Guidelines for
The Use of Environmental Performance Indicators

International Marine
Contractors Association

www.imca-int.com

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The International Marine Contractors Association (IMCA) is the international trade association representing offshore, marine and underwater engineering companies.

IMCA promotes improvements in quality, health, safety, environmental and technical standards through the publication of information notes, codes of practice and by other appropriate means.

Members are self-regulating through the adoption of IMCA guidelines as appropriate. They commit to act as responsible members by following relevant guidelines and being willing to be audited against compliance with them by their clients.

There are two core activities that relate to all members:

- Competence & Training
- Safety, Environment & Legislation

The Association is organised through four distinct divisions, each covering a specific area of members' interests: Diving, Marine, Offshore Survey, Remote Systems & ROV.

There are also five regional sections which facilitate work on issues affecting members in their local geographic area – Asia-Pacific, Central & North America, Europe & Africa, Middle East & India and South America.

IMCA SEL 010

This report has been prepared for IMCA, under the direction of its Safety, Environment & Legislation (SEL) Core Committee, by URS Netherlands BV.

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1 Introduction

Companies throughout the world observe a growth in the number of their stakeholders and other interested parties. They also notice that the information about the company that these stakeholders now expect to receive far exceeds the traditional financial information given in an annual report. This increasing audience expects information on environmental performance, policy and objectives, as well as health and safety information and sometimes data on social issues as well.

Gradually, national and international initiatives have helped the business community with guidelines on how to report this data to their stakeholders. Several organisations have published guidelines on environmental reporting. This data is becoming increasingly useful to outside stakeholders and internal management systems, for company benchmarking and company strategic planning.

Consideration of the best way to measure, analyse and present the data has led to the development of the concept of performance indicators, which facilitate comparison by filtering out the size of the activities. In this way, one can compare a company's performance data over the years despite changing activity levels, and one can also compare the data of different companies of different sizes.

These guidelines suggest a suite of environmental performance indicators (EPIs) for IMCA members and give guidance on using them.

The guidelines define all the terms, suggest ways of collecting and using the data and provide default factors if, for example, conversion factors are not available. In the Appendix a tabular format is presented for ease of completion.

These guidelines are the result of a project initiated by IMCA, and carried out by URS Netherlands BV, a consulting firm and member of the URS Corporation, which operates world-wide and has considerable experience as a consultant to oil and gas companies.

2 The Basics

2.1 What is an Environmental Performance Indicator?

International standards on Environmental Management such as the standard on Environmental Management Systems (ISO 14001) and the Guideline on Environmental Performance Evaluation (ISO 14031) have defined Environmental Performance.

In ISO 14031 'environmental performance' is defined as:

"The result of an organisation's management of its environmental aspects."

An 'environmental performance indicator' (EPI) is then defined as:

"A specific expression that provides information about an organisation's environmental performance."

The purpose of EPIs is to generate a suite of (effectively non-dimensional) numbers which can be compared over time in a company or benchmarked against other companies. EPIs are usually expressed as a performance unit/unit of activity.

2.2 The State of the Art

Once, only top companies tried to find the best way of expressing their EPIs. This time has passed.

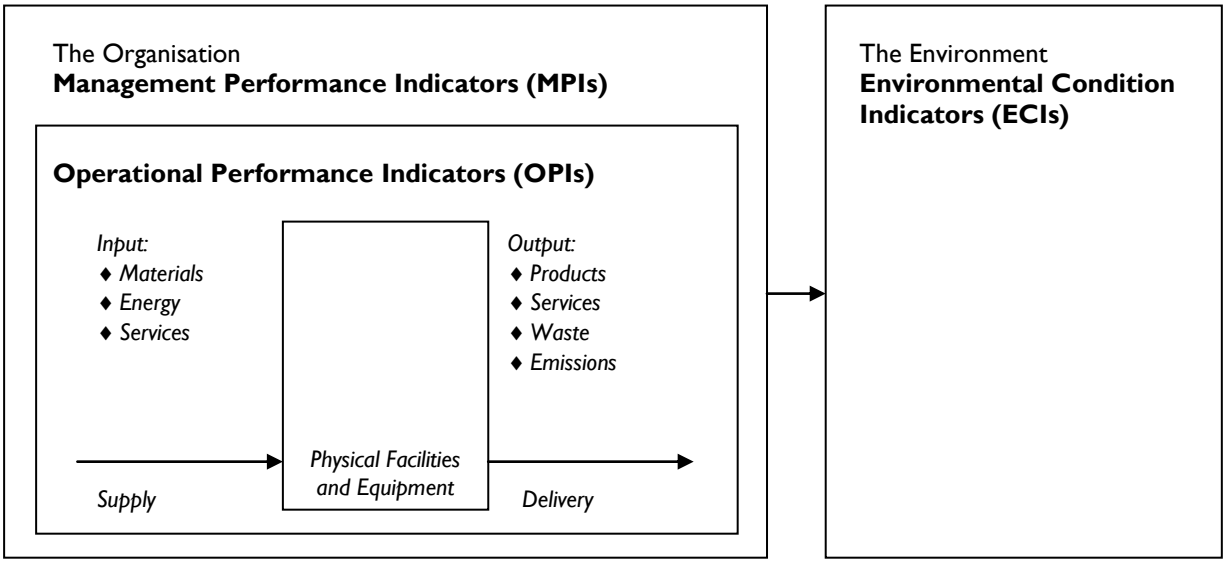
Today a wide variety of international guidelines for performance measurement and performance reporting have been issued. Two of these will briefly be described here.

2.2.1 ISO 14031: Guidelines for Environmental Performance Evaluation

ISO 14031 is a recent publication and deals with guidelines on environmental performance evaluation. It describes the benefits of expressing the environmental performance of a company in terms of indicators, and distinguishes three distinct types (see figure 1):

- Management Performance Indicators
- Operational Performance Indicators
- Environmental Condition Indicators

Figure 1: Types of EPI



2.2.2 Global Reporting Initiative (GRI)

Many guidelines are available on the contents of environmental reports, and on how to evaluate and validate them. Over the years different stakeholders concerned with environmental reporting and company reporting have created a forum called the Global Reporting Initiative (GRI). This platform has the objective of developing guidelines for both the reporting process and report contents, as well as for the verification/validation of the reports. GRI's objective in this is not to limit the scope of the reports to environmental issues, but to go for so-called sustainability reports, in which also financial and social issues are reported.

Guidelines on reporting were issued for the first time in June 2000. These guidelines give a concrete list of examples of Performance Indicators that can be used for reporting.

3 IMCA and EPIs

3.1 How can IMCA and its members benefit from EPIs?

During the IMCA "Setting Performance Indicators" workshop held in Aberdeen on June 19th 2001, the following functions of EPIs to be developed for IMCA and IMCA members were identified. These have been used as the parameters for developing the guidelines.

- Encouraging and enabling members to use EPIs for their performance measurement,
- Stimulating members to use EPIs in environmental reporting to their stakeholders,
- Showing the potential to members of using EPIs as a quick reference for checking compliance with local environmental regulations,
- Collecting EPIs from members to develop a benchmarking database for comparision.

This Guideline should stimulate the use of EPIs by IMCA members. There have been no decisions yet on any initiatives to try to harmonize the use of certain EPIs further, or on starting a central database.

3.2 Linking IMCA Members' Activities, Applicable Legislation and Relevant Industry Requirements

3.2.1 Activities

The IMCA members are active in offshore operations in the following areas:

- Laying pipelines
- Lifting
- Diving
- Construction
- Decommissioning
- Remote & ROV Operations
- Offshore Surveys
- Rock dumping

The main aim has been to identify EPIs that can be used by the majority, if not all, IMCA members. This can only be achieved if it is possible to identify EPIs that are free from factors like the magnitude or volume of the activities. One is looking for data per unit of activity. In this way, some IMCA common EPIs have been identified.

Some EPIs have been identified which cannot easily be compared. For these, benchmarking should only be done between companies that have similar activities and perhaps a similar volume of activity.

3.2.2 Applicable Legislation

A desk study has been carried out on the legislative and industry requirements for environmental performance indicators using information available from the United States, United Kingdom, Norway, The Netherlands and Japan.

The environmental legislation of these countries does not incorporate concrete environmental performance indicator requirements for each environmental aspect. Nevertheless, they do give guideline as to how to develop these indicators.

Normally, the appropriate authorities will lay down the reporting requirements, in each operating licence, as issued to the field operator/oil company. Because there is a great difference in operational activities, the reporting requirements can broadly differ.

[References: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 15, 16 and 17]

3.2.3 Relevant Industry Requirements

In the context of industry environmental requirements the International Maritime Organization (IMO), the International Association of Oil & Gas Producers (OGP), American Petroleum Institute (API), and oil companies such as BP and Shell have developed relevant EPIs. The relevant EPIs have been taken into account and are included in chapter 4.

Relevant references include: [10, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 30]

4 The IMCA EPIs

4.1 Overview of Applicable EPIs

A distinction has been made between applicable EPIs and recommended EPIs. The recommended EPIs should be taken into account as a minimum, since these could best be used for internal monitoring through time, but these are also the most useful EPIs to be used in a possible later stage for benchmarking between IMCA members. The list of applicable EPIs is longer and contains other useful EPIs as well.

The list of applicable EPIs is presented in Appendix A in a simple format for completion.

4.2 What EPIs will Suit an Individual IMCA Member Best and are therefore Recommended?

The recommended EPIs are presented in this paragraph.

We have distinguished the three types of EPIs which were quoted in the ISO Guideline on Environmental Performance Evaluation ISO 14031:

- Management Performance Indicators
- Operational Performance Indicators
- Environmental Condition Indicators

4.2.1 Management Performance Indicators

- Number of spills per million operation hours (no/10^6 operation hours)
- Amount of spills per million operation hours (tonnes/10^6 operation hours)
- Number of fines per million operation hours (no/10^6 operation hours)

4.2.2 Operational Performance Indicators

- Fuel consumed per energy generated (m3/kWh)
- Energy consumption per million operation hours (GJ/10^6 operation hours)
- Total amount of freon used per million operational hour (tonnes/10^6 operational hours)

4.2.3 Environmental Condition Indicators

- Contribution to global warming per million operation hours (CO_2 equivalent/10^6 operation hours)
- Hazardous waste generated per million operation hours (tonnes/10^6 operation hours)
- Non-hazardous waste generated per million operation hours (tonnes/10^6 operation hours)

4.3 Collecting the Necessary Information

4.3.1 Introduction

The basic material from which one can derive the Environmental Performance Indicators is explained below. Since there is a preference for using EPIs that are **relative**, and thus contain a **numerator** as well as a **denominator**, one has to go through the process of selecting useful '**Environmental Performance Parameters**' for both the numerator and denominator.

The parameters will be presented for every environmental aspect. The description has been given under the following headings:

- Operations,
- Spills,
- Energy,
- Consumables,
- Water,
- Air and
- Waste.

For every Environmental Performance Parameter the following points will be described:

- Definition:

  A definition is given for each parameter.

- Parameters:

  The presented parameters have been identified as relevant parameters as they may have an environmental impact during the activities carried out by the IMCA members.

- Potential Environmental Performance Indicators:

  The Potential Environmental Performance Indicators are suggested for use by IMCA members.

- Default conversion factors:

  The presented conversion factors can be used if the default unit of measurement used by an IMCA member is different from the proposed unit of measurement for a certain parameter or when no company or equipment specific data is available. (Example: The parameter requested for the EPI is the fuel consumption in m^3. If an IMCA member only has the fuel consumption available in tonnes per year and does not have the density of the fuel, then the IMCA member can use the default conversion factor to convert to the requested unit of measurement.)

Appendix B provides an overview of all the parameters and can be used as a reporting questionnaire, when collecting the data for the EPIs.

Appendix C gives the recommended prefixes and multiplication factors.

An overview of common conversion factors is presented in Appendix D.

4.3.2 Distinction in type of data (tiered approach)

Ideally, all data used will be measured directly. Since this may prove difficult, it will be useful to indicate what the source of the data is. For this we propose to use 4 distinct tiers:

1 Tier 1: Data derived from a Mass/volume balance calculation

2 Tier 2: Data drawn from equipment (manufacturer's) data

3 Tier 3: Data from intermittent measurement

4 Tier 4: Data directly measured with flow meters, other equipment or from records of purchase.

The tier used should be reported with the data as this indicates the accuracy.

4.3.3 Information per Category

4.3.3.1 Operations

These parameters can be used as denominators.

Definition

Operation hours

The total hours worked on operations in the reporting period, based on a 24-hour exposure day.

Number of employees

The average number of people working in the offices and on board the vessels over the reporting period. Only report the number of people that were under direct supervision of the IMCA member.

Number of vessels

The average number of vessels that were under direct licence to the IMCA member during the reporting period.

Exposure hours

The total of the 'actual' hours worked, including overtime hours, in the reporting period, by the total number of employees.

Parameters

- Operation hours (10^6 hours)
- Number of employees in offices and onboard vessels (no)
- Number of vessels (no)
- Exposure hours (10^6 hours)

Note: This paragraph is written to develop the denominators to be used with the parameters in 4.3.3.2-4.3.3.7. However, a number of other options could be developed in the area of 'operations'. These include:

- Percentage of number of employees trained in environmental awareness; or
- Familiarisation, etc. per total project employees (%);
- Number of environmental complaints received per million man hours;
- Number of environmental notices, fines or convictions received from regulators per million man hours;
- Number of environmental research/charities/aid programmes contributed to.

These have not been further pursued in this guidance.

4.3.3.2 Spills

A spill has been defined as an unexpected loss of oil, diesel, hazardous substances, condensate, etc that reaches the receiving environment. It does not include spillages that are contained on board and do not reach the environment. Only spills that are above 50 litres need to be reported for IMCA benchmarking. The actual spill volume which triggers a report will be defined by local regulations and/or the client.

Parameters

- Number of spills (please specify what kind of spills) (no)
- Amount of spills (tonnes)
- Number of fines (no)
- Amount of fines (US$)

Potential Environmental Performance Indicators

- Number of spills per million operation hours (no/10^6 operation hours)
- Amount of spills per million operation hours (tonnes/10^6 operation hours)
- Number of fines per million operation hours (no/10^6 operation hours)
- Number of spills per million exposure hours (no/10^6 exposure hours)
- Amount of spills per million exposure hours (tonnes10^6 exposure hours)
- Number of fines per million exposure hours (no/10^6 exposure hours)

4.3.3.3 Energy

The pressure to use energy from burning fossil fuels in a sustainable manner is increasing. In this respect, IMCA members are expected to demonstrate their efficient use of energy. In addition, some of these data are needed to calculate emissions to air.

Definitions

Fuel consumed for operations

The fuel consumption has been identified as an important parameter with respect to energy efficiency as fuel is used to generate electricity and power on board the vessels. All fuel consumed needs to be included. This means both fuel purchased and fuel provided by the client.

Average load efficiency of turbines and engines (%)

To calculate energy efficiency, the average load efficiency is required. The average load efficiency is the percentage of the capacity used for each of the power generating installations. This value can be calculated by taking the weighted average for all the energy generating installations over the reporting period.

Average sulphur content of the diesel consumed (wt%)

This value can be determined by taking the weighted average sulphur content of the fuel used in the reporting period. This parameter is used for the calculation of sulphur emissions to air.

Total electricity generated (kWh)

This number can be determined from the electricity meter attached to the equipment. Alternatively, if no electricity meter is attached, equipment data can be used. The total amount of electricity generated might be compared with the fuel consumption, which provides a good indication of the efficiency of the power generation.

Total energy consumption for operations (GJ)

This parameter represents the conversion of the fuel consumption to a general unit of energy.

The value for this parameter can be calculated by multiplying the fuel consumption by the default heat of combustion conversion factor quoted below.

Parameters

- Fuel consumed for operations (engines, turbines, heaters, etc.) (m3)
- Average load efficiency of turbines and engines (%)
- Average sulphur content of the diesel consumed (wt%)
- Total electricity generated (kWh)
- Total energy consumption for operations (GJ)

Potential Environmental Performance Indicators

- Fuel consumed per unit of energy generated (m3/kWh)
- Energy consumption per million operation hours (GJ/10^6 operation hours)
- Electricity generated per unit of energy consumed (kWh/GJ)

Conversion factors

These conversion factors can be used if no company or equipment data for fuel density and heat of combustion is available. The conversion factors described below can be used to convert from m^3 to tonnes and the other way around, and to convert from m^3 fuel to GJ.

- Fuel oil: 0.85 tonnes/m3, 36.02 GJ/m3
- Heavy fuel: 0.84 tonnes/m3, (API gravity 34) 37.36 GJ/m3

4.3.3.4 Consumables

Proper use, re-use and/or recycling of materials consumed and proper waste management can be demonstrated by means of the following EPIs.

Definition

Brought in

Brought in is defined as the amount of all materials brought to the location at the beginning of the period. Only report materials for which your company is accountable.

In stock

In stock is defined as the amount of all materials net in stock (e.g. in stock at the end of period. Only report the amounts for which your company is accountable. So, do not include materials that are in stock on behalf of your clients.

Used

Used material is defined as the amount of material that is brought in minus the amount of materials in stock.

Freon

Freon is defined in the Montreal Protocol. Freons are used in refrigerators, air conditioners and sometimes for oil in water analyses. Freons include HCFC-22 (R-22), HCFC-124 (R-124), HCFC-141b, HCFC-142b and HCFC-231.

Halon

Halons are those substances as defined in the Montreal Protocol. Halons are used in fire equipment. Halon production has stopped in many countries and will stop in developing countries in 2010.

The assumption is made that the refilled volumes of Halon will be emitted to air.

Parameters

- Freon brought in (tonnes)
- Freon in stock (tonnes)
- Freon in equipment (tonnes)
- Freon used (tonnes)
- Lubrication oil brought in (tonnes)
- Lubrication oil in stock (tonnes)
- Lubrication oil used (tonnes)
- Hydraulic oil brought in (tonnes)

- Hydraulic oil in stock (tonnes)
- Hydraulic oil used (tonnes)
- Halon brought in (tonnes)
- Halon in stock (tonnes)
- Halon in equipment (tonnes)
- Halon used (tonnes)
- Paints (solvents) brought in (tonnes)
- Paints (solvents) in stock (tonnes)
- Paints (solvents) used (tonnes)
- Other chemicals brought in only operation related (please specify) (tonnes)
- Other chemicals in stock only operation related (please specify) (tonnes)
- Other chemicals used only operation related (please specify) (tonnes)

(Some companies record consumption of paper and/or plastic. This could lead to a PEPI of consumption per vessel, for example, but has not been pursued further in these guidelines.)

Potential Environmental Performance Indicators

Only for the purpose of internal benchmarking within the company of an IMCA member:

- Total amount of oil (lubrication and hydraulic) used per vessel (tonnes/vessel)
- Total amount of freon used per vessel (tonnes/vessel)
- Total amount of oil used per million operational hours (tonnes/10^6 operational hours)
- Total amount of freon used per million operational hours (tonnes/10^6 operational hours)
- Total amount of oil used per million exposure hours (tonnes/10^6 exposure hours)
- Total amount of freon used per million exposure hours (tonnes/10^6 exposure hours)

4.3.3.5 Water

Water is essential for all life on earth, and the availability of "good quality" water is decreasing. Therefore, it is necessary to reduce the amount of water resources used and to promote the recycling of water as much as possible. This aspect has been identified as one where IMCA members only create a minor impact, since they only use the seawater temporarily for cooling or washing down and do not add substances to it. The parameters of oil in water and 'grey water' have been identified as relevant parameters.

Definition

Oil in water

This parameter represents the average oil in water content, as it is a legal requirement.

For vessels a limit of 15 ppm for oil in water content is given in MARPOL. For (fixed) installations, a limit of 40 mg/l (monthly average) is agreed within the OSPAR agreement.

Grey water

Grey water is defined as the amount of discharged water (shower water, wash water and toilet water) in the reporting period.

Parameters

- Grey water discharged (m3)
- Oil content in operational discharged water (ppm)

Potential Environmental Performance Indicators

- Oil content in discharged water (ppm)
- Total grey water discharged per million operational hours ($m3/10^6$ operational hours)

Conversion factors

The following conversion factors can be used to convert from mg/l to ppm and from tonnes to ppm.

Concentration of oil in water 1 mg/l = tonnes/10^6 m^3 = 1 ppm

Note: This paragraph excludes water produced from a well during hydrocarbon production which is discharged, as this is outwith the scope of IMCA members' marine construction activities as listed in 3.2.1. IMCA members may also be required to monitor and comply with requirements for avoiding 'pollution' during ballast water exchanges where marine life may be carried from one location to another in the ballast tanks. This subject has not been pursued further in these guidelines.

4.3.3.6 Air

In view of concerns about the consequences of emissions to the atmosphere, enhancing phenomena such as 'global warming' and 'acidification', emissions should be reported on the so-called:

- "Kyoto greenhouse gases" (GHGs): Such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and HFCs
- "Acidification gases": SO_x (sulphur oxides) and NO_x (nitrogen oxides)

Definition

Operations

The calculation of these emissions from stationary combustion sources like turbines, engines, furnaces and heaters, is based on the reported fuel consumption and default emission factors.

Halons

See paragraph 4.3.3.4

Freon

See paragraph 4.3.3.4

Global warming potential

Global warming potential or CO_2 equivalent is a way of presenting the environmental impact of these "greenhouse gases" as result of emissions to air. The potential for each component is based on the environmental impact of the component compared with the impact of CO_2. This potential number is often used in environmental investment models.

Acidification potential

Acidification potential or SO_2 equivalent is a way of presenting the environmental impact of "acidification" gasses as result of emissions to air. The potential for each component is based on the environmental impact of the component compared with the impact of SO_2.

Parameters

- Halon emissions (tonnes)
- Freon emissions (tonnes)
- CO_2 emissions (tonnes)
- CO emissions (tonnes)
- NO_x emissions (tonnes)
- N_2O emissions (tonnes)
- SO_x emissions (tonnes)
- CH_4 emissions (tonnes)
- VOC (Volatile organic compounds) emissions (tonnes)
- Global warming potential (CO_2 equivalents)
- Acidification potential (SO_2 equivalents)

Default calculations

Halon/freon emissions

Emission = change in stock

To calculate the air emission components the following formula can be used if no company or equipment figures are available.

For emission components CO_2; CO; NO_x, N_2O; CH_4 and VOC:

Emission component x = A * B* C

Where: A is the fuel consumption [m3]
B is the fuel density [tonnes/m3] default 0.84
C is the emission factor component x which can be found in Table 1.

For SO_x emissions

SO_x emission = A * B * 2 * C

Where: A is the fuel consumption [m3]
B is the density [tonnes/m3] default: 0.84
C is the average weight percentage of sulphur in the fuel [%wt] default: 0.4 %wt

Table 1: Emission Factors

	CO_2	CO	NO_x	N_2O	CH_4	VOC
	tonnes emission/tonnes fuel					
Turbines	3.2	$2.10 * 10^{-3}$	$9.4 * 10^{-3}$	$0.22 * 10^{-3}$	$0.08 * 10^{-3}$	$0.7 * 10^{-3}$
Engines	3.2	$1.90 * 10^{-3}$	$7.0 * 10^{-3}$	$0.22 * 10^{-3}$	$0.14 * 10^{-3}$	$1.9 * 10^{-3}$
Heaters	3.2	$0.07 * 10^{-3}$	$2.8 * 10^{-3}$	$0.22 * 10^{-3}$	$0.0078 * 10^{-3}$	$0.028 * 10^{-3}$

Conversion factors to be used below

- Global warming: weighting factors to convert to CO_2 equivalent (based on a 100 years time horizon):
  - CO_2: factor 1
  - CH_4: factor 30
  - VOC: factor 117 (based on 50% C_2 and 50% C_3+)
  - NO_x: factor 244
  - Halon: factor 64600 (based on 50% Halon 1211 and 50% Halon 1301)
  - Freon: factor 11300 (based on 25% HCFC-22, 25% CFC-11, 25% CFC-12 and 25% CFC113

- Acidification: weighting factors to convert to SO_2 equivalent:
  - SO_x: factor 1
  - NO_x: factor 0.7

Potential Environmental Performance Indicators

- Halon emitted per quantity in stock and in equipment (%)
- Freon emitted per quantity in stock and in equipment (%)
- Contribution to global warming per million operation hours (CO_2 equivalent/10^6 operation hours)
- Contribution to acidification per million operation hours (SO_2 equivalent/10^6 operation hours)

4.3.3.7 Waste

The environmental consequences of disposal of waste in terms of land take and risks for soil, groundwater and surface water quality, require a structured and focussed management of these discharges. For that reason most IMCA members have a waste management plan in place. The purpose of waste management is to control and reduce waste. Reference the Basel Convention.

Definition

Definitions of 'waste' and 'disposal' vary widely.

Waste

In this guideline waste is defined as unavoidable liquid and (semi-) solid products generated from operations and housekeeping.

Hazardous waste

Hazardous waste is defined by local legislation. In absence of local legislation, other definitions such as the OECD definition or those developed for the Basel Convention should be used. (example: medical waste, oily waste, batteries, and obsolete chemicals) LSA (Low Specific Activity)

Non-hazardous waste

Non-hazardous waste is all waste not classified as hazardous. (Wooden pallets, plastic, construction waste, scrap metal, kitchen waste, office waste, etc.)

Controlled disposal on land or at sea

Controlled disposal is the disposal on land or at sea, i.e. to government controlled, public disposal sites; discharges with permits outside landfills; off-site incineration; or to sea.

Uncontrolled disposal

Uncontrolled disposal is the disposal not covered by the description of "controlled disposal". These disposals are not acceptable and can be seen as non-compliances with regard to the regulations. Nevertheless, IMCA members are requested to record data on these disposals, as they are a concern for potential liability.

Parameters

- Total waste generated (tonnes)
- Total amount of hazardous waste generated (tonnes)
- Amount of hazardous oily waste generated (exclusive Slops/bilge water) (tonnes)
- Amount of hazardous chemical waste generated (tonnes)
- Amount of hazardous LSA waste generated (tonnes)

- Amount of hazardous other waste generated (tonnes)
- Total amount of non-hazardous waste generated (tonnes)
- Amount of non-hazardous kitchen waste generated (tonnes)
- Amount of non-hazardous wood waste generated (tonnes)
- Amount of non-hazardous paper waste generated (tonnes)
- Amount of non-hazardous metal waste generated (tonnes)
- Amount of non-hazardous other waste generated (tonnes)
- Amount of recycled waste (tonnes)
- Amount of incinerated waste (tonnes)
- Amount of controlled disposed waste (tonnes)
- Amount of uncontrolled disposed waste (tonnes)
- Amount of waste discharged into sea (tonnes)

Potential Environmental Performance Indicators

- Hazardous waste generated per million operation hours (tonnes/10^6 operation hours)
- Non-hazardous waste generated per million operation hours (tonnes/10^6 operation hours)
- Percentage of hazardous waste per total waste generated (%)
- Percentage of non-hazardous waste per total waste generated (%)
- Percentage of waste recycled per total waste generated (%)
- Percentage of waste incinerated per total waste generated (%)
- Percentage of waste to controlled disposal per total waste generated (%)
- Percentage of waste to uncontrolled disposal per total waste generated (%)
- Percentage of waste discharged to sea per total waste generated (%)

Conversion Factors

If the volume of waste is reported in m^3 and no specific density data is available, one can use the conversion factor presented below to convert a volume to mass.

- Domestic waste or garbage: 0.65 T/m^3

5 Abbreviations

Abbreviation	Description
API	American Petroleum Institute
CH_4	Methane
CO_2	Carbon dioxide
ECI	Environmental condition indicators
EPI	Environmental performance indicator
GHG	Greenhouse gases, (CO_2, CH_4, N_2O etc)
GJ	Giga Joule
GRI	Global Reporting Initiative
HCFC	Hydro chlorofluorocarbon
HFC	Hydro fluorocarbon
IMCA	International Marine Contractors Association
IMO	International Maritime Organization
ISM (Code)	International Safety Management (Code)
ISO	International Organisation for Standardization
kWh	kilowatt hour
MARPOL	MARine POLlution (International Convention for the Protection of Pollution from Ships 1978 as Amended)
MJ	Mega Joule
MPI	Management performance indicators
N_2O	Nitrous oxide
NO_x	Nitrogen oxides
OECD	Organisation for Economic Co-operation and Development
OPI	Operational performance indicators
OSPAR Agreement	OSlo PARis Agreement (Convention for Protection of the Marine Equipment of the North East Atlantic 1998)
ppm	Parts per million
SO_x	Sulphur oxides
UNEP	United Nations Environmental Programme
VOC	Volatile organic compounds
wt%	Weight percentage

6 References

1 *NORSOK Standard: Design Principles: Environmental Care*, S-003 Rev.2, May 1999, NTS.

2 *NORSOK Standard: Diving Respiratory Equipment*, U-101, Rev.1, August 1999, NTS.

3 *NORSOK Standard: Piping Fabrication, Installation, Flushing and Testing*, L-CR-004, Rev.1, January 1996, NTS.

4 *NORSOK Standard: Marine Operations*, J-003, Rev.2, August 1997, NTS.

5 *NORSOK Standard: Subsea Pipelines*, Y-001, Rev.1, September 1997, NTS.

6 *NORSOK Standard: Piping and Valves*, L-001, Rev.3, September 1999, NTS.

7 *Pollution Control Act*, 13 March 1981 No.6, amended by Act 12 June 1996 No. 36, Ministry of the Environment.

8 *List of acts* –ministry of the Environment, Norway

9 *NORSOK Standard: Common Requirements Health, Safety and Environment (HSE) During Construction*, S-CR-002, Rev.1, January 1996, NTS.

10 *Annual Report OLF 2000*, 2001, Norwegian Oil Industry Association.

11 *Requirements for ecotoxicological testing and environmental assessment of offshore chemicals and drilling fluids*, August 1998, SFT.

12 *General Conditions, Given as a Part of the Permit for Discharge of Oil, Drilling Fluids and Chemicals*, September 1998, SFT.

13 *Novatech as, Emissions and Discharges from the Exploration Activities*, December 1999, Norwegian Oil Industry Association.

14 *Values and Strategy Document* OLF, march 2001, Norwegian Oil Industry Association.

15 *International Convention for the Prevention of Pollution from Ships*, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)

16 *Environmental Performance Indicators for Businesses Fiscal -Year 2000 version-*, The Ministry of the Environment Government of Japan, February 2001

17 *Environmental Reporting Guidelines for Businesses Fiscal Year -2000 version-*, The Ministry of the Environment Government of Japan, February 2001

18 *Methods for Estimating Atmospheric Emissions from E&P Operations*, E&P Forum, September 1994

19 *Ranking Environmental Investment Model*, Nederlandse Aardolie Maatschappij

20 *Environmental Performance, Group Reporting Guidelines*, BP, 26th June 2000, Version 2.2

21 *Getting HSE Right*, A Guide for BP Amoco Managers, May 1999

22 *Inputs to the North Sea from the offshore Oil & Gas industry from 1989 to 1999*, Report No. 2.82/316, International Association of Oil & Gas Producers (OGP), February 2001.

23 *Draft EU Legislation, Environmental issues, Health & Safety issues, Legal & Insurance issues, Affecting/Likely to Affect E&P Activities*, International Association of Oil & Gas Producers (OGP), February 2001

24 *Environmental Management in Oil & Gas Exploration and Production, An Overview of Issues and Management Approaches*, Joint E&P Forum and UNEP Technical Publication, UNEP IE/PAC Technical Report 37, E&P Forum Report 2.72/254, ISBN 92-807-1639-5, 1997

25 *Exploration and Production Waste Management Guidelines*, Report No. 2.58/196, E&P Forum, September 1993.

26 *Group HSE Performance Monitoring and Reporting*, December 2000, Health, Safety and Environment Advisers Panel, Royal Dutch/Shell Group of companies

27 *Striking a Balance, The UK Offshore Oil and Gas Industry Strategy for its Contribution to Sustainable Development* 2001, UKOOA.

28 *Background Document, Environmental Practices in Offshore Oil and Gas Activities*, 2nd International Expert Meeting Stavanger, Norway, 29-30 June 2000, UNEP, E&P Forum and WWF

29 *Sustainability Guidelines on Economic, Environmental, and Social Performance*, GRI, June 2000

30 *Performance Monitoring and Reporting*, Report no. EP 95-0325, Shell, November 1998

31 *Examples of Environmental Performance Evaluation*, Report no. ISO/TC 207/SC 4, ISO, February 1999

32 *Environmental Performance Evaluation*, ISO 14031 first edition, ISO, November 1999

33 *Environmental Management Roundtable, Minutes of meeting ISO/TC 207*,EM Roundtable, ISO, 14 June 2000

34 *Report of Safety Statistics for IMCA Members, Period: 1 January-31 December 2000*, Information Note IMCA SEL 24/01, IMCA, July 2001

6.1 Websites

The following websites were used to compile this report. There are many more produced by other nations and organisations around the world.

International

1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	http://www.unep.org/unep/secretar/basel/
BP	http://www.bp.uk
Global Reporting Initiative (GRI)	http://www.globalreporting.org
International Association of Oil & Gas Producers	http://www.ogp.org.uk
International Marine Contractors Association	http://www.imca-int.com
International Maritime Organization	http://www.imo.org
International Organisation for Standardization (ISO)	http://www.iso.ch
Shell	http://www.shell.com
UNEP Offshore Oil and Gas Environment Forum (OEF)	http://oef.unep.ch
United Nations Framework Convention on Climate Change	http://www.unfccc.de

USA

American Petroleum Institute	http://www.api.org/
US Environmental Protection Agency	http://www.epa.gov

Europe:

Oslo and Paris Commission	http://www.ospar.org/

The Netherlands:

Staatstoezicht op de Mijnen (State Supervision of Mines)	http://www.sodm.nl

Norway:

Competitive Standing of the Norwegian Offshore Sector	http://www.nts.no/norsok
Norwegian Petroleum Directorate	http://npd.no
Norwegian Oil Industry Association	http://www.olf.no/
Norwegian Pollution Control Authority	http://www.sft.no

United Kingdom:

Department of Trade & Industry - Oil & Gas Division	http://www.og.dti.gov.uk
Her Majesty's Stationary Office	http://www.hmso.gov.uk
Offshore Oil & Gas Industry UK, Legislation and Guidance	http://www.westonenergy.com
United Kingdom Offshore Operators Association	http://www.ukooa.co.uk

Appendix A: Environmental Performance Indicators

See also sheet "EPIs" in spreadsheet 49343.001 EPI Reporting.xls"

Organisation:	
Reporting year:	

Management Performance Indicators		
Number of spills per million operation hours	no/10^6 operation hours	
Amount of spills per million operation hours	tonnes/10^6 operation hours	
Number of fines per million operation hours	no/10^6 operation hours	
Number of spills per million exposure hours	no/10^6 exposure hours	
Amount of spills per million exposure hours	tonnes/10^6 exposure hours	
Number of fines per million exposure hours	no/10^6 exposure hours	

Operational Performance Indicators		
Fuel consumed per energy generated	m^3/kWh	
Energy consumption per million operation hours	GJ/10^6 operation hours	
Oil content in discharged water	ppm	
Total grey water discharged per million operational hours	m^3/10^6 operation hours	
Only for use for internal benchmarking of an IMCA member.		
Total amount of oil used per vessel	tonnes/vessel	
Total amount of freon used per vessel	tonnes/vessel	
Total amount of oil used per million operational hour	tonnes/10^6 operational hours	
Total amount of freon used per million operational hour	tonnes/10^6 operational hours	
Total amount of oil used per million exposure hour	tonnes/10^6 exposure hours	
Total amount of freon used per million exposure hour	tonnes/10^6 exposure hours	

Environmental Performance Indicators		
Power generated per energy consumed	kWh/GJ	
Halon emitted per quantity in stock and in equipment	%	
Freon emitted per quantity in stock and in equipment	%	
Contribution to global warming per million operation hours	CO_2 equivalent/10^6 operation hours	
Contribution to acidification per million operation hours	SO_2 equivalents/10^6 operation hours	
Hazardous waste generated per million operation hours	tonnes/10^6 operation hours	
Non-hazardous waste generated per million operation hours	tonnes/10^6 operation hours	
Percentage hazardous waste per total waste generated	%	
Percentage non-hazardous per total waste generated	%	
Percentage recycled waste per total waste generated	%	
Percentage waste incinerated per total waste generated	%	
Percentage waste to controlled disposal per total waste generated	%	
Percentage waste to uncontrolled disposal per total waste generated	%	
Percentage waste discharged to sea per total waste generated	%	

Appendix B: Environmental Performance Parameters

See also sheet "EPPs" in spreadsheet " 49343.001 EPI Reporting.xls"

Organisation:				
Reporting year:				

line	aspect indicator item	unit	value	conversion factor	Tier	remark
1	**Operations**					
2	Number of employees in offices	no				
3	Number of vessels	no				
4	Exposure hours	10^6 hours				
5	Operation hours	10^6 hours				
6						
7	**Spill**					
8	Number of spills (please specify what kind of spills)	no				
9	Amount of spills	tonnes				
10	Number of fines	no				
11	Amount of fines	US$				
12						
13	**Energy**					
14	Fuel consumed for operations (engines, turbines, heaters, etc.)	m^3				Fuel oil: 0.85 tonnes/m^3, 36.02 GJ/m^3; Heavy fuel: 0.84 tonnes/m^3, (API gravity 34) 37.36 GJ/m^3
15	Average load efficiency of turbines and engines	%				
16	Average sulphur content of the diesel consumed	wt%				Default 0.4%
17	Total electricity generated	kWh				
18	Total energy consumption for operations	GJ	0			line 14 * conversion factor (default 36.02 GJ/m^3)
19						
20	**Consumables**					
21	Freon brought in	tonnes				
22	Freon in stock	tonnes				
23	Freon in equipment	tonnes				
24	Freon used (brought in - in stock)	tonnes				
25	Lubrication oils brought in	tonnes				
26	Lubrication oils in stock	tonnes				
27	Lubrication oils used	tonnes	0			line 25 - line 26
28	Hydraulic oils brought in	tonnes				
29	Hydraulic oils in stock	tonnes				
30	Hydraulic oils used	tonnes	0			line 28 - line 29
31	Halon brought in	tonnes				
32	Halon in stock	tonnes				
33	Halon in equipment	tonnes				

Organisation:				
Reporting year:				

line	aspect indicator item	unit	value	conversion factor	Tier	remark
34	Halon used (brought in minus in stock)	tonnes				
35	Paints (solvents) brought in	tonnes				
36	Paints (solvents) in stock	tonnes				
37	Paints (solvents) used	tonnes	0			line 35 - line 36
38	Other chemicals brought in only operation related (please specify)	tonnes				
39	Other chemicals in stock only operation related (please specify)	tonnes				
40	Other chemicals used only operation related (please specify)	tonnes	0			line 38 - line 39
41						
42	**Water**					
43	Grey water discharges	m^3				
44	Oil content in operational water discharges	ppm				
45						
46	**Air**					
47	Halon emissions	tonnes	0			line 34
48	Freon emissions	tonnes	0			line 24
49	CO_2 emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines; Engines; Heaters: 3.2
50	CO emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines: $2.10 * 10^{-3}$; Engines: $1.90 * 10^{-3}$; Heaters: $0.07 * 10^{-3}$
51	NO_x emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines: $9.4 * 10^{-3}$; Engines: $7.0 * 10^{-3}$; Heaters: $2.8 * 10^{-3}$
52	N_2O emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines; Engines; Heaters: $0.22 * 10^{-3}$
53	SO_x emissions	tonnes				
54	CH_4 emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines: $0.08 * 10^{-3}$; Engines: $0.14 * 10^{-3}$; Heaters: $0.0078 * 10^{-3}$
55	VOC emissions	tonnes				Emission factor (tonnes emission/ tonnes fuel) Turbines: $0.7 * 10^{-3}$; Engines: $1.9 * 10^{-3}$; Heaters: $0.028 * 10^{-3}$
56	Global warming potential	CO_2 equivalents	0			Halon: factor 64,600; Freon: factor 11,300; CO_2: factor 1; CO: factor 2.3; NO_x: factor 244; NO: factor 328; SO_x: factor 218; CH_4: factor 30; VOC: factor 117
57	Acidification potential	SO_2 equivalents	0			SO_x: factor 1; NO_x: factor 0.7
58						
59	**Waste**					
60	Total waste generated	tonnes	0			line 61 + line 66
61	Total amount of hazardous waste generated	tonnes	0			line 62 + line 63 + line 64 + line 65
62	Amount of hazardous oily waste generated (exclusive Slops/bilge water)	tonnes				
63	Amount of hazardous chemical waste generated	tonnes				

Organisation:				
Reporting year:				

line	aspect indicator item	unit	value	conversion factor	Tier	remark
64	Amount of hazardous LSA waste generated	tonnes				
65	Amount of hazardous other waste generated	tonnes				
66	Total amount of non-hazardous waste generated	tonnes	0			line 67 + line 68 + line 69 + line 70 + line 71
67	Amount of non-hazardous kitchen waste generated	tonnes				
68	Amount of non-hazardous wood waste generated	tonnes				
69	Amount of non-hazardous paper waste generated	tonnes				
70	Amount of non-hazardous metal waste generated	tonnes				
71	Amount of non-hazardous other waste generated	tonnes				
72	Amount of recycled waste	tonnes				
73	Amount of incinerated waste	tonnes				
74	Amount of controlled disposed waste	tonnes				
75	Amount of uncontrolled disposed waste	tonnes				
76	Amount of waste discharged into sea	tonnes				

Appendix C: Prefixes and multiplication factors

Multiplication factor	Abbreviation	Prefix	Symbol
1 000 000 000 000 000	10^{15}	Peta	P
1 000 000 000 000	10^{12}	Tera	T
1 000 000 000	10^{9}	Giga	G
1 000 000	10^{6}	Mega	M
1 000	10^{3}	Kilo	k
100	10^{2}	Hecto	h
10	10^{1}	Deca	da
0.1	10^{-1}	Deci	d
0.01	10^{-2}	Centi	c
0.001	10^{-3}	Milli	m
0.000 001	10^{-6}	Micro	μ

Appendix D: Common Conversion Factors

To convert from	to	multiply by
US gal	litres (l)	3.78541
barrels (bbl)	litres (l)	158.987
barrels (bbl)	m^3	0.159
ft^3	m^3	0.0283168
US ton	tonne (t)	0.907186
lb	tonne (t)	0.000453592
$lb.ft^{-3}$	$kg.m^{-3}$	16.0185
Btu	kJ	1.05506
hp	kW	0.7457
$Btu.ft^{-3}$	$kJ.m^{-3}$	37.2589
psi	bar	0.0689476
$kgf.cm^{-3}$	bar	0.980665
atm	bar	1.01325
ins water	mbar	2.49089
mm water	mbar	0.0980665
ins Hg	mbar	33.8639
mm Hg	mbar	1.33322
1000 m^3 gas	tonne gas	0.8458
tonne heavy fuel	m^3 heavy fuel	1.190
tonne fuel oil	m^3 heavy fuel	1.176
tonne CO_2	m^3 CO_2	509