Secretariat of the Basel Convention

Guidance for Ship Recycling Facility Operators

Guidance for compliant ship recycling facilities in consideration of the requirements of the Basel and Hong Kong Conventions

Document prepared by:
Roy Watkinson

RWECLTD
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Secretariat of the Basel Convention:

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List of Acronyms Used

CA	Competent authority
CIP	Compliance Implementation Plan
EMS	Environmental Management System
ESM	Environmentally Sound Management
EU	European Union
HKC	Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009
ILO	International Labour Organization
IMO	International Maritime Organization
ISO	International Standards Organisation
OECD	Organization for Economic Cooperation and Development
PCB	Poly-Chlorinated Biphenyl
QMS	Quality Management System
SRFP	Ship Recycling Facility Plan
SRP	Ship Recycling Plan
UNEP	United Nations Environment Programme

1. Introduction – purpose and scope

This guidance note is intended for use by operators of ship recycling facilities employing the beaching method to assist them to implement actions towards compliance with the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention) of 1989 and the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (the Hong Kong Convention, HKC), in the short, medium and long term. This includes consideration of environmentally sound ship recycling activities at the facility and preparation for downstream management of wastes arising from activities at the ship recycling facility. For operators of ship recycling facilities the main issues covered are:

- what constitutes environmentally sound management (ESM) at the facility level;
- the operational and procedural steps necessary at the facility level to facilitate compliance with the Basel and Hong Kong Conventions;
- steps to be taken at the facility level to facilitate ESM operations downstream;
- the key roles and competencies of staff in meeting these obligations; and
- prioritising actions for implementation.

The preparation of this guidance was informed by a case study[1] and field work at ship recycling facilities representative both of simpler types for which the guidance is intended and for facilities that are more advanced. The guidance, for use by managers and supervisors at ship recycling facilities, is to be used in conjunction with the training materials produced for the purpose of raising the awareness and understanding of the facility workers about environmentally sound management in practice. Appendix C lists further reading material for reference and information.

Approach

The overall approach of this document is to identify the essential criteria for ESM of ship recycling, as discussed in the case study, and from that describe a series of appropriate actions that can be carried out in the short, medium and long term that will lead to improvements in ship recycling consistent with improving compliance with the Basel and Hong Kong Conventions. These proposed actions also cross-refer to issues related to occupational safety and health. While occupational

[1] The case study to develop models of compliant ship recycling facilities is available on the Basel Convention website at: http://www.basel.int/Implementation/TechnicalAssistance/ShipDismantling/CapacityBuilding/tabid/2764/Default.aspx#section2

safety and health is not the primary focus of the guidance it is inevitable that such topics will be encountered because of the close connection that exists between the protection of the environment and human health and safety.

2. Environmentally Sound Management at Ship Recycling Facilities

Introduction

This section describes the general principles of ESM and how the concept applies to ship recycling facilities. It discusses the meaning of pollution and its control, through readily available techniques such as containment and segregation. This is intended to assist in understanding the reasons for and the actions that may be taken operationally to support environmentally sound management at a ship recycling facility both with respect to the general requirements of the Basel Convention and the Hong Kong Convention. It is not intended to elaborate specific articles and regulations of these two Conventions, as specific guidance has already been published (described in later sections of this document). The two international agreements and their associated guidelines are briefly discussed to provide a context for this guidance. National implementation of the Basel and Hong Kong Conventions, however, should have an over-riding influence on application of any compliance requirements that a ship recycling facility plans or proposes to put into action and reference should always be made to the Conventions.

The Basel Convention

The Basel Convention on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention) of 1989 is already in force and most States are party to it. It applies, as the title indicates, to controls on international movements of hazardous and other wastes. How its obligations are implemented in each State is a matter for the country concerned. At the heart of it is the principle of ESM of the treatment and disposal of hazardous and other wastes (as defined by the Convention), and a notification system of prior informed consent for their transboundary movement. This system is backed up with many guidelines on the ESM of hazardous and other wastes that have been produced since the Convention entered into force in 1992. These can be found on the web site of the Basel Convention[2]. The standards of facilities that deal with hazardous and other wastes, including different types of waste and differing techniques for their management and disposal, are covered.

The Basel Convention web site has a section dedicated to ship dismantling and a technical guideline for the environmentally sound management of the full and partial dismantling of ships has been developed[3]. Competent Authorities and the relevant Ministries (usually, but not exclusively

[2] http://www.basel.int/TheConvention/Publications/TechnicalGuidelines/tabid/2362/Default.aspx
[3] Found at: http://www.basel.int/Implementation/TechnicalAssistance/ShipDismantling/TechnicalGuidelines/tabid/2767/Default.aspx)

environment) of the State concerned should be referred to for advice and clarification on their application of the Basel Convention to the recycling of end of life ships. The requirements of the Convention will apply in any event (as transposed into national legislation) to the downstream hazardous waste management facilities accepting wastes from ship recycling facilities. The Basel guidelines on managing hazardous and other waste can be consulted for assistance in determining how to apply ESM or helping to assess whether any facility for downstream treatment of hazardous waste meets an appropriate standard.

The Hong Kong Convention

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (the Hong Kong Convention, HKC) of 2009 was adopted by a Diplomatic Conference, although it is not yet in force internationally. It makes provisions for safe and environmentally sound ship recycling. It is specifically designed for application to ships, including some features which will apply to the whole life-cycle of a ship relating to its design, construction, operation and maintenance. The Convention as a whole is aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risks to human health, safety and to the environment. A number of guidelines have been developed by the International Maritime Organization (IMO), through its Marine Environment Protection Committee, which have been adopted and are available for use. Early application of these has been encouraged by Resolutions made at the Diplomatic Conference. These guidelines and further information can be found on the IMO web site[4]. Of particular interest are the Guidelines for Safe and Environmentally Sound Ship Recycling[5]. There is also a useful compendium of information sources on recycling of ships[6].

Meaning of "Pollution" for ESM

Understanding the meaning of the term "pollution" for the purposes of this guidance note is relevant as Article 4.2(c) of the Basel Convention contains the requirement to "Ensure that persons involved in the management of hazardous wastes or other wastes within it take such steps as are necessary to prevent pollution due to hazardous wastes and other wastes arising from such management and, if such pollution occurs, to minimize the consequences thereof for human health and the environment". In other words, for ESM pollution must be minimised. Pollution therefore can be regarded as contamination caused by the release of substances from an activity to air, water or

[4] At: http://www.imo.org/OurWork/Environment/ShipRecycling/Pages/Default.aspx
[5] At: http://www.imo.org/OurWork/Environment/ShipRecycling/Documents/210(63).pdf
[6] At: http://www.imo.org/KnowledgeCentre/InformationResourcesOnCurrentTopics/RecyclingOfShips/Documents/Information%20Resources%20on%20RECYCLING%20OF%20SHIPS.pdf

land that causes harm to human health and the environment. Pollution of the environment adversely affects living things and ecosystems, either locally or further away as pollutants are carried by air or water currents. Contamination of the environment may not directly or immediately cause harm, for example, heavy metals such as lead or mercury are deposited into inert material such as sand, but can be transported to other places where they can poison water supplies or fisheries and wildlife.

Uncontrolled, activities involving hazardous or toxic substances that are allowed to be freely distributed can cause significant harm that may be costly to clean up and damage human health and the environment. An example of this is poly-chlorinated biphenyl (PCB), found in transformer oils, cabling and some plastics. PCB is a persistent organic pollutant listed under the Stockholm Convention on Persistent Organic Pollutants of 2001 (and a hazardous waste under the Basel Convention) that even in low concentrations (parts per million levels) show a variety of toxic properties including carcinogenicity (cancer-causing) and negative effects to hormone systems in mammals.

Industrial processes that are well controlled nevertheless do release some substances into the environment, as some emissions are unavoidable. But the essence of a well-managed process is that it involves the application of techniques where the majority of the potentially polluting substances are captured and treated safely by process management and emission control technologies (such as a filter for particulate matter for example). Depending on knowledge of the type of substance, its form, concentration and method of release and by applying appropriate management and technical systems, the potential environmental harm can be managed so that the impact is minimal and meets the test of ESM. The same approach can apply to those activities in ship recycling facilities that may cause pollution to ensure environmentally sound ship recycling.

It is important to recognise that pollution control need not be costly, and may well be less costly than cleaning up uncontrolled pollution of the environment. This is achieved by setting appropriate standards and using techniques applicable to the activity that enable the objective to be realised without excessive expenditure. In many cases simple measures, such as physical containment, allow the greater part of pollution control objectives to be achieved at low cost. Important factors in successful control entail knowing what substances or materials are being released or generated from the activity, in what form and in what concentration so that an appropriate technical method and management can be used to control them.

Many "best practice" guidelines have been produced for regional groupings of countries, such as the Best Available Techniques Reference[7] documents published by the European Commission in the European Union (EU). Other guidance, produced for national use, provides comprehensive details on how to exercise process control for compliance in an environmentally sound manner for specific industries, for example the Environmental Permitting Guidance produced by the Environment Agency (the national regulator) in the UK[8].

Meaning of "Environmentally Sound Management"

In the context of the management of hazardous and other waste in accordance with the Basel Convention the standards are set out generally within the framework of ESM. The concept of ESM was developed from work under the United Nations Environment Programme (UNEP) that underpinned the development of the Basel Convention using the adopted Cairo Guidelines[9]. These established that an authorization or operating permit for approved sites or facilities for storage, treatment and disposal of hazardous wastes should be granted only if two criteria are met, namely:

> " i) An assessment undertaken by or at the request of the competent authority has established that no significant adverse effects on health or the environment are to be expected as a result of such storage, treatment or disposal;
> ii) The competent authority is satisfied as to the suitability of the operator of the facility at which such storage, treatment or disposal is to be carried out, including the technical knowledge and financial means of that operator to carry out the operations in respect of which the authorization or operating permit is sought to be granted and to take the appropriate safety measures in respect thereof."

The role of governments is important, for example with respect to ensuring that operators of sites or facilities at which hazardous wastes are managed **monitor** the effects of those activities on health and the environment; that **competent authorities have the power** to enter the facilities for the purposes of **monitoring** the effects upon health and the environment of the activities carried out;

[7] A number of these documents deal with wastes, as well as process industries, and can be found on the European Commission's Joint Research Centre website at: http://eippcb.jrc.es/reference/

[8] For example the Environment Agency in the UK has available on its web site a wide range of guidance notes for permitting under their systems, at: http://www.environment-agency.gov.uk/business/topics/permitting/32320.aspx

[9] UNEP Governing Council 14th Session Decision 14/30 of the Council on 17th June 1987 adopting the Guidelines and recalling the UNEP Governing Council Decision 10/24 of 31 May 1982 forming an Ad Hoc Working Group of Experts on the environmentally sound management of Hazardous Wastes.

that appropriate **remedial action** is taken in cases where monitoring gives indications that management of hazardous waste has resulted in adverse effects on health or the environment and that **records** of monitoring and other actions are kept. These principles all have their expression in the Basel Convention.

The Basel Convention itself defines the "environmentally sound management of hazardous wastes or other wastes" in Article 2 of the Convention as:

> "...taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

A ship recycling facility differs from the majority of facilities covered by the Basel Convention which are largely land-based. Ship recycling facilities often operate at a land-sea interface with the consequent impacts of tides and shore conditions adding a complicating factor. But the essential principles of ESM can still be applied here, a practical way of expressing it for ship recycling facilities may be as follows:

> "The combination of practical standards, procedures and management controls applied to shoreline, dock and other ship recycling activities, ensuring the protection of human health and the environment from the potential impacts of all the operations carried out that may give rise to release of potentially harmful substances, including wastes, to air, water or land."[10]

The three factors – practical standards, procedures and management control identify key areas that are needed to ensure that ESM is realistic, achievable and effective both at a ship recycling facility and for waste management downstream. A similar approach may be taken to move towards compliance with the Hong Kong Convention and its guidelines.

Types of Standards

There are two main types of standards. Broadly speaking standards may be either technical standards or management standards. The former specify what should be achieved, for example an emission limit from an incinerator, such as the quantity of particulate matter released and the latter

[10] Environmentally Sound Management of Ship Recycling – Principles and Practice, Watkinson, R. Proceedings 1st International Conference on Dismantling of Obsolete Vessels; Sep. 2006 Glasgow UK.

describe methods or systems such as those developed by the International Standards Organisation (ISO) that defines how a particular result may be achieved. These standards may be:

- International Standards,
- National Standards (including regulatory standards) or
- Regional /Local Standards (that may supplement national standards)

And a combination of these may be used depending on the local circumstances. Those for ship recycling facilities have been specifically developed for the Basel and Hong Kong Conventions as described in their respective guidelines as well as the ISO 30000[11] series.

[11] ISO 30000:2009 Ships and marine technology -- Ship recycling management systems -- Specifications for management systems for safe and environmentally sound ship recycling facilities available at: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=51244

3. Practical Procedures for ESM compliance with the Basel and Hong Kong Conventions

Introduction

This section describe the steps that can be taken at ship recycling facilities to facilitate environmentally sound management, including the downstream ESM of wastes produced from the ship recycling activity that need to be treated at specialised facilities e.g. by landfill or incineration. There are two main aspects:

i) the steps to be taken to achieve compliance with the Basel and Hong Kong Conventions to protect the environment during operations at the ship recycling facilities and

ii) the steps to be taken to ensure that downstream waste management of the wastes arising from ship recycling can be treated safely and appropriately in accordance with defined standards that provide for ESM.

In doing so a combination of a certain level of technical infrastructure and operator skills are needed to ensure that the standards are achieved. The following factors can be taken into account when setting up technical procedures and techniques to undertake environmentally sound ship recycling:

- Technical complexity is not a necessary requirement for many tasks or operations - similar standards can be met by both simple and sophisticated means but with differing requirements e.g. depending on whether a task is carried out with a labour intensive technique or with machinery;
- The basic facility infrastructure needs to be capable of containing materials and wastes so that they can be controlled and are not able to escape to the environment;
- Provision of equipment should be appropriate to the hazards expected to be encountered, for example through knowledge of the inventory of hazardous materials supplied for a ship and from inspections, monitoring and surveys carried out to determine the hazardous materials on board;
- Standards of environmentally sound management are readily and consistently achieved by following defined procedures which the workforce is trained to carry out.

A number of steps can be taken to make progress towards an ESM compliant facility. For practical procedures key steps are outlined below. The next chapter deals with the approach to be taken by management, to complement the procedures to ensure ESM. The HKC guidelines for the development of a Ship Recycling Facility Plan [12] cover these issues in more detail.

Step 1- Identifying and Managing Hazardous Materials and Wastes

It is necessary to understand what hazardous materials need to be managed by the facility to decide what infrastructure the facility will need and what techniques are needed to be applied to managing them. The actual hazardous materials found should have been recorded as part of the Ship Recycling Plan developed under the HKC, or an equivalent plan which provides this information where the HKC has not yet been implemented. This can then be checked as part of the ship reception process to ensure the materials present are consistent with the records provided.

The hazardous materials on board a ship may be present as specific substances, such as lubricating oil, or may be incorporated into equipment or a part of the ship's infrastructure that is removed, for example a pump or generator. The hazardous material contained in the equipment may become waste by its removal or separation from recyclable materials. It may remain as part of or within an item or component that is recovered for sale or re-use. It will be important to identify such substances so that they can be appropriately and safely managed without causing harm. The IMO guidelines[13] for the development of the inventory of hazardous materials describe the items listed in the Hong Kong Convention Annex (as hazardous materials and potentially hazardous items). A standard format of the inventory of hazardous materials shows where they may be found on a ship. Appendix A lists hazardous wastes and materials found on ships in the categories provided for by the Hong Kong Convention (hazardous material contained in the ships structure and equipment, operationally generated wastes and stores).

Initially hazardous materials can be identified by visual inspection, which is used to make a preliminary assessment of the main likely articles and substances and their hazards. This may be assisted by the presence of hazard labels on the items or components and documentation available on the ship or provided as part of the inventory of hazardous materials produced in accordance with

[12] Guidelines for safe and environmentally sound ship recycling, 2012; (adopted by Resolution MEPC.210(63) http://www.imo.org/OurWork/Environment/ShipRecycling/Documents/210(63).pdf

[13] Guidelines for the development of the Inventory of Hazardous Materials, 2011; (adopted by Resolution MEPC.179(59)): http://www.imo.org/OurWork/Environment/ShipRecycling/Documents/RESOLUTION%20MEPC.179(59)%20Inventory%20guidelines.pdf

the IMO guidelines for the Hong Kong Convention. The locations and amounts should be noted in order to be able to inform those carrying out the dismantling about existing potential hazards, what personal protection is required and any specialist techniques needed for removal of the materials, such as the need to check hazardous atmospheres (gas-free testing and certification).

Additional tests are sometimes required beyond visual inspection where the substances are not readily identifiable. These tests provide confirmation of the identity of the substances to assist with their correct handling, storage and treatment. They may include sampling and chemical analysis, on site or in a laboratory, and physical examination such as inspection with a microscope (e.g. for asbestos). Independent laboratories may be used to carry out sampling and analysis where the ship recycling facility does not have specialist staff available.

Step 2 - Ship Recycling Facility Infrastructure

In order to safely manage the hazardous materials identified, applying environmentally sound management principles and compliance with regulations for recycling of a ship will rely, at least partly, on developing appropriate infrastructure in specific areas. A number of possible actions to take will include:

a) Develop Infrastructure – containment to prevent pollution

Infrastructure development may be restricted as to what can be achieved at a beaching location. Beaching without any infrastructure at all has similarities with the slipway/landing method, as employed at some facilities. The tendency has been to adapt a natural shoreline and improve the shoreside areas by levelling and creating hard standing with reinforced concrete. The limitations that a gently sloping sandy (rather than for example, a steeply shelving rocky) beach imposes are on the capability (or rather the difficulty) of hauling at least that part of a ship that is being dismantled away from the water to reduce the risk of cutting actions and other operations causing contamination of the water through spillage of polluting liquids and solids.

A combination of spill prevention and management techniques can be applied to help overcome this problem, to the extent that it is possible at a beach. A defined area of the beach, where potentially polluting activities are carried out, can be protected by simple infrastructure (e.g. a concrete base) that acts as a barrier to the

escape of polluting materials. There would be drainage for contaminants and the capacity for the drainage channels to be periodically cleaned, for example by installing removable grilles. Creating impermeable hard standing, with environmental protection such as drainage catchpits, enables operations involving hazardous or polluting materials to be carried out. Figure 1 below shows an inclined, concreted slope with a drainage channel to intercept spillages.

Figure 1 Hard standing with drainage channels. Photo: R Watkinson

Improvement to vehicle access at the facility to provide firm, level roadways will help to reduce wear and tear on the vehicles. This would permit easier and faster loading onto trucks by mechanical equipment and provide better stability for vehicles in poor weather, where they may sink in soft ground. A simple road base can be constructed initially with e.g. crushed concrete. Construction of site roads can be carried out gradually according to a phased plan improving their standards as resources permit. A compacted road base can be provided initially on a single track,

ensuring that this is well drained and maintained (filling in pot holes, repair of the edges damaged by traffic and weather).

b) Develop Infrastructure – Fixed Plant

Fixed plant is equipment on site that helps with mechanical operations to provide power and energy (e.g. for lighting) all of which can assist with more efficient, speedier and safer conduct of tasks.

This may include, for example:

- improvements to winching gear and cables for safely pulling a ship further away from the shore line while undergoing dismantling. More highly geared pulley systems and ensuring winching cables are in good condition will assist movement of heavy sections about the site;
- where possible fixed cranes for loading and unloading and transporting heavy materials within the yard can be installed to improve speed and efficiency and reduce the amount of manual handling, hence avoiding accident risks;
- the use of generators to provide electrical power for lighting and pumps (themselves obtainable from dismantled ships) to transfer liquids will enable safer working under low light conditions and the pumping of liquids from drainage catchpits.

c) Develop Infrastructure – Waste and Materials Storage

As with operational areas these can contribute significantly to improving the containment of potentially polluting materials and provide places where hazardous wastes can be safely stored temporarily before being removed for proper treatment and disposal. Solid and liquid hazardous and other wastes can be securely retained within such areas, protected from the weather or careless impact that may cause spillage and pollution.

The designation of an area also serves to readily identify where wastes need to be put when removed from the ship - or as the result of other operations on site – and from where they need to be removed by waste treatment contractors when arriving to take them away for specialist handling and disposal.

Containment can be constructed in a stepwise fashion. Initially a hard standing area (with good track/road access right up to it) with controlled drainage can be provided with bunded partitions for the reception of waste oils and for storing asbestos waste. Vertical walls can be created from a variety of materials (wood, concrete, steel) according to their availability and made with access from one side to enable materials to be stored and loaded. The orderly emplacement of wastes in containers within the bunded areas will also assist with safe, efficient and low risk storage until ready to be collected. As a development, where the waste management system is coordinated with an off-site contractor, the contractor's methods, systems and equipment can be integrated with that of the on-site storage, for example the contractor may supply his own specialist containers for use at the facility to speed up loading and unloading. The bunded areas may be used to house the contractor's bulk containers into which wastes can be securely placed ready for collection by the contractors. Figure 2 shows how this can be achieved simply and effectively.

Figure 2- Simple covered storage area for hazardous materials using an ISO container with one side cut away. Photo: R Watkinson

d) Develop Infrastructure - Mobile Plant

As with fixed plant, cranes and other lifting devices can provide safer and more effective site materials management and work efficiently on areas laid to hard standing. Properly maintained and used within their design limits (e.g. taking care not to exceed gross weight that a crane can lift) by trained workers, the use of on-site mobile plant to move drums and tanks of fuel and wastes can reduce the incidence of accidents and spillages while improving efficiency. Even where spillages have occurred, on-site plant can also be used to quickly bring resources for clean-up to the spot and remove contaminated absorbents etc. Where there is uneven or soft ground away from hard engineered surfaces, machinery with tracked wheels or low ground pressure tyres can be used to good effect. Figure three shows use of mobile plant.

Figure 3 - Employing on-site mobile plant. Photo: R Watkinson

Step 3- Identify Downstream Environmentally Sound Waste Facilities

Downstream management of the wastes arising from ship recycling activities should be considered as important as handling of hazardous material and wastes at the ship recycling facility. Wastes selected to be sent off site need to be treated safely and appropriately in accordance with defined standards for example as described in the Basel Convention Technical Guidelines series, listed in Appendix C.

The quality of available waste treatment and disposal facilities and their capacity to accept and properly manage the wastes should be a key concern for the ship recycling facility to be compliant with the Basel and Hong Kong Conventions. Ship recycling facility operators may need to investigate the availability of downstream facilities that meet the requirements of ESM as outlined in section 2 above. National laws and regulations and waste disposal company standards will determine how far the waste operators themselves meet ESM criteria.

Having undertaken the on-site management of wastes at ship recycling facility the segregated waste streams stored at the site can be matched to the downstream facilities best suited to treat them. These waste treatment facilities need to be checked by the ship recycling facility operator. Not all waste facilities will be alike in terms of size, standards and location and those that might appear, superficially, to be suitable may not possess all the necessary infrastructure themselves. For example if asbestos is to be disposed of by landfill then that landfill ought to be able to demonstrate that it can:

- handle it safely at all times from receipt to final disposal;
- deal with inappropriate loads (e.g. not conforming to specification or presented unprotected);
- dispose of the asbestos while ensuring it remains secure without being allowed to escape before being landfilled,
- apply an effective method for covering the asbestos;
- protect the deposited waste against being exposed or uncovered – such as by scavenging or re-excavation of a filled area;
- show that the that the asbestos is deposited in a defined are whose location is recorded so that its long term protection can be assured; and
- possess and employ safety measures and equipment through the whole process.

A similar approach may be taken for other facilities so that the ship recycling facility can assure itself that its wastes will be properly managed. The ship recycling facility operators may take a number of

steps to determine the ESM of waste facilities either directly or by obtaining independent evidence. This can include:

- examining the permits for the operation of the facility and any standards that it has achieved;
- making a visit to the facility to see it in operation or employing a contractor to do so;
- inspect the records of the facility's operation to see how the management of the facility assures correct procedures are carried out;
- ask the competent authority for the facility about its track record of compliance (if empowered to release this information); and
- examine any other published information such as the policies and reporting on environmental performance e.g. under ISO 14001.

National or international standards may be applied. The Basel Convention has published a number of technical guidelines on the environmentally sound management of wastes, including on specific waste streams such as waste oils, mercury, waste lead acid batteries and polychlorinated biphenyls (PCB). Also a number of techniques are described in the guidelines including specially engineered landfill and incineration on land. A list of these is provided in Appendix C.

Other facilities may also be able to accept wastes even though they are not primarily designed for waste disposal, if appropriately adapted to do so. Examples of this may be oil refining plant that could take waste oils or other facilities that can burn waste oil as a fuel for energy. Cement kilns can also be adapted to take waste if their conditions are suitable. For example any wastes with a calorific value may be used as a fuel, or some chlorinated organic compounds can be destroyed by co-processing. Such facilities tend to have their own design parameters so it is necessary to consult with the operators to find out whether the ship recycling wastes can be safely treated in this way. The Basel Convention has approved a specific guideline on this topic[14].

[14] Technical guidelines on the environmentally sound co-processing of hazardous wastes in cement kilns Revised final version (31 October 2011), Secretariat of the Basel Convention available at: http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/cement/06a3r1e.pdf

4. Implementing a compliant approach – key roles for management

Introduction

The management of a ship recycling facility have a key role in delivering the agreed standards of operation for ESM of the facility, whether the standards are national rules and regulations or industry standards. The managers and their supervisory staff are integral to successful implementation of improvements in environmental compliance and the competencies of managers and supervisors should be matched to these tasks. This can be achieved in a variety of ways using methods that best suit the culture of the facility and the prevailing requirements. In addition the documentation of all the activities:- ship recycling plans, the facility plans and all the necessary permits and working practices will play a vital role in enabling management to ensure that ship dismantling is systematic, consistent, reliable and as a result will be environmentally sound. Quality Management Systems (QMS) rely on this approach and, whether a formal QMS is used or not, a similar approach is likely to prove beneficial to successful conduct of the process.

Elements for successful implementation of ESM

A facility's management will need to consider the following elements[15]:

a. Policy setting- giving the overall framework under which the activities are carried out. The policy is a (short) written statement that can be communicated to all staff and workers as the purpose of the organisation which all can understand and work towards;
b. Objectives- Describing how the policy of the organisation is translated into objectives to be achieved on a day-to-day and longer term basis;
c. Delivery- Outlines how delivery of the objectives is supported by adopting methods that are designed to ensure consistency and quality of the output (the whole process of dismantling a ship from its reception and inspection, through reduction by cutting and removal of hazardous wastes etc.), such as defining and developing written procedures, (the core elements of QMS);
d. Measures- Selecting measures to achieve the objectives set (i.e. the standards and techniques) these comprise the range of tasks and the techniques to carry them out that combine to ensure safe dismantling;
e. Training of staff- Giving new recruits and existing workers clear instruction on their tasks, in order to understand the company's objectives, the importance of protecting the

[15] The Turkish ship recycling company Leyal for example has an integrated management system based on the ISO 9001, ISO 14001 and OHSAS 18001 standards to which the company is certified since 2006.

environment and how to carry out their own tasks as well as coordinating with others, how to respond to emergency situations;

f. Supervision- supervision of the tasks is undertaken to ensure that workers have received instruction and apply it correctly and consistently;
g. Monitoring - monitoring is the process of observing and gathering information using any necessary equipment and can including monitoring of the environment to ensure that the activities have led to the desired result, for example this could be taking samples of seawater and checking for any oil contamination;
h. Recording and record keeping – noting the results of monitoring and other actions taken informs management that instructions are being carried out and enables the facility to respond with evidence to inquiries made by inspectors of competent authorities/regulators.

Implementing ESM through Compliance Implementation Planning

Managers can use a compliance implementation plan to put all the elements outlined above into action. While not every element may be completed, a substantial number of these would have to be fulfilled to achieve ESM compliance. A significant factor will be the requirements of national regulations and guidance that will determine just how much is expected to be done and if any transitional schemes are in place to allow gradual improvements to be planned for and carried out as a compliance plan. If national regulations etc. are not yet in place some equivalent means of demonstrating that the key criteria are being met may be provided by the operator of the facility. For example, where national standards do not exist, a facility could develop its own, using the reference standard from international guidance, adapted for local circumstances. Where these are documented and evidence exists that they are being adhered to, for example by a QMS backed up with monitoring, then it will be possible to show that ESM is being delivered.

Managers can determine their level of compliance by assessing their facility against a set of criteria. An example of this approach is shown in Tables 4.1 and 4.2. Completing these simple checklists will enable the manager to identify the necessary actions to be detailed in a compliance implementation plan.

Table 4.1 Compliance criteria for ship recycling facility

Criterion	Status		
	Yet to start	In progress	Achieved
Are there published environmental criteria at national or local level that identify the expected level of environmental protection?			
Are there published environmental standards[16] at the national level, either derived from the above criteria or independently (may include relevant recognised international standards)?			
Are there published industry standards, especially those based on convention objectives and obligations?			
Are there technical standards for operation of facilities, such as may have been developed by the operators, including practical manuals?			
Are there environmental assessment techniques or procedures for identifying the potential impact of facilities?			

Table 4.2 Compliance criteria checklist for operators of facilities

Criterion	Status		
	Yet to start	In progress	Achieved
Are there documented operational facility procedures?			
Are quality management systems (that may be audited by a third party, such as an accredited independent auditor) in place that underpin the operation of the facility?			
Are staff trained and technically competent?			
Is there monitoring of the operation of individual facilities by the operator to check for compliance with the permit?			
Is there monitoring of the environment outside and in the vicinity of the facility?			
Are records kept of monitoring results and made available/reported to the competent authority?			
Are there provisions (e.g. emergency plans, shut down procedures) for dealing with non-compliance or remediating effects of non-compliance?			

Developing Stepwise Improvements

The Basel Convention Technical Guidelines for the Environmentally Sound Management of the Full and Partial Dismantling of Ships recognised that not all facilities may yet be in compliance. Their approach was to identify progressive improvement steps to be taken that would lead to ESM, over one, five and ten years, depending on the current status of a facility. An operator is at liberty to decide how to fulfil the requirements. It will prove useful to be able to show that a planned and

[16] A standard means a defined method of undertaking a task or set of actions that may include the sequence of actions and numerical limits e.g. values that should not be exceeded. A standard will determine the quality of the action or output. For example the OSPAR Commission, 2008. "Overview of Contracting Parties' National Action Levels for Dredged Material (for Denmark)." London.

managed approach is being achieved through using a Compliance Implementation Plan. With this approach a facility operator may determine his own steps to achieve compliance with the ESM standards and identify those specific actions to be taken and the timescale needed. This will assist in determining any investment required for financial planning as well as time taken to develop any new methodologies for facility operation. Table 4.3 provides a matrix that can be adapted for use by a facility to plan the implementation of the changes identified.

Use of Third Party Auditing

Commonly some form of third-party assessment can be made to determine whether set standards are met and adhered to on a continuing basis. This is employed for ISO standards verification for which a number of third-party auditing organisations already exist. Such independent verification can be extremely valuable either i) where an operator wishes to show his facility meets a high standard that may go beyond the available regulatory standards which may have a commercial advantage or ii) to demonstrate to a regulator that the facility is of such a standard that meets or replaces the need for the regulator's check monitoring and inspection (especially if this is subject to charging) or iii) in the absence of available regulatory inspection regime to provide an independent means of verifying to clients, or insurers, that the site is well-managed and compliant.

Documentation to provide evidence to support third-party assessment can include site operational manuals, health and safety policy and procedures and practices to ensure good integration with external facilities such as downstream waste management.

A Quality Management System may include an Environmental Management System (e.g. where certified according to ISO 14001). This will document the procedures used and subject them to regular review by audit processes including by a third party, such as an accredited independent auditor, to demonstrate the sound operation of the facility and compliance with the certificate. As the certification relies in part on the prevailing legislation this approach helps to provide evidence for compliance with those requirements.

TABLE4.3 EXAMPLE COMPLIANT MODEL SHIP RECYCLING WASTE MANAGEMENT IMPLEMENTATION MATRIX

Activity	Lead Role	Phase 1- Plan and Initiate (Years)				Phase 2 Develop – Enhance (Years)			
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
Ship Recycling Facilities – ship									
1. Initiate, implement minimal equipment / cost actions	Industry - Ship Recycling Facility								
2. Implement, simple low cost techniques	Industry - Ship Recycling Facility								
3. Improve infrastructure and equipment	Industry – Ship Recycling Facility								
4. Establish, maintain dialogue with Ministry / Competent Authority	Industry and Competent Authority								
Ship Recycling Facilities – shore									
5. Initiate, implement minimal equipment/ cost actions	Industry - Ship Recycling Facility								
6. Implement, simple low cost techniques	Industry - Ship Recycling Facility								
7. Improve infrastructure and equipment	Industry - Ship Recycling Facility								
Develop ESM at Waste Treatment Facilities									
8. Undertake enhanced survey of waste generation, facilities, capacity	Competent Authority								
9. Identify waste infrastructure gaps and needs , compliance requirements	Competent Authority								
10. Identify priority needs for specific waste streams - asbestos, PCB, ODS	Competent Authority								
11. Develop/enhance waste management strategy	Government Ministry								

12. Devise long term wastes management options –e.g. pre cleaning, import bans	Government Ministry								
13. Implement priority waste treatment policy	Competent Authority								
14. Develop / enhance regulatory compliance framework	Competent Authority								
15. Establish new capacity, specialised Facilities	Industry								
16. Establish, maintain dialogue with Ministry/Competent Authority	Industry								
Strategic Financing									
17. Develop, implement sustainable financing strategy	Government Ministry								

5. Prioritising Actions for Implementation -Short, Medium and Longer Term

Introduction

The actions for ESM of wastes at ship recycling facilities concern the identification, segregation and safe storage of wastes produced from ship recycling, i.e. those materials from the ship that cannot be re-used or recycled and for which an off-site treatment option must be found in the short to medium term. A review or audit of the facility's infrastructure and systems currently in place can be carried out to assist in identifying actions and prioritising them. The compliance implementation plan can be developed on this basis.

Key Actions

Key actions for ship recycling facilities are outlined in Tables 5.1a and 5.1b. The actions are separated into those dealing with the ship itself (Table 5.1a) and those dealing with shoreside activities (Table 5.1b). Tables 5.1a and 5.1b can be applied to facilities being authorized either under the requirements of the Basel or the Hong Kong Convention in general terms (as well as some ILO related actions, particularly where health, safety and environmental protection issues merge), as allowed for in the applicable domestic legislation. They are practically based and are not necessarily Convention specific.

These Tables can be adapted and brought into line with the planned improvements at a specific facility, depending on its current state of development. Where the actions have already been completed then it can be recorded as part of the overall description of the ship recycling facility in a Ship Recycling Facility Plan, as referred to in Chapter 3 above.

Table 5.2 additionally describes a route for graduated development of specific processes aiming towards compliance with the HKC requirements in the short, medium and longer term, where a State is taking steps towards implementation of HKC requirements and accession to this convention. These may be carried out in parallel with the practical actions described in Tables 5.1a and 5.1b. These actions can be expanded by including further elements of the format for the Ship Recycling Facility Plan for the Hong Kong Convention, the recommended format for which is reproduced in Appendix B.

Table 5.1a ACTIONS FOR SHIP RECYCLING FACILITIES - THE SHIP

SHORT TERM **WITHIN ONE YEAR**	**MEDIUM TERM** **ONE TO THREE YEARS**	**LONG TERM** **THREE TO EIGHT YEARS**
Minimal Equipment /Cost	*Simple/low cost techniques*	*Improved infrastructure and equipment*
Carry out visual inspection, identification and labelling of hazardous materials on board prior to beaching.	Test suspect hazardous materials in situ, sample for confirmatory testing	Document all hazardous materials on board against supplied Inventory of Hazardous Materials
Determine pollutant concentrations prior to removal of bilge and ballast water.	Apply simple tests for key parameters: oil, selected metals	Apply full monitoring protocol for key parameters: oils, PCB, metals (mercury, cadmium)
Make and record visual inspection of pollutants in waters around ship.	Deploy spill containment boom with spill clean-up equipment on standby	
Pump out heavy oils and sludges to drums before starting other work.	Pump out liquids to secure storage	Prioritise pumping over man entry for liquid removal operations inside the tanks
Test compartments for presence of toxins, corrosives, irritants and breathable and flammable gases before entering.		Install gas monitoring equipment at key locations
Ventilate spaces (compartments/ tanks) and monitor for breathable and flammable gases during work.		
Remove combustible and recyclable materials, including cables before hot work.		
Clean oil tanks and compartments before starting hot work.		
Apply “hot work” certification system.		
Identify and remove toxic or flammable paint prior to metal cutting. Collect and contain waste paints removed		
Identify and remove to safe store presumed PCB-containing material (closed and open sources - solids and liquid). No hot work carried out on or near any PCB.		
Create dedicated area for asbestos removal. Apply safe removal procedures. Limit access to trained workers.	Seal areas on board ship where asbestos has been identified. Limit access. Filter air emissions. Securely pack all asbestos.	Install dedicated decontamination system.

Table 5.1b - ACTIONS FOR SHIP RECYCLING FACILITIES – ON SHORE

SHORT TERM **WITHIN ONE YEAR**	**MEDIUM TERM** **ONE TO THREE YEARS**	**LONG TERM** **THREE TO EIGHT YEARS**
Minimal Equipment /Cost	*Simple/low cost techniques*	*Improved infrastructure and equipment*
Set out facility plan - design major areas to indicate places for storage, cutting, roadways etc.	Provide firm compacted surfaces suitable for vehicle access.	Pave roadways. Employ lifting machinery and plant for heavy items, with low ground-bearing capacity or on firm services.
Create a dedicated area for segregation of hazardous materials (e.g. PCB, hazardous waste, liquids). Install clear signs to show where each type is put.	Install impermeable base for hazardous materials, paint removal and hazardous wastes handling / storage. Drain impermeable areas to tanks for later treatment and disposal.	Cover hazardous waste handling areas. Test, remove and dispose of PCB containing material to hazardous waste facility. (Optional) Develop communal ship decontamination facility. Utilise environmentally sound treatment/ disposal facilities for hazardous materials.
Install warning signs, buffer protection zone around fuel drums and tanks.	Protect fuel tanks (bunds) on hard standing.	
Inspect winch cables regularly, replace damaged and frayed cable.	Test cables regularly, install pulley and block system.	Install strain gauges and alarms.
Develop and implement spill clean-up and notification procedures.	Provide storm water discharge facilities, to avoid contamination of storm water run-off.	Install and operate draining and pumping equipment to impermeable areas linked to storage tanks /catch pits.
Supply and use Personal Protective Equipment: (Hard hats, gloves, eyes/face protection, welding goggles, torches, safety shoes).		
Supply and use respiratory hazard protective equipment.		
Supply fire extinguishing equipment at risk areas.		Commission dedicated fire and rescue service (joint venture).
Implement appropriate asbestos management procedures in accordance with ILO code of practice. Asbestos work by trained personnel only. Access to asbestos identified areas to designated personnel.	Collect and contain all wastes from asbestos removal processes. Pack asbestos in approved packaging. Decontaminate workers when leaving the designated area.	
Post notices/pictograms of key safety hazards.		
Provide emergency first aid post	Provide occupational health service.	Establish medical centre (cooperative venture)

TABLE 5.2 – SPECIFIC ADDITIONAL ACTIONS FOR SHIP RECYCLING FACILITIES IN STATES PROGRESSING TOWARDS HONG KONG CONVENTION COMPLIANCE

SHORT TERM **ONE YEAR**	**MEDIUM TERM** **ONE TO THREE YEARS**	**LONG TERM** **THREE TO EIGHT YEARS**
Establish basic Ship Recycling Facility Plan (referring to the IMO Guidelines for the Development of the Ship Recycling Plan) • Employers and workers responsibilities • Worker Safety policy • Worker Training programme	Implement Intermediate Ship Recycling Facility Plan: • Worker ESM and safety Training and information • Emergency Plan • Record Keeping • Reporting system for discharges, incidents accidents • Reporting system for accidents injuries etc.	Advanced Ship Recycling Facility Plan • Performance Monitoring Plan • Quality System to achieve HKC goals and continuous improvement
Basic check hazardous materials on board (refer to IMO Guidelines for the Development of the Inventory of Hazardous Materials)	Use Inventory of Hazardous Materials as main	
Safe and Environmentally Sound Management of Hazardous Materials • Identify • Label • Segregate	Upgrade storage • Hard standing • Drainage Identify waste disposal facilities • Survey capacity	Upgrade Storage • Cover/protect storage areas Waste Management • All wastes to authorized ESM facilities
Basic Ship Recycling Plan (Refer to IMO Guidelines for Safe and Environmentally Sound Ship Recycling)		

APPENDICES

Appendix A: Hazardous materials and wastes found on ships

(Including Parts I, II and III of the Inventory of Hazardous Materials)

a) Hazardous materials contained in the ship's structure and equipment (HKC IHM, Part I)
Asbestos
Polychlorinated biphenyls (PCBs)
Ozone-depleting substances (ODSs)
Anti-fouling compounds and systems
Cadmium and cadmium compounds
Hexavalent chromium and hexavalent chromium compounds
Lead and lead compounds
Mercury and mercury compounds
Polybrominated biphenyls (PBBs)
Polybrominated diphenyl ethers (PBDEs)
Polychlorinated naphthalenes (PCNs)
Radioactive substances
Certain short-chain chlorinated paraffins

(b) Operationally generated wastes (HKC IHM, Part II):
Waste oil (sludge)
Bilge and/or waste water generated by the after-treatment systems fitted on machinery
Oily liquid cargo residues
Ballast water
Raw sewage
Treated sewage
Non-oily liquid cargo residues
Dry cargo residues
Medical/infectious waste
Incinerator ash
Garbage
Fuel tank residues
Oily solid cargo tank residues
Oily or chemical contaminated rags
Dry tank residues
Cargo residues

c) Stores including regular consumable goods (IHM, Part III). (Regular consumable goods potentially containing Hazardous Materials comprise goods which are not integral to a ship and are unlikely to be dismantled or treated at a Ship Recycling Facility.)
Acetylene
Alcohol/methylated spirits

Antifreeze fluids
Anti-seize compounds
Batteries (including lead-acid batteries)
Battery electrolyte
Boiler and feed water treatment and test reagents
Bunkers, e.g. fuel oil
Butane
Carbon dioxide
Chemical cleaner (including electrical equipment cleaner, carbon remover)
Chemical refrigerants
Deionizer-regenerating chemicals
Detergent/bleacher (potentially a liquid)
Engine coolant additives
Evaporator dosing and descaling acids
Extinguishers
Fire-fighting clothing and personal protective equipment
Fuel additive
Fuel gas
Grease
Hydraulic oil
Hydrofluorocarbons (HFCs)
Kerosene
Lubricating oil
Methane
Miscellaneous medicines
Nitrous oxide (N_2O)
Oxygen
Paints
Paint stabilizers/rust stabilizers
Perfluorocarbons (PFCs)
Pesticides/insecticide sprays
Propane
Solvents/thinners
Spare parts containing Hazardous Materials
Sulfur hexafluoride (SF^6)
White spirit

Appendix B: Ship Recycling Facility Plan Elements

(from IMO 2012 guidelines for safe and environmentally sound ship recycling, appendix 1: recommended format of the ship recycling facility plan)

1 Facility management

- 1.1 Company information
- 1.2 Training programme
- 1.3 Worker management
- 1.4 Records management

2 Facility operation

- 2.1 Facility information
- 2.2 Permits, licences and certification
- 2.3 Acceptability of ships
- 2.4 Ship Recycling Plan (SRP) development
- 2.5 Vessel arrival management
- 2.6 Ship recycling methodology
- 2.7 Reporting upon completion

3 Worker safety and health compliance approach

- 3.1 Worker health and safety
- 3.2 Key safety and health personnel
- 3.3 Job hazard assessment
- 3.4 Prevention of adverse effects to human health
  - 3.4.1 Safe-for-entry procedures
    - 3.4.1.1 Safe-for-entry criteria
    - 3.4.1.2 Competent person for Safe-for-entry determination
    - 3.4.1.3 Safe-for-entry inspection and testing procedures
    - 3.4.1.4 Oxygen
    - 3.4.1.5 Flammable atmospheres
    - 3.4.1.6 Toxic, corrosive, irritant or fumigated atmospheres and residues
    - 3.4.1.7 Safe-for-entry determination by a competent person
    - 3.4.1.8 Safe-for-entry certificate, warning signs and labels
    - 3.4.1.9 Safe-for-entry operational measures
  - 3.4.2 Safe-for-hot-work procedures
    - 3.4.2.1 Safe-for-hot-work criteria
    - 3.4.2.2 Competent person for Safe-for-hot-work determination
    - 3.4.2.3 Safe-for-hot-work inspection, testing and determination
    - 3.4.2.4 Safe-for-hot-work certificate, warning signs and labels
    - 3.4.2.5 Safe-for-hot-work operational measures
  - 3.4.3 Welding, cutting, grinding and heating
  - 3.4.4 Drums, containers and pressure vessels
  - 3.4.5 Prevention of falling from heights and accidents caused by falling objects
  - 3.4.6 Gear and equipment for rigging and materials handling
  - 3.4.7 Housekeeping and illumination
  - 3.4.8 Maintenance and decontamination of tools and equipment
  - 3.4.9 Health and sanitation
  - 3.4.10 Personal protective equipment
  - 3.4.11 Worker exposure and medical monitoring

3.5 Emergency preparedness and response plan
3.6 Fire and explosion prevention, detection and response

4 Environmental compliance approach

4.1 Environmental monitoring
4.2 Management of Hazardous Materials
4.2.1 Potentially containing Hazardous Materials
4.2.2 Additional sampling and analysis
4.2.3 Identification, marking and labelling and potential on-board locations
4.2.4 Removal, handling and remediation
4.2.5 Storage and labelling after removal
4.2.6 Treatment, transportation and disposal
4.3 Environmentally sound management of Hazardous Materials
4.3.1 Asbestos and materials containing asbestos
4.3.2 PCBs and materials containing PCBs
4.3.3 Ozone-depleting substances (ODSs)
4.3.4 Paints and coatings
4.3.4.1 Anti-fouling compounds and systems (organotin compounds including tributyltin (TBT))
4.3.4.2 Toxic and highly flammable paints
4.3.5 Hazardous liquids, residues and sediments (such as oils, bilge, and ballast water)
4.3.6 Heavy metals (lead, mercury, cadmium and hexavalent chromium)
4.3.7 Other Hazardous Materials
4.4 Prevention of adverse effects to the environment
4.4.1 Spill prevention, control and countermeasures
4.4.2 Storm-water pollution prevention
4.4.3 Debris prevention and control
4.4.4 Incident and spills reporting procedures

Plan Attachments

Facility Map
Organizational Flow Chart
Permits, Licences and Certification
Resumes

Appendix C References and Bibliographic material

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Back Cover: Ship Recycling at Aliaga, Turkey using mechanised equipment on hard standing.
Photo R Watkinson