Shipping KPI

"An Industry Initiative to enhance excellence in ship operation by setting standards for Corporate Governance"

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Document summary information

Authors and contributors

Initials	Author	Organization	Role
AM	Atle Minsaas	MARINTEK	QC Responsible
CAH	Christian August Høy	MARINTEK	Project Participant
DAN	Dag Atle Nesheim	MARINTEK	Project Participant
HS	Harald Sleire	MARINTEK	Project Manager
JAN	Jan Arthur Norbeck	MARINTEK	Project Participant

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	Who	Date
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1 Introduction

1.1 Project background

The lack of an international standard for ship management operational performance reporting has lead to a situation where many companies are defining, measuring, and reporting performance information differently. The consequences are:

- Too many different Key Performance Indicators (KPIs) which increase the risk for confusion and mistakes
- Comparison of performance between companies is difficult, if possible at all
- Difficult to mobilize organizational focus on quality improvement due to lack of aggregated measurements and available benchmarking
- New reporting requirements are emerging, especially regarding environmental issues and corporate social responsibility (CSR)
- Additional manpower is required to present the same information in different formats to many stakeholders: Onboard, in office and to external stakeholders
- Difficult to document transparent and consistent operational, HSE and CSR performance improvements in the shipping industry

In order to improve the situation, a group of leading ship management organizations and ship owning companies (The Sponsor Group) in November/December 2004 agreed to cooperate to establish a global industry standard for KPIs in the shipping industry. The members of the Sponsor Group represent a unique competence and experience ensuring that the development of the new KPI Standard should be:

- Practical to use
- A representative and transparent picture of the performance
- Economical to implement

During 2005 the company Intellectual Capital Services (ICS) performed a feasibility study proposing KPIs relevant for an industry standard (ICS 2005), and in February 2006 the Sponsor Group and MARINTEK agreed to apply for a full scale project with funding from the Research Council of Norway. The Research Council of Norway decided to fund the research and development project in June 2006.

With the funding secured, the Sponsor group, fronted by Intermanager and Wilh. Wilhelmsen ASA as the contractual partner towards the Research Council of Norway hired MARINTEK as the research partner and project manager. The objective was to develop a global industry standard

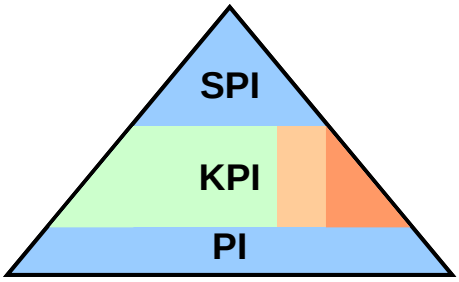
for performance measurement in ship operations. The new performance measurement standard should:

- Boost performance improvements internally in companies engaged in ship operation activities
- Provide an efficient communication platform of ship operation performance to internal and external stakeholders

A project organization was established with steering group participation from Wilh Wilhelmsen ASA, Eurasiagroup and Intermanager. Intermanager supported the project with the establishment of a KPI Working Group consisting of experienced ship managers among their members.

1.2 Introduction to the project

Based on KPIs already captured from the industry, the MARINTEK team in cooperation with Intermanager's KPI Working Group defined and described the new standard for KPIs. In addition to the KPIs, a set of high level shipping performance indexes (SPIs) for external communication was developed. The work was performed as an iterative process with several quality loops over a two years period.



The KPI standard is now well defined and described in a hierarchy where SPIs (high level indexes) are calculated from KPIs, and where KPIs are calculated from Performance Indicators (PIs). The PIs are based on data captured from a vessel or from an organisation.

It has been outside of the scope of the project to interpret the calculated KPI Values, and no recommendations are given to what is considered as good performance. These considerations need to be done in collaboration with external stakeholders in order to realize the full potential for external communication.

1.3 Structure of the document

Chapter 1 gives information about the document structure, project history and general background. Chapter 3 describes the Shipping KPI Performance Hierarchy at a concept level: What it is and how it can be utilized. Chapter 4 describes the project's development process and methodology; how the Shipping KPI Performance Hierarchy was developed and different tools that were used in the process. Chapter 5 presents the Shipping KPI Performance Hierarchy in detail and Chapter 6 present guidelines on how to use the Shipping KPI Performance Hierarchy. Chapter 7 describes areas for further research.

2 List of Abbreviations

CSR	Corporate Social Responsibility
HSE	Health, Safety and Environment
ICS	Intellectual Capital Services
ICT	Information and Communication Technology
ISM	International Safety Management (Code), Part of SOLAS.
KPI	Key Performance Indicator
RCN	Research Council of Norway
PI	Performance Indicator
PSC	Port State Control
SPI	Shipping Performance Index
WS	Workshop

3 The Shipping KPI Performance Hierarchy

The Shipping KPI Performance Hierarchy is based on three levels of indicators:

3.1 Performance Indicators

The Performance Indicators (PIs) are the building blocks giving the basis for KPI Value calculations. PIs are directly observable parameters (measurements) for each vessel under management, e.g. Absconded crew, Collision and Total number of fire incidents.

The Performance Indicators are the only elements that must be reported manually or by means of implemented ICT solutions. Focus has been to provide the hierarchy with unambiguous definitions of measurable low level parameters based on existing measurements in the industry. Each PI may be used in the calculation of several KPIs. An example is the PI 'Total number of external inspections' which is used as a denominator in the calculation of several KPI Values.

In some cases the PI Value requires an intermediate calculation of lower level parameters (as in the case of the PI Value for 'Emitted mass CO2'). How to perform the intermediate calculation as well as relevant parameters is described in the PI description.

3.1.1 Capturing PI Values

As capturing PI Values is the only manual operation it requires a more detailed description. There are two different settings to consider; namely capturing PI Values for external communication (basis for KPI and SPI calculation) and capturing PI Values for internal improvement.

For internal improvements, annual data capture will not be adequate to provide management with updated information. There are two issues to consider:

- The frequency of data capture
- The time period for which PI Values should be captured

The frequency of recalculation of KPI Values should be in line with the plan for monitoring improvement initiatives. Quarterly data capture will give the person responsible for monitoring a more accurate and up to date picture of the effects of improvement initiatives than yearly data capture. As a rule of thumb, the time period for which the PI Values should be captured should be the same as the frequency of data capture. This means that if a certain improvement initiative is planned to be monitored on a quarterly basis, the time period for which the PI Values should be captured should be 3 months. If one maintains the one year period for the KPI Value, it becomes slower (more insensitive to change) than if one use a quarterly or monthly period.

The main element for external communication of performance is the SPI. The standard reporting period for the SPIs is one calendar year. Consequently the time period for which the PI Values must be captured should be a full calendar year.

The two objectives are a bit contradicting and one has to evaluate how this can be implemented in the reporting system to ensure supporting both objectives. One method is to use the quarterly reporting and than to average PIs for the year based on the 4 quarterly reports and use this when calculating the SPI's.

3.2 Key Performance Indicators

The Key Performance Indicators (KPIs) are expressions of performance within a specific area. The KPIs can be expressed in two ways; a KPI Value which is a mathematical combination of relevant PI Values and a KPI Rating which is an expression of the KPI Value on scale between 0 and 100 where a high rating (100) is a result of high/excellent performance. Some PI Values can be included in the calculation of more than one KPI Value. Examples of KPIs are: Budget control per vessel, Drydocking planning performance and Vessel availability.

Calculation of KPI Values

The calculation of KPI Values is based on relevant PI Values. In most cases the PI Values are used directly in the KPI Value calculation. [1]

Below is an example of how to calculate the KPI Value for Flawless Port State Control Performance.

PI Values:

- PSC inspections resulting in zero deficiencies: 2
- Total number of PSC inspections: 4

KPI Value formula:

$$\frac{PSCinspect\ ion\ \_\ resulting\ \_\ in\ \_\ zero\ \_\ deficienci\ es}{Total\ \_\ number\ \_\ of\ \_\ PSC\ \_\ inpections} = \frac{2}{4} = 0.5$$

Calculation of KPI Rating

The calculation of KPI Ratings is based on the relationship between the KPI Value and a target value reflecting excellent performance. The Z parameter is used to convert the KPI Value into a

[1] One exception is in the calculation of the KPI Value for 'Crew management' where additional parameters are used to make the PI Values suitable for the calculation formula. These parameters are defined and explained in the KPI definition.

KPI Rating between 0 and 100 based on the target value. A high Rating indicates high performance.

Below is an example of how to calculate the KPI Rating for Flawless Port State Control Performance. The starting point is the KPI Value and the defined Z-value.

KPI Value: 0.5
Z-value: 100

KPI Rating formula:

Z*KPI Value = 100 *0.5 = 50

The KPI Rating is calculated to 50 (on the scale between 0 and 100). When values are above 100 or below 0 the KPI Rating is set to 100 or 0 accordingly.

3.3 Shipping Performance Indexes

The Shipping Performance Indexes (SPIs) are aggregated expressions of performance within a particular area. The SPIs are expressed as a weighted avarage of relevant KPI Ratings on a scale between 0 and 100. Some KPIs can be included in several SPIs. An example is the KPI 'Crew management' which is used in calculation of all SPI Ratings The objective of the SPIs is to give external stakeholders information about the overall performance of a vessel in specific areas.

In order to calculate a SPI Rating between 0 and 100, the following formula is applied:

SPI Rating formula: $$\frac{H*(A+B+...)+L*(X+Y+...)}{(H*n)+(L*m)}$$

Where:

H = Weighting parameter for highly relevant KPIs
L = Weighting parameter for relevant KPIs
A, B = Highly relevant KPIs
X, Y = Relevant KPIs
n = the total number of highly relevant KPIs
m = the total number of relevant KPIs

The SPI Rating is calculated by adding all KPI Ratings defined as highly relevant (H) and all KPIs defined as relevant (L) multiplied with the weighting factor. All highly relevant KPI Ratings are multiplied with the weighting parameter H. All relevant KPI Ratings are multiplied with the weighting parameter L. To ensure an SPI Rating between 0 and 100, the formula uses a

denominator with the total number of highly relevant KPIs multiplied by rating parameter H and the total number of relevant KPIs multiplied with the rating parameter L. This gives an weighted average.

Below is an example of how to calculate the SPI Rating for Navigational Performance.

KPI Ratings, Highly relevant KPIs (H):

A: Navigational incidents	80
B: Navigational deficiencies	60

KPI Ratings, Relevant KPIs (L):

X: Crew management	70
Y: Failures of critical equipment and systems	40
Z: Crew planning	45

Rating parameters value:

H: 3

L: 1

SPI Rating formula:

$$\frac{H*(A+B)+L*(X+Y+Z)}{(H*2)+(L*3)} = \frac{3*(80+60)+1*(70+40+45)}{(3*2)+(1*3)} = 64$$

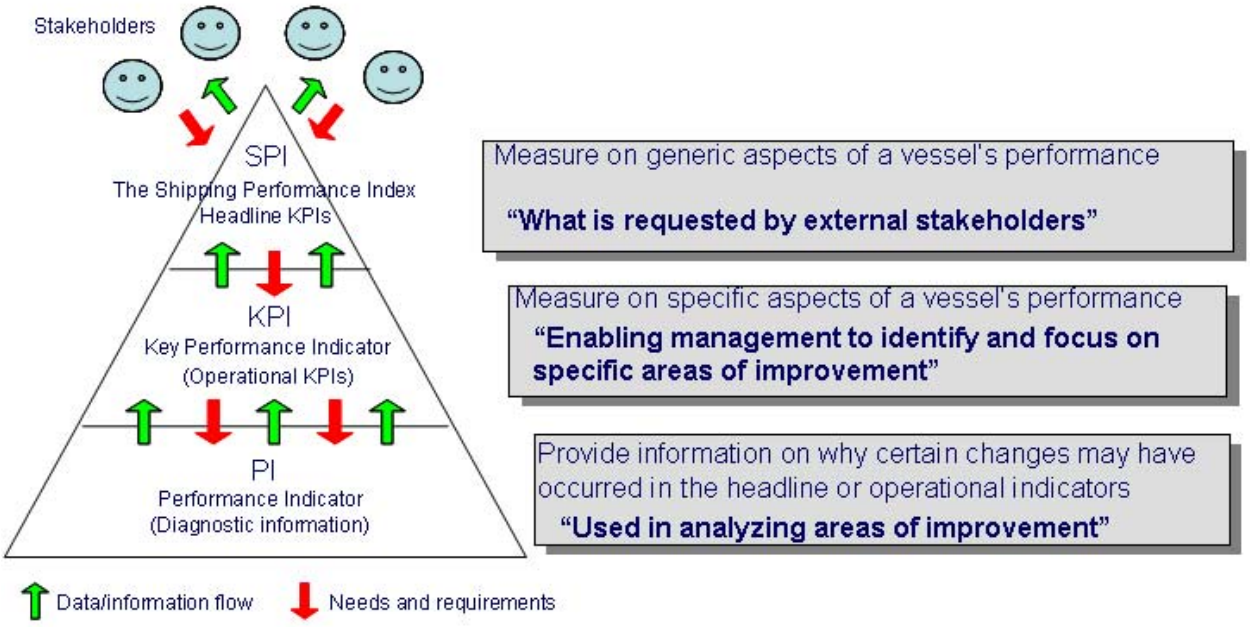


Figure 1 The Shipping KPI Performance Hierarchy

4 Project Methodology

In the process of designing the Shipping KPI Performance Hierarchy, we have utilized a three phased iterative development approach:

Phase 1: Evaluation of existing industry KPIs
Phase 2: Designing the Shipping KPI Performance Hierarchy
Phase 3: Evaluation by Stakeholders

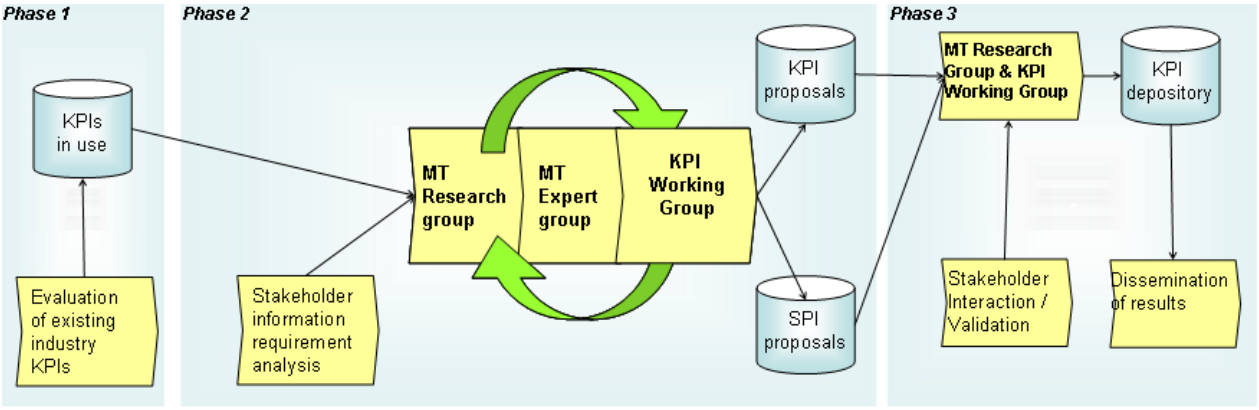


Figure 2 A three phased iterative development approach

4.1 Phase 1: Evaluation of existing industry KPIs

In this phase the members of the Sponsor Group were asked to share their existing KPIs. The idea was that a new global standard for Shipping KPIs would have to be based on existing KPIs to ensure data capture feasibility. The rationale for this starting point is twofold: The Shipping KPI standard must be measurable and the Shipping KPIs must be in demand. KPIs in use are in most cases based on either internal requirements related to performance or external requirements from stakeholders.

Approximately 175 KPI definitions were collected from the industry. In addition,
65 indicators and KPIs were identified and documented in a feasibility study by ICS (Intellectual Capital Services).

The collected KPIs were compared and analyzed on basis of three criteria:

- Categorizing the KPIs in focus areas
- KPIs measuring the same performance were defined as one KPI
- KPIs with identical names that measured different performance were renamed

Criteria number 1 resulted in organizing KPIs in 8 focus-areas: Statutory Requirements, Environmental, Technical, Crew Safety, Crew Management, Cargo, Financial and Reputation.

Criteria number 2 and 3 resulted in a reduction of KPIs from 240 to approx. 50.

In the next step the KPIs were validated against a set of criteria described by Kjellén (2000). These criteria were originally developed for validating indicators to be used in HSE management systems, but are equally relevant for most types of management and performance indicators.

Validation-Criteria	**Definition**
Observable and Quantifiable	It must be possible to observe and measure the performance by applying a recognized data-collection and scale of measurement
Valid indicator of performance	Especially concerned with criterion-related validity. Is the KPI actually measuring what we want it to measure?
Sensitive to Change	Must allow for early warning by capturing changes in an industrial system that have significant effects on performance. Will the score on the KPI over time reveal changes in performance (if such changes have taken place of course)?
Compatible	The KPI must be compatible with other indicators to prevent the decision-makers receiving contradictory control signals
Transparent and easily understood	The KPI must be easily understood in that its meaning is apparent and compatible with the user's theoretical understanding and unconscious mental models.
Robust Against Manipulation	The question is whether the indicator allows the organization to 'look good' by, for example, changing reporting behaviour rather than making the necessary basic changes that improve actual performance. Is the Shipping KPI robust against initiatives for manipulating the score?

Table 1 6 generic indicator validation criteria (Kjellén, 2000)

The validation process revealed that it was very difficult to meet the criteria with the high number of KPIs with measurement definitions involving multiple factors. A lower level of measurements, Performance Indicators (PIs), was required with a clear and unambiguous definition. These PIs were defined and described, as illustrated in Figure 1.

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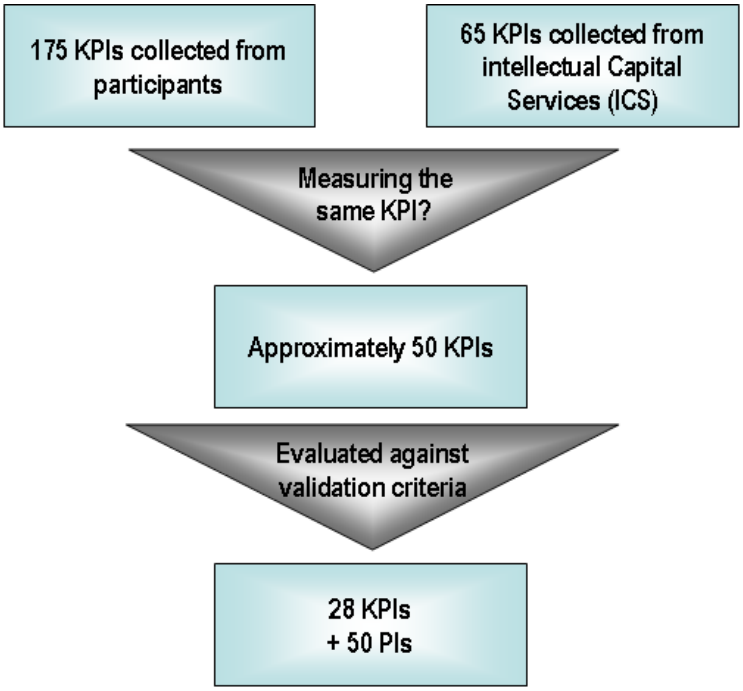

Figure 3 Identification of building blocks for a new KPI framework

4.2 Phase 2: Developing the Shipping KPI Performance Hierarchy

The next phase of the project focused on designing a new set of SPIs, KPIs and PIs based on already collected KPI's. However, the industry agreed that the KPI's had a substantial potential for improvement in order to support internal improvement initiatives and external communication. This objective where pursued in a series of workshops.

In order to reach a consensus on definitions of SPIs, KPIs and PIs, Intermanager established a KPI Working Group to participate in an iterative process. The KPI Working Group consisted of InterManager members with extensive experience in the industry. The project plan was redesigned and several workshops were conducted:

- Workshop 1 objective: KPIs for internal improvement
- Workshop 2 objective: SPIs for external reporting
- Workshop 3 objective: Conclude and get consensus on SPIs, KPIs and PIs: Descriptions, definitions and relationships
- Workshop 4 objective: Review data collection feasibility and obtain consensus on calculation principles for KPIs and SPIs

4.2.1 Workshop 1: KPIs for internal improvement

The objective of WS1 was to reach a consensus on KPIs for internal improvement in ship management organizations. A good starting point was the identified KPIs from phase 1. However, the general feedback from phase 1 was that the KPI definitions were ambiguous, and it was unclear whether the KPIs were covering all aspects of internal improvement needs. In response to these challenges members of the KPI Working Group were invited to identify new KPIs and to improve existing KPI and PI definitions.

A number of different approaches were evaluated in order to provide a good framework to:

- Provide a system for company internal improvements
- Provide a system for industry benchmarking

The Shipping KPI project chose the Balanced Scorecard framework, Kaplan & Norton (1996), for addressing internal improvement and benchmarking.

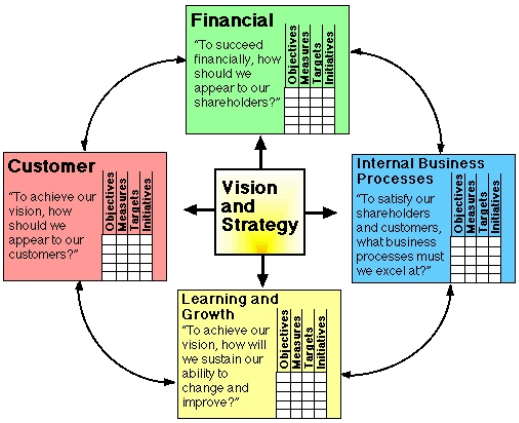

Figure 4 Original BSC Perspectives

The Balanced Scorecard is a framework for deriving measurable objectives from the organization's strategy. While retaining financial measures of past performance, The Balanced Scorecard introduces drivers of future financial performance. The drivers, encompassing customer, internal-business-processes, and learning and growth perspectives, are derived from an explicit and rigorous translation of the organization's strategy into tangible objectives and measures.

The Balanced Scorecard framework encompasses four different perspectives:

1. The financial perspective
2. The customer perspective
3. The internal-business-process perspective
4. The learning and growth perspective

Due to an increasing focus on 'Corporate Social Responsibility' within the business community, the project suggests to add a fifth perspective on HSE issues in order to focus on value creation in a socially acceptable and desirable manner.

5. The health-safety-environment perspective

The financial perspective encompasses KPIs focusing on increasing revenues and productivity, reducing cost and risk and enhancing asset utilization, whereas the customer perspective focuses on core customer KPIs such as satisfaction, loyalty, retention, acquisition and customer profitability.

The internal-business-process perspective focuses on measures that are critical for achieving financial and customer objectives. Typical KPIs describe business processes in quality, time, productivity and cost. It is important to encompass measures not only focusing on existing processes, but also new processes that need to be developed in order to meet customer needs and succeed financially.

The learning and growth perspective encompasses KPIs that provide the infrastructure to enable ambitious objectives and achievements in the other three perspectives. There are typically three categories for the learning and growth perspective:

1. Employee capabilities
2. Information system capabilities
3. Motivation, empowerment and alignment

The HSE perspective focuses on KPIs important to stakeholders other than owners and employees of the company. Three categories are included in this perspective:

1. Employee and crew health
2. Asset security
3. Environmental issues such as emissions, spills etc.

By using The Balanced Scorecard, some new KPIs were identified. However, it was concluded that financial KPIs were already well defined, and several KPIs within the customer perspective were regarded as not relevant for the ship management industry. Furthermore, the different business models within the industry make it difficult to measure meaningful financial and customer related KPIs.

As a result of the workshop, KPI and PI definitions were considerable improved by the KPI Working Group. The definitions were sent to all participants in order to comment and verify the outcome.

4.2.2 Workshop 2: SPIs for external reporting

A tool for identification of the SPIs, the *Stakeholder Analysis*, was introduced to the KPI Working Group. Traditionally Stakeholder Analysis (SA) is used to identify stakeholders influencing or being affected by a policy or organizational change. Methods for performing SA as described by K.Schmeer (1999) were too rigorous for our purpose. We used a more pragmatic approach in the tradition of System Engineering and Requirements Engineering.

Due to the lack of direct access to a broad set of stakeholders we relied on the earlier Shipping Model (Maritime IT Drift 1997) and from this model we identified relevant stakeholders. Based on the Shipping Model, four main shipping functions are identified: Ship Owners, Charterer, Ship Manager and Ship Operator. A comprehensive list of external stakeholders was created based on the model. For each stakeholder, its main area of interest was identified.

Because stakeholders can act in different roles, a diverse set of roles were defined. From the roles we anticipated the information requirements. The hypothesis was that if different roles were satisfied with information, the stakeholders would get consistent information about performance in all areas they had an interest.

The result from the work shop was initial SPI descriptions/definitions and initial thoughts on the SPI – KPI matching matrix (see next section).

4.2.3 Workshop 3: Conclude and get consensus on SPIs, KPIs and PIs

In the previous session the KPI Working Group was introduced to the need for building a relationship between KPIs and SPIs. In workshop 3 the thoughts from the previous session were concretized in a *KPI – SPI Matching Matrix*.

In order to select KPIs to calculate the SPI Ratings, a matching matrix was designed. The Matching Matrix identifies which KPIs are the best indicators of the performance within each SPI area.

For each SPI there are three categories of KPIs; Highly relevant (H), Relevant (L) and Not relevant. Each KPI could only have high relevance (H) for one SPI. The SPIs can consequently consist of several KPIs with high and low relevance. This exercise was conducted iteratively and resulted in the following Matching Matrix.

KPIs \ SPIs	Environmental Performance	HR Performance	Safety Performance	Security Performance	Technical Performance	Navigation Performance	Operational Performance
Accidental releases of substances as def by MARPOL	H				L		L
Ballast water discharge violations	H	L					
Budget control per vessel							H
Cargo incidents during cargo operations	L	L	L		L		H
Cargo incidents during voyage	L	L	L		L		H
CO2 emissions	H				L		L
Condition of class					H		
Contained spills	H				L		L
Crew behavior		H	L	L			
Crew management	L	H	L	L	L	L	L
Crew planning	L	H	L	L	L	L	L
Drydocking planning performance							H
Environmental deficiencies	H						
Failure of critical equipment and systems	L		L		H	L	L
Fire and Explosions			H				
Flawless port state control performance	L		H	L	L		L
HR deficiencies		H					
Lost Time Injuries Frequency (LTIF)		L	H				
Lost Time Sickness Frequency (LTSF)		H					
Navigational deficiencies						H	
Navigational incidents	L	L	L		L	H	L
No of violations of MARPOL Annex 1-6	H	L			L		
NOx emissions	H				L		L
Operational deficiencies							H
Port state control deficiency rate							
Port state control detention	L		L	L	L		H
Safety deficiencies			H				
Security deficiencies		L		H			L
SOx emissions	H				L		L
Vessel availability		L			L		H

Table 2 The Matching Matrix

In addition to a completed Matching Matrix, all SPI, KPI and PI descriptions were revised and updated accordingly. Furthermore, the KPI Working Group committed to conduct a feasibility study of data capture, to elaborate on how difficult it would be to provide the data required on PI level.

4.2.4 Workshop 4: Review data collection feasibility and obtain consensus on calculation principles for KPIs and SPIs

On basis of the Matching Matrix developed in workshop 3 the formulas for calculating KPI Values, KPI Ratings and SPI Ratings were developed.

When calculating the KPI Values and Ratings and the SPI Ratings some mathematical challenges exist. In section 3 an explanation of the formulas for calculating KPI Values, KPI Ratings and SPI Rating is given.

To get an idea about the complexity of capturing PI Values, we engaged the KPI Working Group to briefly evaluate to what extent ship management organizations capture data relevant to the PIs defined in the hierarchy. The result of the evaluation was that for approximately 6-8% of the PIs, the ship managers do not have data directly available. Hence, the data has to be extracted from other sources, or the ship managers have to consult sources in order to capture relevant data that can be transferred to the PI Value. One of the challenges has been that the data captured is not always directly applicable and have to be reworked or reformatted.

At the end of Workshop 3 it was decided to evaluate further the feasibility of data capture. The KPI Working Group agreed to collect data for 3 more ships each in their respective fleets for the fiscal year 2007. This information was used in Workshop 4 to get a picture of the PI Value ranges, and to what extent it is possible to capture correct data. Based on data from the ship managers, the calculation formulas for the KPI Values and Ratings and the SPI Ratings were validated.

4.3 Phase 3: Evaluation by Stakeholders

In phase 3, focus has been on two main issues:

1. Stakeholder involvement
2. Dissemination, maintenance and utilization of results

4.3.1 Stakeholder involvement

Results from the project have been presented to several stakeholders including:

- Intertanko
- Intercargo
- OCIMF
- Lloyds Maritime Academy

The general feedback was positive but some stakeholders have expressed the need for further validation and calibration of the proposed model, specifically related to the KPI Ratings and SPI Ratings as both calculations require a notion of what is considered as poor and/or excellent performance.

4.3.2 Dissemination, maintenance and utilization of Results

An important element in the dissemination and utilization of the Shipping KPI Performance Hierarchy is the development of a Shipping KPI Depository. This depository consists of an information structure related to the elements of the Shipping KPI Performance Hierarchy (SPIs, KPIs and PIs) in addition to the calculation model.

In addition to the design and development of the Shipping KPI Depository, focus in phase 3 has been on creating a sustainable model for management of the depository and the overall Shipping KPI Performance Hierarchy.

The potential for enhancement of the depository's functionality and its added value to the project as well as the strategy for management of the depository is given in section 7.

5 Project results

This section contains a description of the project results: The Shipping KPI Performance Hierarchy and the Shipping KPI Depository.

5.1 The Shipping KPI Performance Hierarchy

The Shipping KPI Performance Hierarchy now consists of:

- 7 Shipping Performance Indexes
- 30 Key Performance Indicators
- 58 Performance Indicators

The complete Shipping KPI Performance Hierarchy is presented in appendix I with definitions, descriptions and some relevant calculation examples.

5.2 The Shipping KPI Depository

The Shipping KPI Performance Hierarchy is available in the web based Shipping KPI Depository www.shipping-kpi.com.

5.2.1 Dissemination and utilization of the Shipping KPI Performance Hierarchy

In addition to general information about the project, its background and methodology, the depository contains detailed information about the Shipping KPI Performance Hierarchy through:

1. Description of all Performance Indicators including
    a. Specification of data capture (PI Values)
    b. Their context in light of how the PI Values are used in the hierarchy
    c. Any intermediate calculation formulas that must be applied to be able to obtain the PI Values
2. Description of all Key Performance Indicators including
    a. The KPI's objective (what to measure)
    b. The KPI Value calculation formula
    c. The KPI Rating calculation formula
3. Description of all Shipping Performance Indexes including
    a. The SPI's objective (what to express)
    b. The SPI Rating calculation formula

In order to facilitate a continuous discussion of the Shipping KPI Performance Hierarchy and allowing for suggestions for improvement as well as involvement of the industry, the depository will provide a blog where material collected from users/KPI working group will be published in a Q&A format on individual indicator level.

5.2.2 Hosting and maintaining the depository

A strategy for maintenance of the depository has to be established. Intermanager are responsible for such maintenance as they have agreed to be the caretaker of the standard in the future. However, the actual work may be contracted to a different organization, and the Shipping KPI Depository may be hosted by a 3rd party provider.

The maintenance will at a minimum consist of:

- Updates and enhancements of the web service
- Revision of the SPI/KPI/PI descriptions
- QA support service
- Management of the ICT platform

The clarification of roles and responsibilities related to the management of the Shipping KPI Depository is under the responsibility of the Project Steering committee until the end of the project, after that Intermanager has agreed to take over the maintenance of the Standard. However, the project has suggested some generic roles and responsibilities that need to be defined.

Role	Responsibilities
ICT Infrastructure Provider	This is a professional body able to host the depository and able to guarantee a Level of Service as required by the KPI Definition Authority and Policy Responsible
Service Responsible	This is a body that is domain qualified to discuss and advice on the use of the SPIs/KPIs and able to put forward proposals for change, to the KPI Definition Authority and Policy Responsible. There are two sub roles involved: *1) Content Responsible* which is the responsible editor of the Shipping KPI Depository actually making the changes to the Depository when authorized by the KPI Definition Authority and Policy Responsible. *2) Benchmark Responsible* who is the responsible manager of the industry benchmark, for the calculations and integrity of the information being uploaded to be used in the benchmark. This role should also perform regularly sensitivity analyses in order to provide qualitative information about the benchmark.
KPI Definition Authority and Policy Responsible	This is a domain expert body that has the authority to alter the definition of the SPIs/KPIs/PIs and the calculation model used. Intermanager will head this role preferably in association with other stakeholder organizations.

Table 3 Roles and responsibilities in the management of the Shipping KPI Depository

6 Guidelines for use of the Shipping KPI Performance Hierarchy

This section contains guidelines for how to use the Shipping KPI Performance Hierarchy once implemented in an organization.

There are two main issues to consider:

- Capturing of Performance Indicator Values with the intent to calculate KPI Values, KPI Ratings and SPI Ratings
- Utilization of the results provided by the Shipping KPI Performance Hierarchy.

As capturing PI Values is the only manual operation it requires a more detailed description. There are two different objectives to consider; namely capturing PI Values and using the SPI's for external communication and capturing PI Values and using the KPI's for internal improvement.

The main element to be used for internal improvement is the KPI Value as this is the most accurate and detailed expression of performance. The KPI Value can be trended over time which will give a good indication of performance development when internal improvement initiatives are launched.

For internal improvements, annual data capture will not be adequate to provide management with updated information. There are two issues to consider:

- The frequency of data capture
- The time period for which PI Values should be captured

The frequency of recalculation of KPI Values should be in line with the plan for monitoring improvement initiatives. Quarterly data capture will give the person responsible for monitoring a more accurate and up to date picture of the effects of improvement initiatives than yearly data capture. As a rule of thumb, the time period for which the PI Values should be captured should be the same as the frequency of data capture. This means that if a certain improvement initiative is planned to be monitored on a quarterly basis, the time period for which the PI Values should be captured should be 3 months. If one maintains the one year period for the KPI Value, it becomes slower (more insensitive to change) than if one use a quarterly or monthly period.

The main element for external communication of performance is the SPI. The standard reporting period for the PIs is one calendar year. Consequently the SPI Ratings will be calculated for a full calendar year.

The two objectives are a bit contradicting and one has to evaluate how this can be implemented in the reporting system to ensure supporting both objectives. One method is to use the quarterly reporting and than to average PIs for the year based on the 4 quarterly reports and use this when calculating the SPI's.

7 Areas for Further Research

There are several areas for further research identified during the Shipping KPI Project. Three main areas are described below.

It should be noted that an application to the Research Council of Norway (RCN) for funding of a phase 2 of the Shipping KPI Project has been sent (RCN decision expected in mid December 2008).

7.1 Validation and calibration of the calculation model

As stated in section 3 there are elements in the Shipping KPI Performance Hierarchy's Calculation Model that require further validation and calibration.

*KPI Rating formulas m*ust be defined with a 'zero target value' in order to rate the KPI Value in a scale between 0 and 100 (the KPI Rating). This target values is interesting to both the industry (mainly through the KPI Ratings directly as it defines the unacceptable performance level) and for external stakeholders (as the KPI Ratings ultimately defines the SPI Ratings).

The two categories of relevance, highly relevant (H) and relevant (L), in the *SPI Rating formulas* must be assigned validated weighting parameters to ensure:

a. The proper SPI Rating on basis of the KPI Ratings
b. The proper SPI sensitivity to change in the KPI Rating.

These weighting parameters are of interest to both the industry (who's performance is to be reflected through the SPI Ratings) and to external stakeholders (who are interpreting the SPI Ratings).

The two abovementioned issues both require interaction with the industry and external stakeholders as well as a much more extensive data capture in order to create a suitable basis for validation and calibration of the calculation model through sensitivity analysis. On proposal to make the rating more robust is to aim for a grade scale (A, B, …, F). And when enough data material is available one can apply a normal distribution to ensure that there is a spread, avoiding potential side effect where all industry is rated in a very narrow band of the rating scale.

7.2 Added value by extended Shipping KPI Depository functionality

In order to make the Shipping KPI Depository more attractive and to enable the development of a benchmarking service (see 7.3) it is proposed by the Intermanager KPI working group that a mock-up/prototype SW tool should be developed as an aid to promote and enhance the Shipping KPI Depository.

Such a tool needs to be web based and should have the following main functionalities in addition to the standard depository functionality described in section 5.2.

- SPI/KPI/PI explanatory guide, interpretations and in-depth explanations (Wikipedia-like)
- Data upload into the Shipping KPI Depository (for benchmarking purposes)
- User management securing anonymity and integrity of data
- Graphic data presentation, comparison and interpretations of results

7.3 Benchmarking by using the Shipping KPI Depository

One of the potential added values from the Shipping KPI Project and its resulting Shipping KPI Performance Hierarchy is the potential for industry wide benchmarking.

Building a benchmarking regime requires several aspects to be in place:

- Industry standards for all elements in the Shipping KPI Performance Hierarchy
  - Performance Indicators
  - Key Performance Indicators
  - Shipping Performance Indexes
- Established and transparent calculation models for
  - KPI Values
  - KPI Ratings
  - SPI Ratings
  - Any intermediate calculations (and related parameters) needed to capture the PI Values for calculation of KPI Values
- Data capture methods, reporting tool
- Data integrity and validation principles established
- Anonymity preservation
- Information presentation and interpretation tools

As can be seen in section 5.2, the Shipping KPI project caters for the two first required aspects. It is therefore important that remaining aspects are developed to complete the required steps in order to realize the full potential advantage of the developed Shipping KPI Performance Hierarchy.

8 References

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“Process redesign adapted to the business of fleet management“

9 Appendix I

The Shipping KPI Standard, include definitions of all SPI, KPI and PI with selected calculation examples.

Shipping KPI

Shipping KPI Standard

Ver 1.1
2009 FEB 12

IPR

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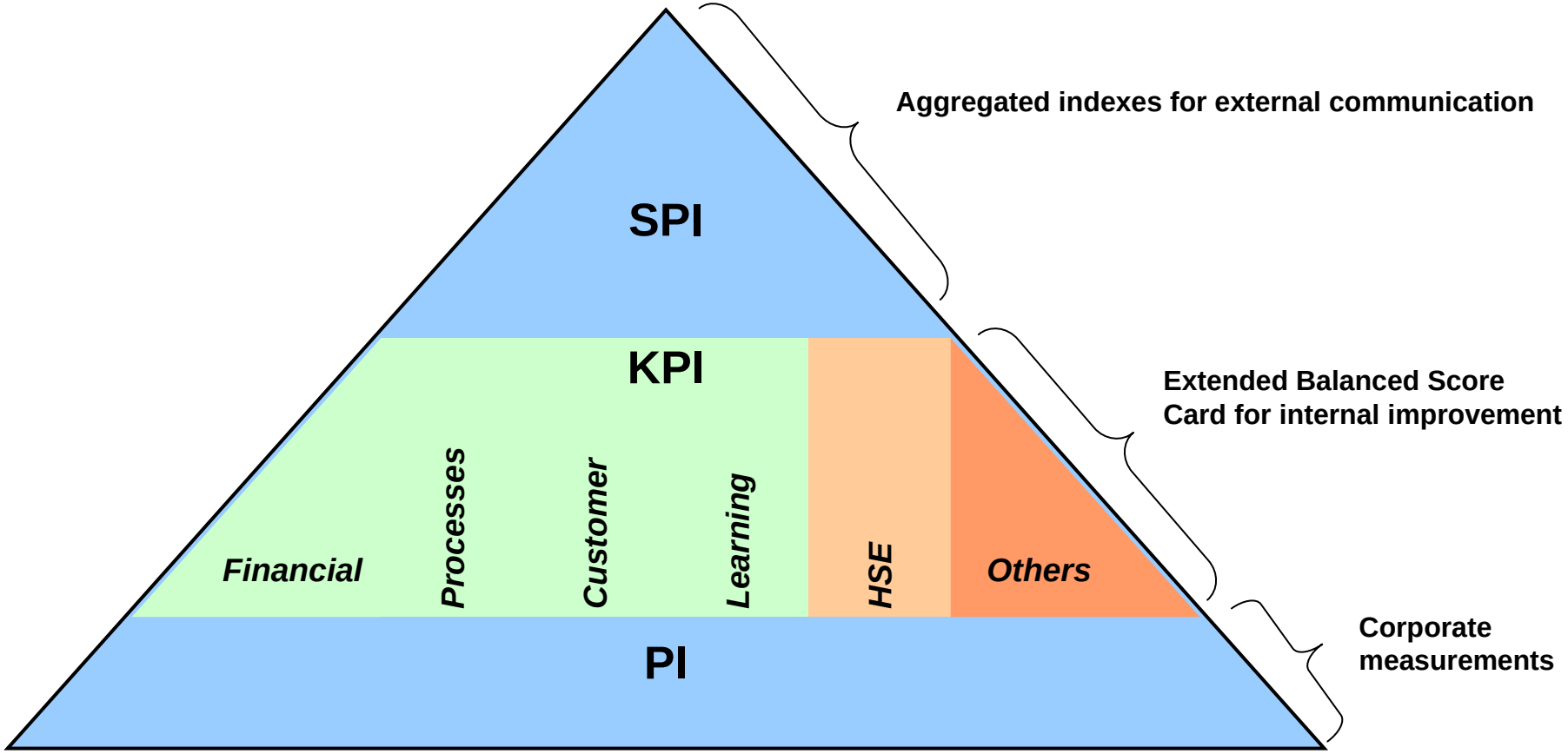
The Shipping KPI Standard - Concept



For Further Information or Help

Contact:

Guy Morel

guy.morel@intermanager.org

General Secretary

InterManager

Phone +336 8086 0986

Harald Sleire

harald.sleire@marintek.sintef.no

Project Manager

MARINTEK

Phone +47 7359 5500

Or visit the Depository (fully implemented by 31/12-2008)

http://www.sintef.no/Projectweb/Shipping-KPI/

Shipping KPI

Shipping Performance Indexes

“SPI”

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The Shipping KPI Standard - SPIs

- Environmental performance
- HR performance
- Safety performance
- Security performance
- Technical Performance
- Navigation Performance
- Operational Performance

SPI: Operational Performance

Operational Performance is a measure of the operational efficiency of the vessel including all cargo transport related operations (safe and efficient cargo handling, transport timeliness, reliability and cost efficiency)

Highly Relevant KPIs (H):

- A: Cargo incidents during cargo operations
- B: Cargo incidents during voyage
- C: Port state control detention
- D: Vessel availability
- E: Budget control per vessel
- F: Operational deficiencies
- G: Drydocking planning performance

Relevant KPIs (L):

- J: Crew management
- K: Failures to critical equipment and systems
- M: Crew planning
- N: Flawless Port state control performance
- O: Navigational Incidents
- P: CO2 Emission
- Q: NOx emission
- R: SOx emission
- S: Accidental releases of substances as defined by MARPOL
- T: Contained spills
- U: Security deficiencies

SPI Rating Formula= $\frac{(H*(A+B+C+D+E+F+G)) + (L*(J+K+M+N+O+P+Q+R+S+T+U))}{(H*7) + (L*11)}$

Rating Parameters:

H=3

L=1

SPI: Navigational Performance

Navigational Performance is a measure of the navigational incidents recorded for each vessels.
Navigational Incident is related to safe navigation.

Highly Relevant KPIs (H):

- A: Navigational incidents
- B: Navigational deficiencies

Relevant KPIs (L):

- C: Crew management
- D: Failures of critical equipment and systems
- E: Crew planning

SPI Rating Formula =

$$\frac{(H*(A+B)) + (L*(C+D+E))}{(H*2) + (L*3)}$$

Rating Parameters:

H=3

L=1

SPI: Navigational Performance
Calculation Example

Highly Relevant KPIs (H):		**Relevant KPIs (L):**	
•A: Navigational incidents	80	•C: Crew management	70
•B: Navigational deficiencies	60	•D: Failures of critical equipment and systems	40
		•E: Crew planning	45

SPI Rating Formula = $\frac{(H*(A+B)) + (L*(C+D+E))}{(H*2) + (L*3)} = \frac{(3*(80+60)) + (1*(70+40+45))}{(3*2)+(1*3)} = \frac{420+155}{9} = 64$

Rating Parameters:

H=3

L=1

SPI: Environmental Performance

Environmental Performance is a measure of emissions, spills and other forms of pollution that impact the environment, caused by the vessel operations.

Recorded for each vessel.

Highly Relevant KPIs (H):

- A: No of Violations of MARPOL Annex 1-6
- B: CO2 emission
- C: NOx emission
- D: SOx emission
- E: Ballast water discharge violations
- F: Accidental releases of substances as def by MARPOL
- G: Contained spills
- I: Environmental deficiencies

Relevant KPIs (L):

- J: Crew management
- K: Failures to critical equipment and systems
- M: Cargo incidents during cargo operations
- N: Crew planning
- O: Cargo incidents during voyage
- P: Port state control detention
- Q: Flawless port state control performance
- R: Navigational incidents

SPI Rating Formula = $$\frac{(H*(A+B+C+D+E+F+G+I)) + (L*(J+K+M+N+O+P+Q+R))}{(H*8) + (L*8)}$$

Rating Parameters:

H=3

L=1

SPI: Technical Performance

Technical Performance is a measure of the technical incidents for each vessel including technical breakdown and technical underperformances.

Highly Relevant KPIs (H):

- A: Failures to critical equipment and systems
- B: Condition of class

Relevant KPIs (L):

- C: Crew management
- D: Cargo incidents during cargo operations
- E: Crew planning
- F: Cargo incidents during voyage
- G: Port state control detention
- I: Flawless Port state control performance
- J: Navigational Incidents
- K: No of violations of MARPOL Annex 1-6
- M: CO2 emission
- N: NOx emission
- O: SOx emission
- P: Accidental releases of substances as defined by MARPOL
- Q: Contained spills
- R: Vessel availability

SPI Rating Formula = $\frac{(H*(A+B)) + (L*(C+D+E+F+G+I+J+K+M+N+O+P+Q+R))}{(H*2) + (L*14)}$

Rating Parameters:

H=3*

L=1*

* These weighting parameters will have to be updated as the ratio of Highly relevant KPIs (H) and Relevant KPIs (L) is 2:14. This will be done in an eventual validation and calibration of the overall calculation model

SPI: Safety Performance

Safety Performance is a measure of accidents/incidents resulting in injuries or death. Environmental damage and safety of assets and cargo are covered by different SPIs. An accident is a special form of incident involving injuries or death to personnel (OSHAS 18001, ISO 18001).

Highly Relevant KPIs (H):

- A: Flawless Port state control performance
- B: LTIF
- C: Safety deficiencies
- D: Fire and Explosions

Relevant KPIs (L):

- E: Crew management
- F: Failures to critical equipment and systems
- G: Cargo incidents during cargo operations
- I: Crew planning
- J: Cargo incidents during voyage
- K: Port state control detention
- M: Navigational incidents
- N: Crew behaviour

SPI Rating Formula = $\frac{(H*(A+B+C+D)) + (L*(E+F+G+I+J+K+M+N))}{(H*4) + (L*8)}$

Rating Parameters:

H=3

L=1

Note: We would also like to include near misses but the challenge here is the reporting and quality of such. Near misses are considered more leading than lagging and inline with TMSA.

SPI: Security Performance

Security Performance is a measure of security incidents (as described in the ISPS Code) recorded for each vessel.
A security incident is an intentional or unintentional breach of security (ref ISPS code).

Highly Relevant KPIs (H):

- A: Security deficiencies

Relevant KPIs (L):

- B: Crew management
- C: Crew planning
- D: Port state control detention
- E: Flawless port state control performance
- F: Crew behaviour

SPI Rating Formula = $\dfrac{(H*A) + (L*(B+C+D+E+F))}{(H) + (L*5)}$

Rating Parameters:

H=3

L=1

SPI: HR Performance

Human Resources Performance is a measure of the company's ability to employ, retain and develop personnel with the required competences in order to ensure safe and efficient operations of the vessels.

Highly Relevant KPIs (H):

- B: Crew planning
- A: Crew management
- C: Crew behaviour
- D: LTSF
- E: HR deficiencies

Relevant KPIs (L):

- F: Cargo incidents during cargo operations
- G: Cargo incidents during voyage
- I: Navigational incidents
- J: No of violations of MARPOL Annex 1-6
- K: Ballast water discharge violations
- M: Security deficiencies
- N: Vessel availability
- O: LTIF

SPI Rating Formula = $\frac{(H*(A+B+C+D+E)) + (L*(F+G+I+J+K+M+N+O))}{(H*5) + (L*8)}$

Rating Parameters:

H=3

L=1

Shipping KPI

Key Performance Indicators

“KPI”

MARINTEK InterManager Norges forskningsråd

The Shipping KPI Standard - KPIs

- Accidental releases of substances as def by MARPOL
- Ballast Water Discharge Violations
- Budget control per vessel
- Cargo incidents during cargo operations
- Cargo incidents during voyage
- CO2 emissions
- Condition of Class
- Contained Spills
- Crew behaviour
- Crew management
- Crew planning
- Drydocking Planning Performance
- Environmental deficiencies
- Failure of critical equipment and systems
- Fire and Explosions
- Flawless Port state control performance

- HR deficiencies
- Lost Time Injury Frequency
- Lost Time Sickness Frequency
- Navigational deficiencies
- Navigational Incidents
- No of Violations of MARPOL Annex 1-6
- NOx emissions
- Operational deficiencies
- Port state control deficiency rate
- Port state control detention
- Safety deficiencies
- Security deficiencies
- SOx emissions
- Vessel availability

KPI: Accidental releases of substances as def by MARPOL

Accidental discharges to the environment in violation of MARPOL in a calendar year.
Due to difficulties related to measuring the actual volume/quantity of a spill, only number of spills are counted.
Measured per vessel for internal improvement as well as external communication (input to SPIs).

Relevant PIs:

- A: Total number of accidental releases of substances covered by MARPOL, to the environment
- B: Severe spills of bulk liquid

KPI Value Formula=	A + B
KPI Rating Formula=	0 = 100 rating 1 = 50 rating > 1 = 0 rating
Rating Parameters:	N/A

This KPI counts the number of (severe) spills of liquid and accidental releases of substances. A severe spill is a spill above one barrel.

KPI: Ballast water discharge violations

Any discharge or exchange of ballast water (or lack of doing so) in a calendar year, not in compliance with applicable rules and regulations

Relevant PIs:

- Ballast water discharge violations

KPI Value Formula= ∑ Ballast water discharge violations

KPI Rating Formula=

0 = 100 rating
1 = 50 rating
> 1 = 0 rating

This KPI counts the number of times where prevailing regulations regarding treatment of ballast water has been violated

KPI: Budget control per vessel

The overall costs deviation (management, purchasing, operation, M&R, crewing) vs. budgets. Show the ability of the ship manager to effectively plan the ship's operating costs (e.g. predictable costs, good budgeting). The cost deviation is adjusted for agreed additional expenditure.
Measured per fiscal year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Vessel running cost budget
- Actual running costs and accruals
- Additional Authorized Expenses (AAE)

KPI Value Formula= $$\frac{\| \text{Vessel running cost budget} - (\text{Actual running costs and accruals} - \text{AAE}) \|}{\text{Vessel running cost budget}} * 100\%$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 10

This KPI measures the deviations from the vessel's running cost budget in percentage by comparing it to the vessel's actual running costs and accruals and taking into account additional authorized expense (AAE) as these expenses are in fact altering the vessel's running cost budget by being authorized/approved by the ship owner. As the KPI measures deviations both positive and negative, the KPI Value is always converted to a positive value

KPI: Budget control per vessel
Calculation Example

Relevant PIs:

- Vessel running cost budget 1,2M USD
- Actual running costs and accruals 1,5M USD
- Additional Authorized Expenses (AAE) 0,25M USD

KPI Value Formula=

$$\frac{\| \text{Vessel running cost budget} - (\text{Actual running costs and accruals} - \text{AAE}) \|}{\text{Vessel running cost budget}} * 100\% \quad = \frac{\| 1{,}2 - (1{,}5 - 0{,}25) \|}{1{,}2} * 100\% = 4{,}17\%$$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (10*4,17) = 100 – 41,7 = **58,3**

Rating Parameters: Z= 10

Please note that as we are measuring deviations both positive and negative, the KPI Value is always converted to a positive.

KPI: Cargo incidents during cargo operations

The total number of received claims concerning damaged or lost cargo or injured passengers during cargo operations in a calendar year. Made relative to the total number of cargo units transported in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of damaged or lost cargo units or passengers injured during cargo handling
- Total number of cargo units or passengers transported

KPI Value Formula=

$$\frac{\text{Total number of damaged or lost cargo units or passengers injured during cargo handling}}{\text{Total number of cargo units or passengers transported}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 100000

This KPI represents a ratio between the total quantity of damaged or lost cargo or injured passengers (during handling operations such as loading cargo or boarding passengers) relative to the total quantity of cargo or number of passengers handled in a calendar year. By defining the KPI as a ratio, benchmarking is feasible even between different vessel sizes.

KPI: Cargo incidents during cargo operations
Calculation Example

Relevant PIs:

- Total number of damaged or lost cargo units or passengers injured during cargo handling 4
- Total number of cargo units or passengers transported 150.000

KPI Value Formula=

Total number of damaged or lost cargo units or passengers injured during cargo handling / Total number of cargo units or passengers transported $= \frac{4}{150.000} = 2{,}6 * 10^{-5}$

KPI Rating Formula= $100-(Z*\text{KPI Value}) = 100 - (10^5 * 2{,}6 * 10^{-5}) = 100 - 2{,}6 =$ **97,4**

Rating Parameters: $Z = 100000 = 10^5$

A KPI Value of 0,001 will give zero rating, 1000 units destroyed out of one million transported

KPI: Cargo incidents during voyage

The total number of received claims concerning damaged or lost cargo or injured passengers during voyage in a calendar year. Made relative to the total number of cargo units transported in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of damaged or lost cargo units or passengers injured during voyage
- Total number of cargo units or passengers transported

KPI Value Formula=

$$\frac{\text{Total number of damaged or lost cargo units or passengers injured during voyage}}{\text{Total number of cargo units or passengers transported}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 1000000

This KPI represents a ratio between the total quantity of damaged or lost cargo or injured passengers (during the actual sea voyage) relative to the total quantity of cargo or number of passengers transported in a calendar year. By defining the KPI as a ratio, benchmarking is feasible even between different vessel sizes.

KPI: Cargo incidents during voyage
Calculation Example

Relevant PIs:

- Total number of damaged or lost cargo units or passengers injured during voyage — 4
- Total number of cargo units or passengers transported — 150.000

KPI Value Formula=

$$\frac{\text{Total number of damaged or lost cargo units or passengers injured during voyage}}{\text{Total number of cargo units or passengers transported}} = \frac{4}{150.000} = 2{,}6*10^{-5}$$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (10^6*2,6*10^{-5}) = 100 – 26 = **74**

Rating Parameters: Z= 1000000 = 10^6

A KPI Value of 0,0001 will give zero rating, 100 units destroyed out of one million transported

KPI: CO2 emissions

The estimated CO2 efficiency in a calendar year. Measured per vessel for external communication (input to SPIs)

Relevant PIs:

- Emitted Mass CO2
- Transport Work

KPI Value Formula= $\frac{\text{Emitted Mass CO2} * 10^6}{\text{Transport Work}}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z=7

This KPI compares emitted mass of CO2 to the vessel's total transport work, hereby stating the value achieved (transport work) by the emission of CO2. As the PI 'Emitted Mass CO2 is to be given in tons, the PI's value is multiplied by 1 million to get the KPI value in g/transport work (tonmile, passengermile, TEUmile, etc).

KPI: CO2 emissions
Calculation Example

Relevant PIs:

- Emitted Mass CO2 103.500 ton
- Transport Work 20.710.647.000 tonmile

KPI Value Formula= $\frac{\text{Emitted Mass CO2}*10^6}{\text{Transport Work}} = \frac{103500*10^6}{20710647000} = 4{,}98 g/tonmile$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (7 * 4,98) = **65,1**

Rating Parameters: Z=7

Z value to be updated (agreed), and need to be differentiated between ship size and other factors

Some typical emission factors				
Ship Type	Index unit	CO2	NOx	SOx
LNG Tanker	g/ tonmile	66,5	1,9	1,2
Chemical Tanker	g/ tonmile	23,5	0,7	0,4
Crude Oil Tanker	g/ tonmile	8	0,2	0,1
Bulk Dry	g/ tonmile	7,6	0,2	0,1
Container	g/ tonmile	96,5	2,7	1,7
Refrigerated Cargo	g/ tonmile	124,3	3,5	2,2
RO-RO Cargo	g/ tonmile	94,9	1,8	1,7

KPI: Condition of class

All condition of class in a calendar year. Condition of class is a written statement from class (ref. IACS). All categories of CoC are counted equally.

Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Condition of class

KPI Value Formula= ∑Conditions of class

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 20

This KPI counts the total number of Conditions of Class issued. Conditions of class is not measured as a ratio because the potential denominator (total no of inspections where CoCs can be stated) is said to be relatively low between all vessels

KPI: Condition of class
Calculation Example

Relevant PIs:
- Condition of class = 3

KPI Value Formula= ∑Conditions of class = 3

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 20*3 = **40**

Rating Parameters: Z= 20

KPI: Contained Spills

Contained spills should cover liquid spills including cargo and bunkers contained on the vessel. Summarized per calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs).

Relevant PIs:

- Total no of contained spills of bulk liquid

KPI Value Formula=	∑ Number of contained spills of bulk liquid
KPI Rating Formula=	100-(Z*KPI Value)
Rating Parameters:	Z= 33,33

Some spills are contained but still represent an incident that should be recorded. This KPI counts the total number of contained spills and is complementary to the KPI 'Accidental releases of substances as def by MARPOL, to the environment'. No denominator has been proven necessary for benchmarking purposes

KPI: Contained Spills
Calculation Example

Relevant PIs:

- Total no of contained spills of bulk liquid 2

KPI Value Formula= ∑ Number of contained spills of bulk liquid = 2

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 33,3*2 = **33,4**

Rating Parameters: Z= 33,33

KPI: Crew behaviour

The behaviour of the crew on a vessel. Counted per calendar year and made relative to the average number of crew onboard the vessel in a calendar year. If one incident of the same crew breach several categories, each breach should be counted individually.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- A: Absconded Crew
- B: Criminal offence
- C: Drugs or alcohol abused
- D: No of dismissed crew
- E: No of logged warnings
- F: Total Exposure hours

KPI Value Formula= $\frac{(A+B+C+D+E)*(24*365)}{F}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 1000

This KPI counts the total number of breaches of code of conduct made by the vessel's crew such as substance abuse, criminal offences and AWOLs.
As the number of crew on different vessels vary significantly, total exposure hours (divided by 24*365 to represent the average number of crew onboard the vessel) is used as a denominator to enable benchmarking

KPI: Crew behaviour
Calculation Example

Relevant PIs:

- A: Absconded Crew 0
- B: Criminal offence 0
- C: Drugs or alcohol abused 0
- D: No of dismissed crew 0
- E: No of logged warnings 1
- F: Total Exposure hours 90.000 (approximately 10 persons onboard)

KPI Value Formula= $\frac{(A+B+C+D+E)*(24*365)}{F} = \frac{(0+0+0+0+1)*24*365}{90000} = 0{,}0973$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 1000*0,0973 = 100 – 97,3 = **2,7**

Rating Parameters: Z= 1000

KPI: Crew management

The KPI measures the ship management organisation's ability to acquire and maintain the required competence/crew for their operations.
Measured per calendar year. Measured as a company KPI for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- D: Training days
- E: Officer working days
- F: Number of new cadets
- G: Average number of vessels under management
- H: Officer retention rate

KPI Value Formula= $A*\frac{D}{E}+B*\frac{F}{G}+C*H$

KPI Value Parameters:

A=60,83
B=2
C=4

KPI Rating Formula= (Z*KPI Value) - 100

Rating Parameters: Z= 35

This KPI combines the training effort, ability to have new cadets onboard and the officer retention rate to express crew management capability of the ship manager. Due to the different score-range for the three ratios, three value parameters (A, B and C) are introduced

KPI: Crew management
Calculation Example

Relevant PIs:

•D: Training days	20
•E: Officer working days	1825 (crew of 5)
•F: Number of new cadets	11
•G: Average number of vessels under management	10
•H: Officer retention rate	66,4

KPI Value Formula= $= A*\frac{D}{E}+B*\frac{F}{G}+C*H = 60{,}83*\frac{20}{1825}+2*\frac{11}{10}+0{,}04*66{,}4 = 0{,}666+2{,}2+2{,}66 = 5{,}526$

KPI Value Parameters:
A=60,83
B=2
C=0,04

KPI Rating Formula= (Z*KPI Value) – 100 = 35*5,526 – 100 = **93,4**

Rating Parameters: Z= 35

KPI: Crew planning

The ship management organisation’s performance in crew planning.
Measured per calendar year.
Measured as a vessel KPI for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- No of crew not relieved on time
- Violation of rest hours

KPI Value Formula=	No of crew not relieved on time + Violation of rest hours
KPI Rating Formula=	100-(Z*KPI Value)
Rating Parameters:	Z= 10

This KPI count the ship manager's ability to relieve crew on time as well as avoiding violations of rest hours.

KPI: Crew planning
Calculation Example

Relevant PIs:

- No of crew not relieved on time 1
- Violation of rest hours 4

KPI Value Formula= No of crew not relieved on time + Violation of rest hours = 1 + 4 = 5

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 10*5 = **50**

Rating Parameters: Z= 10

KPI: Drydocking planning performance

The deviations (positive or negative) from scheduled drydocking plan related to time and costs per drydocking. Summarized per 5 year rolling time period. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Agreed drydocking duration
- Actual drydocking duration
- Agreed drydocking costs
- Actual drydocking costs

KPI Value Formula=

$$\frac{\text{Actual drydocking duration - Agreed drydocking duration}}{\text{Agreed drydocking duration}} * 100\% + \frac{\text{Actual drydocking costs - Agreed drydocking costs}}{\text{Agreed drydocking costs}} * 100\%$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 2

This KPI measures the deviations from planned duration and costs of a vessel's drydocking in percentage.
Both 'positive' and 'negative' deviations are treated equally as the KPI measures the ship managers' ability to create accurate plans and not their ability to cut time and costs

KPI: Drydocking planning performance
Calculation Example

Relevant PIs:

- Agreed drydocking duration 14 days
- Actual drydocking duration 16 days
- Agreed drydocking costs 4M USD
- Actual drydocking costs 3,9M USD

KPI Value Formula=

$$\frac{\text{Actual drydocking duration - Agreed drydocking duration}}{\text{Agreed drydocking duration}} * 100 + \frac{\text{Actual drydocking costs - Agreed drydocking costs}}{\text{Agreed drydocking costs}} * 100$$

$$= \frac{16-14}{14} * 100 + \frac{3{,}9-4}{4} * 100 = 14{,}3 + 2{,}5 = 16{,}8$$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 2 * 16,8 = 100 – 33,6 = **66,4**

Rating Parameters: Z= 2

Be aware that it is the absolute value of the deviation that is used, so both negative and positive deviations reduces your performance

KPI: Environmental deficiencies

Environment-related deficiencies, observations and non-conformances, recorded during external inspections and audits in a calendar year. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of environmental related deficiencies
- Total number of recorded external inspections

KPI Value Formula=

$$\frac{\text{Total number of Environmental related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 33,33

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature such as deficiencies related to environmental issues such as a failure in the Oily Water Separator (OWS).

The total number of recorded external inspection is used as a denominator in all these KPIs (related to deficiencies) to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: Environmental deficiencies
Calculation Example

Relevant PIs:

- Total number of Environmental related deficiencies 13
- Total number of recorded external inspections 3

KPI Value Formula= $\frac{\text{Total no of Environmental related deficiencies}}{\text{Total number of recorded external inspections}} = \frac{13}{3} = 4{,}33$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 33,33*4,33 = 100 – 144,4 = **0** **NB!**

Rating Parameters: Z= 33,33

Worse performance than zero is not recorded. The rating will in this example give a negative number but the KPI Rating is still zero.

KPI: Failure of critical equipment and systems

The total number of failures to equipment and systems in the critical list (as required by the ISM code 10.3 and defined in the company Safety Management System) resulting in whole or partial unavailability in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Failure of critical equipment and systems

KPI Value Formula=	∑Failure of critical equipment and systems
KPI Rating Formula=	100-(Z*KPI Value)
Rating Parameters:	Z= 20

As the vessels' critical lists may vary in size it could be argued that e.g. the number of items on the list could be used as a denominator for benchmarking purposes. In any case, a failure to a critical equipment or system is a serious matter, regardless of the number of items in the vessel's critical list, and the KPI 'Failure to critical equipment and systems is kept without a denominator

KPI: Failure of critical equipment and systems
Calculation Example

Relevant PIs:

- Failure of critical equipment and systems = 3

KPI Value Formula= ∑Failure of critical equipment and systems = 3

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 20*3 = **40**

Rating Parameters: Z= 20

KPI: Fire and Explosions

The total number of fire and explosions incidents in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of fire incidents
- Total number of explosion incidents

KPI Value Formula=	Total number of fire incidents + Total number of explosion incidents
KPI Rating Formula=	0 = 100 rating 1 = 50 rating > 1 = 0 rating
Rating Parameters:	N/A

This KPI counts the total number of incidents related to fire and explosions

KPI: Flawless Port state control performance

The ratio of port state control inspections resulting in zero deficiencies in a calendar year compared to the total number of PSC inspections. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- PSC inspections resulting in zero deficiencies
- Total number of PSC inspections

KPI Value Formula=

$$\frac{\text{PSC inspections resulting in zero deficiencies}}{\text{Total number of PSC inspections}}$$

KPI Rating Formula= Z*KPI Value

Rating Parameters: Z= 100

This KPI is one of three KPIs related to Port State Control Inspections. The three areas covered are; 'Port state control deficiency rate' which measures the ratio of the total number of issued deficiencies during port state control inspection against the total number of port state control inspections conducted, 'Port state control detention' which measures the total number of port state control inspections resulting in a detention and this specific KPI, 'Flawless port state control performance' which measures the percentage of port state controls resulting in zero deficiencies against the total number of port state control inspections conducted

KPI: Flawless Port state control performance
Calculation Example

Relevant PIs:

- PSC inspections resulting in zero deficiencies 2
- Total number of PSC inspections 4

KPI Value Formula= $\frac{\text{PSC inspections resulting in zero deficiencies}}{\text{Total number of PSC inspections}} = \frac{2}{4} = 0{,}5$

KPI Rating Formula= Z*KPI Value = 100 *0,5 = **50**

Rating Parameters: Z= 100

KPI: HR deficiencies

HR-related deficiencies, observations and non-conformances, recorded in external inspections and audits in a calendar year. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of HR related deficiencies
- Total number of recorded external inspections

KPI Value Formula

$$\frac{\text{Total number of HR related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 33,33

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature such as deficiencies related to HR issues such as lack of compliance to resting-hours.

The total number of recorded external inspection is used as a denominator in all these KPIs to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: Lost Time Injury Frequency

The number of Lost Time Injuries (LTI) per million exposure hours (OCIMF). Exposure hours are 24 hours per day while serving onboard. Note that injuries during spare-time on board are also included. LTI is the sum of Fatalities, Permanent Total Disabilities, Permanent Partial Disabilities and Lost Workday Cases.
Measured per calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs).

Relevant PIs:

- F: Fatalities due to injuries
- LWC: Lost workday cases
- PTD: Permanent total disabilities
- PPD: Permanent partial disabilities
- TEH: Total exposure hours

KPI Value Formula= $\frac{F+LWC+PTD+PPD}{TEH * 10^{-6}}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 25

This KPI represents a ratio between Lost Time Injuries (fatalities, lost workday cases and permanent total and partial disabilities) against the total exposure hours. The measurement unit for the KPI value is incidents per million hour exposure.

KPI: Lost Time Injury Frequency
Calculation Example

Relevant PIs:

•F: Fatalities due to injuries	0
•LWC: Lost workday cases	1
•PTD: Permanent total disabilities	0
•PPD: Permanent partial disabilities	0
•TEH: Total exposure hours	438000 (crew of 10) in 5 years

KPI Value Formula= $\frac{F+LWC+PTD+PPD}{TEH * 10^{-6}} = \frac{0+1+0+0}{438000*10^{-6}} = \frac{1}{0,438} = 2.28$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 25*2.28 = **43**

Rating Parameters: Z= 25

The z-value of 25 indicates that 4 incidents per million exposure hour will give 0 KPI Rating

KPI: Lost Time Sickness Frequency

The number of cases where a crew member is sick for more than 24 hours per unit exposure hours, including fatalities. Exposure hours are 24 hours per day while serving onboard. Note that sickness during onboard spare-time is also included.
Measured per calendar year

Relevant PIs:

- A: Number of cases where crew member is sick for more than 24 hours
- B: Fatalities due to sickness
- TEH: Total Exposure Hours

KPI Value Formula= $\frac{A+B}{TEH * 10^{-6}}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 10

This KPI represents a ratio between the total number of cases where a crew member is sick for more than 24 hours as well as the total number of fatalities due to sickness per the total exposure hours (TEH is divided by 1000000). The unit of measure for the KPI value is in incidents per million hour exposure.

KPI: Lost Time Sickness Frequency
Calculation Example

Relevant PIs:

- A: Number of cases where crew member is sick for more than 24 hours — 2
- B: Fatalities due to sickness — 0
- TEH: Total Exposure Hours — 438000 (crew of 10) in 5 years

KPI Value Formula=

$$\frac{A+B}{TEH * 10^{-6}} = \frac{2+0}{438000*10^{-6}} = \frac{2}{0{,}438} = 4{,}57$$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 10* 4.57 = **54.3**

Rating Parameters: Z= 10

The z-value of 10 indicates that 10 incidents per million exposure hour will give 0 KPI Rating

KPI: Navigational deficiencies

Navigational related deficiencies, observations and non-conformances recorded during external inspections and audits in a calendar year. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of Navigational related deficiencies
- Total number of recorded external inspections

KPI Value Formula=

$$\frac{\text{Total number of Navigational related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 33,33

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature. An example of a navigational related deficiency is a mal-functioning radar.

The total number of recorded external inspection is used as a denominator in all these KPIs in order to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: Navigational incidents

Any navigational incident resulting in a collision, allision or grounding in a calendar year. All incidents are counted regardless of the cause of the incident.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:
- Collision
- Allision
- Grounding

KPI Value Formula=	(A*Collision) + (B*Allision) + (C*Grounding)
Value Parameters:	A= 2 B= 1 C= 2
KPI Rating Formula=	100-(Z*KPI Value)
Rating Parameters:	Z= 50

This KPI measures the total number of collisions, allisions and groundings recorded in a calendar year.

The KPI's value is a simple counter where the parameters weight collision and grounding twice as influential to the KPI as an allision

KPI: Navigational incidents
Calculation Example

Relevant PIs:

- Collision 0
- Allision 1
- Grounding 0

KPI Value Formula= (A*Collision) + (B*Allision) + (C*Grounding) = 2*0+1*1+2*0=1

Value Parameters:

A= 2
B= 1
C= 2

KPI Rating Formula= 100-(Z*KPI Value) = 100 – 50*1 = **50**

Rating Parameters: Z= 50

KPI: No of violations of MARPOL Annex 1-6

KPI covering substances overboard (outside operational emissions and oil-spills) in breach of regulation in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs).

Relevant PIs:

- Number of violations of MARPOL Annex 1-6

KPI Value Formula= ∑ Violations of MARPOL Annex 1-6

KPI Rating Formula=

0 = 100 rating

1 = 50 rating

> 1 = 0 rating

This KPI counts the number of times where MARPOL Annex 1-6 has been violated

KPI: NOx emissions

The estimated NOx efficiency in a calendar year. Measured per vessel for external communication (input to SPIs)

Relevant PIs:

- Emitted Mass NOx
- Transport Work

KPI Value Formula= $\frac{\text{Emitted Mass NOx} * 10^6}{\text{Transport Work}}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z=250

This KPI compares emitted mass of NOx to the vessel's total transport work, hereby stating the value achieved (transport work) by the emission of NOx. Because the PI 'Emitted Mass NOx' is measured in tons, the PI's value is multiplied by 1 million in order to get the KPI value in g/ton mile (tonmile, passengermile, TEUmile, etc).

KPI: NOx emissions
Calculation Example

Relevant PIs:

- Emitted Mass NOx 4000ton
- Transport Work 20.710.647.000 tonmile

KPI Value Formula= $\frac{\text{Emitted Mass NOx}}{\text{Transport Work}} = \frac{4500*10^6}{20710647000} = 0{,}217\,g/tonmile$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (250 *0,217) = 100 – 54,3 = **45,7**

Rating Parameters: Z=250

Z value to be updated (agreed), and need to be differentiated between ship size and other factors

Some typical emission factors

Ship Type	Index unit	CO2	NOx	SOx
LNG Tanker	g/ tonmile	66,5	1,9	1,2
Chemical Tanker	g/ tonmile	23,5	0,7	0,4
Crude Oil Tanker	g/ tonmile	8	0,2	0,1
Bulk Dry	g/ tonmile	7,6	0,2	0,1
Container	g/ tonmile	96,5	2,7	1,7
Refrigerated Cargo	g/ tonmile	124,3	3,5	2,2
RO-RO Cargo	g/ tonmile	94,9	1,8	1,7

KPI: Operational deficiencies

Operational related deficiencies, observations and non-conformances, recorded during external inspections and audits in a calendar year, not including HR, security, safety and environmental deficiencies. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of Operational related deficiencies
- Total number of recorded external inspections

KPI Value Formula=

$$\frac{\text{Total number of Operational related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 16,67

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature such as deficiencies related to security or environment. This specific KPI (Operational deficiencies) is a KPI that will cover all deficiencies that are not easily related to one of the other more specific KPIs within this range.

The total number of recorded external inspection is used as a denominator in all these KPIs in order to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: Port state control deficiency rate

The number of deficiencies reported during Port State Control Inspections in a calendar year. Made relative to the total number of port state control inspections in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of PSC deficiencies
- Total number of PSC inspections

KPI Value Formula=

$$\frac{\text{Total number of PSC deficiencies}}{\text{Total number of PSC inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 15,2

This KPI is one of three KPIs related to Port State Control Inspections. The three areas covered are; 'Flawless port state control performance' which measures the percentage of port state controls resulting in zero deficiencies, 'Port state control detention' which measures the total number of port state control inspections resulting in a detention and this specific KPI, 'Port state control deficiency rate', which measures the ratio of the total number of issued deficiencies during port state control inspection relative to the total number of port state control inspections conducted

KPI: Port state control deficiency rate
Calculation Example

Relevant PIs:

- Total number of PSC deficiencies 6
- Total number of PSC inspections 2

KPI Value Formula= $\frac{\text{Total number of PSC deficiencies}}{\text{Total number of PSC inspections}} = \frac{12}{4} = 3$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (15,2*3) = 100 – 45,6 = **54,4**

Rating Parameters: Z= 15,2

KPI: Port state control detention

The number of Port State Control Inspections resulting in a detention in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of PSC inspections resulting in a detention

KPI Value Formula=	Total Number of PSC inspections resulting in a detention
KPI Rating Formula=	100 if KPI Value = 0 0 if KPI Value > 0
Rating Parameters:	N/A

This KPI is one of three KPIs related to Port State Control Inspections. The three areas covered are; 'Flawless port state control performance' which measures the percentage of port state controls resulting in zero deficiencies, 'Port state control deficiency rate' which measures the ratio of the total number of issued deficiencies during port state control inspection against the total number of port state control inspections conducted and this specific KPI, 'Port state control detention' which measures the total number of port state control inspections resulting in a detention.

No denominator is used in this KPI

KPI: Port state control detention
Calculation Example

Relevant PIs:

- Total number of PSC inspections resulting in a detention = 1

KPI Value Formula=	Total Number of PSC inspections resulting in a detention = 1
KPI Rating Formula=	**0** 100 if KPI Value = 0 0 if KPI Value > 0
Rating Parameters:	N/A

This KPI is binary. If you have a detention on the vessel your Rating will be zero.

KPI: Safety deficiencies

Safety related deficiencies, observations and non-conformances, recorded during external inspections and audits in a calendar year. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of Safety related deficiencies
- Total number of recorded external inspections

KPI Value Formula=

$$\frac{\text{Total number of Safety related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 33,33

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature. An example of a safety deficiency can be misplaced life buoys or fire hoses.

The total number of recorded external inspection is used as a denominator in all these KPIs in order to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: Security deficiencies

Security related deficiencies, observations and non-conformances, recorded during external inspections and audits in a calendar year. Made relative to the total number of external inspections in a calendar year.
Measured per vessel for internal improvement as well as external communication (input to SPIs)

Relevant PIs:

- Total number of Security related deficiencies
- Total number of recorded external inspections

KPI Value Formula=

$$\frac{\text{Total number of Security related deficiencies}}{\text{Total number of recorded external inspections}}$$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z= 33,33

This KPI is part of a range of KPIs related to deficiencies that are identified during external inspections. These deficiencies are categorized depending on their nature. An example of a security deficiency can be lack of compliance to the ISPS code.

The total number of recorded external inspection is used as a denominator in all these KPIs in order to enable benchmarking between vessels that are subject to a uneven number of external inspection.

KPI: SOx emissions

The estimated SOx efficiency in a calendar year. Measured per vessel for external communication (input to SPIs)

Relevant PIs:

- Emitted Mass SOx
- Transport Work

KPI Value Formula= $\frac{\text{Emitted Mass SOx} * 10^6}{\text{Transport Work}}$

KPI Rating Formula= 100-(Z*KPI Value)

Rating Parameters: Z=500

This KPI compares emitted mass of SOx to the vessel's total transport work, hereby stating the value achieved (transport work) by the emission of SOx. Because the PI 'Emitted Mass SOx' is measured in tons, the PI's value is multiplied by 1 million in order to get the KPI value in g/ton mile (tonmile, passengermile, TEUmile, etc).

KPI: SOx emissions
Calculation Example

Relevant PIs:

- Emitted Mass SOx 2000ton
- Transport Work 20.710.647.000 tonmile

KPI Value Formula= $\frac{\text{Emitted Mass SOx}}{\text{Transport Work}} = \frac{2000*10^6}{20710647000} = 0{,}097\,g/tonmile$

KPI Rating Formula= 100-(Z*KPI Value) = 100 – (500 *0,097) = 100 – 48,5 = **51,5**

Rating Parameters: Z= 500

Z value to be updated (agreed), and need to be differentiated between ship size and other factors

Some typical emission factors

Ship Type	Index unit	CO2	NOx	SOx
LNG Tanker	g/ tonmile	66,5	1,9	1,2
Chemical Tanker	g/ tonmile	23,5	0,7	0,4
Crude Oil Tanker	g/ tonmile	8	0,2	0,1
Bulk Dry	g/ tonmile	7,6	0,2	0,1
Container	g/ tonmile	96,5	2,7	1,7
Refrigerated Cargo	g/ tonmile	124,3	3,5	2,2
RO-RO Cargo	g/ tonmile	94,9	1,8	1,7

KPI: Vessel availability

A percentage of the total utilization related to the total availability (subtracting planned off-hire) of a vessel in a calendar year. Measured per vessel for internal improvement as well as external communication (input to SPIs).

Relevant PIs:

- Actual off-hire
- Planned off-hire

KPI Value Formula= $(1-\frac{\text{Actual offhire - Planned offhire}}{(365*24)\text{ - Planned offhire}})*100$

KPI Rating Formula= (Z*KPI Value)-100

Rating Parameters: Z=2

This KPI calculates the vessel utilization as a percentage of the total utilization time available. By subtracting hours of planned off-hire from 365x24 (which would be the 'optimal utilization') the 100% availability is found.

KPI: Vessel availability
Calculation Example

Relevant PIs:

- Actual off-hire 23h
- Planned off-hire 18h

KPI Value Formula= $(1-\frac{\text{Actual offhire - Planned offhire}}{(365*24)\text{ - Planned offhire}})*100 = (1-\frac{23-18}{(365*24)-18})*100 = 99{,}94$

KPI Rating Formula= Z*KPI Value – 100 = 2 * 99,94 - 100 = **99,88**

Rating Parameters: Z=2

Shipping KPI

Performance Indicators

“PI”

MARINTEK InterManager Norges forskningsråd

The Shipping KPI Standard - PIs

- *AAE (Additional Authorized Expense)*
- *Absconded crew*
- *Actual drydocking costs*
- *Actual drydocking duration*
- *Actual off-hire*
- *Actual running Costs and Accruals*
- *Agreed drydocking costs*
- *Agreed drydocking duration*
- *Allision*
- *Average number of vessels under management*
- *Ballast water discharge violations*
- *Collision*
- *Condition of class*
- *Criminal offence*
- *Drug/alcohol abused*
- *Emitted Mass CO2*
- *Emitted Mass NOx*
- *Emitted Mass SOx*
- *Failure of critical equipment and systems*
- *Fatalities due to injuries*
- *Fatalities due to sickness*
- *Grounding*
- *Lost Workday Cases*
- *No of crew not relieved on time*
- *No of dismissed crew*
- *No of logged warnings*
- *No of violations of MARPOL Annex 1-6*
- *Number of cases where a crew member is sick for more than 24 hours*
- *Number of new cadets*
- *Officer working days*
- *Officers retention rate*
- *Permanent Total Disabilities*
- *Permanent Partial Disabilities*
- *Planned off-hire*
- *PSC inspections resulting in zero deficiencies*
- *Severe spills of bulk liquid*
- *Total Exposure Hours*
- *Total no of contained spills of bulk liquid*
- *Total number of accidental releases of substances covered by MARPOL, to the environment*
- *Total number of cargo units/passengers transported*
- *Total number of damaged or lost cargo units/passengers injured during cargo handling*
- *Total number of damaged or lost cargo units/passengers injured during voyage*
- *Total number of Environmental related deficiencies*
- *Total number of explosion incidents*
- *Total number of fire incidents*
- *Total number of HR related deficiencies*
- *Total number of navigation related deficiencies*
- *Total number of operational related deficiencies*
- *Total number of PSC inspections*
- *Total number of PSC deficiencies*
- *Total number of PSC inspections resulting in a detention*
- *Total number of recorded external inspections*
- *Total number of safety related deficiencies*
- *Total number of security related deficiencies*
- *Training days*
- *Transport Work*
- *Vessel running cost budget*
- *Violation of rest hours*

PI: AAE (Additional Authorized Expense)

The amount asked by the ship manager from the ship-owner (or charterer) for additional expenses related to agreed exceptional items during a fiscal year

Used in KPI(s):

- Budget control pr vessel

PI Value:

Total AAE per vessel

AAE should be given in USD

Data Capture:

This PI is used in the calculation of deviation from the vessel's running cost budget as AAE should be withdrawn when calculating a vessel's actual running costs and accruals as the AAE are in fact approved by the ship owner hence it can be argued that they are in fact part of the vessel's running cost budget

PI: Absconded crew

Number of crew absent without leave (AWOL) in a calendar year

Used in KPI(s):

- Crew behaviour

PI Value:

∑Crew AWOL

Data Capture:

Data concerning this PI is taken from internal reporting and is subject to manipulation and subjective interpretations

This PI is part of 5 PIs related to crew misbehaviour.

All incidents (all PIs) together are used in calculation of the KPI 'Crew behaviour' with the average number of crew onboard vessel used as a denominator

PI: Actual drydocking costs

The actual costs of the yard stay for drydocking. Summarized per 5 year rolling time period

Used in KPI(s):

- Drydocking planning performance

PI Value:

Actual costs

Costs should be given in USD

Data Capture:

This PI is used to be able to measure the deviation from a vessel's drydocking schedule (related to costs) by comparing the value to the Agreed drydocking costs. Together with the PIs 'Actual drydocking duration and 'Agreed drydocking duration' a KPI called 'Drydocking planning performance' is created

PI: Actual drydocking duration

The actual duration of the yard stay for drydocking. Summarized per 5 year rolling time period

Used in KPI(s):

- Drydocking planning performance

PI Value:

Actual duration

Duration should be given in Days

Data Capture:

This PI is used to be able to measure the deviation from a vessel's drydocking schedule (related to duration) by comparing the value to the Agreed drydocking duration. Together with the PIs 'Actual drydocking costs' and 'Agreed drydocking costs' a KPI called 'Drydocking planning performance' is created

PI: Actual off-hire

The actual number of hours lost in a calendar year due to (full details described in prevailing Charter Party); Interruption of service level caused by; deficiency of personnel or stores, repairs, breakdowns and overhaul, neglect of duty of crew, medical advice or treatment of crew, detention of vessel or quarantine, planned off-hire, reduction of vessel performance regarding speed or cargo handling

Used in KPI(s):

- Vessel availability

PI Value:

∑Number of hours claimed by the Charterer through the principals

Data Capture:

This PI together with the PI 'Planned off-hire' provides a percentage of the vessel's actual availability in light of (365x24) minus the planned off-hire=100%

PI: Actual running costs and accruals

Total annual (fiscal year) cost per vessel including M&R, purchasing, operation, crewing, insurance and other vessel operating costs. Capital expenses such as upgrades, drydockings and modifications are not taken into account.

Used in KPI(s):

- Budget control pr vessel

PI Value:

Total annual cost per vessel

Costs should be given in USD

Data Capture:

This PI is used to be able to measure the deviation from a vessel's running costs budget represented in percentage by comparing it to the PI 'Vessel running costs budget'

PI: Agreed drydocking costs

The agreed costs of the yard stay for drydocking. Summarized per 5 year rolling time period

Used in KPI(s):

- Drydocking planning performance

PI Value:

Agreed costs

Costs should be given in USD

Data Capture:

This PI is used to be able to measure the deviation from a vessel's drydocking schedule (related to costs) by comparing the value to the Actual drydocking costs. Together with the PIs 'Actual drydocking duration and 'Agreed drydocking duration' a KPI called 'Drydocking planning performance' is created

PI: Agreed drydocking duration

The agreed duration of the yard stay for drydocking. Summarized per 5 year rolling time period

Used in KPI(s):

- Drydocking planning performance

PI Value:

Agreed duration

Duration should be given in Days

Data Capture:

This PI is used to be able to measure the deviation from a vessel's drydocking schedule (related to duration) by comparing the value to the Actual drydocking duration. Together with the PIs 'Actual drydocking costs' and 'Agreed drydocking costs' a KPI called 'Drydocking planning performance' is created

PI: Allision

The act of unintentional striking a fixed objects. Summarized pr calendar year

Used in KPI(s):

- Navigational incidents

PI Value:

∑ Allisions

Data Capture:

This PI is one of three PIs used in the KPI 'Navigational incidents'. The two other PIs are Collision' and 'Grounding'. The categorization of navigational incidents is used to be able to identify the different potential results of a navigational incident

PI: Average number of vessels under management

The average number of vessels under management in a calendar year

Used in KPI(s):

- Crew management

PI Value:

∑Average number of vessels under management

Data Capture:

All vessels within the fleet should be given the same value on this PI

This PI is one of 5 PIs related to the KPI 'Crew management' which reflects the ship manager's willingness and ability to acquire and maintain the required competence/crew for their operations. This specific PI gives the average number of vessels under management (in a calendar year) which is used as a (sub) denominator in the KPI

PI: Ballast water discharge violations

Any discharge or exchange of ballast water (or lack of doing so) in a calendar year, not in compliance with applicable rules and regulations

Used in KPI(s):

- Ballast water discharge violations

PI Value:

∑Violations

Data Capture:

This PI counts the total number of violations of applicable rules and regulations related to ballast water management.
The PI is the only PI in the KPI 'Ballast water discharge violations' as the potential denominator related to the total number of ballast water operations is considered as non relevant

PI: Collision

The total number of recorded collision incidents between two or more floating objects. Summarized pr calendar year

Used in KPI(s):

- Navigational incidents

PI Value:

∑ Collisions

Data Capture:

This PI is one of three PIs used in the KPI 'Navigational incidents'. The two other PIs are 'Allision' and 'Grounding'. The categorization of navigational incidents is used to be able to identify the different potential results of a navigational incident

PI: Condition of class

Existing CoC at time of measurement. Condition of class is a written statement from class (ref. IACS)

Used in KPI(s):

- Condition of Class

PI Value:

∑ Condition of class

Data Capture:

Data concerning this PI can be taken from class inspection reports

This PI counts the total number of Conditions of class that are stated for the vessel in a calendar year. The PI is the only PI in the KPI 'Condition of class' as there is no need for a common denominator (such as the total number of class inspections) in the KPI for benchmarking purposes

PI: Criminal offence

Crew (Officers and Ratings) charged with criminal offence in a calendar year

Used in KPI(s):

- Crew behaviour

PI Value:

∑Crew charged

Data Capture:

Data concerning this PI is taken from internal reporting and is subject to manipulation and subjective interpretations

This PI is part of 5 PIs related to crew misbehaviour.

All incidents (all PIs) together are used in calculation of the KPI 'Crew behaviour' with the average number of crew onboard vessel used as a denominator

PI: Drug/alcohol abused

Cases where crew (Officers and Ratings) are caught abusing drugs or alcohol in a calendar year

Used in KPI(s):

- Crew behaviour

PI Value:

∑Crew caught abusing

Data Capture:

Data concerning this PI is taken from internal reporting and is subject to manipulation and subjective interpretations

This PI is part of 5 PIs related to crew misbehaviour.

All incidents (all PIs) together are used in calculation of the KPI 'Crew behaviour' with the average number of crew onboard vessel used as a denominator

PI: Emitted mass CO2

The total qty of emitted tons of CO2 in laden and ballast condition in a calendar year

Used in KPI(s):

- CO2 emissions

PI Value:

Fuel Used * Fuel Quality Factor

Fuel Used to be given in ton

Fuel Quality Factor:

3.09 for Distillate fuels

3.02 for Residual Fuels

Data Capture:

Calculation is based on the fuel consumption and fuel quality, so to be accurate the emitted mass should be calculated for each bunkering (or at least each change in fuel quality) and than aggregated for a year per vessel.

This PI is used in calculation of energy efficiency in the KPI 'CO2 emissions' by dividing the value on the PI 'Transport work'

PI: Emitted mass NOx

The total qty of emitted kilos of NOx in laden and ballast condition in a calendar year

Used in KPI(s):

- NOx emissions

PI Value:

Fuel Used x Engine Speed Factor

Fuel Used to be given in ton

Engine Speed Factor:

93 for RPM < 200

60 for RPM 200-1000

50 for RPM > 1000

Data Capture:

This PI apply a rule of thumb to be generally applicable. A more accurate method exists for newer vessels which have emission certificates, those who have this should use the more accurate method to calculate the emitted mass NOx.

This PI is used in calculation of value achieved by emitting NOx in the KPI 'NOx emissions' by dividing the value on the PI 'Transport work'

PI: Emitted mass SOx

The total qty of emitted kilos of SOx in laden and ballast condition in a calendar year

Used in KPI(s):

- SOx emissions

PI Value:

Fuel Used x Sulphur Content Factor

Fuel Used to be given in ton

Sulphur Content Factor = Sulphur Content in % x 20

Data Capture:

Calculation is based on the fuel consumption and fuel quality, so to be accurate the emitted mass should be calculated for each bunkering (or at least each change in sulphur content) and than aggregated for a year per vessel. Sulphur content should be taken from fuel quality reports.

This PI is used in calculation of value achieved by emitting SOx in the KPI 'SOx emissions' by dividing the value on the PI 'Transport work'

PI: Failure of critical equipment and systems

The total number of failures to equipment and systems in the critical list (as required by the ISM code 10.3 and defined in the company SMS) resulting in whole or partial unavailability in a calendar year

Used in KPI(s):

- Failure to critical equipment and systems

PI Value:

∑ Failures to critical equipment and systems

Data Capture:

This PI is the only PI for the KPI 'Failure of critical equipment and systems'. As the vessels' critical lists may vary in size it could be argued that e.g. the number of items on the list could be used as a denominator for benchmarking purposes. In any case, a failure to a critical equipment or system is a serious matter, regardless of the number of items in the vessel's critical list, and the KPI 'Failure to critical equipment and systems is kept without a denominator.

PI: Fatalities due to injuries

Crew fatalities due to work-related injuries occurring (extension of OCIMF) in a calendar year

Used in KPI(s):

- Lost Time Injury Frequency

PI Value:

∑Fatalities

Data Capture:

This PI is part of 5 PIs that together form the KPI 'Lost Time Injury Frequency' by counting all lost workday cases, fatalities due to injuries, permanent total disabilities and permanent partial disabilities and use the total exposure hours as a denominator to get the frequency

PI: Fatalities due to sickness

The number of crew fatalities other than injury related cases. Including suicide

Used in KPI(s):

- Lost Time Sickness Frequency

PI Value:

∑Cases

Data Capture:

This PI is part of 3 PIs that together form the KPI 'Lost Time Sickness Frequency' by counting cases of sickness over 24 hours as well as fatalities due to sickness and use the total exposure hours as a denominator to get the frequency

PI: Grounding

Unintentional contact by a vessel with the sea bed. Summarized pr calendar year

Used in KPI(s):

- Navigational incidents

PI Value:

∑ Groundings

Data Capture:

This PI is one of three PIs used in the KPI 'Navigational incidents'. The two other PIs are 'Collision' and 'Allision'. The categorization of navigational incidents is used to be able to identify the different potential results of a navigational incident

PI: Lost Workday Cases (LWC)

LWC is an injury resulting in an individual being unable to carry out any of his duties or to return to work on the next scheduled work shift on the day following the injury, unless caused by delays in getting medical treatment ashore (OCIMF).
Summarized per calendar year.

Used in KPI(s):

- Lost Time Injury Frequency

PI Value:

∑LostWorkdayCases

Data Capture:

This PI is part of 5 PIs that together form the KPI 'Lost Time Injury Frequency' by counting all lost workday cases, fatalities due to injuries, permanent total disabilities and permanent partial disabilities and use the total exposure hours as a denominator to get the frequency

PI: No of crew not relieved on time

Number of crew not relieved within the agreed tenure of contract, excluding extensions initiated by crew measured over a calendar year

Used in KPI(s):

- Crew planning

PI Value:

∑Crew not relieved within the agreed tenure of contract measured over a cal. year

Data Capture:

This PI is used in the KPI 'Crew planning which reflects the ship manager's ability to adhere to agreed tenure of contracts as well as official requirements related to rest hours

PI: No of dismissed crew

Cases where crew has been dismissed due to breach of discipline before end of contract, in a calendar year

Used in KPI(s):

- Crew behaviour

PI Value:

∑Crew dismissed

Data Capture:

Data concerning this PI is taken from internal reporting and is subject to manipulation and subjective interpretations

This PI is part of 5 PIs related to crew misbehaviour.

All incidents (all PIs) together are used in calculation of the KPI 'Crew behaviour' with the average number of crew onboard vessel used as a denominator

PI: No of logged warnings

Any logged warning given by superior to a member of the crew in a calendar year

Used in KPI(s):

- Crew behaviour

PI Value:

∑Logged warnings

Data Capture:

Data concerning this PI is taken from internal reporting and is subject to manipulation and subjective interpretations

This PI is part of 5 PIs related to crew misbehaviour.

All incidents (all PIs) together are used in calculation of the KPI 'Crew behaviour' with the average number of crew onboard vessel used as a denominator

PI: No of violations of MARPOL Annex 1-6

No of violations of MARPOL Annex 1-6

Used in KPI(s):

- No of violations of MARPOL Annex 1-6

PI Value:

∑Violations

Data Capture:

This PI counts the number of times where MARPOL Annex 1-6 has been violated and feeds data into the KPI with the same name

PI: Number of cases where a crew member is sick for more than 24 hours

The number of cases where crew members are sick for more than 24 hours,
only counted when the crew member has been onboard the vessel for a minimum of four days.
Summarized per calendar year

Used in KPI(s):

- Lost Time Sickness Frequency

PI Value:

∑Cases

Data Capture:

This PI is part of 3 PIs that together form the KPI 'Lost Time Sickness Frequency' by counting cases of sickness over 24 hours as well as fatalities due to sickness and use the total exposure hours as a denominator to get the frequency

PI: Number of new cadets

The total no of cadets recruited in a calendar year for the overall organisation

Used in KPI(s):

- Crew management

PI Value:

∑New Cadets

Data Capture:

As the number of new cadets is calculated on a fleet level, all vessels within the fleet should be given the same value on this PI

This PI is one of 5 PIs related to the KPI 'Crew management' which reflects the ship manager's willingness and ability to acquire and maintain the required competence/crew for their operations. This specific PI reflects the total number of new cadets assigned to the fleet

PI: Officer working days

Total number of officer working days in a calendar year (fleet average)

Used in KPI(s):

- Crew management

PI Value:

∑Officer working days

Data Capture:

As Officer working days is calculated on a fleet level, all vessels within the fleet should be given the same value on this PI

This PI is one of 5 PIs related to the KPI 'Crew management' which reflects the ship manager's willingness and ability to acquire and maintain the required competence/crew for their operations. This specific PI reflects the total number of officer working days which is used as a (sub) denominator in the KPI

PI: Officers retention rate

Percentage of officers staying with the organisation after a period, normally a year. Adjusted for unavoidable terminations.

The formula is defined by INTERTANKO Officer Retention Formula. (Corrected) Version 2 Dated 12th March 2008

Source: The above formula is modelled upon the Abelson adjusted turnover rate "Abelson M (1996) Turnover cultures and turnover audits" in Human Resources Management. But is adjusted by INTERTANKO to create a retention rate formula, as opposed to a turn over rate formula.

Used in KPI(s):

- Crew management

PI Value:

$$\text{RetentionRate(RR)} = 100 - \frac{S - (UT + BT)}{AE} * 100$$

S = Total Number of terminations from what ever cause (In effect this means the total number employees that have left the company for what ever reason)
UT = Unavoidable Terminations (i.e. retirements or long term illness)
BT = Beneficial Terminations (i.e. sometimes those staff that do leave provide benefit to the company by virtue of leaving, for example under performers
AE = The average number of employees working for the company during the same period as calculated, this should be any period of 12 months.

Data Capture:

The officers retention rate is calculated on a fleet level, all vessels within the fleet should be given the same value on this PI. Data is captured by analysing your employment database a years back and identifying how many of those in the data base have left and for what reason. The average number of employed officers in the period take into account any reduction in the officer-need (reduction in fleet size).

This PI is one of 5 PIs related to the KPI 'Crew management' which reflects the ship manager's willingness and ability to acquire and maintain the required competence/crew for their operations. This specific PI reflects the ship manager's ability to retain their officers (hence competence and experience).

PI: Officers retention rate
Calculation Example

Percentage of officers staying with the organisation after a period, normally a year. Adjusted for unavoidable terminations.

Used in KPI(s):

- Crew management

Parameters:

S:	Number of officers left in the period	96
UT:	Unavoidable Terminations	10
BT:	Beneficial Termination	2
AE:	Total number of officers in the period	250

$$\text{RetentionRate(RR)} = 100 - \frac{S - (UT + BT)}{AE} * 100 = 100 - \frac{96 - (10 + 2)}{250} * 100 = 100 - 33{,}6 = 66{,}4\%$$

PI: Permanent Total Disabilities (PTD)

PTD is any work injury which incapacitates an employee permanently and results in termination of employment on medical grounds (e.g. loss of limb(s) permanent brain damage, loss of sight) and precludes the individual from working either at sea or ashore (OCIMF). Summarized per calendar year

Used in KPI(s):

- Lost Time Injury Frequency

PI Value:

∑PermanentTotalDisabilities

Data Capture:

This PI is part of 5 PIs that together form the KPI 'Lost Time Injury Frequency' by counting all lost workday cases, fatalities due to injuries, permanent total disabilities and permanent partial disabilities and use the total exposure hours as a denominator to get the frequency

PI: Permanent Partial Disabilities (PPD)

PPD is any work injury which results in the complete loss, or permanent loss of use, of any member or part of the body, or any impairment of functions of parts of the body, regardless of any pre-existing disability of the injured member or impaired body function, that partially restricts or limits an employees basis to work on a permanent basis at sea. Such an individual could be employed ashore but not at sea in line with industry guidelines (OCIMF).
Summarized per calendar year

Used in KPI(s):

- Lost Time Injury Frequency

PI Value:

∑PermanentPartialDisabilities

Data Capture:

This PI is part of 5 PIs that together form the KPI 'Lost Time Injury Frequency' by counting all lost workday cases, fatalities due to injuries, permanent total disabilities and permanent partial disabilities and use the total exposure hours as a denominator to get the frequency

PI: Planned off-hire

The number of hours planned for repair and maintenance during a specific calendar year, including Class renewal surveys, Intermediate surveys, Dry-dockings, and Modification jobs that are agreed with the charterer/vessel operator

Used in KPI(s):

- Vessel availability

PI Value:

∑ Hours planned off-hire

Data Capture:

To be able to measure a vessel's availability it is natural to subtract the planned off-hire from a total potential availability (typically 365x24) as it is the unplanned unavailability that should be given focus

PI: PSC inspections resulting in zero deficiencies

The total number of port state control inspections resulting in zero deficiencies (not counting observations - code99) in a calendar year

Used in KPI(s):

- Flawless port state control performance

PI Value:

∑Port state control inspections resulting in zero deficiencies in a calendar year

Data Capture:

Data concerning this PI is captured by counting the number of Port state control inspections where no deficiencies are reported.

This PI is used in the KPI, 'Flawless port state control performance' which measures the percentage of port state controls resulting in zero deficiencies against the total number of port state control inspections conducted

PI: Severe spills of bulk liquid

A severe spill is a spill above one barrel. Summarized per calendar year

Used in KPI(s):

- Accidental releases of substances as def by MARPOL

PI Value:

∑Cases

Data Capture:

This PI together with the PI 'Total no of accidental releases of substances covered by MARPOL, to the environment' makes the KPI 'Accidental releases of substances as def by MARPOL' by counting the total number of spills, liquid (this PI) or solids (covered by the PI 'Total no of accidental releases of substances covered by MARPOL, to the environment')

PI: Total Exposure Hours (TEH)

TEH is the total number of hours the crew stays on a given vessel in a given year. The number is an aggregate of all crew-members on a given vessel in a given year. (OCIMF)

Used in KPI(s):

- Lost Time Sickness Frequency
- Lost Time Injury Frequency
- Crew behaviour

PI Value:

∑Crew days X 24

Data Capture:

Aggregate the number of crew days to be able to capture varying crew sizes over the year.

This PI is used as a denominator in several KPIs on basis of enabling benchmarking of vessels which vary regarding the number of crew onboard

PI: Total no of contained spills of bulk liquid

Total no of contained spills (nothing going overboard) in a calendar year

Used in KPI(s):

- Contained spills

PI Value:

∑Cases

Data Capture:

Some spills are contained but still represent an incident that should be recorded. This PI counts the total number of contained spills and feeds into the KPI 'Contained spills' as the only PI

PI: Total number of accidental releases of substances covered by MARPOL, to the environment

Total number of accidental releases of substances covered by MARPOL, to the environment

Used in KPI(s):

- Accidental releases of substances as def by MARPOL

PI Value:

∑Cases

Data Capture:

This PI together with the PI 'Severe spills of bulk liquid' makes the KPI 'Accidental releases of substances as def by MARPOL' by counting the total number of spills, liquid (covered by the PI 'Severe spills of bulk liquid') or solids (this PI)

PI: Total number of cargo units/passengers transported

The total number of cargo units/passengers transported in a calendar year

Used in KPI(s):

- Cargo incidents during cargo operations
- Cargo incidents during voyage

PI Value:

∑ Number of cargo units/passenger transported

For Container Carriers use number of units
For Gas Carriers use cubic metres
For PCC/PCTC use units
For Bulk use metric tons
For Passenger use number of passengers

Data Capture:

Data concerning this PI is available from an aggregation of all consignments in a calendar year for the vessel in question. It is vital that this PI's unit is in coherence with the unit chosen for the PI 'Total number of damaged or lost cargo units/passengers injured during cargo handling' or PI 'Total number of damaged or lost cargo units/passengers injured during voyage', depending on which KPI that is to be calculated

This PI is used as the denominator in two KPIs ('Cargo incidents during cargo operations' and 'Cargo incidents during voyage') both related to cargo incidents or passenger injuries during handling/embarking and voyage.

PI: Tot no of damaged or lost cargo units/passengers injured during cargo handling

The total number of damaged or lost cargo units/passengers injured during cargo operations in a calendar year. The number is taken from received claims

Used in KPI(s):

- Cargo incidents during cargo operations

PI Value:

∑Number of damaged or lost cargo units/passengers injured

For Container Carriers use number of units
For Gas Carriers use cubic metres
For PCC/PCTC use units
For Bulk use metric tons
For Passenger use number of passengers

Data Capture:

Data concerning this PI is taken from official claims reports received by the ship manager from the ship owner/operator depending on who the cargo owner directs the claim to.
It is vital that this PI's unit is in coherence with the unit chosen for the PI 'Total number of cargo units/passengers transported' which is the denominator when calculating the relevant KPI's value

This PI is used in the KPI 'Cargo incidents during handling' and captures data related to damaged or lost cargo as well as injured passengers during cargo handling or embarking passengers

PI: Tot no of damaged or lost cargo units/passengers injured during voyage

The total number of damaged or lost cargo units/passengers injured during voyage in a calendar year. The number is taken from received claims

Used in KPI(s):

- Cargo incidents during voyage

PI Value:

∑Number of damaged or lost cargo units/passengers injured

For Container Carriers use number of units
For Gas Carriers use cubic metres
For PCC/PCTC use units
For Bulk use metric tons
For Passenger use number of passengers

Data Capture:

Data concerning this PI is taken from official claims reports received by the ship manager from the ship owner/operator depending on who the cargo owner directs the claim to.

It is vital that this PI's unit is in coherence with the unit chosen for the PI 'Total number of cargo units/passengers transported' which is the denominator when calculating the relevant KPI's value

This PI is used in the KPI 'Cargo incidents during voyage' and captures data related to damaged or lost cargo as well as injured passengers during voyage

PI: Total number of Environmental related deficiencies

Includes deficiencies, negative observations and non-conformances of an environmental consequence (local regulations and MARPOL) as a result of recorded external inspections and audits in a calendar year

Used in KPI(s):

- Environmental deficiencies

PI Value:

∑ Environmental-related deficiencies

Data Capture:

Data concerning this PI can be taken from external inspection reports. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Total number of explosion incidents

The total number of explosion incidents on a vessel in a calendar year

Used in KPI(s):

- Fire and Explosions

PI Value:

∑Incidents

Data Capture:

This PI counts the total number of explosion incidents onboard a vessel and together with the PI 'Total number of fire incidents' form the KPI 'Fire and Explosions'

PI: Total number of fire incidents

The total number of fire incidents on a vessel in a calendar year

Used in KPI(s):

- Fire and Explosions

PI Value:

∑Incidents

Data Capture:

This PI counts the total number of fire incidents onboard a vessel and together with the PI 'Total number of explosion incidents' form the KPI 'Fire and Explosions'

PI: Total number of HR related deficiencies

Includes deficiencies, negative observations and non-conformances with a HR consequence as a result of recorded external inspections and audits in a calendar year

Used in KPI(s):

- HR deficiencies

PI Value:

∑ HR-related deficiencies

Data Capture:

Data concerning this PI can be obtained from external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI Performance Hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Total number of Navigation related deficiencies

Navigation-related deficiencies, negative observations and non-conformances, recorded during external inspections and audits in a calendar year

Used in KPI(s):

- Navigational deficiencies

PI Value:

∑ Navigation-related deficiencies

Data Capture:

Data concerning this PI can be obtained from external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI Performance Hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Total number of Operational related deficiencies

Operational-related deficiencies, negative observations and non-conformances, recorded during external inspections and audits in a calendar year, not including HR deficiencies, security deficiencies, safety deficiencies and environmental deficiencies

Used in KPI(s):

- Operational deficiencies

PI Value:

∑ Operational-related deficiencies

Data Capture:

Data concerning this PI can be obtained from external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI Performance Hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Total number of PSC inspections

Total number of port state control inspections in a calendar year

Used in KPI(s):

- Port state control deficiencies
- Port state control detentions

PI Value:

∑ Port state control inspections pr calendar year

Data Capture:

Data concerning this PI is captured by counting the number of Port state control inspections

This PI is used as the denominator in two KPIs ('Port state control deficiencies' and Port state control detentions') to enable benchmarking of vessels even with a different number of port state control inspections (hence a different risk for receiving deficiencies/detentions in the first place)

PI: Total number of PSC deficiencies

The total number of deficiencies including deficiencies resulting in detention, excluding observations (code99) from port state control inspections in a calendar year

Used in KPI(s):

- Port state control deficiency rate

PI Value:

∑ Deficiencies

Data Capture:

Data concerning this PI can be taken from the Port state control inspection reports issued after each inspection

A comprehensive picture regarding port state control performance is considered as vital. This PI together with the PI 'Total number of PSC inspections' provides a ratio of the total number of deficiencies over the total number of PSC inspections in the KPI 'Port state control deficiency rate'.

PI: Total number of PSC inspections resulting in a detention

The total number of port state control inspections, excluding verifications, resulting in a detention in a calendar year. Multiple reasons for detention in one inspection count as ONE

Used in KPI(s):

- Port state control detention

PI Value:

∑Number of inspections resulting in a detention

Data Capture:

Data concerning this PI can be taken from counting all port state control inspection reports that contains a detention

This PI counts the number of port state control inspections resulting in a detention. This is because a comprehensive picture regarding port state control performance is considered as vital

PI: Total number of recorded external inspections

Total number of recorded external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS audits in a calendar year (excluding voluntary inspections made for the purpose of quality improvement)

Used in KPI(s):

- Environmental deficiencies
- HR deficiencies
- Security deficiencies
- Operational deficiencies
- Safety deficiencies
- Navigational deficiencies

PI Value:

∑ External inspections

Data Capture:

Data concerning this PI can be taken from summing up all external inspections for the vessel in question in a calendar year

This PI serves as a common denominator in 6 different KPIs (for benchmarking purposes) related to deficiencies identified during external inspections

PI: Total number of Safety related deficiencies

Safety-related deficiencies, negative observations and non-conformances, recorded during external inspections and audits in a calendar year

Used in KPI(s):

- Safety deficiencies

PI Value:

∑ Safety-related deficiencies

Data Capture:

Data concerning this PI can be obtained from external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI Performance Hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Total number of Security related deficiencies

Total number of security related deficiencies, including negative observations and non-conformances as a result of recorded external inspections and audits in a calendar year. A security related deficiency is a result of violation of the ISPS code

Used in KPI(s):

- Security deficiencies

PI Value:

∑ Security-related deficiencies

Data Capture:

Data concerning this PI can be obtained from external inspections by external bodies (class, port, flag, vetting, insurance, charterers) also including external ISO/ISM/OHSAS. In any case the categorization of deficiencies (according to the PIs in the Shipping KPI Performance Hierarchy) must be done subjectively

This PI is one of several PIs that capture information concerning deficiencies. A system of 6 categories of deficiencies (environmental, HR, security, operational, navigational and safety) are feeding values into 6 different KPIs (based on the same categorization) with the PI 'Total number of external inspection) as the common denominator in all KPIs for benchmarking purposes

PI: Training days

Total number of training days in a calendar year (fleet average)
Training = Training exceeding statutory requirements performed by formal trainer (excluding computer-based)

Used in KPI(s):

- Crew management

PI Value:

∑Training days

Data Capture:

As Training days is calculated on a fleet level, all vessels within the fleet should be given the same value on this PI

This PI is one of 5 PIs related to the KPI 'Crew management' which reflects the ship manager's willingness and ability to acquire and maintain the required competence/crew for their operations. This specific PI reflects the ship manager's willingness to invest in crew training.

PI: Transport Work

Transport work is a product of the cargo transported and the laden distance sailed for a specific vessel in a calendar year.

Used in KPI(s):

- CO2 emissions
- NOx emissions
- SOx emissions

PI Value:

=∑Loaded Cargo * Laden Distance Sailed

Data Capture:

Transport work is given as ton-mile i.e. Loaded cargo is measured in metric tons and laden distance is measured in nautical miles. For some shipping segments, the metric ton may not be considered applicable as cargo measure and IMO opens for the usage of different units of measure for different segments. [Container Ships: TEU (empty or full), Passenger vessels: passengers, Car carriers: car units or occupied lane meters]

NOTE: This is not suitable for the KPI if it is to enable comparison between modes (e.g. bulk vs. containers)

This PI is used as a denominator in KPIs related to emissions in order to be able to say something about the energy efficiency (related to CO2) and value achieved by emissions (related to NOx and SOx)

PI: Vessel running cost budget

Total annual (fiscal year) budget per vessel including M&R, purchasing, operation, crewing, insurance and other vessel operating costs.
Capital expenses such as upgrades, drydockings and modifications are not taken into account

Used in KPI(s):

- Budget control pr vessel

PI Value:

Total budget per vessel

Budget should be given in USD

Data Capture:

This PI is used to be able to measure the deviation from a vessel's running costs budget represented in percentage by comparing
it to the PI 'Actual running costs and accruals'

PI: Violation of rest hours

This PI measures the number of cases of STCW or ILO violations regarding rest or work hours

Used in KPI(s):

- Crew planning

PI Value:

∑Number of cases of work hours violations in a calendar year

Data Capture:

This PI is used in the KPI 'Crew planning' which reflects the ship manager's ability to adhere to official requirements related to rest hours as well as agreed tenure of contracts