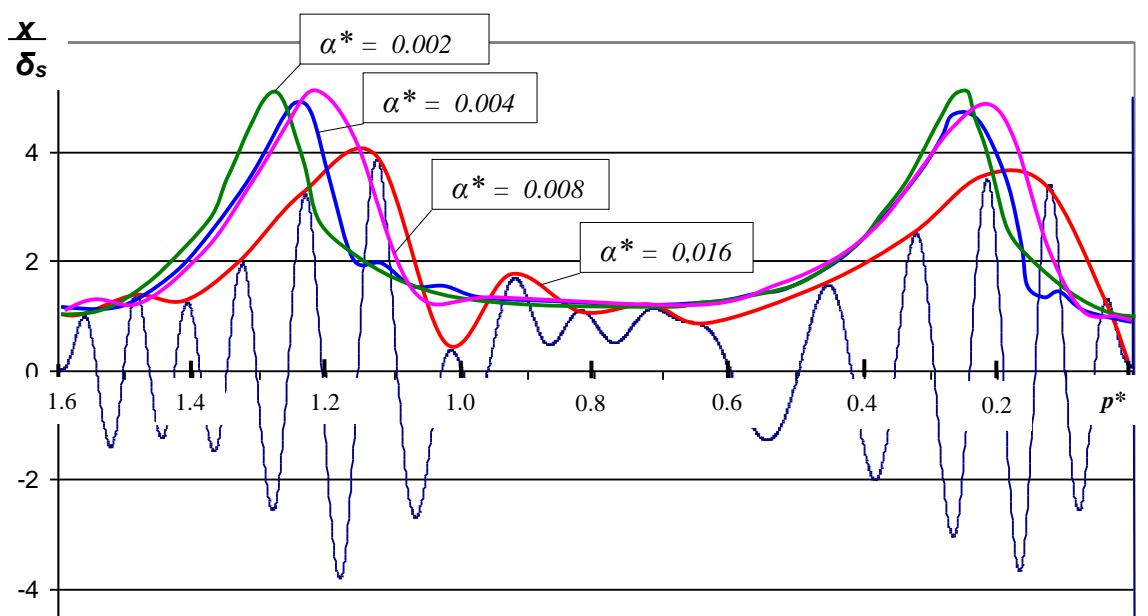


Figure 6. Graphs of the calculation by formula (4) results for  $p_{0}^*= 1.6$  ,  $n^* = 0.1$

The resultant graphs (Figures 1, 2 and 3) shows that amplitudes of vibrations have maxima before the resonance frequency. Difference is approximately 40 ÷ 50% of resonance frequency, when frequency of excitation force increases linearly from zero to the frequency above the resonance frequency, and about 20% of resonance frequency, when frequency of excitation force increases from half of resonance frequency. In addition the greater difference is at the higher dissipation and slower growth rate.

Very interesting changes of the vibration amplitude is in case, when the frequency of excitation force decreases. In such case (Figure 4) the curves of amplitudes changes has two peaks. The first peak is 10 ÷ 30 % of resonance frequency before resonance, but the second peak is briefly before stopping.

## Conclusions

The results of forced oscillation calculations for linear elastic system with one degree of freedom of movement with the harmonious excitation force by linearly varying frequency, leads to the following conclusions:

- if frequency of excitation force increases, then the oscillation amplitude has the peak before the resonance frequencies. Difference increases if the dissipation of energy increases and if the growth rate of frequency decreases;
- if frequency of excitation force decreases, then the oscillation amplitude has two peaks - the first is at a frequency greater than the resonant frequency, while the second is just before stopping;
- taken out integral formula for the calculation of amplitude growth allows a calculation to adopt such a flexible system parameters under which the oscillation amplitude does not exceed the permissible limit;
- explanation is found for a significant increase of the oscillation amplitude before stopping, what is observed in practice.

## References

1. Cimanskis, J., Indriksons, R., Sotnichenko, A. Torsional Vibrations during passage over Resonance. In: Maritime Transport and Infrastructure – 2013. Proceedings of the 14<sup>th</sup> international conference (Riga, Latvia, April 25-26 April, 2013, Latvian Maritime Academy), 2013, p. 15.
2. Gradziela, A.. Modelling of Propeller Shaft Dynamics at Pulse Load. Polish Maritime Research, Vol. 15, 2008, pp. 52-58.
3. Kalis, H. Diferenciālvienādojumu tuvinātās risināšanas metodes. Rīga: Zvaigzne, 1986.
4. Korkmaz, F. C., Alarcin, F. Determination of Appropriate Torsional Vibration Dampers for Propulsion Plant. In: In: Maritime Transport and Infrastructure – 2013. Proceedings of the 14<sup>th</sup> international conference (Riga, Latvia, April 25-26 April, 2013, Latvian Maritime Academy), 2013, pp. 126-131.
5. Kronbergs, E., Rivža, P., Bože, Dz. Augstākā matemātika, 2.daļa. Rīga: Zvaigzne, 1968.
6. Sotņičenko, A. Vērpes svārstību pārejas procesa izpēte kritisko apgriezienu zonās. Maģistra darbs. Rīga: Latvijas Jūras akadēmija, 2012.
7. Пановко, Я. Г. Основы прикладной теории упругих колебаний. Москва: Машиностроение, 1967.
8. Тимошенко, С. П. Колебания в инженерном деле. Москва: Наука, 1967.

# SUPPORTING MARITIME LEADERSHIP IN REGARD TO MORAL AUTHORITY ON BOARD AND PRE-SELF-DEVELOPMENT OF SEAFARERS AS PSYCHO-EDUCATIONAL FACTORS IMPROVING THEIR SELF-CONFIDENCE AT WORK

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## **Abstract**

*This paper discusses the supporting maritime leadership in regard to moral authority on board and pre-self-development of seafarers as psycho-educational factors improving their self-confidence at work. The object is researched by revelation of influence of socio-cultural factors of the micro-environment, discussion on influence of socio-cultural factors of the macro-environment, characterization of the top officer as a moral authority on board at the first maritime practice, discussion on seafarers' aspirations to such leader who could be motivating for their self-confidence at work and revelation of seafarers' positions to be leaders as moral authorities for their subordinates. Methods such as scientific literature analysis, written survey, phenomenological content-analysis and statistical analysis of the empirical data, interpretation, comparison, classification, systemization and synthesis are used in the research. The methodology of the research is based on the STCW convention, paradigm of the universal upbringing and existentialism. The methodological type of the research is empirically quantitative and partially qualitative.*

**Keywords:** *supporting maritime leadership, moral authority on board, pre-self-development of seafarers, psycho-educational factors, self-confidence at work.*

## **Introduction**

Supporting maritime leadership is expressed in the behavior of the top officer who performs without traditional dictatorship principles of the seafaring because he / she intends to create a good working-climate (*as much as it is possible when working in extreme conditions at sea*) and self-confidence of working seafarers on board [10]. We must note that relationship between the global maritime policy and the psychology of leadership was so complicated traditionally with reference to the anthropologically based approaches and needs of maritime business, and success of management practice. The autocratic management was usually applied with some moments of leadership in seafaring. Applying of some moments of leadership depended / depends on maturity of the master's personality and on his / her work experience [3; 16].

The leadership firstly requires an adequate structure of the internal culture of the top officer on board. It is very difficult to develop this culture because the educational situation of the society, family, school and especially mass media is often poor at the level of leadership. Personality develops usually without the position of leader. He / she considers workers as the farmhands being accused at any failure; threatening them with dismissal, etc.

However, the leadership is firstly based on supporting. So, it is usually called as *the supporting leadership* or directly as leadership, and *supporting* means the base of its motivation and processes. The leader considers the team of workers as a team of his / her own partners and accepts responsibility as the feature that characterizes not only subordinates but also the leader. The leadership does not allow accusing somebody because of failures. The leader looks for what is possible to undertake in the actual situation, discusses with them, takes care for a sound working-climate, encourages the workers, supports them and listens to them, and feels grateful to the employees [1; 10; 11; 12]. It is very relevant especially to beginners of maritime career that they get such top officer who is a leader and can help develop the future leader at the level of the supporting leadership during adaptation of the seafarer-beginner.

We know that the development of leader (*as a moral authority who can apply leadership on board*) requires implementation of leadership in all stages of education according to psycho-educational (*endogenic and exogenic or socio-cultural*) factors. These factors influence on self-development of a future seafarer, especially by improving his / her self-confidence that is fundamental of self-leadership and of leadership of a team. It determines self-leadership. The person who is characterized by self-leadership, he / she is able to make decision, to work and to be responsible in his / her own personal life,



to take position that nobody is guilty if failure occurs. The leader accepts problems as challenges of his / her life and can solve them. The leader loves his / her job and is happy, he / she loves himself / herself and his / her loved ones despite difficulties.

The worker cannot fully devote himself / herself to the work, he / she is afraid unnecessary and too much, and tends to panic when lacking self-confidence. The psychic self-regulation, that is especially relevant when working in extreme conditions at sea, is low. The top officer cannot trust the employee who lacks self-confidence. Such employee is dependable and his / her work must be tested not only at the level of results but also at the level of processes. The worker without self-confidence constantly feels badly, feels like a victim of circumstances, he / she develops an inner conflict and eventually begins to suffer neurosis. Such person cannot perform the work of high quality.

Self-confidence of the seafarer grows since childhood. So, it is important to note so called pre-self-development that is fundamental to accept the leader's moral authority. It is a special part of general personal self-development by following the leaders who are encountered in life when psycho-educational - endogenic and exogenic factors of micro- and macro-environments are influencing. The human later follows the moral authority of the leader on board and learns self-confidence working as a seafarer. The quality of the work directly depends on self-confidence.

### **The grade of the exploration**

Direct researches of the supporting maritime leadership, in regard to moral authority on board and pre-self-development of seafarers as psycho-educational factors improving their self-confidence at work, are scarce. Relevant trends of the world of maritime industry related to the need of the leadership application are scientifically analyzed from the point of view of:

- High-tech ships, smaller crew and more democracy;
- The manner in which the global economic competitiveness in the shipping industry is influenced by the transformational leadership;
- Empowering of subordinates, the plight of international seafarers, responding to emerging challenges on board, recognizing of the importance of soft skills, enhancing of inter-personal relationship both on board and ashore;
- Promotion of good safety culture on board;
- Motivation of people to perform effectively, safely and excel in their work and duties;
- Ability to communicate vision and strategies to the crew on behalf of the management;
- Physical and psychosocial work factors that are related to the levels of job satisfaction and intentions to remain in the maritime industry;
- Maritime governance, policy-making, leadership of maritime education and training institutions, and psychological evaluation of seafarers;
- Successful occupational career and reduction of health and life hazards in the maritime work environment;
- Health promotion in the maritime work environment by means of training of leaders;
- Psycho-emotional stress, loneliness, social isolation, monotony and depression of seafarers [1; 2; 4; 5; 6; 7; 8; 10; 11; 12; 13; 14; 17; 18; 19; 20].

So, it is appropriate to enrich the scientific problems of maritime leadership by the results of this research of the supporting maritime leadership in regard to moral authority on board and pre-self-development of seafarers as psycho-educational factors improving their self-confidence at work.

### **Goal and tasks of the research**

The goal of the research is a problematical discussion on the supporting maritime leadership in regard to moral authority on board and pre-self-development of seafarers as psycho-educational factors improving their self-confidence at work.

Tasks are as follows:

1. Revelation of the influence of socio-cultural factors of the micro-environment.
2. Discussion on the influence of socio-cultural factors of the macro-environment.
3. Characterization of the top officer as the moral authority on board during the first maritime practice.
4. Discussion on seafarers' aspirations for such leader who can be motivating for their self-confidence at work.
5. Revelation of seafarers' positions to be leaders as moral authorities for their subordinates.

The research object is supporting maritime leadership improving seafarers' self-confidence at work. This object is researched at levels of moral authority on board and pre-self-development of the seafarer's personality.

### Methodological attitudes and type of the research

The methodology of the research is based on the STCW convention, paradigm of the universal upbringing and existentialism. Methodological attitudes are as follows:

*International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* and requirements of Manila amendments highlight the improvement of the shipping safety developing leadership of seafarers at the level of their preparation along with other actualities [15]. Technological training of future seafarers, and their positive world-view, creativity, understanding of the constructive philosophy and psychology for the development of own's personality, wide intellectual and cultural horizons, and the development of internal and cooperative culture influence on safety at sea. All mentioned components could help develop the supporting leadership abilities of future seafarers.

*Paradigm of the universal upbringing* notes the development of all powers of the personality. This holistic approach to the maritime education helps implement improvement of the self-leadership of future seafarers, especially at flexible and creative levels of the adequate reaction to nonstandard physical and psychosocial situations working at sea. The supporting leadership and moral authority on board are based on wide conception of the universal and integral nature of the personality.

*Existentialism* refers to the human fear on land and especially at sea. Existential psychology is the cause for personality's hope. This psychology denies an attachment to life pleasures, and promotes liberation of the personality, and purification of his / her existence. The development of maritime leadership, especially of self-leadership, expands the horizon and helps people overcome the tragedy of existence, improve their emotional state and find unique comfort. Existentialism helps get a valuable basis for self-confidence and self-regulation in extreme conditions, especially with help of moral authority of the leader.

This is a pilot study. The methodological type of the research is empirically quantitative and partially qualitative.

### Methods, scientific conception, organization and methodological limits of the research

Methods such as scientific literature analysis, written survey, phenomenological content-analysis and statistical analysis of the empirical data, interpretation, comparison, classification, systemization and synthesis are used in the research.

It is appropriate to show the scientific conception of the research (Figure 1).

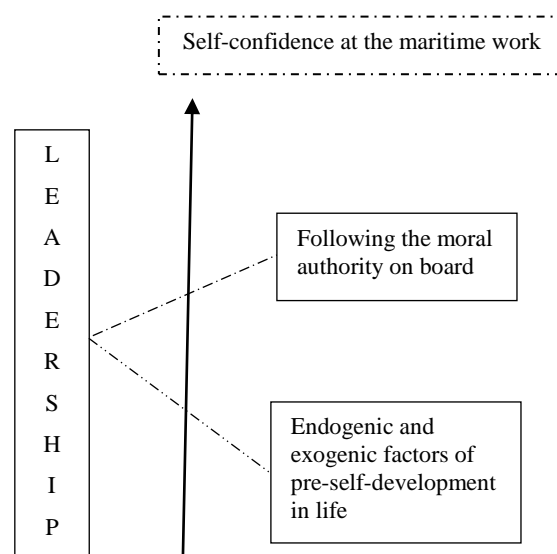


Figure 1. General self-development of the seafarer's personality following the leaders

The figure shows the scientific conception of general self-development of the personality following the leaders who were founded in life by influencing of all psycho-educational, it means - endogenic and exogenic factors of micro- and macro-environment, and following the moral authority of the actual top officer as a leader on board. The leader helps get self-confidence to his / her subordinates at the maritime work based on confidence to the leader.

The questionnaire of the research was created basing on the endogenic and exogenic factors of self-development.

*Endogenic* factors are as follows:

- Genes;
- Physiology;
- Psychics (especially - motives).

*Exogenic* (socio-cultural) factors are as follows:

- Society;
- Material and spiritual culture;
- Religious culture;
- Culture of human activity and communication [9].

Socio-cultural factors of the upbringing are naturally concreted for the scientific research based on criteria at levels of micro- and macro-environments.

*Micro-environment:*

- Family (parents, brothers, sisters and grand-parents) that gives a base to self-development with reference to self-confidence with the experience of moral authority;
- Influencing friends and neighbors that are living nearby;
- High- and higher schools (personality of the teacher). The higher school may belong to the macro-environment but to have it here (near the high school) is more convenient for the research.

*Macro-environment:*

- Mass media (heroes of internet, social nets, books, movies, TV shows);
- NGO;
- Church.

Some relevant factors of moral authority are added because they possibly could influence on self-confidence. There are teachers of preschool, head of the first job and the top officer on board at the first maritime practice, some seafarer, doctor, psychologist or psychiatrist (psychotherapist) and possible experience of moral authority in army of the top officer and / or chaplain.

So, the questionnaire was composed basing on mentioned socio-cultural factors of micro- and macro-environments that were revealed as 23 closed valuable questions characterized by the criterion of acceptance. Evaluation of these factors was based on a ten-point system. 3 open questions were additionally added for more reliable results based on qualitative research. These questions are as follows:

- What kind of moral leader was your first top officer on board to you?
- What kind of moral leader has the top officer on board to be so that his / her subordinates get more self-confidence at work?
- What kind of top officer and moral leader are you or would you be to your subordinates?

Components of the phenomenological content-analysis are as follows:

- Selection of manifest categories;
- Decomposition of categories into subcategories;
- Determination of frequency of categories and subcategories;
- Interpretation.

The base of the research is Lithuanian Maritime Academy. The sample size of respondents consists of 36 seafarers who are as third-year students at the part-time studies program *Marine Engineering*. So, the research is homogenous. Maritime students are called *seafarers* because all of them have had the maritime practice.

The research is valid because of ethical communication with respondents, practical experience of seafarers, their free participation by answering the questionnaire, situation when all questionnaires were returned and all questions were answered (*all open questions are answered but abundance of words is different*). Obvious signs of no-thoroughness in answers were not detected so that it is sufficient for this unrepresentative investigation.

Results of the research can be psycho-educationally applied to the selected population.

## Revelation of the influence of socio-cultural factors of the micro-environment

The research carried out revealed how the family (*parents, brothers, sisters and grandparents*), friends and neighbors, teachers of preschool, high school and higher school provide the basis for self-development with reference to self-confidence by experiencing the moral authority. The results of the research are showed in Table 1.

Table 1. Influence of socio-cultural factors of the micro-environment

FACTORS	NUMBER OF HIGHEST EVALUATIONS
<b>FAMILY</b>	
Parents	<b>16</b>
Brothers	2
Sisters	8
Grand-parents	<b>14</b>
<b>TEACHERS</b>	
Teacher of preschool	2
Teacher of high school	8
Teacher of higher school	6
<b>OTHERS</b>	
Friends	8
Neighbors	1

The main socio-cultural factors of the micro-environment are parents and grand-parents as the moral authorities. They have the greatest influence on the personality's development with regard to his / her self-confidence by experiencing the moral authority. Other socio-cultural factors, such as brothers, sisters, friends, neighbors and teachers of preschool, high school and higher school are significantly less influential.

So, family traditions are still highly important for the development of the future seafarers' self-confidence regardless of the postmodernistic trend of individualistic life style in general.

## Discussion on the influence of socio-cultural factors of the macro-environment

It was investigated how mass media (*heroes of internet, social nets, books, movies, TV shows*), NGO, the Church, the head of the first job, the top officer on board during the first maritime practice, the seafarer, the doctor, the psychologist or psychiatrist (psychotherapist), the top officer and the chaplain of the army influence on self-development with reference to self-confidence by experiencing the moral authority. The results of the research are shown in Table 2.

Table 2. Influence of socio-cultural factors of the macro-environment

FACTORS	NUMBER OF HIGHEST EVALUATIONS
<b>MASS MEDIA</b>	
Heroes of internet (social nets)	2
Books	6
Movies	8
TV shows	3
<b>ORGANIZATIONS</b>	
NGO	4
Church	2
<b>SOME PEOPLE</b>	
Head of the first job	4
Top officer on board at the first maritime practice	<b>14</b>
Some seafarer	8
Doctor	2
Psychologist or psychiatrist (psychotherapist)	6
Top officer in the army	<b>10</b>
Priest / chaplain of the army	3

The main socio-cultural factors of the macro-environment are the top officer on board during the first maritime practice and the top officer in the army. They have the greatest influence on the personality's development with regard to his / her self-confidence by experiencing the moral authority. Other socio-cultural factors, such as mass media, NGO, the Church, the head of the first job, the seafarer, the doctor, the psychologist or psychiatrist and the chaplain of the army are significantly less influential.

It is appropriate to note a great culture of the top officers (*chief engineers in this case*) on board regarding the relevant supporting maritime leadership that is especially important to beginner seafarers.

### Characterization of the top officer as the moral authority on board during the first maritime practice

Seafarers were asked about their first top officer as the moral leader on board. The answers of the respondents are shown in Table 3.

Table 3. Top officer as moral authority on board during the first maritime practice

POSITIVE CATEGORIES	NUMBER OF RESPONDENTS	NEGATIVE CATEGORIES	NUMBER OF RESPONDENTS
“good specialist and a wonderful person”	4	“not a leader, not cooperative, he does not like his job”	2
“supporting, smart and patiently explaining”	4	“explains things, but very impatiently”	3
“strict, demanding, responsive”	8	“too strict, unwilling to explain, and interfered to work”	9
“acts as equal, cooperative and as a leader”	3	“unnecessarily sincere and a beginner as a specialist”	1
“charismatic, sincere, intelligent”	2		
<i>TOTAL</i>	<i>21 (of 36)</i>	<i>TOTAL</i>	<i>15 (of 36)</i>

It was found that most seafarers highlight the positive categories (21) of characterization of their top officers as moral authorities on board during the first maritime practice (15 negative categories). We can state that the maritime culture on board is based enough on the supporting maritime leadership. This tradition is very important to the future seafarers who begin their maritime career and especially need supporting communication and cooperation on board.

### Seafarers' aspirations for the leader who can be the cause for their self-confidence at work

The seafarers were asked about their aspirations, specifically, how the top officer, as the moral leader on board, can contribute that his / her subordinates get more self-confidence at work. The answers of the respondents are presented in Table 4.

Table 4. The seafarers' aspirations for the leader for their self-confidence at work

CATEGORIES	NUMBER OF RESPONDENTS
“ability to provide, solve conflicts, be honest and professional”	3
“demanding, professional and humane, so that subordinates can trust him”	2
“ability to communicate and explain patiently”	<b>8</b>
“creation of a work team, understanding of his own job and self-confidence”	2
“ability to be responsible, strong and correct”	3
“it depends on the maturity of the subordinates”	1
“do not shout at people and trust them, so that they can be committed to work”	<b>9</b>
“ability to trust the subordinates, be smart, sincere and helpful if needed”	4
“ability to respect different opinions, to plan and recognize his / her own mistakes”	3
“ability to cope with a stressful situation”	1
<i>TOTAL</i>	<i>36</i>

It was stated that most seafarers stress the need that the top officer does not shout at the subordinates and trust them, so that they can be committed to work; and his / her ability to communicate and explain problems patiently. Professional ability is naturally related to moral maturity. The main problem that the seafarers point out is shouting of the top officer at the subordinates because it causes disorder. It also demonstrates impulsivity of the heads and the lack of their skills to apply the moral authority and leadership for cooperation on board. It is appropriate to apply the above mentioned ideas of the seafarers aimed to gain higher self-confidence of the subordinates at work.

### Seafarers' positions to be leaders as moral authorities for their subordinates

Every seafarer was asked about his position, specifically, how is (would be) he as top officer and moral leader for his subordinates. The answers of the respondents are shown in Table 5.

Table 5. Seafarers' positions to be leaders as moral authorities

CATEGORIES	NUMBER OF RESPONDENTS
"a professional who helps and supports others"	7
"flexible and controlling only the results, not the process"	1
"able to lead without a shout, combine friendliness with strictness"	<b>15</b>
"human, calm and honest"	4
"cooperating with the team"	<b>8</b>
"positive, responsible, instructive"	1
<i>TOTAL</i>	<i>36</i>

It was found that most seafarers emphasize real leadership without a shout, combining friendliness with strictness and cooperating with the team. This research is enriched by the answers of the seafarers that showed their personal and professional maturity. They naturally understand leadership as the needed moral support that is directly related to the authority of the top officer. The seafarers do not support the principle "fear implies respect" but they note a necessity of the authentic personality of the head. So, the seafarers wish to sincerely respect the mature personality of the top officer and follow him as the leader, thus improving their self-confidence at work.

### Conclusions

1. Revelation of the influence of socio-cultural factors at the micro-environment has shown that the main factors are parents and grand-parents as moral authorities. Pre-self-development of the seafarers is based on the family traditions that are still important for improvement of the future seafarers' self-confidence.

2. The main socio-cultural factors of the macro-environment are top officer on board during the first maritime practice and the top officer in the army. The great culture of the top officers on board, regarding the relevant supporting maritime leadership, is especially important for the development of the beginner seafarers' self-confidence at work.

3. Characterization of the top officer as a moral authority on board during the first maritime practice showed that most seafarers highlight positive categories. So, the development of self-confidence at work regarding the supporting maritime leadership is hopeful in maritime affairs related to the career of the future seafarers as the maritime students of the Lithuanian Maritime Academy.

4. The seafarers' aspirations to such leader who can be the cause for their self-confidence at work are characterized. Most seafarers highlight the need that the top officer does not shout at his subordinates and trust them, so that they can be really committed to work; and ability to communicate and explain things patiently because the main problem is that the top officers often shout at their subordinates. It causes disorder of the subordinates and failure to develop their self-confidence at work.

5. Discussion on the seafarers' positions to be leaders as moral authorities for their subordinates revealed the positive trend of the self-confidence development in the future. Most seafarers note the real leadership without a shout, combining friendliness with strictness and cooperating with the team. The supporting maritime leadership is very important on board. Moral authority of the leader makes positive influence on the seafarer's self-confidence at work regardless of his pre-experiences. We can suppose that

the supporting maritime leadership is able to transform some negative pre-experiences and develop and partially correct them. So, self-confidence at work becomes better.

The results of the pilot study can be psycho-educationally applied to the selected population only. Further it is appropriate to investigate and correlate the approaches of all levels' seafarers to supporting leadership on board in regard to the development of self-confidence at work because of moral authority of the leader. The pilot study showed the relevance to enrich the main research with the investigation of seafarers' self-esteem. So, the main research will be more integrated at the psychological level by correlating their self-esteem with the self-confidence development with reference to moral authorities and important situations applying supporting maritime leadership. The psycho-educational factors regarding maritime self-leadership improvement is the object of future researches.

## References

1. An Introduction to Resource Management, 1. Videotel Marine International. DVD PAL. London: Videotel, 2012.
2. Andres, T. Q. D. Management by Filipino Values Training. Manila: Our Lady of Manaoag Publishers, 1991.
3. Astikas, E. Mačiau žaliąjį spindulį. Klaipėda: Lietuvos marinistikos žurnalistų klubas „Marinus“, 2012.
4. Gerstenberger, H., Welke, U. Arbeit auf See. Zur Ökonomie und Ethnologie der Globalisierung. Münster: Westfälisches Dampfboot, 2008.
5. Haughton, Ch. J. The leadership of Maritime Education and Training (MET) Institutions. Birmingham: The University of Birmingham, 2012.
6. Jezewska, M. Psychological Evaluation of Seafarers. International Maritime Health, 54, 2003, pp. 68-76.
7. Jezewska, M. Jaremin, B., Leszczyńska, I. Health Promotion in the Maritime Work Environment - Training of Leaders. International Maritime Health, 58, 2007, pp. 1-4.
8. Johnsen, B. H., et. al. Cultural Differences in Emotional Intelligence among Top Officers on Board Merchant Ships. International Maritime Health, 63, 2012, pp. 90-95.
9. Jovaiša, L. Ugdymo mokslas ir praktika. Vilnius: Agora, 2002.
10. Maritime Leadership and Demands for Change. Maritime Leadership. 2013. Available (accessed on 13.12.2013): <http://www.green-jakobsen.com>
11. Nielsen, M. B., Bergheim, K., Eid, J. Relationships between Work Environment Factors and Workers' Well-Being in the Maritime Industry. International Maritime Health, 64, 2013, pp. 80-88.
12. Resource Management and Accident Prevention, 7. Videotel Marine International. DVD PAL. London: Videotel, 2012.
13. Roe, M. Maritime Governance and Policy-Making. London: Springer, 2013.
14. Sąlyga, J. Jūrininkų patiriama psichoemocinė įtampa, socialinė izoliacija: krikščioniškosios karitatyvinės veiklos patirtis. Tiltai, 36 priedas, 2007, pp. 164-183.
15. STCW Manila Seafarer Training Amendments Enter into Force on 1 January 2012. International Maritime Organization. 2011. Available (accessed on 16.12.2012): <http://www.imo.org>
16. Šileris, S. Kodėl anksti pražyla kapitonai. Klaipėda: Eglės leidykla, 2007.
17. Vasilovschi, N., Georgescu, S. Transformational Leadership and the Economic Competitiveness in Shipping Industry Today. Constanta Maritime University Annals, 17, 2012, pp. 307-310.
18. Vervoort, M. Maritime Leadership Competence and Its Further Implementation and Assessment into the Nautical Education Program. In: International Conference on Education and New Learning Technologies. Proceedings of the 4th International Conference (Barcelona, Spain, July 2-4, 2012, International Forum Edulearn). 2012, pp. 804-810.
19. Истомина, О. А. Профессиональная психология моряка. Владивосток: Морской государственный университет имени адмирала Г. И. Невельского, 2006.
20. Лебедев, В. И. Экстремальная психология. Психическая деятельность в технических и экологически замкнутых системах. Москва: Юнити-дана, 2001.

# MARITIME ENGLISH

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## **Abstract**

*The paper examines the requirements and constraints of The International Convention on Standards of Training, Certification and Watchkeeping of Seafarers (STCW) 1978, as periodically amended, and strives to identify the problems maritime English lecturers encounter in their efforts to improve instruction in linguistic communication and looks into some of the aspects of learning and teaching a language. The resulting challenge for the maritime English course is to achieve the STCW specified outcomes for the maritime profession and to practise those as a daily operational norm. The paper analyses various methods how to provide the necessary instruction and skills needed onboard and reach the expected standards of work and behaviour at sea with regard to maritime English. The paper also stresses the importance of a comprehensive and relevant maritime English course with regard to day-to-day communication issues and awareness of a safety culture. High standards of English communication skills fulfil the aims and objectives of the STCW 95 by providing a competence discernible in shipboard communications and the maritime profession to promote vessel safety and stress-free social interaction. The paper outlines burning issues in materials design and analyses test formats and look in more detail at what kind of test format best fits our specific maritime requirements.*

**Keywords:** *STCW requirements, linguistic communication, communicative approach, test formats*

## **Preamble. STCW - requirements and constraints**

The International Convention on Standards of Training, Certification and Watchkeeping of Seafarers (STCW) 1978, as periodically amended, requires mariners to be able to use a full range of language with proficiency approaching their mother tongue to be able to cope with demanding and complex language situations.

The maritime officer must have adequate knowledge in English to be able to perform the following tasks:

- Use charts & other nautical publications,
- Understand meteorological information & messages,
- Communicate with other ships & coast stations,
- Perform the officer's duties with a multilingual crew,
- Use engineering publications & perform engineering duties,
- Communicate with passengers during an emergency,
- Use and understand the IMO SMCP [5]

The problem that this definition brings forward is that it uses such nebulous words as *adequate* without at any time specifying what *adequate* means. According to Oxford English Dictionary, if something is *adequate* it is equal or amounting to what is required; fully sufficient, suitable, or fitting. [9]

Various interpretations of the STCW requirements may result in a varying degree of skill in Maritime English. *When I use a word*, said Humpty Dumpty, *it means just what I want it to mean – neither more nor less*. People who attribute their own meaning to the word *adequate* and consequently are prepared to tolerate low standards risk to sound as dogmatic as Humpty Dumpty in their utterances.

Indisputably, the majority of IMO member states set very high standards with regard to officers' competence. However, some shipping companies to this day employ masters and/or officers who have practically no knowledge of the working medium i.e. English, thereby rendering communications very difficult.

In my understanding, we should interpret the word *adequate* within the whole context of the STCW because words are almost always found embedded in specific contexts. The context may play a vital part in fixing the meaning of words which are too vague or too ambiguous to make sense by themselves. Linguists not only place great emphasis on context but also considerably broaden its scope and probe more deeply into its influence on word meanings. In the words of Jespersen *any linguistic phenomenon may be regarded either from either within or without, or from the outward form or the inner meanings* [9].



In the case of the STCW, *adequate* refers to the whole spectrum of skills, knowledge, understanding and abilities defined and tabulated that are needed to ensure that officers are capable of fulfilling the roles expected of them at sea.

The STCW sets the goals. It is for us to decide how we will equip our students with maritime English proficiency to enable them to safely and efficiently operate, maintain and manage maritime industry of today and tomorrow.

Should the STCW be a straitjacket, a guide or a stimulus? Perhaps the answer is all three:

# A straitjacket in the sense that it prescribes the aims and objectives, or the proficiency that students are expected to acquire by the end of the course

# A guide in the sense that the syllabi, materials or techniques are not prescribed - those are left for the teacher to choose, formulate and decide on

# A stimulus in the sense that enough stimulus is offered to stimulate the teacher to produce good lessons in which the students can effectively acquire the stated performance objectives

How can we provide the necessary instruction and skills needed onboard and reach the expected standards of work and behaviour at sea with regard to maritime English? I do not believe that there is a method or set of methods, which guarantees successful learning in all circumstances. The assumption, that planning equals teaching equals learning is too simplistic [8].

The measure of successful teaching is successful learning. Language and learning are complex phenomena and there is no simple answer of a best method or best approach.

### **How to improve instruction in linguistic communication?**

Today nobody doubts the necessity for the modern seafarer to receive appropriate instruction in linguistic communication during their training. Most of marine accidents with more ships involved are caused by *mis-communication*.

STCW requirements advocate team coordination and communication. No coordination and communication is possible without a working medium i.e. a language. It seems that the key issue is not necessarily the shortage of requirements or regulations in maritime English but the correct implementation/enforcements of existing requirements. The modern seafarers should receive adequate instruction in linguistic communication during their training which is not blindly geared to a particular table in the STCW, but to the realities of life as implied by the whole STCW. The resulting challenge for the maritime English course is to achieve the STCW specified outcomes for the maritime profession and to practise it as a daily operational norm. The maritime English course must be comprehensive and relevant to day-to-day communication issues and aware of a safety culture.

The STCW 95 criteria for evaluating competence are the following:

- Communications are clear and understood
- Communications are clear and concise at all times
- English language publications are correctly interpreted or drafted
- English language messages are correctly drafted/handled

The problem here is that the word *clear* is not an easy concept to describe. What is *clear* and understood and therefore *adequate* for one person may not necessarily be *clear* for somebody else. Various interpretations of the words *adequate*, *clear* and varying overall standards result in communication difficulties among crew and between crew and passengers. Most of marine accidents with more ships involved are caused by *mis-communication*. When communication goes wrong, consequences can be heavy. Mistakes are made; accidents may and do happen.

Language barriers between crew members in the past have led to serious accidents at sea. Due to English language deficiency communications are ineffective, emergency activities confusing and instructions given in gestures, as crew English language ability has varying standards. It follows from the above that crew interaction, communication and decision making are essential to the safe operation of the ship. For a ship carrying a multinational crew, officers' and crews' ability to read and understand operating and safety instructions and their ability to effectively interact in English, is equally critical to the safe operation of the ship. English language situations at sea can be demanding and complex therefore mariners need to use a full range of language with proficiency approaching their mother tongue to be able to effectively cope with them.

According to Jeremy Harmer communication between humans is an extremely complex and ever-changing phenomenon [2].

Teachers are always on the lookout to improve their teaching. There are many things we can do to help ourselves to evaluate our work.

The first step towards eliminating a problem is to identify it. Of course, the next step is to try to solve the problems, to improve our teaching and to perform the education and training more efficiently and accurately.

In the communicative approach to language study the successful completion of tasks depends less on the teacher's and more on the learner's efforts [10].

How to improve instruction in linguistic communication, which addresses the skills required to manage a multicultural environment and guarantees that quality is maintained?

What aspects of cross-cultural awareness are necessary for the maritime English student? How can these be taught?

How much specialist content knowledge does the maritime English teacher need?

Is it possible to teach maritime English but avoid conceptual difficulties?

What are the roles of testing in a maritime English programme?

Is teaching subject matter through the medium of English preferable to teaching maritime English?

To what extent is maritime English testing possible?

To what extent should authentic maritime English materials be simplified?

What is more important in maritime English context: authenticity of text or authenticity of task?

How skilled in navigation/engineering should maritime English teacher be? How can this expertise be achieved?

These are some of the questions we have been asking ourselves, questions that still need to be answered.

## **Communicative approach to language learning**

The STCW requires seafarers to develop communicative competence in English, which is evaluated by the use of the four communication skills: listening, reading, writing and speaking.

IMO Model Course 3.17 puts emphasis on seafarers' communicative competence: for seafarers to be able to communicate effectively, they need to be able to use and understand English in a range of situations. *Being able to use English* means that the seafarer can combine the *building blocks* of language (grammar, vocabulary, phonology) to express himself clearly in speech and writing. *Being able to use English* means that the seafarer can interpret messages that he hears and reads correctly and can respond to these messages appropriately and comprehensively. When a seafarer can demonstrate ability to do this, he proves his communicative competence in English. [4]

Any act of communication involves the use of two or more language skills i.e. receptive skills: listening and reading and productive skills: speaking and writing.

As a result, communicative competence requires the ability to use any combination of these skills effectively. Classroom training should therefore give integrated skill practice as well as single skill training.

Accuracy and fluency in English are essential for communicative competence. In order to develop communicative competence properly, it is important to balance the time spent on accuracy which is the ability to use language correctly and fluency i.e. the ability to produce language freely and independently and not to focus on just one aspect.

Teachers are constantly engaged in a process of seeking the best match between different variables: material and resources, the needs of the students, the aims of the course, the methodology, the target language, and the teacher's own teaching style. Effective adaptation is a matter of achieving congruence between these variables [7].

Communicative activities for language learning share some central characteristics. They should:

- Be meaningful, "real world" tasks
- Have a "real life" purpose
- Involve communication in English about the task
- Combine two or more communicative skills
- Require social interaction (pair/group/whole class)
- Utilise authentic materials
- Have clear learning outcomes
- Be achievable
- Be motivating & interesting
- Be relevant to students
- Be well planned

Teaching style is combination of the teacher's approach to teaching/ learning and his/ her beliefs and attitudes. In the Communicative approach, teachers assume the roles of facilitators, participants, observers and enablers. The control is shared with students who are required to be creative and independent.

According to Scrivener the Enabler

- Knows subject matter and adapts a range of teaching methodologies very well
- Has an awareness of how individuals in the class learn, feel and think. His/her planning and teaching responds to the needs of the students. He/she strives to create a good classroom atmosphere and working relationship with the students. Decisions in class are often shared with students who actively participate in class activities. For him/her teaching is about creating conditions
- Involves students and encourages their confidence because if there is trusting, positive, supporting rapport amongst the learners and between learners and teacher, then there is a much better chance of useful interaction happening [13].

## Maritime English learning and teaching

It is essential to ensure that The resulting challenge for the maritime English course is to achieve the STCW specified outcomes for the maritime profession and to practise those as a daily operational norm. The paper analyses various methods how to provide the necessary instruction and skills needed onboard and reach the expected standards of work and behaviour at sea with regard to maritime English. The paper also stresses the importance of a comprehensive and relevant maritime English course with regard to day-to-day communication issues and awareness of a safety culture. How can we provide the necessary instruction and skills needed onboard and reach the expected standards of work and behaviour at sea with regard to maritime English?

We know that learning and teaching a language is an essentially organic process encompassing all the facets of language. According to E.Sapir language is the most massive and inclusive art we know, a mountainous and anonymous work of unconscious generations [11]. Students need to develop awareness of language to which they are exposed; they learn better in language-rich classrooms and with language - rich materials. We must look for lessons and ideas that work with a particular class to suit their needs.

There are many theories on communication, training and instruction. I do not wish to discuss them in this paper.

The STCW 95 prescribes the proficiency the students are expected to acquire and offers enough stimuli to produce good lessons in which the students can effectively acquire the stated performance objectives.

Lesson planning should help to clarify STCW 95 requirements not to restrict them.

We all know the golden rule *Teach the learners, not the plan.*

Effective use of lessons plans should be based on the following criteria:

- The plan should be adapted as the lesson progresses
- It is a guide to fall back on, it reminds the teacher of what is intended to be done: when, how and in what sequence
- It is a quick reference for comparing the intended objectives with what was actually achieved

Ideally, we should develop and design teaching aids and materials that provide not only a well-rounded foundation in maritime English, but also ensure that the graduate is practically competent for the job.

At the LMA we select and adapt training materials from the formats used in the industry, e.g. company fleet standing instructions, company personal appraisal forms, checklists to confirm completion of necessary procedures, samples of incident report forms, company safety management system policy based on IMO's ISM code, etc.

Yet all of us encounter the following burning issues in maritime English materials design

- Subject content or language skills?
- Process-oriented or product-oriented maritime English materials?
- Authenticity or simplification?
- Contextualisation

Precisely set levels of achievement in general English with knowledge of English maritime vocabulary would enable maritime officers to cope with any emergency situations.

English language ability fulfils the communication requirements of international ships and will prepare the student to react to the emergency for which he is trained and, incidentally, also for business life ashore.

Achievements in English will provide maritime officers with real and transferable skills. Competence and eloquence in everyday spoken English, both face-to-face and by telephone will increase the standards of the world maritime profession both afloat and ashore [16].

High standards of English communication skills fulfil the aims and objectives of the STCW 95 by providing a competence discernible in shipboard communications and the maritime profession to promote vessel safety and stress-free social interaction.

## Language systems and communication skills

Language can be divided into language systems and communication skills. Successful language use and communication require ability to integrate systems and skills. Contemporary approaches to language teaching rely on a balance between all language systems and communication skills therefore every lesson needs to include a balance of language systems work and communication skills work.

It is a well known fact that language is not an aggregate of discrete elements but an organised totality, which has a pattern of its own. In Saussure's famous simile, *language is like a game of chess: you cannot add, remove or displace any element without affecting the entire field of force* [12]. Hence, patterns which are generally incomplete are made by our pattern making minds.

The idea of an underlying pattern has proved an extremely fruitful hypothesis and brought about many attempts to standardise communication, in our case maritime communications with the help of the SMCP.

The purpose of the SMCP is to:

- Standardise language used in the light of the increasing number of internationally trading vessels with crews speaking many languages since the problems of communication may cause misunderstanding leading to dangers to the vessel, the people on board and the environment
- Provide navigational and safety communications from ships to shore and vice versa, ship to ship and on board
- Provide phrases which are precise, simple and unambiguous so as to avoid confusion and error [14].

The phrases were made by statistical analysis of word and term frequency and other functional features based on the assumption that words work like ordinary tools and are subject to the same laws which govern the use of tools. To pursue it to its ultimate implications, there is a direct relationship between the frequency of use of the word and the diversity of the uses to which it is put.

Edward Sapir in 1921 wrote these prophetic words: *There is such a thing as a basic plan, a certain cut, to each language* [11]. Sapir's words refer in the first place to grammatical structure, but it seems probable that the vocabulary too if properly explored, will reveal some idiosyncratic tendencies, some characteristic preferences and aversions for certain modes of expression. These tendencies vary and may even change within the meaning of the word. Some structures are capable of strictly statistical formulation; others are less sharply defined, but stand out all the same very clearly. The SMCP is based on intrinsic connection between terms and their frequency and attempts to identify various lexical structures into which our words are organised to promote vessel safety and effective communications at sea.

Every word is surrounded by a network of associations which connect it with other terms related to it in form, in meaning or in both; as Saussure graphically put it is *like the centre of a constellation, the point where an indefinite number of coordinated terms converge* [12]. The associative field of a word or terminological collocation is an unstable and highly variable structure; it differs from one mariner to another, from one ship to another and possibly from one maritime situation to another.

The SMCP relies on the phonological and grammatical system, which though subject to long-term changes, is relatively stable at a given moment, whereas vocabulary is in a perpetual state of flux. New words and terms are continually formed or borrowed to fill a genuine gap and to suit the needs of the profession; new meanings are attached to old words, etc.

Meanings of words are seldom precise and sharply delimited – various meanings of a word cannot be set up simply as so many independent entities. Meanings have no clear cut demarcation lines but rather a hazy fringe through which they imperceptively merge into each other – concepts with blurred edges [15]. In the SMCP there are many phrases which are repetitive and occur with slight modifications under a number of headings.

It is a sad fact that the successful acquisition of the phrases requires a lot of effort and excessive learning by rote. The reasons for this are not far to seek: they lie in the very nature of the subject.

Whereas the phonological and grammatical resources of a language are closely organized and limited in number, the vocabulary is a loose assemblage of a vast multitude of elements.

### **Choosing maritime English test formats**

Successful learning is much more complicated than anything, which can be evaluated by a simple test.

The SMCP is based on intrinsic connection between terms and their frequency and attempts to identify various lexical structures into which our words are organised to promote vessel safety and effective communications at sea.

In practice however, this is not so easy to achieve. If we want high reliability, discrete item test formats are the most suitable. These are formats with many items requiring short answers, (e.g. multiple-choice questions). Because there are more items, we have more information available to us and reliability is increased. These test formats are also very practical, usually being quick and easy to mark. Unfortunately, such formats have low validity, because doing a test such as a multiple choice is not a test of real communication. [1]

On the other hand, if we want high validity, integrative and open-ended test formats can be better. Integrative formats involve communication and interaction (for example, reading a letter and replying to it). Open-ended formats are those where responses are open (e.g. reports, essays).

Both these formats can have beneficial washback effects, as students become aware of communication. However, it can be difficult to interpret results from such open-ended tests. It can be hard to decide why students had problems (was it the reading or the writing?). Secondly, these tests can be impractical, taking a long time to mark and administer. Thirdly, they can be unreliable, as they are much more difficult to mark consistently than discrete test item tests.

As both discrete item and integrative test formats have their advantages and disadvantages, according to Harris and McCann the solution is to mix the kinds of test formats we use. [3]

We could employ some integrative tasks, especially for productive skills like writing or speaking. For receptive skills and for testing language, we could use some discrete item tasks. Our discrete item formats make it easier for us to assess with greater reliability and with less time for marking. Our open-ended formats enable us to give our students tests of real communication. However, we need to look in more detail at what kind of test format best fits our specific requirements.

In our experience at the LMA we have found that modern techniques like computer based training can give enormous added value to instruction and testing. It can be used as an excellent assessment tool for evaluating competence and language proficiency instead of demonstrating knowledge which is mostly done via written examination.

By choosing these methods of assessment a student can be evaluated on a much wider scale. We can offer them to learn in an environment, which in itself contains most important items which they will come across on a real ship.

### **Conclusion**

Despite problems, LMA is dedicated to its task of enhancing professionalism and competitiveness of the entire Latvian shipping industry.

Mistakes will be made, undoubtedly, but we hope to learn and profit from them.

It takes resourcefulness, intelligence, patience, tact and courage to meet the troubles of any job. Because if it were not for the things that go wrong, the problems we have to deal with, and challenges of our working day we would not start looking for solutions and analyse consequences.

### **References**

1. Alderson, J.C., Wall, D. Does Washback Exist? *Applied Linguistics*, Vol. 14, No. 2, 1993, pp.115-129.
2. Harmer, J. *The Practice of English Language Teaching*. London: Longman, 1994.
3. Harris, M., McCann, P. *Assessment*. London: Heinemann, 1994.
4. IMO Model Course 3.17 (Maritime English) IMO, 2009.
5. IMO STCW Convention 1978/1995/2010, IMO.
6. Jespersen, O. *Growth and Structure of the English Language*, Leipzig, 1969.

7. McDonough, J., Shaw, C. *Materials and Methods in ELT*, Oxford, 1993.
8. Nunan, D. *Language Teaching Methodology*. Prentice Hall International, 1991.
9. *Oxford English Dictionary on CD*, OUP, 2014.
10. Wright, T. *Roles of Teachers and Learners*. OUP, 1991.
11. Sapir, E. *Language: An Introduction to the Study of Speech*. Echo Library, 2006
12. Saussure, F. *de Course in General Linguistics*, ed. C. Bally and A. Sechehaye in collaboration with A. Reidlinger, trans. W. Baskin, London, Peter Owen (rev. ed. 1974).
13. Scrivener, J. *Learning Teaching*. Oxford, 1994.
14. SMCP International Maritime Organisation. London, 2002.
15. Ullmann, S. *Language and Style*. Blackwell Publishers, 1973
16. Weeks, F.F. *Ship to Shore Communications: Present Facts and Future Prospects*. WOME 9 – 9<sup>th</sup> IMLA Proceedings, 1998.

# MECHANICAL FEATURES OF WELDING JUNCTIONS OF STEEL PCD32 USED IN SHIPBUILDING

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## Abstract

Mechanical features of PCD32 steel used in shipbuilding and also strength and plasticity of welding junction of this steel subjected to thermal treatment (tempering and tempering of metal) before welding are researched in this article; it is revealed that the thermal treatment preceded the welding improves features of welding junction.

**Keywords:** feature, welding junction, steel, shipbuilding, strength, limit of fluidity, sheet

## Introduction

To estimate mechanical features of steel PCD32 and welding junction of it strength, the limit of fluidity and percussive viscosity were determined. At the same time influence of welding mode and thermal treatment on abovementioned features were studied.

## Discussion of results

The results of research of mechanical feature of sheet rolling of steel PCD32, also mechanical features of metal, cut from rolling tubus are shown in Figures 1 and 2 and Table 1.

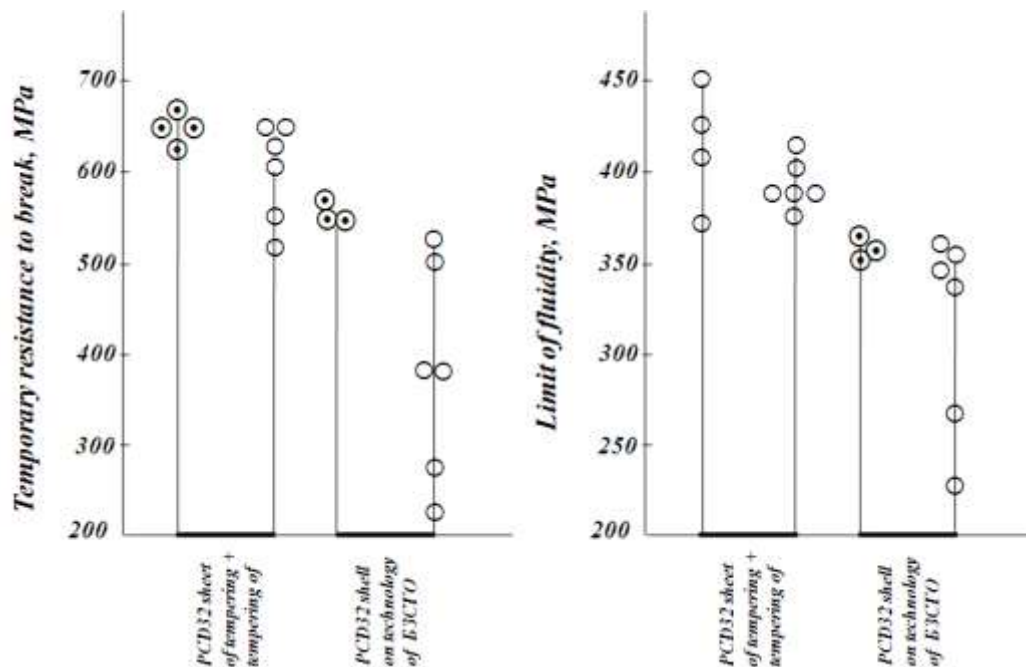


Figure 1. Results of trial of strength feature of steel in sheets of 50mm thickness and  
⊗ – cross models ○ - models of Z direction

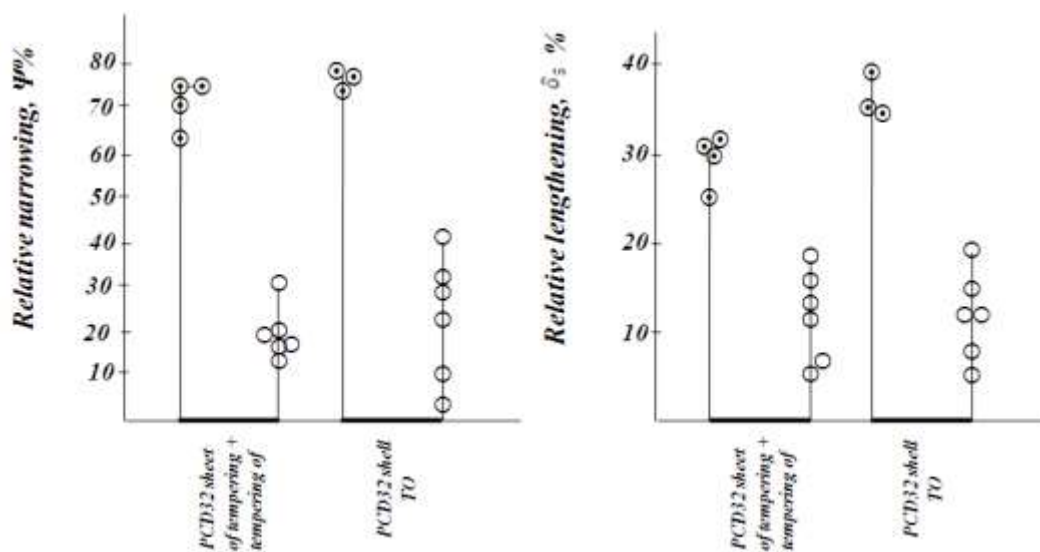


Figure 2. Results of trial of plastic features of steel in sheets of 50mm thickness and shells  
 ⊙ – cross models ○ - models of Z direction

Table 1. The results of research of mechanical feature of sheet rolling of steel PCD32

Mark of steel, kind of rolling	Place of engraving of metal models	Limit of fluidity, MPa $\sigma_{0,2}$	Temporary resistance of break $\sigma_B$ , MPa	Relative lengthening $\delta_5$ , %	Relative narrowing $\psi$ , %
1	2	3	4	5	6
PCD32 sheet of 50mm thickness	Across the direction of rolling	326	512	41,0	76,4
		329	515	32,9	75,6
		332	516	39,7	77,0
		334	505	41,2	76,2
	In direction of thickness of rolling (Z is direction)	328	498	17,2	29,1
		313	324	5,4	6,5
		424	502	14,5	18,3
		308	315	4,0	5,9
PCD32 sheet of 50mm thickness (in tempering)	Across the direction of rolling	304	377	5,9	6,2
		228	236	2,6	1,0
		460	657	29,7	74,5
		383	616	24,6	74,0
	Across the thickness of rolling (Z is direction)	414	649	28,5	67,0
		429	644	30,6	71,0
		403	619	11,6	16,8
		402	530	6,0	13,1
PCD32 sheet, having heat treatment on technology Baku stationary deep-water foundations plant (B3CFO)	Across the direction of rolling	395	629	11,9	16,5
		405	638	13,9	17,6
		413	636	15,9	29,4
		433	570	6,3	18,8
	In direction of thickness of rolling (Z is direction)	357	530	38,0	78,9
		355	530	36,0	78,9
		366	537	35,1	78,9
		359	528	30,2	71,3
		228	228	11,0	3,9
		274	274	11,0	10,0
		352	497	14,0	42,0
		349	385	5,46	24,1
361	507	18,6	34,4		
356	383	8,1	31,4		
307	349	4,1	9,9		
333	475	10,4	19,6		
304	325	-	15,7		



From analysis of results of trial shown in Figures 1 and 2 and Table 1 it is necessary to note that the steel of PCD32 mark has the most strength feature in analogue condition of thermo treatment and tempering.

The thermo-treatment of steels on B3CFO technology for taking down the residual strength (the temperature of tempering is  $\approx 600^{\circ}\text{C}$ ) for PCD32 steel had reduced the strength feature (up to 100MHa) in comparison with sheet rolling.

For models, cut on thickness of rolling (in Z – direction), the analysis of results (Fig.2) testify to considerable anisotropy of plastic features for steel. The middle value for PCD32 steel is equal 21,5%. It does not fully meet the requirements put to steel in constructions of responsible value with rolling strength in 1-3 thickness direction. So, according to requirement of ISO 7778-2 standards for attestation of rolling with giren characteristics in thickness PCD32 steel may be considered only to the Z 15 class, that is its plastic features in Z direction is lower of regulated for rolling of the I class -  $\Psi \geq 30\% /3/$ .

Mechanical features of PCD32 steel of cross and longitudinal rolling sheet do not differ. The results of trials of models cut in Z – direction considerably differ from spread in values. It is conditioned by the presence of crack defect in kind of noncontinuity in model of working cross (Fig.3) which causes the sharp reduce of strength characteristics and plastisity at the expence of sensivity of steel to crack, especially, at low temperature and reduce of nominal cross. So, trials let to reveal the heterogeneity of PCD32 steel on thickness of rolling.

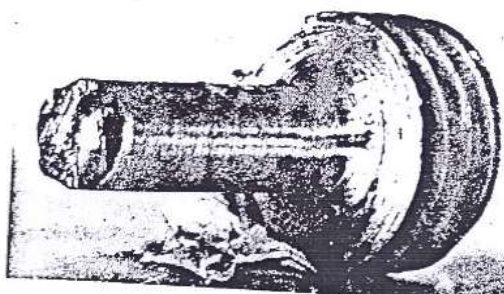


Figure 3. Noncontinuity of thicksheet rolling PCD32 steel revealed at determination of strength characteristics of metal in Z – direction.

It is also advisable to determine the mechanical features of welding junctions of research steel.

The results of research of mechanical features of welding junctions-shells-of PCD32 steel are shown in Table 2 and in Figures 4 and 5.

The welding junction of shells of 09Г2СIII steel were tested after thermal treatment.

Longitudinal seams of shells were carried out by automatic welding using welding wire Св-08ХМ, joining seams were carried out and by manual welding electrodes УОНИ-13/55 for PCD32 steel, the models of circle cross  $\varnothing 6\text{mm}$  have been cut from metal of welding junction along the seam.

Table 2. Results of the tests of mechanical features of welding junctions

Mark of steel shell, condition	Kind of welding, welding materials	Limit of fluidily $\sigma_{0,2}$ , MPa	Temporary resistance to break $\sigma_B$ , MPa	Relative lengthening $\delta_5$ , %	Relative narrowing $\Psi$ , %
PCD32	Manual УОНИ-13/55	473	564	29,7	72,7
		479	571	27,5	71,6
		472	571	25,0	71,5
	Automatic Св-08ХМ	621	707	22,2	59,6
		642	713	21,0	58,7
		623	705	20,7	59,6

Plastic features of welding junctions as a whole is in sufficient satisfactory level, at which plastic features of metal seam must be given preference, which were carried out by electrodes УОНИ-13/55 for PCD32 steel during manual welding.

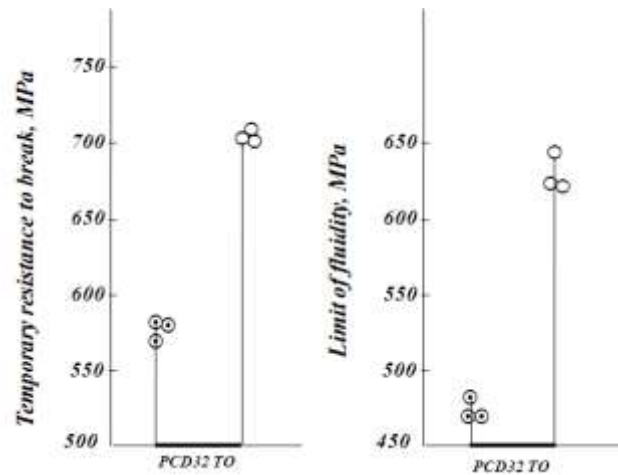


Figure 4. Results of tests of strength features of metal of welding seams in shells  
 ⊙ – manual welding of ring seam ○ - automatic welding of longitudinal seams

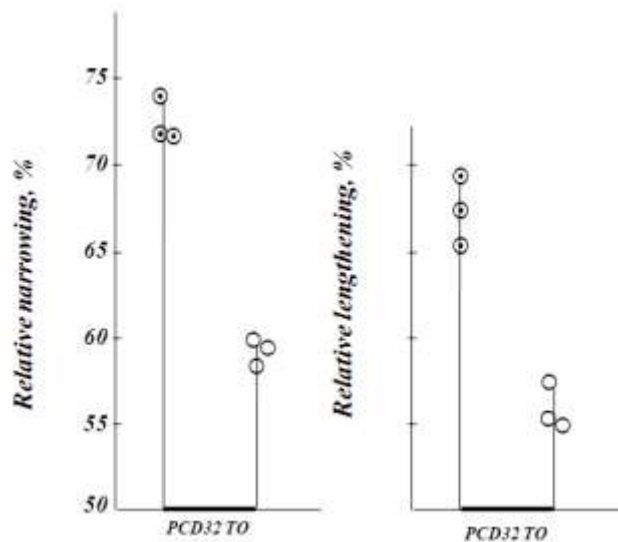


Figure 5. Results of tests of plastic features of metal of welding seams of shells  
 ⊙ – manual welding of ring seam ○ - automatic welding of longitudinal seams

## Conclusion

1. Test of mechanical features of PCD32 steel, used in shipbuilding permit to reveal heterogeneity of characteristic of this steel on thickness of rolling

2. Thermal treatment (tempering and tempering of metal) improves the strength features of welding junctions of PCD32 steel. Plastic features of welding junctions are on satisfactory level.

## Literature

1. Стандарт фракции NFA36-202. Продукция черной металлургии. Листовой и широкополосовый металл с заданными свойствами в направлении перпендикулярном поверхности, февраль, 1997.

2. Международный стандарт HCO 7778, Стальной лист с заданными характеристиками по толщине, 1 изд., 1993, 01-15.7778 -1993 (E).

3. Временные технические требования к толстолистовому прокату стали для металлоконструкций стационарных глубоководных оснований, 88 с.

# NATURAL GAS BUNKERING AND STORAGE OPTIONS

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## **Abstract**

*To comply with upcoming emission restrictions set by MARPOL 73/78 convention Annex VI regarding sulphur and nitrogen oxides one of the options is to use gaseous fuels, especially natural gas (NG). European Commission in its Directive "Directive of the European Parliament and of The Council on the deployment of alternative fuels infrastructure" proposed to build LNG filling stations across all 139 TENT-T sea ports by 2020 and inland waterway ports by 2025, thus, ensuring supply of NG as ships bunkers. Various studies have shown the environmental advantage of using LNG (Liquid Natural Gas) technology from ship operator's perspective. The article is attempt to evaluate economic aspects and compare CNG (Compressed Natural Gas) and LNG (Liquefied Natural Gas) bunkering options and analyse choice of optimal bunkering ship size from the point of view of final gas supply cost.*

**Keywords:** LNG, CNG, bunkering, alternative marine fuel

## **Introduction**

The emissions caused by ships are regulated by IMO's MARPOL 73/78 convention Annex VI that states restrictions to sulphur oxides, nitrogen oxides, carbon dioxide and particular matter, which is eliminated as a result of the combustion of marine fuels. In the next years MARPOL 73/78 convention's Annex VI will sets out significant limits to emissions from ships. Special attention is paid to the Emission Control Area, in which from 19 may 2006 is included the Baltic Sea, which means this regulation is binding to Latvia, as the Baltic Sea's costal country. Changes in international regulation related to reducing the level of sulphur in marine fuels forces to implicate the European Union institutions to meet the requirements imposed by the International Maritime Organization. The European Union institutions adopt various measures to support prevention of environmental pollution. Such measures are focused not only to the transport sector, but to all energy sources that cause environmental pollution. Therefore, the European Union is imposing strategies which not only improves the environment quality, but also from which it follows a number of other strategies objectives, which are related to the efficient use of resources and energy in the European Union.

Despite of the fact that shipping world is still suffering from the consequences of recent global crisis shipping companies are required to comply with the new much stricter environmental regulations for reduction of harmful emissions from ships. Shipping companies shall contribute large investments for new technologies to meet these requirements or use expensive ultra-low sulphur distillate oil products as Marine Gas Oil plus invest in low NO<sub>x</sub> engine technologies. Other alternative is to go for alternative fuels.

In order to develop alternative fuels spread in the European Union maritime transport appropriate infrastructure is needed to ensure appropriate supply. One of the most prospective alternatives to comply with upcoming environmental regulations is considered of using LNG ship fuel technology that allows using natural gas as a ship fuel. The European Union is ready to take the first steps to support the spread of this technology between the costal countries in the European Union, particularly in the Baltic Sea region as this region is considered as the most sensitive to environmental pollution.

Although various studies have shown the advantage of using LNG technology and regulatory requirements are environmental friendly it requires from ship-owners and stakeholders serious decision making which is technical and economic aspect assessment.

## LNG properties and advantages

When the temperature of natural gas is reduced to approximately  $-163^{\circ}\text{C}$ , at atmospheric pressure, it condenses to a liquid (LNG) and at that temperature, natural gas volume is reduced about 600 times. [9] As liquefied natural gas contains of up to 98% methane ( $\text{CH}_4$ ), its thermodynamic parameters are close to pure methane. In order to use natural gas as a fuel for internal combustion engines LNG must comply with the basic parameters which shall be expressed as the individual LNG components (Table1).

Table 1. Main components of LNG to use it in internal combustion engines [14]

Methane ( $\text{CH}_4$ )	$92\pm 6\%$
Ethan ( $\text{C}_2\text{H}_6$ )	$4\pm 3\%$
Propane ( $\text{C}_3\text{H}_8$ )	$2.5\pm 2.5\%$
Nitrogen ( $\text{N}_2$ )	$1.5\pm 1.5\%$
Hydrogen sulphide ( $\text{H}_2\text{S}$ )	Not more than 0.005% (50ppm)

On gaseous stage NG complies classical V-P relations and density depends on temperature and pressure and necessary volume could be decreased by increasing pressure or cooling down the gas. On cooling down to  $-163^{\circ}\text{C}$  (plus/minus 2-3 deg. depending on impurities) natural gas will turn to liquid aggregate condition with necessary storage volume decreasing 600 times respectively.

In opposite way– warming the gas and keeping the volume constant the pressure of the developing gas condensate and gas will dramatically increase. (Figure 1).

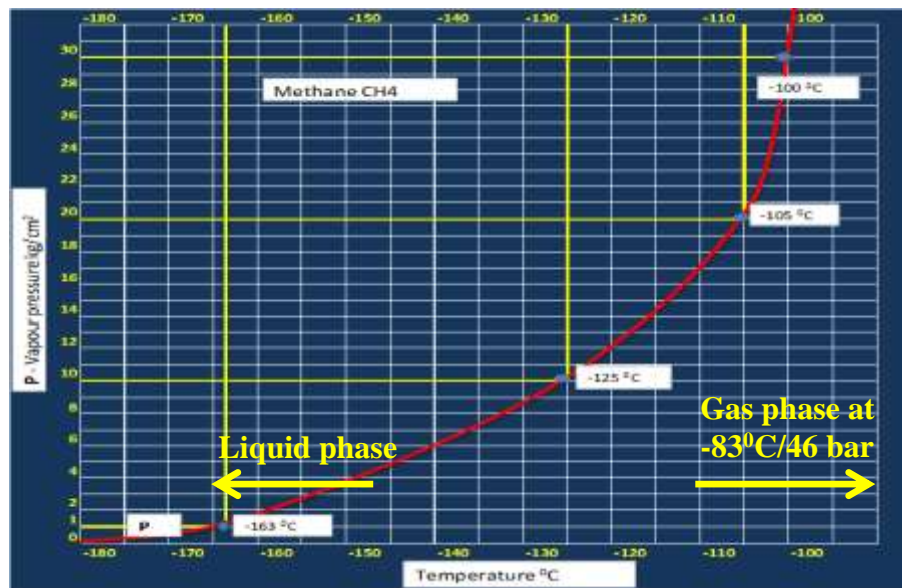


Figure 1. Relation between temperature and pressure of LNG [4]

The critical temperature of LNG is about  $-83^{\circ}\text{C}$ . At this temperature LNG from liquid phase goes to gas phase and reach a pressure at about 46 bars. The density of LNG falls between  $430\text{ kg/m}^3$  and  $470\text{ kg/m}^3$ . [2] Comparing LNG with other options it has 2.4 times more energy density than CNG and at the same volume about 60% less energy density than of MGO. One of the main advantages comparing LNG with conventional marine fuels is in less emission of harmful substances (Table 2).

Choice between use of on-board Hi Tech cryogenic re-liquefaction plant and bulky and expensive high pressure on-board storage tanks mainly depend of storage time, volume and usage of the gas. After 2015 MGO will be chosen as a reference fuel, if no other purification strategies will be chosen, because its sulphur limit will comply with the regulations, but it will not comply with the Tier 3  $\text{NO}_x$  requirements after 2016 as in the same time LNG do.

Table 2. Comparison of emission of harmful substances [5]

Emissions	MGO 0.1%S *	LNG	LNG less emissions
NO <sub>x</sub>	8-11 g/kWh	2 g/kWh	85-90%
CO <sub>2</sub>	580-630 g/kWh	430-480 g/kWh	15-20%
SO <sub>x</sub> , PM	0.4 g/kWh	0 g/kWh	100%

\*Sulphur limit comply with MARPOL convention Annex VI

Second advantage of LNG is in the actual price and energy equivalent price. LNG is cheaper than marine fuels taking into account LHV (lower heat value) as total cost of energy (Table 3) [1].

Table 3. Energy price equivalent for LNG and MGO

LNG €/t	MGO €/t	LNG EUR/GJ	MGO EUR/GJ
640	696	11.70	16.30
696	696	12.72	16.30
720	696	13.16	16.30
885	696	16.18	16.30

Assuming different price scenarios for LNG and comparing with the current price of MGO in the port of Rotterdam it can be seen that even price of LNG is more expensive than MGO, it has energy price advantage.

### LNG bunker price analysis

The main concern of LNG bunkering stakeholders is about the future price of LNG, whether it will remain competitive to the other alternatives as the price is the main driver for switching to LNG technology and providing necessary infrastructure. In the future LNG bunker price will depend on regional market LNG import price and the LNG bunker price in particular ports will additionally depend on supply chain costs in particular port and infrastructure cost including handling and transshipment of LNG. As well as the price will depend on LNG bunkering demand which influence infrastructure costs and the price could be dependent on cooperation between neighbour ports using the same supply chain to minimize the supply costs of LNG. [6]

It is impossible at this moment to provide a precise statement of the cost of LNG bunker price. The costs that can be agreed will emerge from ongoing development and commercial processes and will vary over time.

At the moment most of the international natural gas trade including LNG tends to be more long term orientated not as oil products and where the price of natural gas is agreed as formula indexed to crude oil price ensuring favourable relationship between competing products. The main reason of closing long term contracts is that natural gas sellers, buyers and users has to make significant investments in dealing with natural gas which they would like be able to refund. Most likely long term contracts are suitable for the ship owners or ship operators to ensure predictable supply terms in case, if there are limited suppliers of LNG bunker in the market, but possibly there could be also short term contracts. Such type of contracting could become possible if LNG bunkering will be widely established with a multitude LNG suppliers and buyers. [3, 7]

The forecast of LNG bunker price in particular port is difficult due to its high dependence on demand which is unpredictable. But there could be made general assumption of LNG bunkering price idea based on historical development of crude oil and marine fuels. [8, 10] In the time scale the fluctuation of bunker fuels was greatly.

During the last decade the price of bunker fuels was volatile. It can be seen from the Figure 2. that in the last decade the price of HFO increased up to 100%. Increase of MGO was about 40% and Brent oil about 52%. The price of LNG was less than other marine fuels for whole historical period except few months when the price was higher than HFO price. As well the price of LNG is less volatile than other fuels. Because of the strong correlation among LNG and MGO it is predicted that in the future the difference between these two fuel prices will stay stable which is favourable for ship owners and bunker suppliers in decision making process.

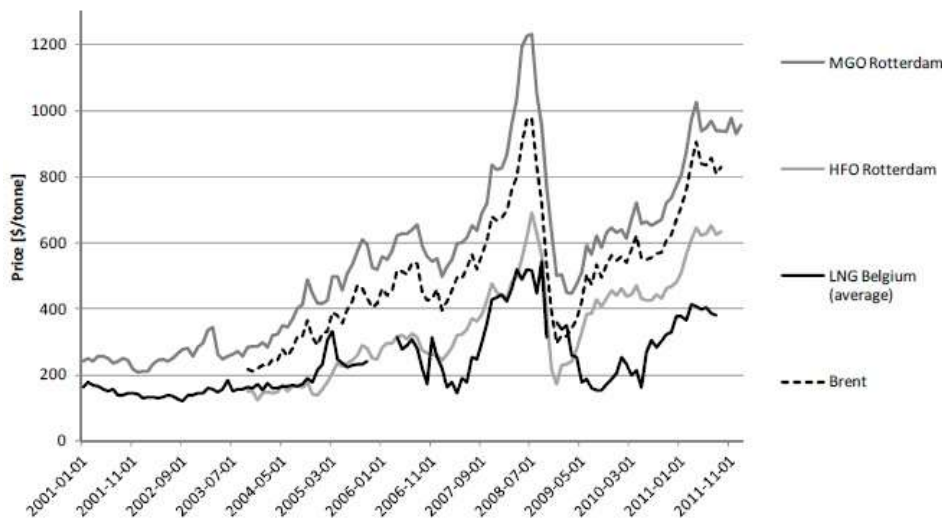


Figure 2. Historical prices in USD/tonne of HFO, MGO, LNG (average of all locations in Belgium) and Brent oil. [10]

The future LNG price from the main European import terminals was forecasted. First, it was forecasted crude oil price up to 2030. Then future LNG price was forecasted according to historical correlation between crude oil. The average future HFO price of 520 €/t was estimated and then three possible LNG import price scenarios were derived from estimated HFO price and possible global LNG production and demand (Table 4).

Table 4. LNG import price scenarios [10]

LNG price development scenarios	LNG import price from regional terminal €/t
High production/Low demand	315
High production/Medium demand	440
High production/High demand	570

### Optimal size of LNG bunkering ship

It is predicted that, at the first stage Ro/Ro ships will be the first using LNG technology. It was suggested that for the east Baltic ports LNG bunkering ships size should be from 800m<sup>3</sup> to 1200m<sup>3</sup> considering the possibility to bunker at least two Ro/Ro ships. [11] To conduct the technically economic study it was compared two possible bunkering ship sizes respectively 800m<sup>3</sup> and 1200m<sup>3</sup>. The price idea of LNG bunkering ships by one German shipbuilding company was assumed 12 000 000 € for the 800m<sup>3</sup> and 15 000 000 € for the 1200m<sup>3</sup> bunkering ship. Assuming that infrastructure cost for LNG terminal on standalone bases (investment only in storage and transshipment without costs of LNG bunkering ships and tank trucks) is 100 € per tonne of LNG import price for LNG bunkering ship was estimated (Table 5).

Table 5. LNG import price for bunkering ship

LNG import price from regional terminal €/t	Infrastructure cost €/t	LNG import price for bunkering ship €/t
315	100	415
440	100	540
570	100	670

Based on given LNG bunkering ships investment costs (CAPEX), operating expenses (OPEX) and expected interest NPV and payback period was calculated for technically economic analysis to opt which LNG bunkering ship would be optimal. Calculations have been made according to six assumed LNG price scenarios according to LNG bunkering ship import prices, end-user prices and yearly bunkering pattern (Figure 3, 4, 5, 6.) [12].

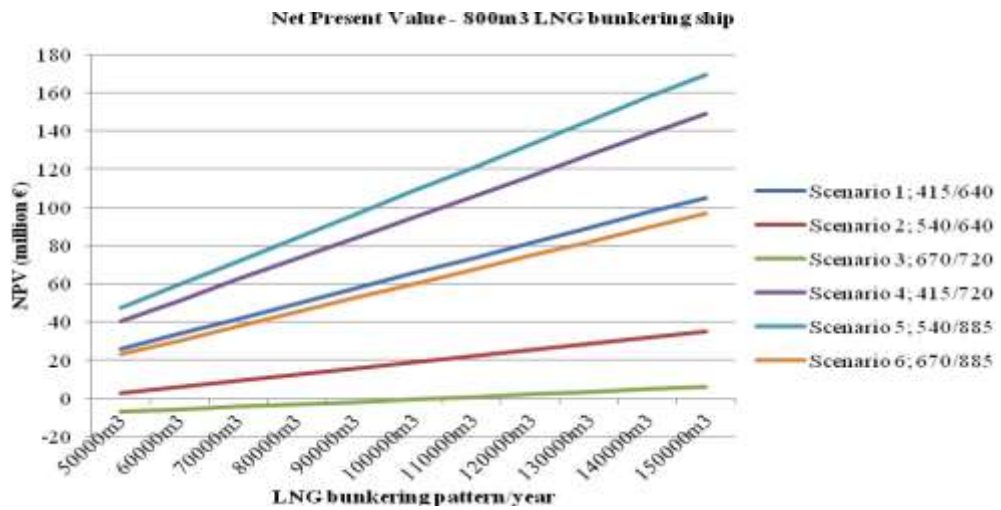


Figure 3. NPV for 800m<sup>3</sup> LNG bunkering ship

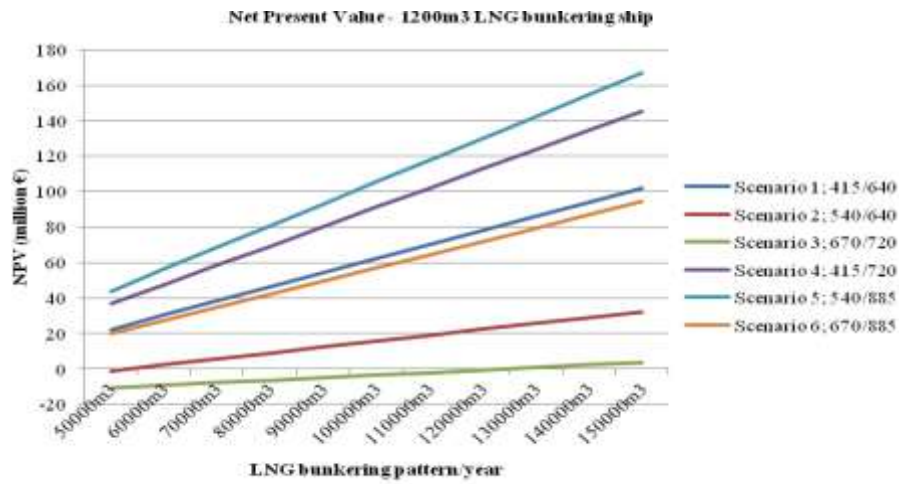


Figure 4. NPV for 1200m<sup>3</sup> LNG bunkering ship

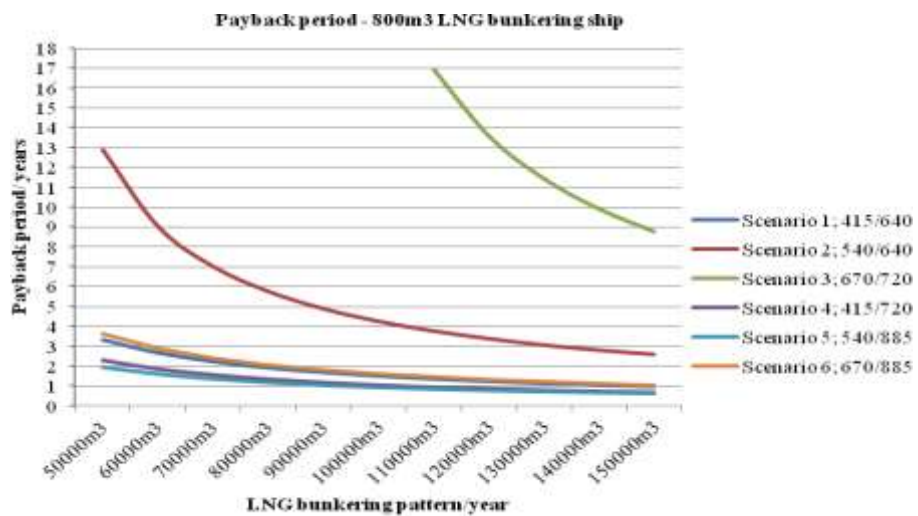


Figure 5. Payback period for 800m<sup>3</sup> LNG bunkering ship

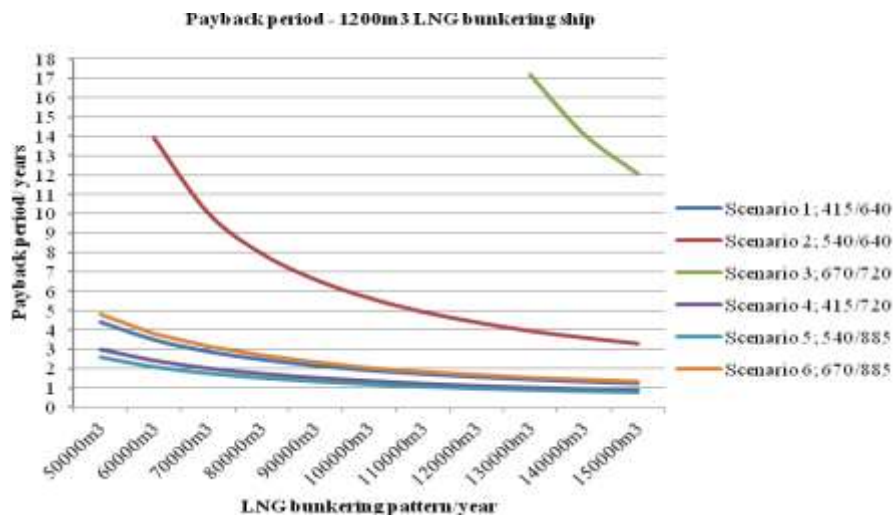


Figure 6. Payback period for 1200m<sup>3</sup>LNG bunkering ship

## Conclusions

1. The technologies for ships, ship engines and storage facilities on-board for the ships running on LNG and CNG are available and tested. As well the technologies for LNG and CNG storage on-shore and further distribution are available and tested.

2. LNG bunkering business depends on demand and upcoming environmental regulations as any corrections may be vital for LNG bunkering in terms of lack of demand in case of bunkering infrastructure already is in place.

3. To create the demand LNG infrastructure stakeholders have to ensure sustainable supply and stable price offer.

4. LNG bunkering infrastructure and technology projects financial support from EU side is paramount and at least one LNG bunkering pilot project has to be completely EU financed.

5. LNG bunkering ship optimal size for Baltic region operations is in the range between 1100m<sup>3</sup> to 1300m<sup>3</sup>.

## References

1. Andreola, M. The use of LNG as fuel for propulsion on board merchant ships. Rolls Royce Marine, European Fuel Conference, Paris, March 2011.
2. Basic Properties of LNG. GIIGNL Information Paper No. 1, France, 2011.
3. Developing LNG as a clean fuel for ships in the Baltic and North Seas. MAGALOG, December 2008.
4. Gas tanker familiarisation course.
5. Herdzik, J. Consequences of using LNG as a marine fuel. Journal of KONES Powertrain and Transport, Vol. 20, No. 2, 2013.
6. Johan, A. The difficult choice. LNG bunkering summit, White Smoke Consulting, Sweden, 2013.
7. LNG fuelled ships as a contribution to clean air in harbours. CNSS, May 2013.
8. LNG Market Perspective, TRI-ZEN, January 2012.
9. Natural Gas for Marine Vessels. U.S. Market Opportunities. Report prepared by M. J. Bradley & Associates LLC, American Clean Skies Foundation, April 2012.
10. North European LNG Infrastructure project: a feasibility study for an LNG filling station infrastructure and test of recommendations. Trans European Transport Network, Danish Maritime Authority, 2012.
11. Paulauskas, V. LNG bunkering – Klaipeda Case. Klaipeda Shipping Research Centre.
12. Skrejija, O. Technical and economic study of natural gas as ship's bunkers. In: Maritime Transport and Infrastructure – 2014. Proceedings of the 16<sup>th</sup> international conference (Riga, Latvia, April 24-25, 2014, Latvian Maritime Academy), 2014.
13. Van Tassel, G. W. Introduction to LNG as a Maritime Fuel. Argent Maritime Companies, 2012.
14. Бармин, И. В., Кунис, И. Д., Сжиженный природный газ вчера, сегодня, завтра. Москва: издательство МГТУ им. Н. Э. Баумана, 2009.



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