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PROCJENA I KONTROLA OPERATIVNIH RIZIKA NA BRODU U SKLADU S ISM PRAVILNIKOM

ASSESSMENT AND CONTROL OF OPERATIONAL RISKS ON BOARD SHIPS IN ACCORDANCE WITH THE ISM CODE

SAŽETAK

U svrhu sprječavanja neželjenih događaja na brodu važno je procijeniti situacije koje mogu uzrokovati nesreće ili oštećenje zdravlja, imovine ili morskog okoliša. Sustavnim promatranjem i analizom različitih radnih operacija, moguće je provesti odgovarajuće mjere zaštite te izbjeći ozbiljnije, neželjene posljedice.
Prijevoznik i zapovjednik odgovorni su za planiranje, organizaciju i provođenje procjene rizika na brodu kako to zahtijeva najnovija izmjena (2010) ISM pravilnika (International Safety Management Code). Da bi osigurao djelotvornu provedbu, prijevoznik mora definirati i provoditi sustav procjene rizika na strateškoj razini.
U ovome radu diskutira se metodologija procjene rizika i kategorizacija rizika s obzirom na posljedice, predložen je algoritam procjene elemenata rizika i metodologija pripreme plana za kontrolu rizika vezane za radne aktivnosti na brodu.

***Ključne riječi*:** *procjena rizika, kontrola operativnog rizika, ISM pravilnik*

SUMMARY

To prevent unwanted events on board ships, it is important to assess situations which may cause accidents or damage to health, properties or sea environment. By systematically mapping different work operations, effective measures may be implemented and serious consequences may be avoided.
The ship owner and the master are responsible for planning, organizing and the carrying out of risk assessments on board ships as required by the latest amendments (2010) to the ISM Code. To ensure smooth implementation, the shipping company needs a risk assessment system at a strategic level.
This paper discusses the methodology of risk assessment and categorization of risks considering the consequences, an algorithm of the elements of risk assessment is suggested along with the methodology for the preparation of a risks control plan related to work activities on board ships.

***Key words*:** *risk assessment, control of operational risks, ISM Code*

1. UVOD

Usprkos značajnom napretku učinjenom unutar različitih zemalja i industrije, još uvijek postoje nedoumice i pogrešna tumačenja glede upravljanja rizicima u poslovanju te mnoštvo različitih metoda kontrole rizika. Radi postojanja oprečnih mišljenja i preporuka stručnjaka kao i mnogobrojnih modela kontrole rizika, vrlo je teško dogovoriti općeprihvatljive standarde.

U ovome radu autori daju specifično tumačenje metodologije procjene rizika i pripreme plana za kontrolu rizika u jednom segmentu poslovanja pomorskog prijevoznika. Valja naglasiti da se u radu koristi izraz prijevoznik kojim se objedinjuju izrazi vlasnik broda, brodar ili osoba koja sklapa ugovor s naručiteljem prijevoza.

Rizici koji se pojavljuju u poslovanju pomorskog prijevoznika mogu se definirati kao budući, neizvjesni događaji koji su neovisni od isključive volje prijevoznika ili pomorca koji obavlja određeni posao.

Primjerice, prema ISM pravilniku (Međunarodni pravilnik o upravljanju sigurnošću, engl. International Safety Management ISM Code) [5] svaki prijevoznik dužan je osigurati valjane uvjete rada svojim pomorcima i ostalim osobama na brodu uz primjenu određenih radnih načela koja uključuju i procjenu rizika kao i mogućnost smanjivanja istih. Stoga, svaki član posade na brodu mora obavijestiti nadležne osobe, a oni prijevoznika, ukoliko postoji značajan rizik narušavanja sigurnosti ljudi, broda ili okoliša, te povrede uvjeta rada i radnih postupaka. Prijevoznik mora osigurati da su radna načela učinjena s ciljem poboljšanja zaštite na radu svojih djelatnika te zaštite od rizika koji pri obavljanju određenog posla postoji [5].

Iz navedenog proizlazi da je prijevoznik, nakon učinjene procjene rizika, dužan ponavljati procjenu ukoliko postoji i najmanja sumnja u vezi s promjenom uvjeta rada posade na brodu ili poslovanju, odnosno ako prijašnji uvjeti više ne vrijede.

2. METODOLOGIJA PROCJENE RIZIKA

Procjena rizika smatra se preciznim proučavanjem/istragom određene radnje/čina koja može prouzročiti štetu, da bi se donijele valjane

1. INTRODUCTION

Despite a significant progress that has been made within the different countries and industries, there are still doubts and misrepresentations regarding risk management in business and many different methods of risk control. Because of the existence of conflicting opinions and recommendations of experts as well as the many models of risk control, it is very difficult to agree on generally acceptable standards.

In this paper the authors give a specific explanation of the methodology of risk assessment and preparation of a plan for controlling risks in a segment of maritime transport. It should be noted that the paper uses the term carrier which incorporates the terms of the ship owner, ship operator or the person who signs a sea transportation contract with the charterer.

The risks that arise in the business of maritime transport can be defined as future, uncertain events which are independent of the exclusive will of the carrier or seaman who performs a specific job.

For example, in accordance with the International Safety Management "ISM" Code [5] each carrier shall ensure proper working conditions for seafarers and other persons on board a ship through the application of certain business principles that include risk assessment and the possibility of reducing them. Therefore, each crew member on board a ship must notify the responsible person on board a ship, and he should notify the carrier, if there is a significant risk of compromising the security of people, ships or the environment, and violations of working conditions and work practices. The carrier must ensure that the working principle was made to improve the safety of its employees and to protect against the risks that exist in performing a particular job [5].

Consequently, the carrier, following a risk assessment, should go over the risk assessment if there is any doubt about the change in the working conditions on board a ship or in business, or if the previous conditions are no longer valid.

2. THE METHODOLOGY OF RISK ASSESSMENT

Risk assessment is considered to be an accurate study / investigation of certain working

odluke, povećao oprez prilikom obavljanja istih te izbjegle eventualne štete koje mogu nastupiti.

Procjenom se najprije moraju utvrditi opasnosti koje trenutno postoje u radnom postupku ili poslovanju, a zatim i sve druge čimbenike koji mogu utjecati na povećanje ili smanjenje rizika. Procjena mora sadržavati i odgovarajuće mjere opreza u svrhu suzbijanja rizika, kao što su radne dozvole, ograničena područja, te upotreba znakova upozorenja kao i osobne opreme za zaštitu na radu.

U stvarnosti nema striktno određene forme kako procjena rizika mora biti poduzeta, već postoje samo smjernice koje ovise o vrsti poslovanja prijevoznika, vrsti broda, prirodi operacije/radnje koja se kani provesti te vrsti i opsegu opasnosti koje pri tom postoje. Osnovna namjera je da postupak bude jednostavan, ali smislen i efektivan.

Od procjene se ne očekuje da sadrži popis rizika koji se ne može predvidjeti [9]. Prijevoznika je dužan da procjenom rizika pokrije radne postupke u kojima sudjeluju, ne samo vlastiti zaposlenici na brodu, već i osobe koje nisu njegovi zaposlenici, a rade ili borave na brodu. Ovdje se misli na boravak broda npr. u suhom doku ili u luci kad na brodu boravi određen broj ljudi koji nisu članovi posade. Ovo znači da je prema ISM pravilniku, prijevoznik dužan formu i način provedbe procjene rizika uvrstiti u svoj postojeći sustav upravljanja sigurnošću.

Procjena rizika radnih postupaka na brodu obavlja se neposredno prije početka određenog posla [2], ukoliko za takav posao do tada procjena rizika nije izrađena. Ukoliko se radnja ponavlja, a procjena rizika je prethodno već urađena, tada u nju moramo uključiti nove te preispitati sve njezine postojeće stavke ne bi li utvrdili je li eventualno došlo do promjene uvjeta rada, odnosno novih opasnosti koje sada prijete. U grafikonu 1. dan je algoritam procjene elemenata rizika.

Procjena rizika treba biti što realnija. Valja imati na umu da zaposlenici mogu imati korisne i važne iskustvene doprinose [6]. To uključuje osobna iskustva i znanja o povredama, incidentima i nezgodama tijekom određenih radnih aktivnosti, te relevantna izvješća ili opće znanje o uvjetima rada vezanih za određene aktivnosti na brodu. Statistika je još jedan koristan alat u otkrivanju neželjenih događaja.

procedures / procedures that can cause damage, in order to adopt valid decisions, increase vigilance when carrying out the procedures and to avoid any damage that may occur.

The assessment must first identify the dangers that currently exist in the work process or operation, then all the other factors which might influence, increase or decrease risks.

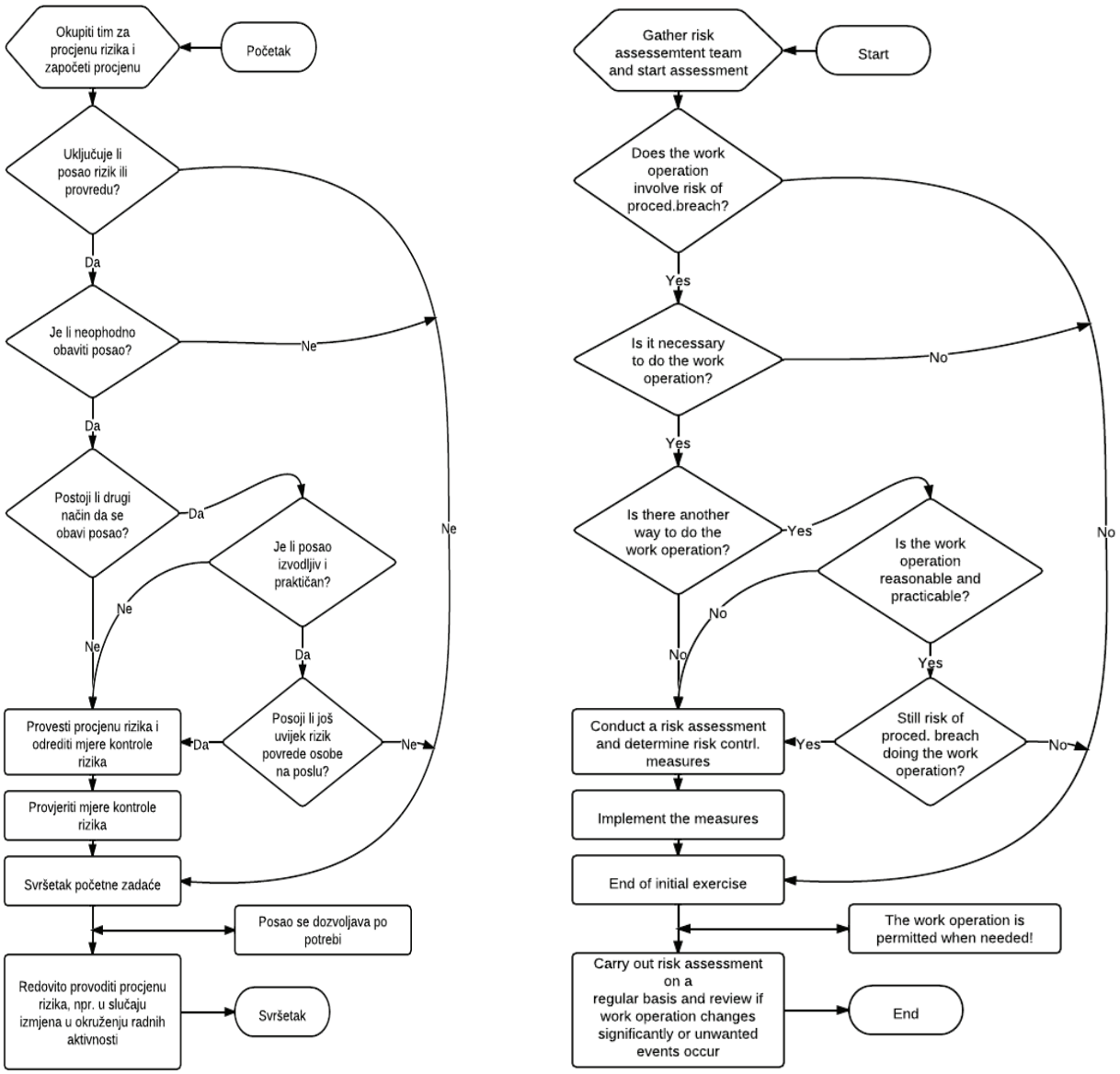
The assessment must include appropriate precautionary measures to combat risks, such as work permits, restricted areas and the use of warning signs as well as personal protective equipment at work.

In reality there is no strictly defined forms on how a risk assessment must be undertaken, but there are only guidelines, which depend on the type of business in which the carrier is involved, the type of ship, nature of operations / actions to be carried out and the type and extent of the dangers that exist at the same time. The basic intention is that the procedure is simple but meaningful and effective.

Risk assessment is not expected to contain a list of risks that cannot be predicted [9]. However, the carrier is expected to ensure that the persons who are not its employees / members of the crew but are working on board a ship or staying as passengers, be covered by risk assessment considering the (work) processes on board a ship in which they participate. This refers, e.g., to the ship's stay in dry dock or in port when a certain number of persons who are not members of the crew, work or stay on board. This means that in accordance with the ISM Code, the carrier shall include the form and method of conducting risk assessments in their existing safety management system.

A risk assessment of a work operation on board a ship is performed immediately before the start of the operation [2], if, for such an operation, by then, a risk assessment is not made. If the working operation is repeated and a risk assessment has already been made, then it must include the new and all of its existing reexamined items in order to determine whether there is a possible change in the working conditions, and possible new dangers. Graph 1 outlines the risk assessment algorithm:

The risk assessment should be as realistic as possible. It should be borne in mind that employees may have a useful and important empirical contribution [6]. This includes personal



Grafikon 1. Algoritam procjene elemenata rizika
Graph 1 *Algorithm for assessing risk elements*

3. RAZVRSTAVANJE RADNIH AKTIVNOSTI S OBZIROM NA RIZIČNOST

Prilikom procjene rizika osnovno je utvrditi te prikupiti sve informacije o poslovima i njihovim fazama koje se trebaju izvršiti pojedinačno, a zatim ih grupirati na prikladan način.

Pritom valja skupiti sve potrebne informacije uključujući:

- lokacije na brodu gdje se poslovi obavljaju
- faze obavljanja poslova
- planirano i neplanirano održavanje
- definirati radnje (ukrcaj/iskrcaj tereta).

experiences and knowledge about the injuries, incidents and accidents during certain work activities, and relevant reports or general knowledge of conditions related to certain activities on board a ship. Statistics are another useful tool in detecting adverse events.

3. CLASSIFICATION OF WORK ACTIVITIES DUE TO RISK

When assessing risk, it is essential to identify and collect all information about work operations and their phases to be carried out individually and then group them in an appropriate manner.

Također, informacije o svakom poslu uključuju:

- učestalost kao i vrijeme obavljanja radnje
- moguće lokacije obavljanja posla
- osobe inače zadužene za obavljanje posla
- ostale osobe uključene u obavljanje posla
- uvježbanost osoblja za obavljanje posla.

Radi što jednostavnije identifikacije rizika, preporuča se [10] rizike podijeliti u grupe prema području djelovanja, primjerice: mehanički, električni, fizički, radijacijski, požar i eksplozija, kemijski, biološki i psihološki.

Nadalje, valja ustvrditi te kategorizirati rizike u ovisnosti o postojećim radnim opasnostima, primjerice:

- pad osobe sa visine
- pad alata, materijala sa visine
- nedostatan slobodan prostor
- nedostatna ventilacija
- opasnosti od mehaničkih ili električnih strojeva prilikom puštanja u pogon, rada, održavanja, preinaka, popravaka
- opasnosti na pogonu, strojevima koje mogu uzrokovati njihovo oštećenje ili potpuni gubitak
- opasnosti prilikom rukovanja materijalima, strojevima ili uređajima
- opasnosti od prekomjerne izloženosti štetnim tvarima.

Navedena lista rizika nije konačna, već se razvija/ proširuje ovisno o posebnostima konstrukcije, namjene i kretanja broda te posebnostima poslovanja prijevoznika. Najučinkovitiji način smanjivanja rizika jest njegova potpuna eliminacija no, to je u stvarnosti često neostvarivo uz razumni utrošak resursa (uloženih sati ljudskog rada i materijalnih sredstava).

4. KATEGORIZACIJA RIZIKA S OBZIROM NA POSLJEDICE

Procjena rizika nastupa, a određene (negativne) posljedice mogu se utvrditi ovisno o:

- žestini/težini potencijalne posljedice
- vjerojatnosti nastanka posljedice.

All necessary information should be gathered, including:

- location on the ship where the work operations are done,
- phases of work operations,
- planned and unplanned maintenance,
- define activities (loading / unloading).

Information about each work operation include also:

- the frequency and time of the activity,
- possible performance site,
- a person normally responsible for performing the work,
- other persons involved in performing the work,
- staff familiarization and training for the activity.

In order to easily identify the risks, it is recommended [10] to divide risks into groups according to the area of impact, such as: mechanical, electrical, physical, radiation, fire and explosion, chemical, biological and psychological.

Moreover, one should determine and categorize the risks depending on the existing operating risks, such as:

- fall of person from heights,
- fall of tools, materials,
- insufficient free space,
- insufficient ventilation,
- the risk of mechanical or electrical machinery during commissioning, operation, maintenance, alteration, repair,
- danger to the plant, machinery that can cause them damage or total loss,
- hazards associated with handling materials, machinery or equipment,
- dangers of excessive exposure to harmful substances.

The above list of risks is not exhaustive, but is developed / expanded depending on the peculiarities of construction, use and movement of the ship and the specifics of the business of the carrier. The most effective way to reduce risk is its complete elimination but, in reality, it is often impossible with a reasonable expenditure of resources (cost of man hours and material resources).

Tablica 1. Primjer kategorizacije težine nastale negativne posljedice
Table 1 *Example of categorization of the resulting negative consequences*

Kategorija *Harm category*	**Neznatna posljedica** *Slight harm*	**Umjerena posljedica** *Moderate harm*	**Posljedica najvećih razmjera** *Extreme harm*
Zdravlje *Health*	Smetnje i iritacije, privremeno oštećenje zdravlja koje uzrokuje nelagode *Nuisance and irritation, temporary ill health leading to discomfort*	Slabljenje sluha, upala kože, astma,oštećenje zdravlja koje dovodi do stalnih lakših nesposobnosti Partial hearing loss, dermatitis, asthma, work related upper limb disorders, ill health leading *to permanent minor disability*	Karcinom, opake smrtonosne bolesti, trajni invaliditet *Acute fatal diseases, severe life shortening diseases, permanent substantial disability.*
Sigurnost *Safety*	Površinske ozljede: lagane posjekotine, modrice, nagnječenje, iritacija očiju od prašine *Superficial injuries, minor cuts and bruises, eye irritation from dust*	Razderana rana, opekline,udarci,uganuće, lakše frakture *Lacerations, burns, concussion, serious sprains, minor fractures.*	Amputacija, teške frakture, trovanje, višestruke ozljede, smrtonosne ozljede Fatal injuries, amputations, multiple injuries, major fractures.

Ove dvije komponente moraju biti prosuđene neovisno. Pri utvrđivanju potencijalne posljedice, sljedeće treba uzeti u obzir:

- dijelove sustava koji su zahvaćeni
- priroda same posljedice, i stupanj opasnosti.

Primjer kategorizacije posljedice, koja se bazira u tri grupe, dana je u tablici 1.

S ciljem utvrđivanja vjerojatnosti posljedice adekvatne mjere opreza trebaju biti razmotrene. U tu svrhu koriste se upute i liste provjere [3], prema kojima je potrebno procijeniti stavke:

- broj osoba koje su izložene opasnosti
- učestalost i ukupno vrijeme trajanja izloženosti
- posljedica prekida opskrbe energijom i vodom
- posljedice prekida opskrbe pogonom, strojnim pogonom te sigurnosnih uređaja
- izloženost elementarnim nepogodama
- stupanj zaštite koju pružaju osobna zaštitna sredstva, kao i njihove nedostatke
- mogućnost nesigurnih/opasnih radnji osoba koje:
  - nisu upoznate s opasnostima
  - nemaju znanje, fizičku sposobnost i vještine za obavljanje određenog zadatka
  - podcjenjuju rizike kojima su izloženi
  - podcjenjuju praktičnost i korisnost metoda zaštite na radu.

4. CATEGORIZATION OF RISKS REGARDING THE CONSEQUENCES

In a risk assessment of an occurrence, certain (negative) effects can be determined based on:

- severity / potential severity of consequences
- probability of occurrence of the consequences.

These two components must be judged independently. In determining the potential consequences, the following should be considered:

- parts of the system that are affected
- the nature of the consequences, and the degree of danger.

An example of the consequences categorization, based on three groups is given in Table 1.

In order to determine the probability of the consequences, adequate precautions should be considered. For this purpose, it is recommended to use instructions and checklists [3], according to which it is necessary to assess the following items:

- number of persons exposed to danger,
- frequency and total duration of exposure,
- consequences of power and water outages,
- consequences of the interruption of the supply plant, machinery and safety devices,
- exposure to natural disasters,
- degree of protection provided by personal protective equipment, as well as their shortcomings,

U tablici 2. daje se kategorizacija nastupa opasnosti koja je podijeljena na četiri grupe redom: vrlo vjerojatne, vjerojatne, malo vjerojatne i vrlo malo vjerojatne.

U sljedećoj tablici navodi se jednostavna metoda procjene rizika prema mogućoj težini posljedice i vjerojatnosti kako je opisana u tablici 1.

- possibility of unsafe / dangerous actions of persons who:
  - are not familiar with the hazards,
  - have the knowledge, physical ability and skill to perform a specific task,
  - underestimate the risks they are exposed to,

Tablica 2. Primjeri kategorizacije vjerojatnosti nastupa opasnosti
Table 2 *Examples of risk categorization of the probability of appearance*

Kategorija Vjerojatnosti opasnosti ***Categories for likelihood of harm***	**Vrlo vjerojatne** ***Very likely***	**Vjerojatne** ***Likely***	**Malo vjerojatne** ***Unlikely***	**Vrlo malo vjerojatne** ***Very unlikely***
Vrsta događaja *Typical occurrence*	Događaj koji osoba doživi jednom u svakih šest mjeseci *Typically experienced at least once every six months by an individual*	Događaj koji osoba doživi jednom u svakih pet godina *Typically experienced once every five years by an individual*	Događaj koji osoba doživi jednom u svom radnom vijeku *Typically experienced once during the working lifetime of an individual*	Manje od 1% događaja / osobi kojoj se ostvari za trajanja radnog vijeka *Less than 1 % chance of being experienced by an individual during his working lifetime*

Tablica 3. Procjena rizika ovisno o opasnosti
Table 3 *Risk assessment based on harm*

Vjerojatnost opasnosti ***Likelihood of harm***	**Stupanj opasnosti** ***Severity of harm***		
	Neznatna šteta *Slight harm*	Umjerena šteta *Moderate harm*	Šteta najvećih razmjera *Extreme harm*
Vrlo vjerojatne *Very likely*	VRLO MALI RIZIK *VERY LOW RISK*	VRLO MALI RIZIK *VERY LOW RISK*	VISOKI RIZIK *HIGH RISK*
Vjerojatne *Likely*	VRLO MALI RIZIK *VERY LOW RISK*	SREDNJI RIZIK *MEDIUM RISK*	VRLO VISOKI RIZIK *VERY HIGH RISK*
Malo vjerojatne *Unlikely*	MALI RIZIK *LOW RISK*	VISOKI RIZIK *HIGH RISK*	VRLO VISOKI RIZIK *VERY HIGH RISK*
Vrlo malo vjerojatne *Very unlikely*	MALI RIZIK *LOW RISK*	VRLO VISOKI RIZIK *VERY HIGH RISK*	VRLO VISOKI RIZIK *VERY HIGH RISK*

Izvor / ***Source*****:** [8], str. 114

Valja naglasiti da se pod vrlo mali rizik podrazumijeva da je rizik sveden na najmanju moguću razumnu razinu.

U sljedećem koraku se postavljaju kriteriji kategorizacije rizika te razlučuju i odjeljuju prihvatljivi od neprihvatljivih rizika. Da bi se to učinilo, potrebno je najprije utvrditi kriterije prihvatljivosti rizika koji osiguravaju osnovu dosljednosti procjene rizika [3]. To uključuje konzultacije s predstavnicima djelatnika kao i

- underestimate the practicality and usefulness of the safety procedures at work.

Table 2 provides a categorization of performance risks, which is divided into four groups respectively: very likely, likely, unlikely and very unlikely.

The following table lists the simple method of risk assessment according to the severity of possible consequences and probabilities as described in Table 1.

Tablica 4. Stupanj procjene rizika
Table 4 *Degree of risk assessment*

Kategorija rizika *Category of risk*	**Procjena tolerancije rizika** *Evaluation of tolerability*
Vrlo mali rizik *Very low*	Prihvatljiv *Acceptable*
Mali rizik *Low*	Podnošljiv *Tolerable*
Srednji rizik *Medium*	Rizici koji se moraju smanjiti i svesti *Risks that should be reduced so that*
Veliki rizik *High*	Na podnošljive ili prihvatljive *they are tolerable or acceptable*
Vrlo veliki rizik *Very high*	Neprihvatljiv *Unacceptable*

Izvor / *Source*: [8], str. 116

ostalih interesnih grupa, a nadasve je potrebno uzeti u obzir zakonske odredbe te preporuke zakonodavnih i stručnih organizacija. Jednostavan prikaz procjene tolerancije rizika, koja je podijeljena na pet grupa, prikazana je u tablici 4.

5. PRIPREMA PLANA ZA KONTROLU RIZIKA

Nakon utvrđivanja stupnja rizika, valja odlučiti koje radnje će se poduzeti da bi unaprijedili sigurnost radnih postupaka ili sustav poslovanja [8], uzimajući u obzir mjere opreza i kontrole koje su već aktivne. Tablica 5. prikazuje takav jedan mogući pristup.

Prilikom odabira mjera kontrole rizika mora se voditi računa o sljedećem:

- mogućim gubicima
- zamjeni s nečim manje opasnim ili manje rizičnim
- izolaciji/zaštiti ljudi
- sigurnosnim uvjetima rada te smanjivanju stupnja rizika na prihvatljivu razinu
- pisanim postupcima koji su svima dobro poznati i razumljivi
- adekvatnom nadzoru
- utvrđivanju potrebne obuke
- informacijama, izvještavanju i podučavanju
- osobnoj zaštitnoj opremi.

Primjerice, kao dodatak planu za izvanredno stanje i evakuaciju, nužno je osigurati i svu adekvatnu sigurnosnu opremu namijenjenu za specifičnu opasnost.

It should be noted that ”under a very low risk” means that the risk is kept to a minimum reasonable level.

The next step is setting up criteria for the risk categorization and differentiating and separating acceptable from unacceptable risks. To do this, one must determine eligibility based on a risk to ensure the consistency of risk assessment [3]. This includes consultation with representatives of employees and other stakeholders and above all take into account the statutory provisions and legislative recommendations, and professional organizations. A simple evaluation of risk tolerability, which is divided into five groups, is shown in Table 4:

5. PREPARATION OF A RISK CONTROL PLAN

After determining the level of risk, it should be decided what actions will be taken to improve the safety of work practices or operational procedures [8], taking into account the precautionary measures and controls that are already active. Table 5 shows that one possible approach.

When selecting risk control measures, the following must be taken into account:

- possible losses,
- replace with something less dangerous or less risky,
- isolation / protection of people,
- safe working conditions and reduction of the level of risk to an acceptable level,
- written procedures that are well-known and understood,

Tablica 5. Osnovni plan kontrole rizika
Table 5 *Basic plan for risk control*

Postupak i vremenski rok/razdoblje ***Risk level – the procedure and time limit / period***	
VRLO MALI *Very low*	Ovi rizici se smatraju prihvatljivima. Nikakve daljnje radnje nisu potrebne, osim onih kojima se održavaju redovne mjere sigurnosti. *These risks are considered acceptable. No further action is required, except those which maintain regular control measures.*
MALI *Low*	Dodatne mjere sigurnosti nisu potrebne, osim ako one mogu biti provedene pri vrlo niskim troškovima (gledano vremenski, novčano ili utrošenog napora). Radnje za daljnje smanjivanje ovih rizika su niskoprioritetne. Sporazumi i dogovori moraju se provoditi u svrhu održavanja kontrolnih mjera. *Additional control measures are not necessary, unless they can be implemented at a very low cost (as seen in time, money or effort expended). Actions to further reduce these risks are of low priority. Treaties and agreements must be implemented in order to maintain control measures.*
SREDNJI *Medium*	Potrebno je razmotriti može li se stupanj rizika smanjiti na razinu podnošljivog ili još bolje na razinu prihvatljivog, ali pritom valja uzeti u obzir mogućnost i troškove dodatnih rizika. Radnje kojima se smanjuje stupanj rizika moraju biti poduzete u definiranom razdoblju. Potrebni su i razni sporazumi/dogovori s ciljem održavanja mjera sigurnosti, osobito ako su navedenim stupnjevima rizika pridružene štetne posljedice. *It is necessary to consider whether the degree of risk can be reduced to the level of tolerable or better yet to a level acceptable, but, the possibility of additional costs and risks should be considered Actions to reduce the degree of risk must be taken within a defined period of time. Various agreements / arrangements are needed with the aim of maintaining control measures, particularly if these levels of risk are associated with adverse effects.*
VELIK *High*	Značajan napor treba poduzeti u svrhu smanjivanja rizika. Radnje kojima se smanjuje stupanj rizika moraju biti promptne, poduzete u definiranom vremenskom, te je potrebno uzeti u obzir obustavljanje i mogućnost ograničavanja djelovanja ili pak primijeniti privremene kontrolne mjere. Potrebni su i razni sporazumi/dogovori s ciljem održavanja mjera sigurnosti, osobito ako su navedenim stupnjevima rizika pridružene ekstremno štetne posljedice ili veoma štetne posljedice. *Significant effort should be taken to reduce the risk. Actions to reduce the degree of risk must be prompt, undertaken in a defined period of time, and it is necessary to consider suspension and the possibility of limiting the activity or apply interim control measures. Various agreements / arrangements are needed with the aim of maintaining control measures, particularly if these levels of risk are associated with extremely harmful consequences, or very harmful consequences.*
VRLO VELIK *Very high*	Ovi rizici smatraju se neprihvatljivima. Potrebno je značajno poboljšanje mjera sigurnosti ne bi li se rizik sveo na razinu prihvatljivog ili podnošljivog. Radnje u svrhu poboljšanja potrebno je obustaviti tek nakon što rizik promijeni kategoriju *Vrlo velik*. Ukoliko nije moguće promijeniti kategoriju rizika, planirani radovi ne smiju se izvoditi. *These risks are considered unacceptable. It is necessary to significantly improve the control measures in order to reduce the risk to a level acceptable or tolerable. The work activity should be discontinued until risk controls are implemented that reduce the risk so that it is no longer very high. If it is not possible to reduce the risk, the planned work should remain prohibited.*

Izvor / *Source*: [8], str. 118

Prema sustavu upravljanja sigurnošću u mnogim prijevozničkim firmama, za procjenu rizika za poslove na palubi odgovoran je 1. časnik palube, odnosno upravitelj stroja za poslove u stroju. Pri navedenoj procjeni obično sudjeluje tim, neovisno o kojem odjelu se radi, a uključuje časnika zaduženog za sigurnost, te članove posade koji će obavljati određeni zadatak [1]. Konačni izvještaj o procjeni te planu

- adequate supervision,
- establishing the necessary training,
- reporting, informing and teaching,
- personal protective equipment.

For example, in addition to the emergency and evacuation plan, it is necessary to ensure all the proper safety equipment designed for specific hazards.

Onboard Risk Assessment Form — **Assessment Number:**

This form is intended for assessing risks onboard and suggesting new areas to be taken into consideration to the Company's Risk assessment.

Vessel:	Date:	Place:

Please specify risk of area- *Specify All team members*

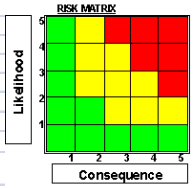
Zone *(Please tick)*			Shipboard Operation	Risk Assessment team		Signatures
Bridge	BR		Cleaning /Maintenance / Painting / Deck, hold, tank	Leader	Master	
Engine	ENG			Participant	Chief officer	
Deck	DE	v		Participant	2nd Officer	
Cargo	CA			Participant	Bosun / deck Crew	

Abbreviations
BR: BRIDGE OPERATION
ENG: ENGINE OPERATION
DE: DECK OPERATIONS
CA: CARGO OPERATIONS

Risk Assessment Checklist		
1	Hazard Descrip.	v
2	Consequence Des.	v
3	Controls In Place	v
4	Risk Evaluation	v
5	Additional Control A	v
6	Action Plan	v
7	Feedback to Comp	

Please fill the blank cells considering the rating guidelines of likelihood (L) and consequence (C) which most applies to the hazard under assessment.After multiplying likelihood and consequence rating, the risk level will be calculated using the Risk matrix provided, by marking the relevant coloured square area.

Ref.No	Hazard description (1)	Consequence Description/Safety/Environment (2)	Controls in Place (3)	Risk Evaluation (4) L	C	R	(5) Additional Control Actions *(input in case of risk above 6,R>6)*	Action Plan (6) Responsible person onboard	Timeline
1	Lack of oxygen / possible exposure to hazardous gases	Minor injury requiring first aid on board.No absence from work	Prior to entry, team to adhere to Entry into Tanks and Other enclosed spaces. Entry permit to be issued. Gas monitoring instrument to be used frequently	3	1	3			
2	Slippery Surface	Minor injury requiring first aid on board.No absence from work	PPE to be used. Tank to be inspected prior entering and must be as dry as possible , avoid slipping on inclined surfaces.	4	2	8	Additional training / familiarization to crew. Actions to be determined during the work meeting. Additional time to be given for better dryness of	Ch.Off.	Prior the work
3	Structural defficiencies of the tank's permanent means of access.	Minor injury requiring first aid on board.No absence from work	Permanent means of access within the tank to be inspected prior to use. Person in charge to alert team of hazards. Any open deck access manholes to be properly protected	4	2	8	Additional training / familiarization to crew. Actions to be determined during the work meeting	Ch.Off.	Prior the work
4	Inadequate ventilation	Minor injury requiring first aid on board.No absence from work	Adequate continuous ventilation to be provided.Gas monitoring instrument to be used frequently	3	1	3			
5	Inadequate illumination	Minor injury requiring first aid on board.No absence from work	Adequate illumination to be provided. Additional portable flashlights to be used.	3	1	3			
6	Inadequate coordination/ supervision/communication	Minor injury requiring first aid on board.No absence from work	Walkie talkies to be carried and have open communication with OOW. Meeting prior to entry	3	1	3			
7	Fatigue/Heat-Humidity Exposure	Minor injury requiring first aid on board.No absence from work	Crew to have adequate rest. If fatigue signs are vissible , release crew.	3	2	6			
8	⬇	...	...				...		⬇



Likelihood Levels (L)
(1) Remote: Once in lifetime
(2) Occasional: Might occur every 10-20 years
(3) Likely: Might occur every 1-10 years
(4) Probable: Might occur once a year
(5) Certain: Might occur once every 6 months

Consequence Levels (C)	
To safety (S):	To Environment:
(1) Negligible: Minor injury not requiring firs aid	(1) Negligible: <10 ltrs
(2) Minor: Minor injury requiring first aid treatment on board	(2) Minor: 10-100 ltrs
(3) Significant: Injury requiring hospitalization	(3) Significant:100-1000ltrs
(4) Critical: Single death or permanent disability	(4) Critical: 1000-10000ltrs
(5) Catastrophic: Multiple deaths	(5) Catastrophic:>10000 ltrs

Acceptable	1-6	May be acceptable; however, review task to see if risk can be reduced further.
Tolerable	7-14	Should only proceed with appropriate Master's / Management authorisation, taking into account the hazards involved or the risk should be reduced further prior to task
Intolerable	15 - 25	Task must not proceed. It should be redefined or further control measures put in place to reduce risk. The controls should be re-assessed for adequacy prior to ask commencement.

(7) Please tick, in case you consider further assessment in office is in need for specific hazard : □

Slika 1. Izvještaj o procjeni rizika i planu kontrole za poslove na palubi
Figure 1 *Example report on risk assessment and control plan for on board work operations*

Izvor: Izradili autori prema [3], str. 21.
Source: *Made by authors on the basis of [3], p.21.*

kontrole rizika potpisuje zapovjednik broda. (Slika 1).

Sve mjere kontrole rizika trebaju biti provjerene neposredno prije provedbe, postavljajući sljedeća pitanja:

- Je li mjerama kontrole stupanj rizika sveden na podnošljivi?
- Jesu li su nastupile nove opasnosti?

According to the safety management system, in many shipping companies, the chief officer is the person on board a ship responsible for assessing deck work risks, and the chief engineer for operations in the engine room. In the assessment procedure, a team is usually formed consisting of an officer in charge of safety and crew members who will perform a particular task [1]. A final report on the assessment and risk control plan is signed by the ship master (Figure 1).

- Što zaposlenici misle o preventivnim mjerama?
- Hoće li nove mjere kontrole rizika biti učinkovite u praksi?

6. PROCJENA RIZIKA NA TEMELJU VJERODOSTOJNIH I TRENUTNO VAŽEĆIH PODATAKA

Kao što je to već naglašeno u prethodnom tekstu, procjena rizika je neprekidan proces, stoga jednom napisana procjena rizika treba biti predmet periodičnih formalnih preispitivanja u svrhu potvrde da su valjanost procjene kao i mjere kontrole rizika još uvijek djelotvorne i adekvatne.

Procjenu rizika valja učiniti prije početka svakog posla, ali ne mora uvijek biti u pisanom obliku [4]. Ukoliko već postoji pisani oblik procjene rizika za neki posao, tada se može na temelju njega provjeriti mjere kontrole za sljedeći posao. Ukoliko je došlo do bilo kakvih promjena u okruženju obavljanja određene aktivnosti ili novih opasnosti tada i njih treba uvesti u već postojeći obrazac. U navedene promjene mogu se uvrstiti:

- proširenje, sužavanje ili restrukturiranje djelovanja
- premještanje odgovornosti/nadležnosti
- promjena metoda sigurnosti rada ili strukture ponašanja i načina rada
- pojavljivanje opasnog događaja.

Preispitivanje procjene rizika u detalje, i njegova kontrola za vrijeme procesa ocjenjivanja je koristan alat koji pomaže u njegovu održavanju, zakonitosti i efikasnosti procjene rizika i mjera sigurnosti.

Tek ukoliko posjedujemo kompletnu i detaljnu procjenu rizika te valjane mjere kontrole za smanjenje rizika na razinu prihvatljivog ili podnošljivog, možemo pristupiti obavljanju planiranog posla.

7. ZAKLJUČAK

Procjena rizika je detaljno i sustavno vrednovanje svih stvarnih i potencijalnih izvora opasnosti te se mora provoditi redovito. Svrha je identificirati sve razumno predvidljive rizike

All risk control measures should be checked immediately, prior to implementation, asking the following questions:

- Whether the measures to control the level of risk have been reduced to tolerable ones?
- Whether there is the occurrence of new dangers?
- What do employees think about preventive measures?
- Shall the new risk control measures be effective in practice?

6. RISK ASSESSMENT BASED ON AUTHENTIC AND CURRENT DATA

As already mentioned above, risk assessment is an ongoing process, therefore, a written risk assessment should be subject to periodic formal review to verify that the validity of the assessment and risk control measures are still effective and adequate.

Risk assessment should be done prior to any activity, but may not always be in writing [4]. If there is already a form of a written risk assessment for a work operation, then the next operation can be checked on the basis of the existing control measures. If there was any change in the environment, carrying out certain activities, or new hazards appear, they should be introduced into the already existing form. The above changes may include:

- expanding, narrowing or restructuring activities,
- transfer of responsibility / authority,
- changing the method of operation or safety structures and modes of behavior,
- occurrence of hazardous events.

A review of risk assessment in detail, and its control during the evaluation process is a useful tool that helps in maintaining it, as well as the legality and effectiveness of risk assessment and safety measures.

Only if there is a complete and thorough risk assessment and proper control measures to reduce risk to an acceptable or tolerable level, the planned work can start.

7. CONCLUSION

Risk assessment is a thorough and systematic evaluation of all actual and potential sources of

koji su povezani s radom na brodu i ustvrditi je li rizik prihvatljiv te je li potrebno definirati i primijeniti preventivne ili korektivne mjere. Procjena rizika treba dovesti do odgovarajućih radnih načela i postupka, identificirati potrebnu zaštitnu opremu i sigurnosne mjere kako bi se smanjio rizik od osobnih ozljeda, šteta na imovini i zagađenja mora i morskog okoliša. Zahtjev za procjenu rizika radnih aktivnosti na brodu dio je Rezolucije Međunarodne pomorske organizacije (International Maritime Organization, IMO) br. 808 u vezi radnog okruženja, zdravlja i sigurnosti osoba na brodu. Rezolucija mora biti uključena u sustav upravljanja sigurnošću sukladno ISM pravilniku s izmjenama i dopunama iz 2010. Na brodovima na kojima se ne zahtijeva udovoljavanje navedenom Kodeksu te ne posjeduju sukladan sustav upravljanja sigurnošću, Rezolucija treba biti dio strateškog plana.

U ovom radu diskutira se metodologija procjene rizika i kategorizacija rizika s obzirom na posljedice, predložen je algoritam procjene elemenata rizika i dano tumačenje pripreme plana za kontrolu rizika vezane za radne aktivnosti na brodu. Naglašeno je da je procjena rizika neprekidan proces, stoga treba biti predmet periodičnih formalnih preispitivanja u svrhu potvrde da su valjanost procjene kao i mjere kontrole rizika djelotvorne i adekvatne za cijelo vrijeme trajanja određenih radnih aktivnosti na brodu.

danger and must be conducted regularly. The purpose is to identify all reasonably foreseeable risks associated with work operations on board a ship and determine whether the risk is acceptable and whether it is necessary to define and implement preventive or corrective measures. The risk assessment should lead to appropriate working policies and procedures, identify the necessary protective equipment and safety measures to reduce the risk of personal injury, property damage and pollution of the marine environment. The requirement for risk assessments of work activities on board a ship is a part of the International Maritime Organization ”IMO” Resolution No. 808 regarding the working environment, health and safety of persons on board a ship. The resolution must be included in the safety management system in accordance with the ISM Code, as amended in 2010. Where there is no requirement for a safety management system, the Regulation should be part of a strategic plan.

This paper discusses the methodology of risk assessment and the categorization of risk considering the consequences, an algorithm of the risk elements assessment is given along with the interpretation for the preparation of a risk control plan related to the on board work activities. It was stressed that the risk assessment is a continuous process, therefore, it should be subject to periodic formal review to verify that the validity of the assessment and risk control measures were effective and adequate for the entire duration of specific work activities on board a ship.

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