# FATE OF SHIPBREAKING WASTES IN TURKEY

## Downstream Waste Management at Aliağa Shipbreaking Yards in Turkey

NGO platform
on shipbreaking

**The NGO Platform on Shipbreaking is a global coalition of environmental, human and labour rights organisations working together to reverse the environmental and human rights abuses of current shipbreaking practices and to ensure the safe and environmentally sound dismantling of end-of-life vessels world-wide.**

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# Executive Summary

"Fate of Shipbreaking Wastes in Turkey" is a report by the NGO Platform on Shipbreaking which aims to shed light on the downstream management of hazardous wastes originating from obsolete ships at the Aliağa shipbreaking yards in Turkey. The report follows various waste streams from the arrival of the ships in Aliağa to their final disposal and describes related national legislation and monitoring systems. The NGO Platform visited various recycling and disposal facilities that handle hazardous wastes originating from shipbreaking activities, including the only hazardous waste disposal facility in Turkey.

International awareness about the problems associated with ship recycling has significantly increased in recent years as a result of pressure from environmental and human rights groups. Responsible ship owners and governments are now looking for destinations where their obsolete ships can be dismantled without causing pollution and risk to the life and health of workers - and there is broad agreement that shipbreaking activities in Aliağa have much higher standards of safety and environmental protection in comparison to the shipbreaking activities that take place on tidal beaches in India, Bangladesh and Pakistan.

This report describes how asbestos, waste oils, bilge water, CFCs electrical cables and accumulators on board obsolete ships are managed downstream in Turkey. It also identifies wastes that are currently not properly managed, such as PCBs in certain electrical equipment, mercury, heavy metals and organotins in the paints of the ship structure.

Despite significant progress made these five past years on especially enhancing safety and pollution containment during dismantling operations, this report clearly identifies that there is room for improving the downstream management of hazardous ship wastes in Turkey. Especially the lack of independent monitoring and transparency through publicly available documentation is highlighted as a problematic area for hazardous waste management.

In light of the findings of this report the NGO Platform calls on the Turkish Government:

- To ensure that each incoming ship for scrap to Turkey is controlled by independent third parties (such as accredited companies, chambers of occupational health, other relevant government bodies and NGOs) for the types and amounts of hazardous waste on board and as part of ship's structure;
- To make sure hazardous waste management at the yards and downstream disposal covers all substances found on end-of-life vessels as listed in the Basel Convention; the Basel Technical Guidelines; International Maritime Organisation Guidelines; and relevant industry guidance;
- To ensure that ships for scrap are pre-cleaned to the greatest possible extent before they are exported to Turkey with the aim of minimizing especially chlorinated hazardous wastes; and if no alternative technology is available to incineration a send back system should be put into place for non-recyclable chlorinated wastes;
- To secure public participation in the overall monitoring of yards and downstream waste management; and
- To ratify the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters known as the Aarhus Convention and its Protocol on Pollutant Release and Transfer Registers.

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# I. INTRODUCTION

Since Greenpeace reported in 2002[1], important improvements have been made at the shipbreaking yards in Aliağa, Turkey. These improvements include a new National Regulation on Shipbreaking; a certification system for the yards; the installation of cement flooring, drainage systems and oil booms to improve containment; and the establishment of a Waste Management Centre (WMC) as well as asbestos removal procedures. However, is it enough to manage hazardous wastes in an environmentally sound way only at the shipbreaking yards to be able to call ship recycling a green industry?

Responsibility and ship owners' liability for proper management of ship borne wastes is not confined to the boundaries of the shipbreaking yard. The Basel Convention[2] clearly states that there is an obligation to look downstream:

*"The obligation under this Convention of States in which hazardous wastes and other wastes are generated to require that those wastes are managed in an environmentally sound manner may not under any circumstances be transferred to the States of import or transit" (Article 4.10).*

*Otapan at Aliağa Shipbreaking Yards. © Erdem Vardar*

In addition the Basel Convention Framework Document for Technical Guidelines summarises:

*"Generators of wastes, subject to the Basel Convention and particularly of hazardous wastes, should be responsible under the Convention for management of their wastes from their generation until they have been accepted at a facility to be recovered or disposed of in a manner which is environmentally acceptable to the competent authority; in addition, generators have obligations under Article 8 of the Convention to re-import the wastes when the transboundary movement to which the consent of the States concerned has been given, cannot be completed in accordance with the terms of the contract, the State of export shall ensure that the wastes in question are taken back into the State of export, by the exporter, if alternative arrangements cannot be made for their disposal in an environmentally sound manner" (Article 24(a)).*

The OTAPAN case warranted the need for better identification and monitoring of ship borne wastes and illustrated that minimizing hazardous materials on board end-of-life ships prior to export is possible. The OTAPAN case also provoked an important question: what will happen to the remaining wastes on board after the ship is dismantled? Turkey is often presented as one of the more progressive shipbreaking countries in terms of waste management, but what is the reality on the ground, especially when we look downstream?

The OTAPAN, a chemical tanker, was laid up in the Netherlands in 1999 after the Dutch Government was obliged to seize the vessel due to the former Mexican owner's bankruptcy. Following several scandals, including in 2001 when crew members were caught removing asbestos from the ship with no containment in the port of Amsterdam, the Dutch Government decided in 2006 to sell the vessel to a shipbreaker in Aliağa. While the ship was on its way to Turkey, Greenpeace Netherlands discovered that the license and inventory listing hazardous wastes on board the vessel were incorrect and the NGO Platform on Shipbreaking alerted the Turkish Government. Despite a high level visit to Ankara and an appeal by Dutch State Secretary Van Geel, the Turkish government refused the vessel entry and insisted on a full pre-cleaning of the vessel. The OTAPAN thus had to return to the Netherlands.

After a proper inventory was made, including amongst other sampling of PCBs, a highly toxic substance often found on board ships in paint, cables or insulation material, 76 tons asbestos and 335 tons asbestos contaminated materials (ACM) were removed from the ship, leaving 850 kilograms asbestos and 331 tonnes of bunker oil still on board.

In 2007 Simsekler shipbreaking yard received a permit from the Turkish Government to dismantle the OTAPAN with the precondition that such operations be conducted in accordance with the Basel Technical Guidelines on Ship Dismantling. Furthermore, the Dutch Government agreed to assist Turkey regarding the remaining asbestos. The OTAPAN left Amsterdam on 15 May 2008 and arrived at its final destination, Aliağa, less than three weeks later.

On 14 November 2008, the OTAPAN was fully dismantled and 8.400 tonnes scrap metal retrieved. 1.300 kilograms asbestos were removed from amongst other the tank bases and sent to the hazardous waste landfill in Izmit.

*1) Greenpeace, Ships for Scrap V: Greenpeace Report on Environmental, Health and Safety Conditions at Aliaga Shipbreaking Yards, Izmir, January 2002.*
*2) UN Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal*


*Locations of recycling/disposal facilities subject to this report.*

## Hazardous waste management in Turkey

The Turkish National Statistics Organisation (TUIK) has estimated that 1.12 million tons of hazardous waste is produced every year in Turkey. Where as much as 45% of this waste ends up is unknown. The capacity of licensed recycling and disposal facilities in Turkey was in 2006 estimated at 600.000 tons, but only 120.000 tons of waste were sent to these facilities in that particular year. The only operational hazardous waste landfill site and incinerator is based in Kocaeli. Four additional plants are planned to be built in other regions[3], but due to concerns about leakage from landfills and dioxin pollution caused by incineration of chlorinated materials these plans have encountered strong local opposition.

Meanwhile, as a European Union (EU) accession country, Turkey is developing new legislation on hazardous waste management. The Ministry of Environment and Forestry (MoEF) has issued new or updated Regulations, including the Regulation on General Principles of Waste Management (2008), Regulation on Control of Hazardous Wastes (2005), Regulation on Control of Waste Oils (2004), and the Regulation on Control of Polychlorinated Biphenyls (PCBs) and Polychlorinated Terphenyls (PCTs) (2007). New Regulations on WEEE[4] and Waste Incineration are expected to be issued in 2009. These legislative developments have motivated entrepreneurs to open recycling and disposal facilities - there was for example no licensed electrical cable recycling facility in Turkey before 2006, in 2009 the number had increased to 16[5].

In addition, a new system of National Waste Transportation Forms which allows MoEF to follow national waste movements is being implemented. An upcoming transition to an online system is also expected to further improve the monitoring capacity of MoEF. This transition and some legislative developments are direct results of cooperation programmes such as the one between the Environment Ministries of Turkey and Germany initiated in 2003.

## Hazardous waste management at shipbreaking yards

Turkey as shipbreaking country applies the notification and prior informed consent principles of the Basel Convention. As an OECD and an EU accession country, Turkey seems to constitute a desirable country of destination, especially for EU Member States. After pressure and demands from environmental and labour groups such as Greenpeace and Limter-Is Trade Union for immediate improvements at the Aliağa shipbreaking yards[6] an updated version of the Shipbreaking Regulation[7] was finally issued in 2004.

**Aliağa Waste Management Centre and its activities**

- Identify, analyse, dismantle, collect, temporarily store and dispatch materials defined as hazardous wastes under national legislation to licensed disposal facilities.
- Dispatch wastes defined by national legislation as recyclable to recycling facilities.
- Monitor shipbreaking practices for environmental soundness, inform the companies about risks and ensure that necessary measures are taken.
- Follow up and implement national and international legislation on occupational health and safety and the environmental protection.
- In the context of workers health and safety, monitor radiation, oxygen and explosive gases in closed locations, report to related authorities and provide the workers with healthy working conditions.
- Give periodical training to workers on dealing with fire, identifying hazardous materials (such as asbestos, PCB, lead) and first aid.
- Follow up health check reports for workers.
- Clean up the possible undesired pollution in coastal areas.

Article 8 of the Shipbreaking Regulation on the Protection of the Environment requires that:

*"Wastes originating from scrap vessels shall be handled according to environmental, health and safety standards and disposed of by the shipbreaker according to relevant legislation".* Also, *"the shipbreaker must take all necessary precautions to prevent environmental, health and safety risks during dismantling and must prepare waste management plans."*

These requirements triggered the shipbreaking industry in Aliağa, represented by the Turkish Shipbreaking Association, to establish a Waste Management Centre (WMC).

MoEF and the Undersecretariat for Maritime Affairs are currently working on a new Shipbreaking Regulation which will replace the current 2004 version. This Regulation is expected to be based on the new IMO Convention and IMO Guidelines for Ship Recycling Facilities as well as new national environmental legislation that has been harmonized with relevant EU Directives.

**Capacity of WMC Temporary Storage Station**

- 50 tons in closed cement tank for bilge water
- 214 tons in closed cement tank for waste oils
- 12 tons in iron tank for sludge
- 6 tons in packages in closed room for asbestos
- 55 m³ in plastic barrels in closed depot for pharmaceutical waste
- 55 m³ in plastic barrels in closed depot for contaminated tissues
- 55 m³ in plastic barrels in closed depot for waste accumulators
- 55 m³ in gas cylinders in closed depot for cooling gases

## Downstream waste management of hazardous wastes originating from shipbreaking activities

Information about the amount and type of ship borne waste entering Turkey is based on an inventory sent by the ship owner and an inventory prepared by the WMC on behalf of the shipbreaker. Asbestos, bilge water, waste oils, waste electrical cables, waste accumulators, cooling gases and medical waste are managed by WMC according to relevant national legislation. They are stored at the WMC Temporary Storage Station in Aliağa before being sent to MoEF licensed recycling or disposal facilities. PCB's in electrical devices other than cables, mercury and toxic materials such as lead, TBT and arsenic found in paints on the ship's structure are however currently not identified, nor managed.

It is important to emphasise that the responsibility of the producer of the wastes, in this case the ship owner, does not end at the boundaries of the breaking yard. The way waste is treated after it leaves the shipbreaking yards and the effects it may have on the environment and health needs to be dealt with. Waste must be sent to licensed facilities, and a robust monitoring and auditing system is needed to ensure that these facilities function in compliance with environmental protection and occupational safety requirements. In this process all stakeholders, including NGOs, should be consulted. To further strengthen transparency relevant information needs to be made publicly available.

Shipbreaking practices can thus only be called environmentally sound and safe if the management of hazardous wastes is done in an environmentally sound and safe manner *downstream*. Turkey has progressed a lot in hazardous waste management related to shipbreaking practices, yet there are still some crucial steps to be taken to ensure that the environment, workers and local communities are sufficiently protected, also downstream.

Total waste dispatches in 2007 from Aliağa ship-breaking yards
(From the WMC Waste Dispatches File 2007)

| Type of waste | Recycling/Disposal Facility | Amount of waste |
|---|---|---|
| Waste Cable | Ak Kablo | 127610 kg |
| Asbestos | Izaydaş | 187320 kg |
| Waste Oil (I.category) | Çinkanlar | 967540 kg |
| Bilge Water Dewaterised | Muğla Çimento | 8250 kg |
| Bilge Water Dewaterised | Bati Çim | 11440 kg |
| Medical Waste | Izaydaş | 1322 pieces |
| Waste Accumulator | Mutlu | 2140 kg |
| Waste Accumulator | Aslan Avci | 6580 kg |

*3) From Betül Doğru, Head of MoEF Hazardous Waste Department, presentation at REW 2008 fair in Istanbul.*

*4) Waste of Electric and Electronic Equipment.*

*5) List of Licensed Hazardous Waste Recycling/Disposal Facilities, retrieved from Hazardous Waste Management section of the MoEF website: http://www.atikyonetimi.cevreorman.gov.tr/tehlikeli.htm*

*6) See also Greenpeace report on the Environmental, Health and Safety Conditions at Aliağa Shipbreaking Yards in 2001 http://www.greenpeace.org/raw/content/turkey/press/reports/gemi-soekuemue-raporu-ingilizce.pdf*

*7) Regulation on Shipbreaking by the Ministry of Transport (08.03.2004, no: 225396).*

# II. OBJECTIVE AND METHODOLOGY

## II.1 Objective

Previous environmental work and reporting on shipbreaking activities in Turkey and around the world has focused mainly on the environmental problems arising within the boundaries of the shipbreaking facilities. The main objective of this report is to better understand how hazardous waste is managed after it is generated, i.e. what happens to hazardous waste, such as asbestos, PCBs and waste oils, after it leaves the shipbreaking yards. This has become a growing concern because even though some governments have implemented stricter environmental standards at the yards, there is less incentive for governments to take a holistic approach to the effects of hazardous waste arising through international trade in obsolete vessels.

## II.2 Methodology

In order to collect data about downstream waste management, the NGO Platform on Shipbreaking made several visits to the shipbreaking yards in Aliağa, met with environmental officials and visited five different recycling/ disposal facilities to which the various types of hazardous waste arising from ship dismantling operations are sent or have previously been sent. In addition, the research included screening of relevant national legislation, looking into control and monitoring processes and desk research on types of waste and their proper management.

## II.3 Scope and Limitations

The NGO Platform on Shipbreaking aimed to develop a general understanding about how hazardous wastes are being managed, especially after they leave the shipbreaking yards in Aliağa. The objective has been achieved, with the following limitations:

- The NGO Platform on Shipbreaking looked mainly into the waste treatment processes. Due to budgetary restrictions the NGO Platform on Shipbreaking could not sample and analyse waste water and emissions originating from various recycling/disposal facilities. Therefore conclusions about whether the facilities are operating in an environmentally sound manner are partly dependent on the monitoring and licensing of the facilities by the Turkish Government.
- Not all of the recycling/disposal facilities were co-operative. Some of them did not allow the NGO Platform to see their waste treatment processes and did not share data. Even so, the number of facilities that co-operated was satisfactory.
- Documentation of the transfer of hazardous wastes in Turkey is still being dealt with on paper with no electronic monitoring system in operation. This made it difficult to properly identify all hazardous waste records, a problem even Government officials admitted. In addition, the fact that Turkey has no national legislation ensuring the right to publicly access information and that Turkey is not a signatory to relevant international regulations such as the Aarhus Convention, limited the data available for the research to the information provided voluntarily by the companies involved.

# III. DOWNSTREAM HAZARDOUS WASTE MANAGEMENT

## III.1 Management of Asbestos

### III.1.1 Waste stream

A full inventory of Asbestos Containing Materials (ACMs) is done by the WMC after the ship has been landed at Aliağa shipbreaking yards. The inventory includes types of asbestos, approximate quantities and locations. All potential asbestos containing locations and materials are checked visually and by sampling when necessary; and all asbestos containing materials are marked.

The full inventory of hazardous wastes on board which has been prepared by the WMC is then visually checked and approved by officials from the provincial directorate of MoEF. No sampling is done by MoEF officials in order to re-check the type of asbestos or to search for any additional ACMs.

MoEF has certified the Shipbreaking Association for asbestos identification and removal. It is the only organisation which has such a license in Turkey. This license also permits them to remove asbestos from buildings and factories. The license was obtained in 2004 following the training of workers and employees of the WMC by certified trainers under German asbestos legislation and additional training from the Turkish Ministry of Labour and Social Security.


*ACM marking in the vessel "FIR/FPSO" (from WMC archive)*

*Glovebag is divided in two parts, a work part and a waste part. It makes it easier for the workers to remove asbestos insulation from pipes and then dispose of the waste. © Erdem Vardar*

*Room system with decontamination unit (from WMC archive)*

*Asbestos removal and packaging (from WMC archive)*

SHIPRECYLING ASSOCIATION OF TURKEY
WASTE MANAGEMENT CENTER
HAZARDOUS WASTE RECEIPT
**ATIK ALIM SENEDİ**

KAYIT NO : 51 /2008
RECORD NO :

| ATIĞIN CİNSİ<br>KIND OF WASTE | MİKTARI<br>QUANTITY | TARİHİ<br>DATE | FİRMA VE ATIĞIN AİT OLDUĞU GEMİ<br>SHIPBREAKER COMPANY AND SHIP NAME |
|---|---|---|---|
| ASBESTOS<br>ASBEST | 30 TORBA<br>450 kg | 22.04.08 | LEYAL<br>4 FIR FPSO |

**T.C. ÇEVRE VE ORMAN BAKANLIĞI'NIN "TEHLİKELİ ATIKLARIN KONTROLÜ YÖNETMELİĞİ" GEREĞİNCE GEMİNİZDE TESPİT EDİLEN ATIK İZAYDAŞ BERTARAF TESİSİNE SEVK EDİLMEK ÜZERE MERKEZİMİZCE TESLİM ALINMIŞTIR.**

*WASTES DETERMINED IN YOUR SHIP ACCORDING TO SURVEY, CONDUCTED IN COMPLIANCE WITH THE "HAZARDOUS WASTES CONTROL REGULATION" ISSUED BY THE TURKISH MINISTRY OF ENVIRONMENT AND FOREST HAVE BEEN RECEIVED BY THE WASTE MANAGEMENT CENTER AND THEY WILL BE SEND TO IZAYDAŞ WASTE DISPOSAL FACILITY BY THIS CENTER.*

*RESPONSBILITY OF WASTE MAN.CENTER*
**ATIK YÖN. MRK. SORUMLUSU**

KAPT ERSİN ÇEVİKER
GEMİ SANDER
ATIK YÖN.MRK. SORUMLUSU

*Waste receipt required when the asbestos is removed from the vessel*

The removal and measuring equipment is purchased from the German firm Deconta. Some of the workers are also trained by Deconta on how to use the specialist equipment.

The equipment includes:

- Mobile lock deco-roll (decontamination unit)
- Room system with decontamination unit
- High capacity negative pressure compressor
- Negative pressure monitor
- Security vacuum cleaner
- Asbestos overalls, gloves and protective boots
- 3 M Respiratory protective masks
- Glovebags
- Asbestos garbage bags
- Air sampler
- Electron microscope
- Waste fluid filtration system
- Remaining fibres binder

ACMs are removed by the WMC. Some of the removal works are however done under the additional surveillance of accredited firms such as Solide Turkey, Projeco Eng./ Italy and Plinios /Greece. Solide claims that it is necessary to survey asbestos removal operations for all ships as the training and equipment of the WMC is not sufficient for totally safe removal[8].

*Licensed transportation vehicle (from WMC archive)*

The waste is taken off the vessel with a hazardous waste receipt and collected in asbestos bags which are stored in the Temporary Storage Station. A national hazardous transportation form is completed and finally the waste is sent to the Hazardous Waste Incineration and Landfill site at Izaydas (see Section III.4) in licensed transportation form is completed and finally the waste is sent to the Hazardous Waste Incineration and Landfill site at Izaydas (see Section III.4) in licensed transportation vehicles to be landfilled. vehicles to be landfilled.

**Asbestos** is a group of minerals with long, thin fibrous crystals. The word "*asbestos*" is derived from a Greek adjective meaning inextinguishable. The Greeks termed asbestos the "*miracle mineral*" because of its soft and pliant properties, as well as its ability to withstand heat. Asbestos became increasingly popular among manufacturers and builders in the late 19th century due to its resistance to heat, electricity and chemical damage, its sound absorption and tensile strength. When asbestos is used for its resistance to fire or heat, the fibres are often mixed with cement or woven into fabric or mats. Asbestos is used in brake shoes and gaskets for its heat resistance, and in the past was used on electric oven and hotplate wiring for its electrical insulation at elevated temperature, and in buildings for its flame-retardant and insulating properties, tensile strength, flexibility, and resistance to chemicals.

This "*miracle mineral*" is now known to be highly toxic. The inhalation of asbestos fibres can cause serious illnesses, including mesothelioma and asbestosis. Since the mid 1980s, many uses of asbestos have been banned in many countries.

*(Wikipedia, the free encyclopedia:http://en.wikipedia.org/wiki/Asbestos)*

*8) Meeting with Solide Turkey representitive, Izmir, 21.04.2008.*

## III.1.2 National legislation

Asbestos usage is regulated by several Ministries in Turkey. The Ministry of Environment banned the import of blue asbestos (crocidolite) in 1996 in 'Regulation on Control of Hazardous Chemicals and Products[9]. This Regulation was amended and renamed the "*Hazardous Substances Regulation*" (official gazette no: 24379) in 2001. The new Regulation bans the use and production of all amphibole asbestos types. There is no such ban for chrysotile (white asbestos), although the limitations on its use are regularly tightened. According to the Hazardous Chemicals and Products Regulation, the Undersecretariat for Foreign Trade includes all types of asbestos except chrysotile in its import ban list while chrysotile is in the list of chemicals allowed to be imported with a chemicals importation document[10]. The Ministry of Labour and Social Security demands a similar control document issued by the Workers Health and Occupational Safety Centre for permission to import chrysotile[11].

Article 39 of the above Regulation sets forth the rules for packaging and labelling while Article 40 explains the rules for storage of asbestos fibres. There are also restrictions on asbestos use under the Regulations of MoEF on control of hazardous wastes, and on control of air and water pollution. In addition, the Ministry of Labour and Social Security has issued a Regulation on Health and Safety Measures to be taken while Working with Asbestos (26 December 2003, no: 25328), which entered into force on 04 April 2006. Article 10 of this Regulation sets the upper limit of "*time based concentration of asbestos in air*" to 0,1 fibre/cm³ for eight hours. Article 14 requires that a Working Plan must be prepared and submitted to the Ministry before any asbestos removal or demolition activity starts, including those that occur on shipbreaking yards.

## III.1.3. Summary: Asbestos

While the import of the most hazardous forms of asbestos is banned, chrysotile asbestos is exempt, although its use is increasingly regulated. The hazards of asbestos are well known internationally and as a result regulations and licensing for the dismantling and handling of asbestos waste appear to be relatively stringent.

# III.2 Management of PCBs

## III.2.1 Waste stream

PCB's (polychlorinated biphenyls) are not managed specifically at the Aliağa shipbreaking yards. Nevertheless, electric cables and waste oils in the tanks are treated as potential PCB containing materials. However, other parts of the scrap vessels known to contain PCBs (e.g. transformers, capacitors and paint – see US EPA list), are not checked or labelled for PCBs. The new national Regulation on Control of PCBs and PCTs issued by MoEF in 2007 requires detailed analysis, labelling and inventory preparation (Part 3 of the Regulation). None of these provisions are however implemented yet at Aliağa shipbreaking yards.

Electric cables from scrap vessels are sent to recycling facilities as potential PCB containing material without any sampling being done. They are accumulated in piles at the shipbreaking plots before being dispatched directly to recycling facilities. The WMC does not store them in the Temporary Storage Station, but notes and supervises the quantity stored at the plots.

**General Information on PCBs**

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. They are basically mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties. PCBs, which were domestically manufactured from 1929 until their manufacture was banned in 1979, can range in toxicity and vary in consistency from thin light-coloured liquids to yellow or black waxy solids.

Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; in pigments, dyes and carbonless copy paper; and many other applications. More than 1.5 billion pounds of PCBs were manufactured in the United States before production was stopped in 1979.

PCBs can be ingested, inhaled, or absorbed through the skin. They circulate throughout the body and are stored in the body's fatty tissue. PCBs are toxic and persistent. They have been shown to cause a variety of adverse health effects, such as cancer in animals, as well as a number of serious non-cancer health effects in animals (e.g., effects on the immune system, reproductive system, nervous system, and endocrine system).

Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs. The different health effects of PCBs may be interrelated, as alterations in one system may have significant implications for the other systems of the body. In some cases, chloracne may occur in humans exposed to PCBs. Severe cases of chloracne are painful and disfiguring, and may be persistent.

It is very important to note that the composition of a PCB mixture changes following its release into the environment. The types of PCBs that bioaccumulate in fish and animals and bind to sediments tend to be the most carcinogenic components of PCB mixtures. As a result, people who ingest PCB-contaminated fish or animal products and touch PCB-contaminated sediment may be exposed to PCB mixtures that are even more toxic than the PCB mixtures contacted by workers and released into the environment.

EPA is also very concerned about the toxicity of the chemicals produced when PCBs are heated in fire-related incidents. The chemicals produced include polychlorinated dibenzofurans and polychlorinated dibenzo-p-dioxins, both of which are believed to be much more toxic than PCBs themselves.

*From: A Guide for Ship Scrappers, US EPA 2000*

*9) MoEF, Regulation on Control of Hazardous Chemicals and Products , 07 July 1993, no: 21634.*
*10) Undersecretariat for Foreign Trade, Communique on Importation of Chemicals controlled for environmental protection(Foreign Trade Standardisation 2008/6), 31 December 2007, no: 26743.*
*11) Undersecretariat for Foreign Trade, Communique on Importation of some materials affecting Workers health and occupational safety(Foreign Trade Standardisation 2008/13), 31 December 2007, no: 26743.*

PCB containing waste oils (See section III.3 for management of waste oils and bilge water) and electric cables - after the copper contained in the cables has been removed at cable recycling facilities - are incinerated or landfilled in the only hazardous waste incineration and landfill site in Turkey, Izaydaş (see section III.4 on Izaydaş).

A new contract has been signed in June 2008 between the WMC, Exitcom Electrical and Electronic Waste Recycling Co[12]. Exitcom is will in the future analyse the waste cables for PCBs so that only those that after sampling are proved to be PCB contaminated are sent to Izaydaş.

**Where can PCBs be found on a ship?**

PCBs are found in solid (waxy) and liquid (oily) forms in equipment and materials on ships being scrapped. These equipment and materials which may contain PCBs in concentrations of at least 50 parts per million (ppm) include:

- Cable insulation
- Rubber and felt gaskets
- Thermal insulation material including fibreglass, felt, foam, and cork
- Transformers, capacitors, and electronic equipment with capacitors and transformers inside
- Voltage regulators, switches, reclosers, bushings, and electromagnets
- Adhesives and tapes
- Oil including electrical equipment and motors, anchor windlasses, hydraulic systems, and leaks and spills
- Surface contamination of machinery and other solid surfaces
- Oil-based paint
- Caulking
- Rubber isolation mounts
- Foundation mounts
- Pipe hangers
- Light ballasts
- Any plasticizers

*From: A Guide for Ship Scrappers, US EPA 2000*

## III.2.2 Facilities

According to the WMC's files, 127.610 kg of electric cable was sent to the cable recycling facility Ak Kablo in 2007. At the time of writing Ak Kablo was closed due to re-licensing procedures. Therefore Özdenizcilik Recycling Facility, which was the previous recycler for cables originating from shipbreaking and which uses a very similar technology to Ak Kablo, was chosen as an example.

### Özdenizcilik Cable Recycling

Özdenizcilik Cable Recycling[13] was the first licensed cable recycling company in Turkey and got its license from the MoEF in 2006. In addition to a license from the MoEF for hazardous and non-hazardous waste electrical cable recycling, Özdenizcilik Cable Recycling has ISO 9001 Quality Management, ISO 14001 Environmental Management and ISO 18001 Occupational Safety and Health Management systems certificates. Özdenizcilik Cable Recycling is located at Bagarası industrial estate (Eski Foça / Izmir) on 7500 m2 of open space with a 1100 m2 enclosed area. Its recycling capacity is 4 tonnes/hour and it is able to manage all kinds of cables including oily, gelly and steely cables without using water or any kind of chemicals. In 2006 Özdenizcilik recycled electric cables originating from obsolete ships. However, as these cables contain too much plastic in proportion to copper, Özdenizcilik does not currently find it profitable to recycle cables originating from the shipbreaking industry.

### The Process

Cables are brought by Özdenizcilik's licensed vehicles from the shipbreaking industry and are handled as toxic waste containing materials since up to this point no analysis has been made to check for toxicity. The cables are shredded into very small pieces and pulverized. Copper and plastic are separated through shaker tables and sifting machines.

*Shredder machine in Özdenizcilik Waste Cable Recyling facility © Erdem Vardar*

*Pulveriser machine. © Erdem Vardar*

*12) See detailed info on Exitcom in the section on Management of Accumulators.*
*13) http://www.ozdenizcilik.com.tr/eng/index.php*

*Copper powder at the end of the process. © Erdem Vardar*

*Temporary hazardous waste storage containers at the Özdenizcilik Cable Recycling facility. © Erdem Vardar*

The copper is sold to various buyers and the lead is sent to licensed melting factories to be recycled and reused. The plastic parts and other wastes are sent to the İzaydaş incineration and hazardous waste landfill site in Özdenizcilik licensed vehicles. The waste is there treated as if it contained PCBs or other toxic materials.

## III.2.3 National legislation

PCBs are regulated in Turkey by MoEF through the recently issued Regulation on Control of Polychlorinated Biphenyls and Polychlorinated Terphenyls (27.12.2007, No: 26739). The scope of the Regulation is defined under Article 2 as:"

III. preparation of the inventory,
IV. temporary storage,
V . transportation,
VI. decontamination,
VII. disposal

of polychlorinated biphenyls (PCB) and polychlorinated biphenyl-containing materials and equipment as well as

- limitations and obligations concerning the import and export,
- measures to be taken,
- inspections to be made,
- related legal and criminal responsibilities

for PCB and PCB-containing materials and equipment."

PCBs are defined under Article 4(d) as:
"*Polychlorinated biphenyl (PCB) means:*

- *polychlorinated terphenyls (PCT),*
- *monomethyl-tetrachlorodiphenyl methane, monomethyl-dichloro-diphenyl methane or monomethyl-dibromo-diphenyl methane,*
- *any mixture containing more than 50 ppm of polychlorinated biphenyl (PCB), polychlorinated terphenyls (PCT), monomethyl-tetrachlorodiphenyl methane, monomethyl-dichloro-diphenyl methane or monomethyl-dibromo-diphenyl methane.*"

### Disposal

The Regulation on Control of Hazardous Wastes (2005) and Article 16 of the Regulation on Control of PCBs require that the disposal method of PCBs (as defined under Article 4) shall meet the standards of D-10 (on land incineration) in licensed hazardous waste incinerators. Other methods can only be applied if they can meet safe disposal standards set by the Regulation on Control of Hazardous Wastes. Currently there is as mentioned only one licensed hazardous waste incinerator in Turkey, Izaydas, and no other disposal facility which can meet these criteria.

### Import

One important aspect of the new Regulation is that it bans the import of all kinds of "*used PCB, PCB and equipment containing PCBs*" as a general principle. According to this Regulation all ships for scrap sold to Aliağa shipbreaking yards must be pre-cleaned from "*used PCB, PCB and equipment containing PCBs*" prior to import. Current imports of ships for scrap to Turkey may thus be deemed illegal since no full inventory including PCB in transformers, capacitors and paint is provided. However, officials from MoEF claim that this is not the case and that ships for scrap have special status even though there is no legislation specifying this in the context of hazardous wastes. The officials also note that there are plans to prepare new national legislation specifically on shipbreaking in line with the new IMO Convention in which the Government will address the PCB issue[14].

## III.2.4 Summary: PCBs

PCBs are currently not removed from ships exported to Turkey for scrap and an inventory of equipment and structures that contain PCBs is not provided. There is no specific management of PCBs at the Aliaga shipbreaking yards and no sampling for PCBs is undertaken. Electric cables and waste oils are treated as potentially containing PCBs and are sent first to a cables recycling facility and finally to Izaydas for incineration or landfill. However, other equipment and materials known to contain PCBs, such as transformers and capacitors, are not treated as such; their fate is therefore unknown. The regulatory situation on PCBs is also very unclear and needs to be resolved; there is a new Regulation that bans the import of all kinds of PCBs, however, it is not clear whether ships for scrap are included in this. Due to the hazardous nature of PCBs, this is an urgent issue to be addressed by the Government and Shipbreaking Association.

*14) Meeting with Betül Dogru, Head of Hazardous Wastes Department of Turkish MoEF Environmental Management Directorate on 15 July 2008 in Ankara*

# III.3 Management of Waste Oils and Bilge Water

## III.3.1 Waste stream

### Before arrival

Ships that arrive under their own power are checked by Customs, the Marine Police and Coastal Health Departments off the coast of Aliağa. Officials from the Customs Department look for fuel and bilge water in the tanks and write an official report. After the customs and control procedures are completed the vessels are landed at the shipbreaking plots. Vessels that are towed are controlled by the relevant bodies according to the notification letter and the survey report prepared at the last port visited, due to the absence of a captain and his/her declaration. Commodities which are an integral part of the ship and the fuel on board are checked by a Committee including officials from the Directorate of Customs, Aliağa Harbour Authority and Aliağa Chamber of Trade, and an official report is prepared.

Members of the WMC go on board the vessel to prepare the waste inventory and to measure the gas in the tanks. All tanks are checked visually and by sounding. The state of the tanks is specified in the Gas Measurement Reports. The amounts of waste oil and bilge water in machine kegs, barrels and waste oil tanks are identified approximately and included in the Waste Inventory Report. This report is then used by officials from the Izmir Provincial Directorate for Environment and Forestry for a visual inspection on board.

Any fuel and machine oils identified are removed from the tanks under the surveillance of the officials from the Aliağa Directorate of Customs, and a survey firm identifies the amount and seals it in an empty tank in the shipbreaking yard. The fuel and machine oils then become the property of TASIS[15], the trading department of the Undersecretariat of Customs. In reality, TASIS is not able to find buyers for this fuel as analysis of samples commissioned by the Directorate of Customs to the laboratory of TUPRAS refinery show that the bunker oil and other fuels taken from the vessels are not in line with Turkish standards for fuel oil. The oils therefore need to be treated as waste oils in line with the Regulation on the Control of Hazardous Wastes and fuel tanks have most recently been placed at the Temporary Waste Station on the yards.

### Storage

According to MoEF criteria every shipbreaking company must have its own bilge water, waste oil, fuel and machine oil tanks. In order not to delay the dismantling activities, wastes are allowed to be stored in these tanks before they are collected by the WMC.

Waste oils and bilge water identified are supervised by the WMC. During the dismantling operations shipbreaking firms make an official written request to the WMC asking for permission to deliver their waste oil to the WMC's temporary waste storage facilities when their own storage is full. The WMC informs the Section of the Customs Directorate for Shipbreaking about the request. An oil and bilge water collection vehicle brings the waste, with the weighing scale receipt, to the temporary waste station. The station is opened with a letter signed by the WMC and Customs.


*Separate tanks for waste oil, bilge water, fuel oil and mineral oil (from left to right) which are placed in each plot. © Erdem Vardar*

*Waste Management Centre(on the left) and Temporary Waste Storage station in Aliağa © Erdem Vardar*

### Categorisation and Transfer of Waste to Recycling/Disposal Facilities

When the temporary waste storage is full, the WMC makes an official written request for samples to be taken by the Izmir Directorate of Environment and Forestry and the Directorate of Customs. The samples taken are sent to MoEF accredited laboratories and to the Customs laboratory. There the type, category and water content of the waste are determined. When the analysis results are ready, the WMC applies to the Directorate of Customs for transportation permission in which the transportation plan, depending on the results of the analysis, is clearly explained. The method of transportation is laid down by the Regulation on Control of Waste Oils and the Regulation on Control of Hazardous Wastes[16].

*15) General Directorate of Liquidation and Revolving Funds (TASİŞ), which has been established in 1984 with 4 regional directorates and 15 department directorates, provides sales, adjudications, retails, destruction, liquidations and warehouse management activities of all of the goods and vehicles which are controlled by the customs authorities, smuggled and those belong to the government. For more info visit: www.tasis.gov.tr.*
*16) Legal criteria for categorization can be found in the section with the title "National Legislation for Waste Oils and Bilge Water"*

Upon the permission obtained from the Directorate of Customs, the waste is transferred from the temporary waste station to the licensed vehicles of the receiver company under the surveillance of the WMC and Customs. After this procedure is complete, the WMC fills in the National Waste Transportation Form and Customs writes an official report. The waste is then sent to the relevant recycling/disposal company.

### Monitoring of Waste Transportations

National Waste Transportation Forms, which document the receiver facilities and the amounts of waste, are sent monthly to the Provincial Directorate of Environment and Forestry and every three months to the MoEF.

**Duties of the WMC at this stage are;**

- Management of the liquid waste stored in the Temporary Storage Station according to the results of the sample analyses;
- Recycling of waste through recovery by refining or usage as extra fuel;
- Dispatch waste which is found to be hazardous through the analyses;

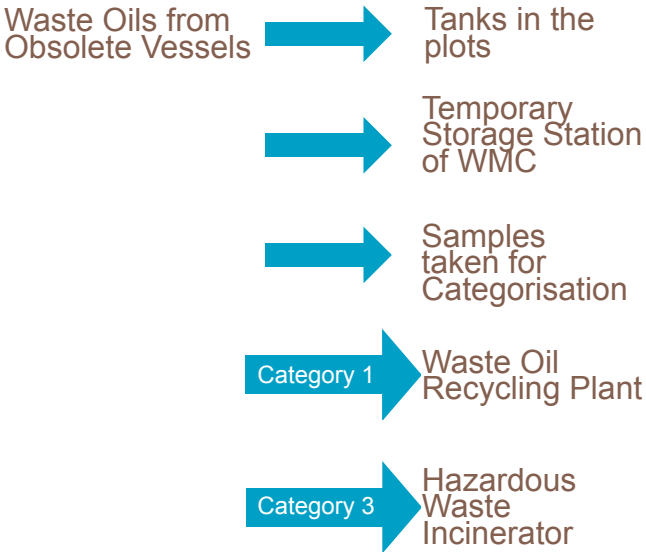
The main objective is to manage the waste according to the relevant national legislation in order to prevent environmental damage

## III.3.2 Facilities

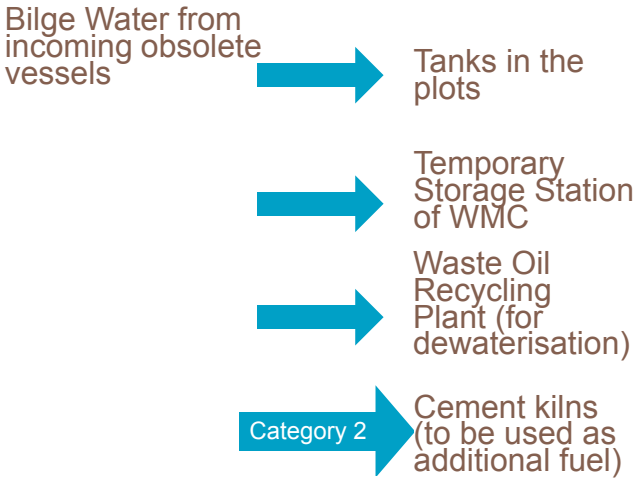
The categorisation of the waste oil is done following analysis by accredited laboratories at the expense of the Shipbreaking Association, and according to the MoEF Regulation on Control of Waste Oils which specifies the levels of PCBs, total halogens and heavy metals for each category. Oils with the lowest level of contaminants are classified as Category I and go to Çinkanlar; Category II oils go to cement kilns after dewaterisation done by Çinkanlar; Category III oils are sent to Izaydaş hazardous waste incinerator. Bilge water is defined as Category II and MoEF does not require any further analyses of bilge water[17] .

The WMC uses Çinkanlar Chemical Factory as waste oil recycling plant. In 2007, dewaterised bilge water was sent to two different cement kilns, Batıçim and Muğla Kireç. Batıçim is given below as an example (the technology and processes for burning dewaterised bilge water is similar to the one used in other cement kilns). All facilities mentioned below have required licenses from MoEF.

The stream of waste oils can be schematised as following:




The stream of bilge water:




| Waste Code | Description | Amount | | Type Of Disposal |
|---|---|---|---|---|
| | | Transferred | In Temporary Storage | |
| 13 04 03 | Other Bilge Water Originating From Shipping Voyages | 19690 Kg Dewaterised Oil (Additional Fuel) | 30900 Kg Water+oil | Cement Kilns R-1 Usage As Main Fuel Or Other Usage For Energy Production |
| 13 02 08 | Other Machine, Transmission And Lubricating Oils | 967540 Kg | 135000 Kg | Recycling Facility R-9 Rerefining Or Used Oils Or Reusage |

*Amounts and disposal types of waste oils and bilge water in 2007 (from the waste management plan prepared by the WMC and submitted to MoEF)*

*17) Details about legal criteria for categorization are in the section titled "National Legislation for Waste Oils and Bilge Water"*

## ÇİNKANLAR Chemicals Site


*Çinkanlar Chemicals Facility © Erdem Vardar*

## General information:

Çinkanlar Chemical Distillation and Recycling Co. was established in 1980 in Izmir, in the Kemalpaşa Organized Industrial Zone, to perform the refinement and recycling of waste oil and waste solvents in its recycling facilities. The recycling facility is permitted to recycle Category I liquid waste. It also accepts bilge water for dewaterisation, though not for recycling or disposal. It has a license for transporting waste oils and other Category I and II liquid wastes.

*Waste oil (Category I) tanks © Erdem Vardar*

## Waste Oils

Two types of waste come from the WMC in Aliağa. Firstly, all kinds of oil and waste oil including mineral oil, bunker oils etc. (Category I in Turkish waste oil legislation). Çinkanlar gets Category I oils for free and through a distillation and refining process it produces a type of lubricating oil used by the textile industry (Turkish standard no: 11874). The waste oil that remains at the bottom of the distillation tanks is used to produce anti rust coating paints (Turkish standard no: 103). See Appendix 1 for details of the quantities of waste oil and bilge water received in 2007.

*Distillation tanks at Çinkanlar facility. Distillation is a separation technique based on the different vapour pressures of the component of a mixture (retrieved from company website).*

The second type of waste from the shipbreaking yards is bilge water. Bilge water originating from ships for demolition is collected in the temporary storage facility at the WMC in Aliağa. This bilge water is then sent to Çinkanlar for dewaterisation. Bilge water is as mentioned Category II waste oil. As Çinkanlar is only licensed to recycle or dispose of Category I waste, it can only provide a dewaterisation service. The processed bilge is then sent by the shipbreakers to cement kilns (such as Batıçim) for final incineration. The waste water is treated at the in house treatment plant. The residual mud from the plant is thinned with toluene xylene to produce a coating used for asphalt roof covers. Some of the mud is also sent to Ekolojik Enerji[18] a hazardous waste disposal firm. The treated waste water is discharged to a nearby stream.

*Waste water treatment plant at Çinkanlar site © Erdem Vardar*

*18) Ekolojik Enerji has a gasification and energy recovery plant in Istanbul. More info can be obtained from http://www.ekolojikenerji.com.tr/eng/services.php*

*Nearby stream where the treated waste water is dumped*
*© Erdem Vardar*

*Batıçim cement kiln © Erdem Vardar*

## BATIÇİM Cement Kiln Site

### General information

Batıçim (Batı Anadolu Çimento Sanayi – Western Anatolia Cement Industry) is one of the biggest cement factories in the Aegean region with a production capacity of 2 million tonnes of cement per year. It is based right outside Bornova, one of the main districts within Izmir city centre. Batıçim cement kiln was used by the WMC on one occasion in 2007 for disposal of bilge water dewaterised by Çinkanlar chemical factory. 11480 kg Category I waste oil was used as additional fuel for the kiln.

### Waste stream process

After the dewaterisation process at Çinkanlar the waste oil (dewaterised bilge water) is re-analysed by accredited laboratories (TUBITAK-MAM, a state-owned laboratory which is currently the only accredited laboratory). If the analysis proves that the waste oil is Category I and contains less then 6% water, Batıçim approves it for use as additional fuel in its kiln. It is burned at 1.200 degrees Celsius after being pumped via the fire pipe of the "*extra fuel oil*" system.

*Batıçim Cement Kiln © Erdem Vardar*

## III.3.3 National legislation

Waste oils and bilge water are regulated under the "*Regulation on Control of Waste Oils*" issued by the MoEF on 21 January 2004 (see Appendix 2). Its scope covers "*prohibitions, limitations and liabilities, measures to be taken, controls to be made as well as legal and penal responsibilities to be followed for generation, temporary storage, collection, handling, recovery, disposal, trade, exportation, importation and transit passage of Category I, II and III waste oils listed in ANNEX I.*"

On 22 June 2005 MoEF issued "*The Communiqué on the general rules to be followed during usage of wastes as additional fuel*". The aim of this communiqué is "*to regulate the technical and administrative issues and the rules concerning the usage of wastes as additional fuel*". The communiqué legalised cement kilns to burn Category I and II waste oils and set forth requirements regarding the use of dewaterised bilge water at cement kilns.

There are specific international maritime rules concerning the treatment of operational wastes from ships in port facilities (such as MARPOL) which Turkey is a party to. Yet shipbreaking facilities in Turkey are not characterised as ports and therefore not subject to the "*Reception of Wastes from Ships and Waste Control Regulation*" of the Ministry of Transport issued in 2004.

The Regulation on Control of Waste Oils also sets forth the rules for transportation of waste oil. In addition, it gives reference to relevant provisions of the "*Regulation on Control of Hazardous Wastes*" regarding the official written forms that need to be available in the vehicles during waste transportation.

## III.3.4 Summary: Waste Oils and Bilge Water

The presence of contaminants such as heavy metals, PCBs and halogens in waste oils and bilge water present some problems for management of these wastes downstream. There is a reasonable regulatory framework for determining the fate of these wastes, which involves analysis and categorisation. The procedures for storage and transfer of wastes also seem to be reasonable. However, there is no available data on emissions from two of the facilities (the chemical recycling factory and the cement kiln) that deal with these wastes or their impact on the local environment. The monitoring of the İzaydaş Hazardous Waste Incinerator and Landfill is discussed in the next chapter

# III.4 İZAYDAŞ Incineration and Disposal Facility

İzaydaş was founded in 1996 by Kocaeli Municipality, yet did not have a license from the Ministry of Health for four years because Regulations[19] did not permit urbanisation within a three km perimeter of waste management facilities, whereas parts of the district of Alikahya and Solaklar village were situated within this boundary. In 2000, the regulations were changed decreasing the perimeter from three km to one km and İzaydaş got its license in 2000.

Its capacity for hazardous waste incineration is 35.000 tonnes a year, but because of annual maintenance the facility does not operate for around 45 days a year, and the actual capacity therefore declines to 26.000 – 30.000 tonnes/year. It was initially designed to serve the Kocaeli region, yet it accepts 25% of its waste from other regions due to the lack of disposal facilities in Turkey.

Design Capacity of the Plant:

- Combustion Capacity: 35.000 tones/year (4.100 kg/hour)
- Solid Waste: 2.500 kg/hour
- Liquid Waste: 1.600 kg/hour
- Calorific Value: 86 GJ/hour
- Generation of Electricity: 5.2 MW

Since the establishment of İzaydaş and up to 2007, 154.809 tonnes of hazardous waste has been accepted for incineration, increasing from 4.000 tonnes in 1997 to annually reach 25.000 tonnes in 2007. The quantities of waste accepted at the hazardous waste landfill site have also increased since 1997; the largest quantity was 23.072 tonnes in 2003 (see Appendix 3).

The Clinical and Hazardous Waste Incineration Facility was fully booked throughout 2008 with a daily capacity of 88.4 tonnes. In addition, when the NGO Platform on Shipbreaking visited the facility in July 2008, İzaydaş was on the point of signing agreements with a network of hazardous waste disposal facilities in Europe in order to export hazardous wastes beyond its capacity. İzaydaş has OHSAS 18001, ISO 14001 and ISO 9001 management systems quality certificates.

*İzaydaş Hazardous Waste Incinerator (İzaydaş archive)*

*İzaydaş laboratories (İzaydaş archive).*

*19) Turkish Ministry of Health, Regulation on Facilities Not Pertaining to Health, 02.09.1995, official gazette no: 22416. The regulation has been revoked in 2005 by Ministers Cabinet and replaced with Regulation on Opening Work Places and Work Permissions, which leaves the decision of limits of urbanization to the Environmental Effects Assessment Report.*

## III.4.1 Waste stream

Asbestos, Category III waste oils and plastic from cables (assumed to contain PCBs) originating from shipbreaking activities end up in İzaydaş. Asbestos is buried in special bags in the hazardous waste landfill site; waste oils and cable waste are incinerated. Recently sludge has also been sent to the kiln of the Petkim petrochemical company in Aliağa, whereas previously it was incinerated at İzaydaş.

Hazardous waste trucks arriving at İzaydaş are first weighed and a registration form is completed. Waste samples are taken and compared with the declaration samples. According to the results of the analyses the disposal method for each waste type is determined.

*Bulk wastes are dumped into the bunker area. (İzaydaş archive)*

*Crane in the bunker area which feeds the incineration kiln. (İzaydaş archive)*

*Liquid hazardous waste heating and mixing tanks (İzaydaş archive).*

Bulk wastes which cannot be landfilled according to the sample results are dumped into the bunker area and prepared for incineration.

Wastes taken to the bunker area are prepared and fed into the kiln via the crane. Also the liquid wastes are sampled and analysed and according to the results they are stored in the incineration storage area. Liquid wastes arriving in bulk or packaged in containers or barrels are taken to the heating and mixing tanks according to sample results and then fed into the incineration kiln.

Liquid wastes which are reactive if mixed with other wastes and highly toxic wastes are stored in a special liquid waste station and then fed into the kiln without being mixed with other wastes. Solid hazardous wastes which are reactive and highly toxic are incinerated together with their containers.

*Special liquid waste station (İzaydaş archive).*

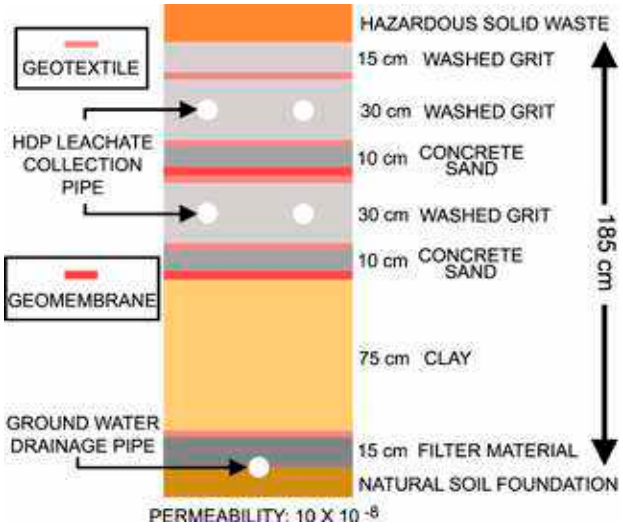

*Solid reactive hazardous wastes in the storage area (İzaydaş archive).*

*Landfill areas of İzaydaş. Hazardous waste landfill site on the upper right (İzaydaş archive).*

## III.4.2 Landfill Site

Landfill areas are located in a 363.007 m² area of a total 800.000 m² which also includes the Clinical and Hazardous Waste Incineration and Energy Generation Plant and administrative buildings. The facility includes six lots with a total volume of 264.842 m² for domestic solid waste, and one lot with a volume of 98.165 m² for "*industrial solid waste*".

Domestic waste and appropriate industrial wastes are disposed of in the Domestic Solid Waste Landfill Site. The floor of the landfill site (which has a total volume 3.163,000 m³) is isolated with an impermeable layer which meets the requirements of the Regulation on Control of Solid Wastes (1991).




*İzaydaş incineration plant. Bunker area on the right side, filtering systems and stack on the left (İzaydaş archive).*

The Industrial Solid Waste Landfill Site is designed to contain ashes and slag from the Clinical and Hazardous Waste Incineration and Energy Generation Plant, and sludge from the Waste Water Treatment Plants. In December 2000 this site, which has a disposal capacity of 969.919 m³, was licensed as a Hazardous Waste Landfill Site by MoEF in line with the Regulation on Control of Hazardous Wastes (1995, amended in 2005). Since then, İzaydaş is the only licensed hazardous waste landfill site in Turkey.

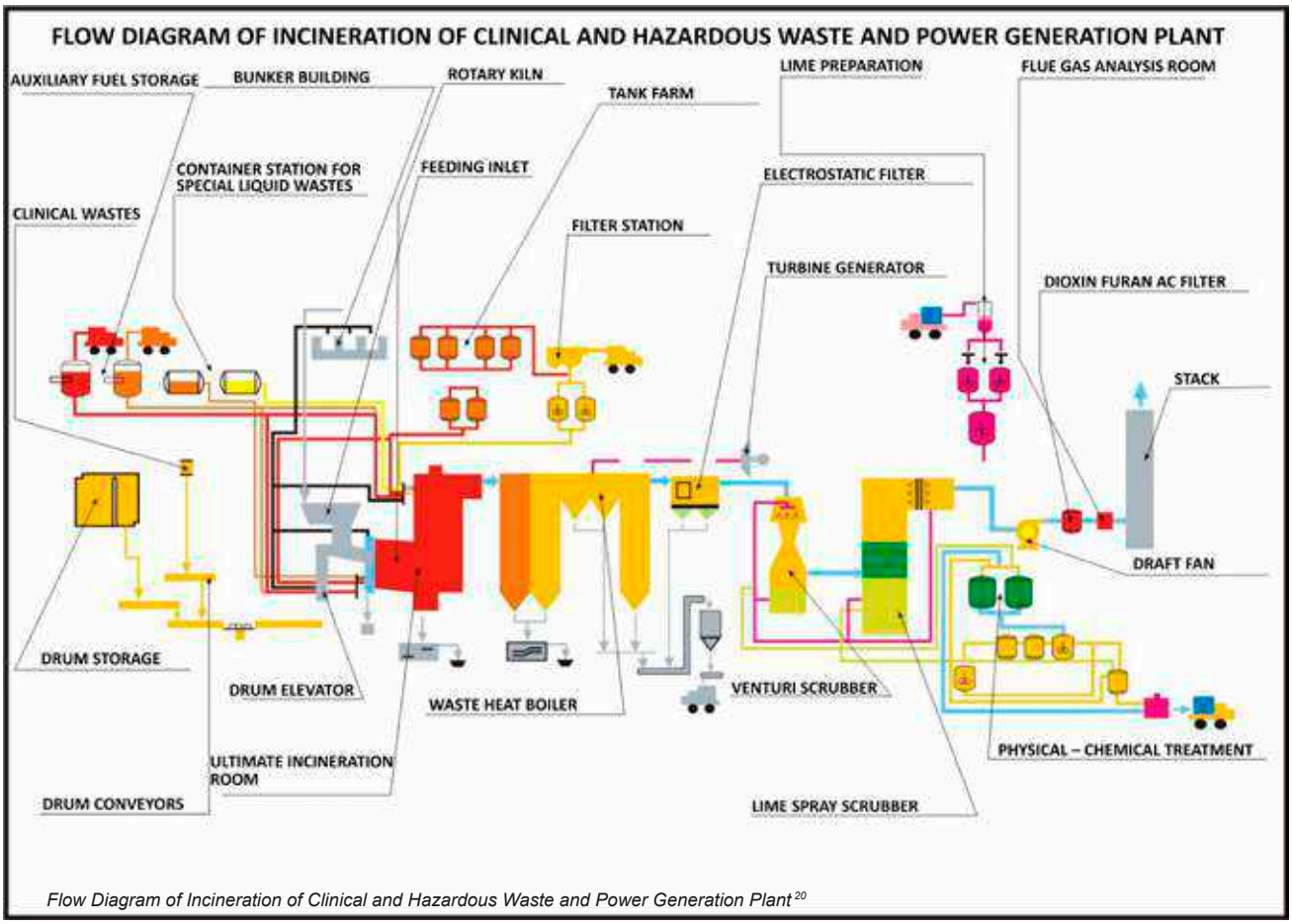
Waste is disposed in cells where it is spread out and compressed. The cells are covered daily with a layer of soil to prevent odour, spillage and proliferation of harmful organisms. Leachate is collected from the drainage system on the impermeable floor and sent to a DAF Unit (Chemical Pretreatment Unit) where it is pre-treated. From there it is sent to the Domestic and Industrial Waste Water Treatment Plant. The landfill site gases generated are collected via funnels for further processing. After 25-32 years this area will be planted and transferred to the Ministry of Forestry.

## III.4.3 Incineration Plant

In this plant the following hazardous industrial wastes are incinerated: plastic and rubber waste; used oil, pharmaceutical and cosmetic waste; petrochemical waste; PVC; solvents; dye residues; adhesives and their packages; substandard and out-of-date products; waste treatment sludge etc. and clinical waste. Explosive materials, radioactive wastes, slaughterhouse waste, faeces and cadavers are not accepted at the plant. Declaration, labelling, transportation and treatment are carried out according to the instructions of the authorized state institutions (see national legislation section on Hazardous Land Filling and Incineration on p.70).

### Incineration Rotary Kiln

According to the Daily Incineration Menu, determined by the laboratory, the waste is incinerated in the Rotary Kiln for 95-120 minutes at 921-1.150°C and in the Post Combustion Chamber for a minimum of 2.5 seconds at 923-1.250°C on average. In the rotary kiln the incineration process starts with propane and continues with the addition of fuel oil. Solid waste is fed when a temperature of 921°C is attained




*Flow Diagram of Incineration of Clinical and Hazardous Waste and Power Generation Plant* [20]

in the rotary kiln.

Air required for combustion is provided by means of fans from over the bunker chambers or from the atmosphere. To obtain the optimum combustion, the daily incineration menu is enriched with fuel oil if necessary. The heat energy generated by combustion is a maximum of 55 GJ/hour in the Rotary Kiln and maximum 31 GJ/hour in the Post Combustion Chamber.

## Control Room

Plant processes are controlled and guided by operators and shift foremen by means of the COROS (Control Room System) Computer stations located in the Control Room. All instruments in the plant operate automatically on a Siemens PLC system. Should there be a fault at any point in the system, it can be seen instantaneously on the COROS computers and the operator can intervene. In addition, supervision of critical areas is facilitated by the cameras located in various parts of the plant.

## Ash and Slag Collection System

The ash generated in the Rotary Kiln is taken from the point where the Rotary Kiln and the Secondary Combustion Chamber connect to the Wet Slag Conveyor. Depending on the laboratory analysis, the ash is disposed of in the appropriate area of the Domestic and Industrial Solid Waste Landfill Site.

The ash generated by the waste heat boiler is taken from the vaporiser to the wet conveyor and from the superheater and economizer section to the Ash Silo where it is fed to the Physical Treatment Unit in order to remove heavy metals.

After the Physical Chemical Treatment Unit, filter cake is sent to the Domestic and Industrial Solid Waste Landfill Site. The dust screened by the Electrostatic Filter is carried to the Ash Silo by means of an ash conveyor and is treated by the same method.

## Waste Water Treatment System

Polluted scrubbing solutions from both systems are treated in the Physical Chemical Treatment Unit for the purpose of sedimentation by flocculating using TMT 15, FeCl3 and polyelectrolyte. Treated waste water is analysed in the laboratory and is sent first to the DAF (Chemical Waste Water Treatment) Unit and then to the Industrial and Domestic Waste Treatment Plant. The sludge which forms in the Physical Chemical Treatment Unit as a result of sedimentation is sent to the Filter Press, where it is dewatered and turned into a cake. After the laboratory analysis, the cake is sent to the appropriate lot in the Domestic and Industrial Solid Waste Landfill Site.

There is a continuous monitoring of the following stack emissions:

- Oxygen (O2)
- Carbon monoxide (CO)
- Carbon dioxide (CO2)
- Nitrogen oxides (NOX)
- Sulphur dioxide (SO2)
- Hydrogen fluoride (HF)
- Hydrogen chloride (HCl)
- Total Organic Carbon (TOC)
- Dust
- Moisture (H2O)

*20) Translated and adapted from the Turkish version in the Izaydaş brochure.*


*Electronic billboard in Kocaeli city centre showing current emissions of İzaydaş incinerator.*

The emission values of each of the above parameters are continuously communicated to the public via electronic billboards in front of Kocaeli and Alikahya District municipality buildings. The facility also has a system that can automatically shut down the incinerator if any of the emission limits are exceeded. Dioxin and furan emissions are sampled and analysed twice a year by Turkish laboratories and once a year by laboratories in Germany. Samples are also taken from livestock around the facility. The results are reported to MoEF every six months, but are not available to the public.

IPEN (International Pops Elimination Network – a coalition of NGOs) prepared a report in April 2005[21] based on independent analysis of samples which showed that levels of dioxins in the free-range chicken eggs collected near İzaydaş exceeded EU limits for chicken eggs and that HCB levels were elevated. The dioxin levels exceeded background levels almost two-fold and HCB levels were five times higher than background levels.

The NGO's recommendations included;

- better monitoring of POPs (Persistent Organic Pollutants) in Turkey;
- more publicly accessible data for unintentionally produced POPs (U-POPs) in cases such as the İzaydaş incinerator;
- a replacement of incineration of POPs containing waste by alternative technologies or practices that considerably reduce or eliminate the formation of dioxins and other U-POPs; and
- Turkey to ratify the Stockholm Convention[22]

## III.4.4 National legislation

Disposal processes that are permitted to be performed by İzaydaş are land storage with special procedures, and incineration (in special furnaces) as detailed in Annex 2 of the Hazardous Wastes Control Regulation issued by the MoEF (14.03.2005, no:25755).

A new Regulation on Waste Incineration has been drafted by the MoEF and has recently been opened to consultation. One important change in the draft Regulation is that the perimeter for nearest settlement is now proposed to be 500 meters, whereas this limit was set at 3.000 meters before 1999 and 1.000 meters before 2005 by the Ministry of Health Regulations. This Regulation is expected to be finalised and put into force by the end of 2009.

Other Regulations related to hazardous waste landfill and incineration are:

- Regulation on General Principles on Waste Management (05.07.2008, no: 26927)
- Regulation on Control of Water Pollution (31.12.2004, no: 25687)
- Regulation on Control of Pollution caused by Hazardous Materials to Water and its Environment (26.11.2005, no: 26005)
- Regulation on Control of Air Pollution caused by Industrial Facilities (22.07.2006, 26236)
- Regulation on Control of Solid Wastes (14.03.1991, no: 20814, last amendment in 2005)

### Landfill

İzaydaş decides whether the waste has hazardous waste characteristics which require the waste to be landfilled in the hazardous waste landfill site according to the requirements set forth in Annex 11 A of the Hazardous Waste Control Regulation (see Appendix 4 for further details about the specific regulatory requirements for landfill and incineration).

## III.4.5 Summary: İzaydaş

Regulations and procedures are in place for the handling and sampling of various hazardous wastes at the Izaydas facility. Certain aspects are tightly monitored, for example, the continuous monitoring of certain gaseous emissions; however, the nature of the hazardous wastes being handled and the disposal methods being used leaves potential for pollution from both incineration and landfill operations. There are likely to be volatile emissions and leachate from the landfill site; incineration leads to the creation of many products of incomplete combustion (PICs), emitted both into the atmosphere, the waste water discharge and remaining in the ashes and slags.

Dioxin is the most toxic of these emissions, however, Government monitoring for dioxin is inadequate, and monitoring for other PICs is non-existent. The fact that the limited Government monitoring of dioxin emissions and levels in livestock are not available to the public is a cause for concern. NGO sampling has shown that levels of dioxins and HCB in chicken eggs exceed EU limits. This raises further concerns about the proximity of residences to the facility and the Government's proposal to allow settlements even closer.

*21) IPEN, Bumerang Turkey, Greenpeace Mediterranean and Arnika Check Republic, Contamination of chicken eggs near the hazardous waste incinerator in Izmit, Turkey by dioxins, PCBs and hexachlorobenzene, Istanbul- Prague, April 2005.*
*22) UNEP Stockholm Convention on Persistent Organic Pollutants was ratified by Turkey on 14th April 2009.*

# III.5 Management of Accumulators and Batteries

Batteries and accumulators generally fall into two categories: wet cell batteries (generally referred to as accumulators) and dry cell batteries. Wet cell batteries or accumulators are mainly lead – acid batteries, consisting around 60% of lead containing material and around 25% sulphuric acid/ water and plastic[23].

Although lead, mercury, and cadmium are by far the most problematic substances in the battery waste stream, other metals contained in batteries, such as nickel, zinc, manganese and lithium, should also not be disposed of together with ordinary household waste. Metals from batteries which are landfilled or incinerated may pollute lakes and streams, vaporise into the air when incinerated, or may leach into groundwater after landfilling and expose the environment to highly corrosive acids and bases[24].

Under (European) Council Directive 67/548/EEC, **lead** compounds in general are classified as:

- Repr. Cat.1, R61 - Substance toxic to reproduction category 119 / May cause harm to the unborn child,
- Repr. Cat.3, R62 - Substance toxic to reproduction category 320 / Possible risk of impaired fertility,
- Xn; R20/22 - Harmful by inhalation and if swallowed,
- R33 - Danger of cumulative effects,
- N; R50-53 - Dangerous for the environment / Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Above certain concentrations, lead is toxic to humans. Continued or acute overexposure to lead can cause severe and cumulative health problems. Lead affects the major organs as well as the central nervous and circulatory systems. Lead exposure is most serious for young children because they absorb lead more easily than adults and are more susceptible to its harmful effects. During pregnancy, especially in the last trimester, lead can cross the placenta and affect the unborn child. Lead can have adverse effects on the ecosystem, including interference with growth and productivity of marine life, and toxicity of fish. The relative importance of any single source of exposure is difficult to predict and will vary with geographic location, climate and local geochemistry. The main concern in regard to the presence of lead in landfills is the potential for the lead to leach and contaminate drinking water supplies.

*European Commission Staff Working Paper Directive of the European Parliament and of the Council on Batteries and Accumulators and Spent Batteries and Accumulators, Extended Impact Assessment, Com(2003)723 Final, Brussels, 2003*

## III.5.1 Waste stream

Accumulators and other batteries are controlled by the WMC according to the Regulation on Used Batteries and Accumulators Control of MoEF (2004, no: 25569). The WMC makes an inventory of the quantity of accumulators and batteries present on all ships arriving at the yards. Some of the accumulators are re-used by the shipbreaking facilities, the ones which cannot be re-used are collected in the WMC Temporary Storage Station. WMC also checks the plots regularly to see if re-used accumulators are still intact or not.

Small batteries are collected immediately after the ship arrives and are stored in the Temporary Waste Station. They are then taken by the Izmir Metropolitan Municipality battery collection vehicles and disposed of at licensed sites.

## III.5.2 Facilities

In 2007 two different facilities were used by the WMC for recycling of used accumulators: Mutlu Akü in Kütahya and Aslan Avci in Izmir. According to WMC 2.140 kg and 6.580 kg of accumulators were sold to these facilities in 2007 respectively. Although they are both licensed companies[25] for accumulator recovery and despite several official and unofficial attempts by the NGO Platform on Shipbreaking, no visit was possible to these facilities. The Board of Mutlu Akü rejected any on site visit. Due to time constraints no visit was possible to Aslan Avci facility either. There are news reports that the community living around Aslan Avci facility are complaining about the air pollution during the night[26].

Aslan Avci Co. explains the process in their facility as follows[27]: Used accumulators are accepted after the licenses of the vehicles carrying waste accumulators and the national waste transport forms are checked. Radiation control takes place and the accumulators are stored in an appropriate field. They are crushed in an automated system and separated into metallic lead, lead oxide, plastic and acidic water. The crushed plastic is sold to licensed recycling companies and the acidic water is neutralised.

The metallic lead and lead oxide gained are transformed to intermediate lead product through melting. The slag produced in this process is first stored in temporary storage areas and afterwards sent to Izaydas to be landfilled. After a refinery process pure and alloy lead are produced which are sold to accumulator producers, chemical factories and other companies as well as used as raw material in the integrated in-house lead monoxide and lead shot facilities. Mutlu Akü facility in Gediz, Kütahya may employ a similar system for recycling of accumulators, although it uses the lead product to make its own new accumulators. It also has an ISO 14001 Environmental Management System Certificate.

*23) Prof. Dr. Mustafa ÖZTÜRK, MoEF, Hazards of Used Accumulators on Environment and their Recovery, Istanbul, 2005.*
*24) European Commission Staff Working Paper Directive of the European Parliament and of the Council on Batteries and Accumulators and Spent Batteries and Accumulators, Extended Impact Assessment, Com(2003)723 Final, Brussels, 2003*

*25) According to the List of Licensed Accumulator Recovery Facilities prepared by MoEF Waste Management Department Mutlu Akü is licensed until 18.04.2009 with license number APAKY-43-001and Aslan Avci until 16.03.2010 with license number APAKY-35-001.*
*26) http://www.evrensel.net/06/11/11/gundem.html, 11.11.2006*
*27) Retrieved from company website, http://www.aslankursun.com/eng/index.htm, on 18.07.2008.*

## III.5.3 National legislation

The Regulation on Used Batteries and Accumulators Control (31 August 2004, number 25569) by MoEF sets out the rules on "*labelling and marking of all battery and accumulator products, the reduction of harmful substances in their production, their collection, transportation and disposal apart from residential (household) and other wastes after their usage, the prohibitions, limitations and obligations about their import, transit passage, and export, the measures to be taken, the controls to be made, and the responsibilities to apply.*" The Regulation defines "*used batteries and accumulators*" as used batteries and accumulators which cannot be re-used. According to the Regulation only MoEF licensed recovery facilities are allowed to recycle used batteries and accumulators.

The importation of batteries containing harmful substances is however banned. Batteries containing harmful substances are defined as: "

- *batteries containing mercury (Hg) more than 0.0005% by weight;*
- *batteries containing more than 25 mg mercury (Hg) per battery, except alkali-manganese batteries;*
- *alkali-manganese batteries containing mercury (Hg) more than 0.025% by weight;*
- *batteries containing cadmium (Cd) more than 0.025% by weight;*
- *batteries containing lead (Pb) more than 0.4% by weight.*"

## III.5.4 Summary: Accumulators and Batteries

There is little information about the environmental impact of battery recyclers and there are no details of monitoring of emissions from the metal smelting process. The basic procedures for handling batteries and accumulators appear to be adequate in that the plastics, metals and acids are separated and the acids are neutralised. However, it is likely that lead and other contaminants will be released during the melting process and will be present in the slag, which is then sent to landfill. Monitoring of these emissions needs to take place and be available to the public.

# III.6 Other Hazardous Wastes

## III.6.1 Medical Waste

Possible medical wastes on board an obsolete vessel are infectious wastes and sharps waste which are categorised as medical wastes and pharmaceutical wastes, classified as hazardous waste under MoEF Medical Waste Regulation (22.07.2008, no: 25883).

Pharmaceutical wastes used to be sent to İzaydaş to be incinerated, however because of capacity problems at İzaydaş this has not occurred for some time. İzaydaş is working on a scheme to export surplus wastes, and for the time being pharmaceutical wastes will be stored temporarily at the WMC Temporary Waste Station. Infectious wastes and sharps waste are collected by Izmir Metropolitan Municipality and landfilled at Harmandalı landfill site.

## III.6.2 Chlorofluorocarbons

Freons are found on board ships as cooling gases in refrigerators or in styrofoams. In 2007 149 kg of this type of waste was sent to İzaydaş to be incinerated. IMO Guidelines describe these types of waste in Appendix 1 Table 3 under the category of "*Waste components that are relevant to ship recycling and which are not included in List A in the Basel Convention*": CFC (R12 - dichlorodifluoromethane, or R22 - chlorodifluoromethane) refrigerants, styrofoam.

## III.6.3 Ballast Water

Oily ballast waters are treated similarly to bilge water at Aliağa shipbreaking yards. The WMC has started to work with Biotek, an environmental consultancy and technology firm, and plans to install distillation systems to separate water and oil in the tanks at the plots. However, it is uncertain whether this system will solve the issue of the transfer of microorganisms.

There is no legislation or control mechanism in Turkey on the possible threat of introducing invasive species via ballast water discharges. The Undersecreteriat of Maritime Affairs contracted TÜBİTAK Marmara Research Centre to undertake a project called "*Control and Management of Hazardous Aquatic Microorganisms Transferred with Ballast Water*" between July 2006 and July 2008. The results of this project and follow up have not been made public at the time of writing.

The IMO adopted the "*International Convention for the Control and Management of Ships' Ballast Water and Sediments*" on 13 February 2004. As of August 2009 the Convention has not entered into force and unfortunately only 18 countries out of the 30 needed have ratified it, not including Turkey[28].

*28) Retrieved from www.imo.org August 2009.*

## III.6.4 Mercury

IMO Guidelines list the possible locations of mercury on board ships as follows: wastes having as constituents or contaminants any of the following, mercury; mercury compounds, thermometers, light fittings, level switches.

At Aliağa shipbreaking yards fluorescent tubes are collected, stored at the Temporary Waste Station and finally sent to İzaydaş. There is no management plan specifically for mercury and therefore it is highly likely that equipment that might contain mercury is not properly dealt with.

## III.6.5 Paint Related Hazardous Wastes

Paints and paint coatings on the ship structure may contain hazardous substances such as lead, chromium, arsenic and organotins. Torch cutting and re-rolling of painted steel may therefore cause serious risks to the environment and human health.

In Aliağa there is no waste management system in place to deal with paint and paint coatings on ship structures. Such a system would need to include analysis, removal and disposal of paints on ship structures. The re-rolling of steel from scrap metal importation and shipbreaking operations at nearby steel rolling mills has created mounds of toxic ashes which are calculated to weigh about 8 million tons[29].

**Hazardous substances used in paints and paint coatings**

**Lead**
A1020 Waste having as constituents or contaminants, excluding metal waste in massive form, any of the following: Lead; lead compounds batteries, paint coatings, cable insulation

**Hexavalent chromium**
A1040 Wastes having as constituents any of the following: Hexavalent chromium compounds paints (lead chromate) on the ships structure

**Arsenic**
A1030 Wastes having as constituents or contaminants any of the following: Arsenic; arsenic compound Paints on the ships structure

**Organotins**
A4030 Wastes from the production, formulation and use of biocides and phytopharmaceuticals, including waste pesticides and herbicides which are off-specification, outdated, or unfit for their originally intended use paints and rust stabilizers, tin-based antifouling coatings on ships bottoms

*From IMO Guidelines on Shipbreaking*

## III.6.6 WEEE (Waste from Electrical and Electronic Equipment)

WEEE (Waste from Electrical and Electronic Equipment) on a ship includes all kinds of household electrical and electronic equipment plus ship specific equipment used for communication, navigation etc. Management of WEEE is a relatively new area for Turkey; relevant regulation is expected to be issued by the end of 2009 by MoEF. On the other hand municipalities are already stating recycling schemes and recycling firms have been established in the last two to three years. The WMC has signed a new contract with the WEEE Recycling firm Exitcom.

### Exitcom

*Exitcom WEEE Recycling plant © Erdem Vardar*

Exitcom is a German company that opened its facility in Turkey in 2003 in Kocaeli. The contract between shipbreaking companies and Exitcom covers accumulators, batteries, waste electronic equipment and non-toxic electric cables. The NGO Shipbreaking Platform made an on site visit immediately after the contract had been signed and many recycling activities were therefore not yet operational, making impossible a visual inspection of the recycling processes. The source of the data is the meeting with Exitcom officials, brochures and the company website.

According to Exitcom officials, electric cables will be recycled using technology similar to Ozdenizcilik, where the cables are broken and pulverized and copper and plastic are separated in machines. The company will only accept non-toxic cables and it stated it will sample them for PCB's before the waste leaves the shipbreaking yards.

CRT monitors will be vacuumed and toxic materials such as lead, barium and phosphorus will be separated. Electronic circuits will be sent to a recycling facility in Germany as there is no recycling technology yet available in Turkey.

Accumulators will be directed to licensed companies who are organised under TUMAKUDER in Turkey, which is an association founded by importers and producers of accumulators in line with the Regulation on Control of Waste Accumulators and Batteries. Batteries will be sent to Germany to be recycled in its main factory.

*29) Press conference of Tansu Kaya, Aliaga Mayor, on 26.07.2006, retrieved from Milliyet internet news site http://www.milliyet.com.tr/2006/07/26/ege/ege01.html*

## III.6.7 National legislation

### Medical Waste

Regulation on Control of Medical Waste by MoEF entered into force on 22 June 2005, (number 25883). The Regulation covers the management of infectious, pathological and sharps waste as well as hazardous medical waste.

### Ballast Water

There is no national legislation specifically aiming to prevent hazardous effects of organisms transferred with ballast water. MoEF Regulation on Control of Waste Oils (21.01.2004, no: 25353) is effective on "*dirty ballast*" which is mixed with fuel, oils etc.

### Chlorofluorocarbons, Mercury and Paint related Hazardous Wastes

Chlorofluorocarbons, mercury and paint related hazardous wastes such as lead, arsenic and organotins are generally controlled under the MoEF Hazardous Waste Control Regulation (14.03.2005, no 25755) which is also based on the Montreal Protocol. The new Shipbreaking Regulation is expected to cover the management of these wastes in a context specifically related to ship recycling.

### WEEE

New legislation is under preparation by MoEF on Waste Electrical and Electronic Equipment. It is planned to be in force by the end of 2009.

## III.6.8 Summary: other Hazardous Wastes

Although these wastes are not the major waste streams from obsolete ships, these substances give cause for concern, even in small quantities; for example CFCs, because of their ozone depleting potential, and mercury, which is a potent neurotoxin. WEEE is also known to contain heavy metals as well as toxic brominated flame retardants and PVC plastic, all of which pose problems for downstream waste management and recycling. Finally, the fact that no waste management system exists for paint related hazardous wastes is a major shortcoming in the management of shipbreaking wastes in Turkey.

# IV. MONITORING

Environmental protection at the shipbreaking yards is monitored by the MoEF according to Protocols which detail necessary improvements, signed by the Shipbreaking Association. Individual plots are licensed depending on whether the particular yard has undertaken the measures set out by these Protocols.

Officials from the provincial directorate of MoEF check every vessel arrival in Aliağa with officials from the Harbour Directorate and Customs office. An independent survey firm also checks the materials on board. Yet these controls do not include the waste that is part of the structure of the ship except, as mentioned, a visual assessment of asbestos containing materials (ACM). No samples are taken and no inventory is prepared. Sampling and an inventory are only done by the Shipbreaking Association for some types of wastes without any real control by other independent bodies.

For the wastes on board the vessels such as waste oils and bilge water the Customs Directorate takes samples and analyses them in their own laboratory. The MoEF Provincial Directorate takes samples to assess possible discharges to the sea every 3 months from off shore and the shoreline. No mud, soil or air samples are taken or analysed by governmental bodies or third parties.

No random, or unannounced inspections are done by MoEF on hazardous waste management at the yards. Prior informed inspections are undertaken less than once a year. The same is true for the recycling/disposal facilities, except İzaydaş which has a different system of online reporting for some emissions. MoEF furthermore rarely takes samples during its inspections.

Although the Shipbreaking Association and the WMC are open to sharing information, public access to information on the processes and emissions of downstream recycling/ disposal facilities is limited. In general, legislation to guarantee public access to environmental information is non-existent despite the recommendations of the Basel Convention, which Turkey is a party of[30]. The participation of the public in monitoring systems is neither guaranteed under law nor existent in practice.

Occupational safety regarding hazardous waste management is monitored by the Ministry of Labour and Social Security. Again, inspections take place very rarely and legal sanctions are not applied. There is no real follow up on reported deficiencies in health and safety measures.

In general, the first and biggest problem in terms of monitoring seems to be the lack of an inventory of hazardous wastes done by governmental bodies or third party organisations. The WMC or the shipbreaking companies are the only parties that check the amounts or types of waste which are part of the structure of the ship. A visual inspection of the ship is clearly insufficient to control the information given by the shipbreakers or provided by the ship owner prior to the arrival of the ship. If the information on the amounts and types of waste given by the shipbreakers is wrong, the whole process of monitoring of downstream waste management could fail.

Public access to information and public participation in monitoring is another important problem to overcome. Lack of financial and human resources at MoEF and the Ministry of Labour and Social Security leaves the Shipbreaking Association with all responsibility. Participation of NGO's or third party institutions in monitoring is essential to ensure good control mechanisms and protection of the environment and workers.

*30) Basel Convention framework to technical guidelines Article 10 (k) The Principle of Public Participation - under which States should ensure that in all stages, waste management options are considered in consultation with the public as appropriate, and that the public has access to information concerning the management of hazardous wastes.*

# V. CONCLUSION AND RECOMMENDATIONS

Environmentally sound and safe downstream management of hazardous wastes related to shipbreaking activities in Turkey appears to be improving. Especially, new legislation put forward by MoEF has had a catalysing effect on developments and improvements of the waste management sector, and the establishment of a Waste Management Centre (WMC) at the yards has improved the handling of ship borne wastes in Aliağa.

Most of the hazardous wastes identified by the WMC are sent for incineration or hazardous waste landfill, for example PCBs in cables and waste oils, and asbestos. But even though the transfer of these wastes to incineration or landfill is regulated, as is the process of incineration and landfill, there is still risk for hazardous substances to be released into the environment. Especially of concern is the incineration of chlorinated hazardous wastes causing unintended production of POPs such as dioxins and furans; indeed, the incineration by-product dioxin has been found in eggs at elevated levels.

The national transportation form system allows limited, but important tracking and control of hazardous waste movements by designated authorities. Monitoring by independent parties and other stakeholders is however difficult because of the lack of laws that secure public access to information concerning the movement and management of hazardous wastes. It should also be noted that since the WMC's legal status is not clear, issues of accountability remain uncertain.

The fact that some hazardous materials in obsolete ships are not identified by the WMC is of even greater concern; these include PCBs in transformers and capacitors, and paint wastes on the ships surface. The processing and fate of these substances is uncertain and monitoring is non existent.

## RECOMMENDATIONS

- The new Shipbreaking Regulation should ensure that each incoming ship for scrap to Turkey is controlled by independent third parties (accredited companies, chambers of occupation, NGOs etc.) for the types and amounts of hazardous wastes on board and as part of the ship structure.
- The new Shipbreaking Regulation should also ensure public participation in the overall monitoring of the breaking operations in the yards and downstream treatment and disposal of wastes.
- Hazardous waste management at the yards and downstream should cover all substances and all forms of their possible existence on board and as part of the ship structure, such as PCB's in electrical devices other than cables, mercury and toxic materials such as lead, TBT and arsenic found in paints.
- Before ships are exported to Turkey they should be pre-cleaned to the greatest possible extent with the aim of minimising especially chlorinated hazardous wastes on board. If no alternative technology is available to incineration a send back system should be put into place for non-recyclable chlorinated wastes still on board.
- Turkey should ratify the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters known as the Aarhus Convention and its Protocol on Pollutant Release and Transfer Registers.

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# VII. APPENDICES

## Appendix 1.

Waste Oil and Bilge Water Received in 2007

Amounts of waste oil received from Shipbreaking Waste Management Centre in 2007 by Çinkanlar.

| Date of Waste Oil received (in 2007) | Amount of Waste Oil received (KG) |
|---|---|
| January | 43.840 |
| February | 0 |
| March | 192.320 |
| April | 9.200 |
| May | 202.610 |
| June | 0 |
| July | 105.730 |
| August | 60.580 |
| September | 102.960 |
| October | 40.920 |
| November | 103.900 |
| December | 105.340 |
| TOTAL | 967.400 |

Amounts of bilge water received from Shipbreaking Waste Management Centre in 2007 by Çinkanlar.

| Date of Reception | Amount Received (KG) |
|---|---|
| 16.04.2007 | 16.700 |
| 17.04.2007 | 10.780 |
| 21.09.2007 | 15.280 |
| 09.10.2007 | 12.800 |
| 22.10.2007 | 7.280 |
| TOTAL | 62.840 |

## Appendix 2.

Regulation on Control of Waste Oils

ANNEX 1
WASTE OIL CATEGORIES AND LIMIT VALUES FOR POLLUTANT PARAMETERS

CATEGORY I WASTE OIL:
The pollutants in the waste oils such as PCBs, total halogens and heavy metals are below the limits given in the following table. The waste oils in this category are available for recovery through refining and regeneration or suitable for use as additional fuel in facilities licensed by the Ministry.

CATEGORY II WASTE OIL:
The heavy metal content of the waste oils is below the limits given in the following table. Chloride and total halogens are between 200 – 2000 ppm, and PCBs are between 10 – 50 ppm. The waste oils in this category are suitable for use as additional fuel in the facilities licensed by the Ministry.

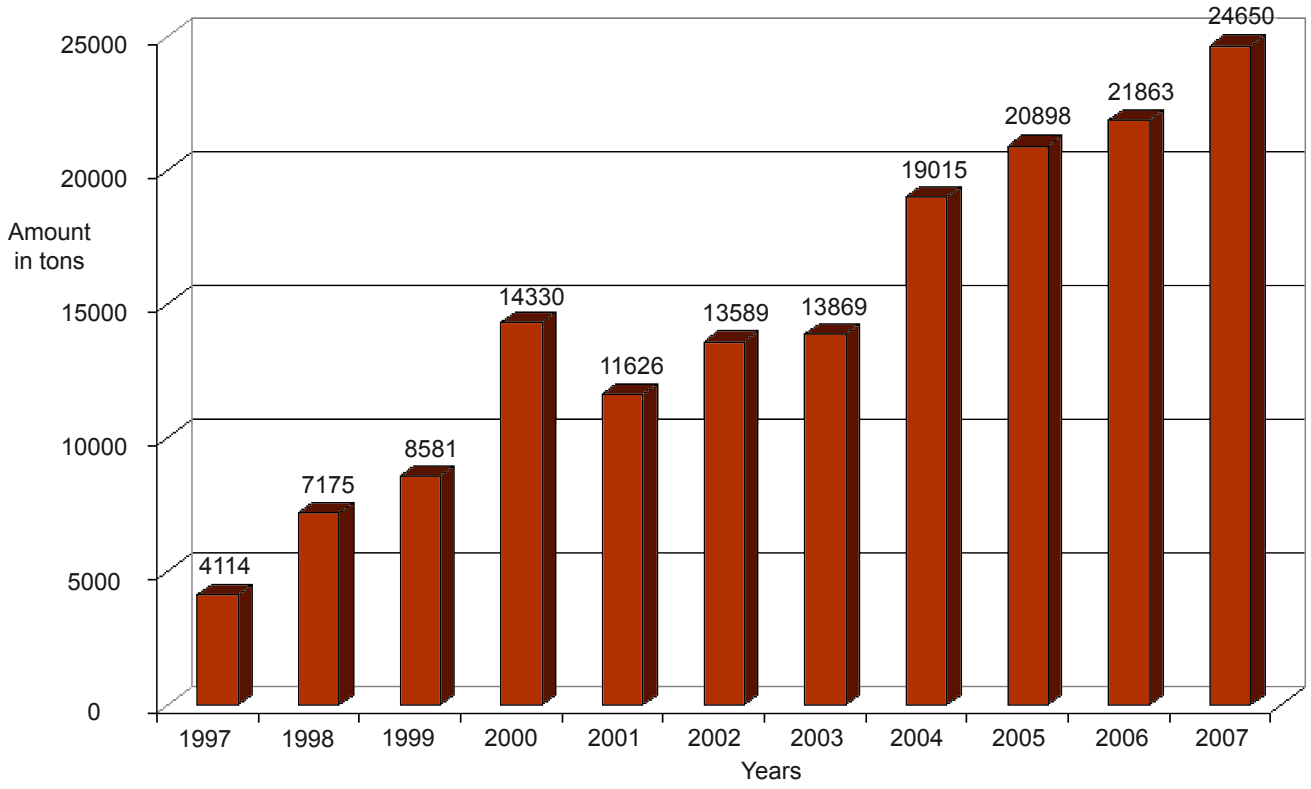
CATEGORY III WASTE OIL:
The heavy metal content of the waste oils is above the limit given in the following table. Chloride and total halogens are above 2000 ppm and PCBs are above 50 ppm. The waste oils in this category not only are not available for refining, but also create risks for human health and environment. Waste oils of this category should be combusted and disposed in licensed hazardous waste oil combustion facilities.

| Pollutants | Allowable Limit Values (Cat. 1 Waste Oils) | Allowable Limit Values (Cat. 2 Waste Oils) | Allowable Limit Values (Cat. 3 Waste Oils) |
|---|---|---|---|
| Arsenic | < 5 ppm | Max. 5 ppm | > 5 ppm |
| Cadmium | < 2 ppm | Max. 2 ppm | > 2 ppm |
| Chromium | < 10 ppm | Max. 10 ppm | > 10 ppm |
| Chloride | Max. 200 ppm | Max. 2000 ppm | > 2000 ppm |
| Lead | < 100 ppm | Max. 100 ppm | > 100 ppm |
| Total halogens | Max. 200 ppm | Max. 2000 ppm | > 2000 ppm |
| Polychlorinated Biphenyls (PCB)[1] | Max. 10 ppm | Max. 50 ppm | > 50 ppm |
| Flashing point | Min. 38 C | Min. 38 C | - |

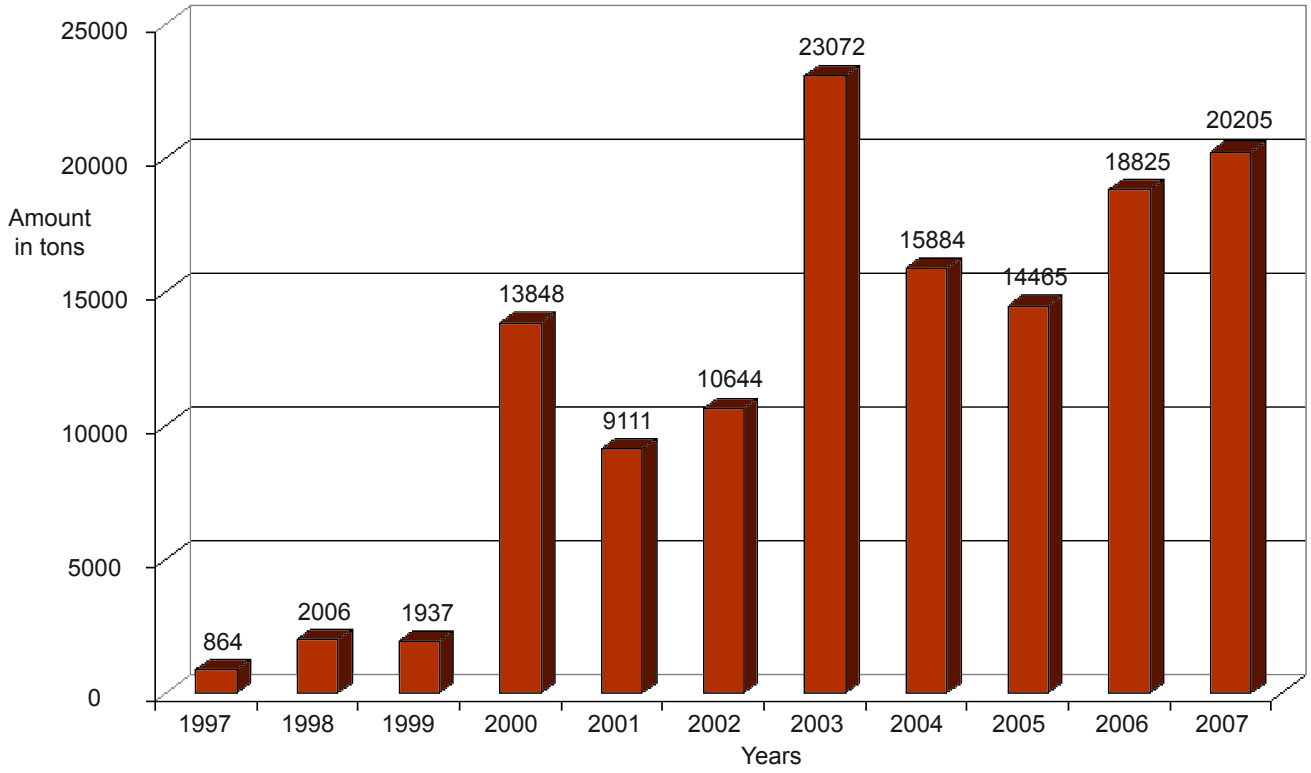
(1) *If the Ministry deems appropriate PCB measurements may be made on sector basis.*

# Appendix 3.

Amount of waste accepted for incineration:




Amount of wastes accepted at the hazardous waste landfill site:



# Appendix 4

Details of Legislation Relating to Hazardous Waste Landfill and Incineration

## 4.1 Landfill

| | | Wastes classified as Inert Waste (mg/lt) | Wastes classified as Non-Hazardous Waste (mg/lt) | Wastes classified as Hazardous Waste (mg/lt) |
|---|---|---|---|---|
| 1 | Eluat Parameters L/S = 10 lt/kg | | | |
| 1.01 | As (Arsenic) | ≤ 0.05 | 0,05–0,2 | < 0,2–2,5 |
| 1.02 | Ba (Baryum) | ≤ 2 | 2–10 | < 10–30 |
| 1.03 | Cd (Cadmium) | ≤ 0,004 | 0,004 – 0,1 | < 0,1–0,5 |
| 1.04 | Total Cr (Total Crom) | ≤ 0,05 | 0,05–1 | < 1 – 7 |
| 1.05 | Cu (Copper) | ≤ 0,2 | 0,2 – 5 | < 5 – 10 |
| 1.06 | Hg (Mercury) | ≤ 0,001 | 0,001– 0,02 | < 0,02– 0,2 |
| 1.07 | Mo (Molybdenum) | ≤ 0,05 | 0,05 - 1 | < 1 – 3 |
| 1.08 | Ni (Nickel) | ≤ 0,04 | 0,04 – 1 | < 1 – 4 |
| 1.09 | Pb(Lead) | ≤ 0,05 | 0,05 – 1 | < 1 – 5 |
| 1.10 | Sb (Antimony) | ≤ 0,006 | 0,006 -0,07 | < 0,07 -0,5 |
| 1.11 | Se (Selenium) | ≤ 0,01 | 0,01 – 0,05 | < 0,05 – 0,7 |
| 1.12 | Zn (Zinc) | ≤ 0,4 | 0,4 -5 | < 5 -20 |
| 1.13 | Chlorine | ≤ 80 | 80 - 1500 | < 1500 – 2500 |
| 1.14 | Fluoride | ≤ 1 | 1 -15 | < 15 -50 |
| 1.15 | Sulfate | ≤ 100 | 100 – 2000 | < 2000-5000 |
| 1.16 | DOC (Dissolved Organic Carbon)(1) | ≤ 50 | 50-80 | <80-100 |
| 1.17 | TDS ( Total dissolved solid) | ≤400 | 400-6000 | <6000-10000 |
| 1.18 | Phenol Index | ≤ 0,1 | | |
| 2 | Parameters examined in Original Waste | (mg/kg) | (mg/kg) | (mg/kg) |
| 2.1 | TOC (total organic carbon) | ≤30000 (%3) | 50000 (% 5)- pH ≥ 6 (2) | 60000 ( %6) |
| 2.2 | BTEX (benzene, toluene, ethylbenzene and xylenes) | 6 | | |
| 2.3 | PCBs | 1 | | |
| 2.4 | Mineral oil | 500 | | |
| 2.5 | LOI ( Loss on Ignition) | | | 10000 (%10) |

*(1) If DOC limit value can not be attained at the original pH value of the waste itself, then the test has to be repeated at a pH value of 7,5-8,0. It must be proved that the limit value is not exceeded.*

*(2) Gypsum based non-hazardous waste should be disposed of in a separate cell where wastes that are easily dissolved in a municipal waste sanitary landfill are not accepted. Wastes that are stored with the gypsum based wastes have to be in accordance with these limits.*

## 4.2 Incineration

The requirements for hazardous wastes incineration are explained in Article 20 of HWCR:

a) There must be a final incineration facility at the installation. The first part of the incineration oven should be kept at a temperature of at least 900°C. The temperature should be controlled and registered regularly, there must be a burner in addition to the final incineration part, the burner should automatically start if the heat decreases below the minimum limit of 850°C for this part of the facility. If hazardous wastes with a content of more than 1 % of halogenated organic substances, expressed as chlorine, are incinerated, the temperature has to be raised to 1100°C for at least two seconds. These burners are used to prevent incomplete combustion because the temperature decreases when the ovens are turned on or off.

At the incineration installation, there must be a system to stop the feed of hazardous wastes;

1. Until the minimum burner room gains the required temperature,
2. Until minimum burning heat is gained
3. When there is a problem with the equipment used for keeping the emissions under emission limit values.

Installations burning hazardous wastes should be operated in such a way that the waste should be burnt as completely as possible. Sometimes to achieve this, it is necessary to pre-treat the wastes. The heat generated at incineration installations should be recovered as much as possible.

b) The following limit values for Carbon Monoxide (CO) should not be exceeded during incineration operations,

1. Daily average value of burning gas: 50 mg/m3,
2. At minimum 95 % of all average value measurements for 10 minutes of burning gas: 150 mg/m3,
3. The average value of all measurements taken at half hourly intervals within any 24 hours: 100 mg/m3.

c) Incineration installations should be planned, equipped and operated according to the following emission limits of stack gases. The combustion gases are released to the atmosphere in a controlled way. The height of the stack of the installation should be planned and constructed according to The Regulation on Control Of Air Pollution Caused By Industry, (dated 7/10/2004, number 25606). The following emission limit values for stack gasses from incineration installations must not be exceeded.

1) Daily average values:

| | |
|---|---|
| Total dust | 10 mg/m3 |
| Gaseous and vaporous organic substances, expressed as organic carbon | 10 mg/m3 |
| Hydrogen chloride (HCl) | 10 mg/m3 |
| Hydrogen Fluoride (HF) | 1 mg/m3 |
| Sulphur Dioxide (SO2) | 50 mg/m3 |
| Nitrogen monoxide and Nitrogen dioxide (NO2) expressed as nitrogen dioxide | 200 mg/m3 |

2) Half-hourly average values:

| | |
|---|---|
| Total dust | 30 mg/m3 |
| Gaseous and vaporous organic substances, expressed as organic carbon | 20 mg/m3 |
| Hydrogen chloride (HCl) | 60 mg/m3 |
| Hydrogen Fluoride (HF) | 4 mg/m3 |
| Sulphur Dioxide (SO2) | 200 mg/ m3 |
| Nitrogen monoxide and Nitrogen dioxide (NO2) expressed as nitrogen dioxide | 400 mg/ m3 |

3) All average values are within the sample period of a minimum of 30 minutes and a maximum of 8 hours:

| | |
|---|---|
| Cadmium and its compounds, expressed as (Cd )<br>Thallium and its compounds, expressed as (Tl ) | Total 0.05 mg/ Nm3 |
| Mercury and its compounds, expressed as (Hg) | Total 0.05 mg/m3 |
| Antimony and its compounds, expressed as (Sb)<br>Arsenic and its compounds, expressed as (As)<br>Lead and its compounds, expressed as (Pb)<br>Chromium and its compounds, expressed as (Cr)<br>Cobalt and its compounds, expressed as (Co)<br>Copper and its compounds, expressed as (Cu)<br>Manganese and its compounds, expressed as (Mn)<br>Nickel and its compounds, expressed as (Ni)<br>Vanadium and its compounds, expressed as (V)<br>Tin and its compounds, expressed as (Sn) | Total 0.5 mg/m3 |

The following emissions should be measured regularly:

- Total dust
- Carbon monoxide (CO)
- Hydrogen Fluoride (HF)
- Hydrogen Chloride (HCl)
- Oxygen, pressure and temperature

These average values contain the gas and steam forms of heavy metal emissions together with metal compounds.The measurement techniques are provided in Attachment 15.

d) Dioxin and furan emissions are minimized by the latest techniques. The average value of samples measured between a minimum period of 6 hours and maximum of 8 hours should not exceed limit values of 0.1 ng/m3.
This limit value is determined as the total of the concentrations of dioxin and furan isomers and this total is calculated according to Attachment 16.

To compare the stack gas measurements with emission limit values in articles (b), (c), (d), the measurement results are standardised as temperature 273 °K, pressure 101,3 kPa, 11 % oxygen and dry gas.

ANNEX-17

Wastewater discharge limit values from treatment of incineration plant emissions

| Contaminant | Limit Values on Mass Concentration Basis |
|---|---|
| 1) Total Suspended Solids<br>2) Mercury (Hg) and compounds | 20 mg/l<br>0.02 mg/l |
| 3) Cadmium and compounds ( as Cd )<br>4) Thallium and compounds (as Tl ) | 0.05mg/l |
| 5) Antimony and compounds (as Sb )<br>6) Arsenic (As)<br>7) Lead (Pb)<br>8) Chromium (Cr)<br>9) Cobalt (Co)<br>10) Cupper (Cu)<br>11) Manganese (Mn)<br>12) Nickel (Ni)<br>13) Vanadium (V) | 5 mg/l |
| 14) Total Dioxin and Furan | 0.5 mg/l |

# VIII GLOSSARY

| | |
|---|---|
| ACMs ..... | Asbestos Containing Materials |
| CFCs ..... | Chloro flouro carbons |
| HCB ..... | Hexachloro benzene |
| HWCR ..... | Hazardous Wastes Control Regulation (MoEF 14/31/05 no. 25755) |
| IMO ..... | International Maritime Organisation |
| IPEN ..... | International POPs Elimination Network |
| MoEF ..... | Ministry of Environment and Forestry |
| NGO ..... | Non Governmental Organisation |
| PCBs ..... | Polychlorinated biphenyls |
| PCTs ..... | Polychlorinated terphenyls |
| PICs ..... | Products of Incomplete Combustion |
| POPs ..... | Persistent Organic Pollutants |
| TBT ..... | Tributyl tin |
| TUIK ..... | Turkish National Statistics Organisation |
| UNECE ..... | United Nations Economic Commission for Europe |
| u-POPs ..... | Unintentionally produced Persistent Organic Pollutants |
| WEEE ..... | Waste Electrical and Electronic Equipment |
| WMC ..... | Waste Management Centre of Turkish Shipbreaking Association in Aliaga |

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