Working Report No. 18, 2003
Arbejdsrapport fra Miljøstyrelsen

Shipbreaking in OECD

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Danish Environmental Protection Agency
Danish Ministry of the Environment

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Table of Contents

Abbreviations and glossary

Abbreviation/Acronym	Name	Explanation
Aframax		Tankers generally 80,000-119,000 DWT
Ballast		Seawater taken into a vessel's tanks in order to submerge the vessel to proper trim.
BIMCO	Baltic and International Maritime Council	Trade organisation representing shipowners, shipbrokers and agents, and other members
Bulk Cargo		Usually a homogeneous cargo stowed in bulk, and not enclosed in any container.
Deadweight ,DWT	Deadweight Tonnage	The lifting or carrying capacity of a ship when fully loaded. The deadweight is the difference, in tonnes, between the displacement and the lightweight. It includes cargo, bunkers, water (potable, boiler, ballast), stores, passengers and crew.
DEPA	Danish Environmental Protection Agency	Government agency under the Ministry of Environment
DNV	Det Norske Veritas	One of several Classification Societies - The professional organisations which class and certify the strength and seaworthiness of vessel construction. Class and certification issued to each vessel may be required for insurance purposes. DNV and Lloyds Register of Shipping are two well known classification societies in the world today.
T	Draught	The depth of a ship in the water. This distance is measured from the bottom of the ship to the surface of the water. The moulded draught T is the distance, in m, measured vertically on the midship transverse section, from the moulded base line to the summer load line.
DT	Displacement Tonnage	Expressed in tonnes it is the weight the water displaced by the vessel which in turn is the weight of the vessel at that time.
Gas free	Gas free (for hot work)	Gas Free Certificate - A certificate issued by a chemist after sampling the air in a tanker's cargo tanks after the cargo has been pumped out.
GT	Gross Tonnage	The internal capacity of a vessel measured in units of 100 cubic feet.
ILO	International Labour Organisation	The UN agency seeking the promotion of social justice and internationally recognized human and labour rights
IMO	International Maritime Organisation	The United Nations' agency responsible for improving maritime safety and preventing pollution from ships.

LDT	Light displacement tonnes or Lightweight	The lightweight is the displacement, in t, without cargo, fuel, lubricating oil, ballast water, fresh water and feed water, consumable stores and passengers and crew and their effects, but including liquids in piping.
MARAD	Maritime Administration	US Department of Transportation Authority
MARPOL		International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78).
MEPC	Marine Environment Protection Committee	IMO's senior technical body on marine pollution related matters.
Panamax.		The maximum size ship that can fit through the Panama Canal in terms of width, length and draught generally about 80,000 DWT
Suezmax		The maximum size ship that can sail through the Suez canal generally considered to be between 150-200,000 DWT depending on ships dimensions and draught.
TEU	Twenty-foot Equivalent Unit	Standard unit for counting containers of various capacities and for describing the capacities of container ships or terminals. One 20 Foot ISO container equals 1 TEU.
ULCC	Ultra Large Crude Carrier	Tanker of 320,000 DWT & above
VLCC	Very Large Crude Carrier	Tanker of 160,000-320,000 DWT

Executive Summary

This report aims at providing an overview on the driving mechanisms of the shipbreaking process, and to report on the environmental compliance in select facilities within OECD countries, which may be used to scrap ships covered by Danish regulations.

Today, almost all shipbreaking takes place in Asia, particularly in Pakistan, India, Bangladesh and China. The prices offered by ship breakers (up to twice the OECD prices) in these countries for scrap ships are attractive for the ship owners. Consequently, very few shipyards in OECD countries remain on the demolition market.

The possible capacity of Canada, France, Germany, UK and other "high-cost" OECD countries have not been investigated due to lack of record of shipbreaking. Likewise, USA was not included, although the authorities responsible for the obsolete Navy vessels have licensed four American companies to perform ship scrapping. The Mexican shipbreaking industry has downscaled over the last ten years. The company with a reported acceptable level of compliance to environmental standards decided during the course of this report to leave the shipbreaking business.

EU/OECD member states with relatively low labour costs and registered ship breakers include Spain, Italy and Turkey. Technically, their ship demolition industry may hold a potential capacity for Danish ships and are not too far from Denmark. Portugal, Poland, and Greece have also been considered, but none of these latter countries reports any significant ship demolition industry, although a capacity in terms of quays, dock facilities and work force is available.

In this report the beaching activities in Turkey, in their present conditions, are not considered an acceptable mode of demolishing ships. It has not been possible to identify Turkish facilities employing pier or dry dock breaking. A few demolition yards in the Asturias province in Spain and in Naples, Italy, are in operation and have the capacity to receive larger vessels (up to approx. 220 m).

The inspected Italian company reports that vessels up to 300 m may be demolished, but that this requires some retrofitting of facilities and lease of additional quay length. Inspection at this yard suggests it is a suitable choice for environmentally acceptable shipbreaking. At the inspected Spanish yard some improvement is necessary to comply with applicable standards.

1 Background

In this report the possibilities for shipbreaking[1] within OECD countries are analysed. Today, ships that are ready for scrapping are often sent to demolition under conditions that would not be accepted in OECD countries with respect to environment, health and safety conditions of the work. This occurs in the beaching yards in India, Pakistan, Bangladesh and in Turkey. Internationally, thus issue is addressed through the work carried out by UNEP's Basel Convention secretariat, the International Maritime Organisation (IMO), the International Labour Organisation (ILO) and shipping organisations such as Baltic and International Maritime Council (BIMCO).

The regulation of demolition of vessels is the subject of discussions between various authorities and industry organisations. Below is cited some of the international regulation applied to shipbreaking:

- The 1989 Convention on Transboundary Movements of Hazardous Wastes and their Disposal (the Basel Convention).
- 1972 London Dumping Convention (1996 Protocol).
- The 1993 Council Regulation (EEC) No. 259/93 on the Supervision and Control of Shipments of Waste within, into and out of the European Community.

None of the regulations were originally meant to be applied to shipbreaking and it is argued by stakeholders that they may not be directly suitable to the issue. This has led to a number of activities related to regulation of shipbreaking, including the following authorities and organisations, which have over the last five years developed or drafted policies, guidelines and assessments on various aspects of the final destiny of obsolete ships under the headings of decommissioning, dismantling, demolition, scrapping, recycling or shipbreaking, Table 1.1.

This project does not attempt a comprehensive review of these activities, but is directed towards establishing a short working list of OECD shipyards with environmentally "acceptable" shipbreaking practises.

Table 1.1 Selected developed or drafted policies, guidelines and assessments on various aspects of shipbreaking issues.

[1] Shipbreaking, scrapping, dismantling, demolition and recycling are not well defined terms. No distinction is implied in this report solely on the term as to the crude beach scrapping or the more refined process employed in pier breaking.

Basel Convention Working Group	Draft technical guidelines for the environmentally sound management of the full and partial dismantling of ships
IMO MEPC	Several papers and notes on the possible regulation of shipbreaking, including a recent draft guideline on recycling of ships
Commission of the European Communities	Technological and Economic Study of Ship Scrapping in Europe
ILO	Shipbreaking: A Background Paper Worker safety in the ship-breaking industries
Marisec	Industry code of practice on ship recycling
BIMCO	Decommissioning and Recycling of Ships and the Capacity of the Recycling Industry Standard contract for the sale of vessels for demolition and recycling (Demolishcon)
Norwegian Ministry of Environment, Norwegian Shipowners Association, Norwegian Research Council	Decommissioning of Ships – Environmental Standards Third Party Environmental Verification - Ship Decommissioning (ENVER) Ship Decommissioning in the OECD Area Decommissioning Guidelines - The GUIDEC Approach
US Navy and US Marad	Disposal options for ships
US EPA	A Guide for Ship Scrappers: Tips for Regulatory Compliance
Greenpeace	Campaign and several reports on "Ships for scrap"

The issue of acceptability of a shipyard's demolition practises for the present work is based on a perceived environmental compliance for the facilities. This will be referred to commonly as Health, Safety and Environment (HSE) viz. a viz. the Basel Convention working group draft (Basel Convention 2002).

Guidance documents that directly addresses the environmental practice and related dos and don'ts of shipbreaking are:

- Draft technical guidelines for the environmentally sound management of the full and partial dismantling of ships (Basel Convention Working Group)
- A Guide for Ship Scrappers: Tips for Regulatory Compliance (US EPA)
- Industry code of practice on ship recycling (Marisec)
- Decommissioning of Ships – Environmental Standards (Norwegian authorities)

The IMO MEPC has discussed the inclusion of recycling of ships on the IMO agenda and agreed to take the item on board as a lead agency, in co-operation with the Basel Convention, ILO and other stakeholders. The MEPC has established a Correspondence Group under the leadership of Bangladesh to look into the matter and report to MEPC. MEPC expects to present an IMO guidance document in November 2003.

2 Shipbreaking industry

2.1 History and geography

Over the past the demolition of European vessels has moved from locally in the European region, notably Spain and Italy, and Japan during the 60 and 70's to Asian countries such as Taiwan, China and Korea in the 80's. In these days shipbreaking took place along piers in connection with ship yard activities. During the 1980's the method of beaching, which was initiated by an accidental beaching became the most frequent method since it allows the demand for infrastructure (piers, sufficient depth of the harbour, cranes etc.) to be replaced by an intertidal mud flat and a huge labour force. It therefore takes place in countries with cheap labour: Bangladesh, Pakistan and India. China is also active in the demolition market with pier breaking. A number of countries are on and off the market: Thailand, the Philippines, Indonesia and Mexico.

Finally, demolition does occur in high cost OECD countries such as the EU countries and North America. Particularly, obsolete fishing ships and navy vessels are demolished, but not larger vessels. The infrastructure needed for ship dismantling also of large vessels in terms of shipyards, steel mills etc. is to some extent still available. However, the economics of shipbreaking are not in favour of OECD countries: it is not only the higher labour costs and the cost of protecting human and environmental health, but also that the market demand for recycled steel and other reusable items from ships is less in the OECD compared to e.g. the Indian subcontinent. The prices obtained in third world countries are consequently better on per tonnes of steel basis.

2.2 Industry profile 1994-2002

The amount of shipbreaking taking place within OECD countries is very limited. Quite a number of countries have done some shipbreaking in the last 8 years (Clarkson's 2002) but only Turkey, Spain and Mexico have more than 10 records of shipbreaking in that period. Yet they cover only 1.5% of the tonnage. Other OECD countries have 1-2 records, see Table overleaf.

Table 2.1 The global number of vessels by break up location and their tonnage, 1994-2002

Breakup location	Number of vessels	Sum of Ldt	% of all vessels	% of total tonnage
India	2245	16,135,949	58%	45%
Bangladesh	529	7,737,562	14%	22%
China	379	4,734,533	10%	13%
Unknown	241	1,255,762	6%	4%
Pakistan	192	3,521,888	5%	10%
Turkey	**109**	**379,641**	**2.8%**	**1.1%**
Indian Sub cont	84	1,191,793	2%	3%
Vietnam	29	372,882	1%	1%
Spain	**18**	**59,439**	**0.46%**	**0.17%**
Mexico	**18**	**75,746**	**0.46%**	**0.21%**
Taiwan	5	31,272	0%	0%
Philippines	4	49,035	0%	0%
Brazil	4	20,041	0%	0%
	2	14,857	0%	0%
Portugal	2	5,781	0%	0%
U.K.	2	13,590	0%	0%
Peru	2	15,762	0%	0%
Cuba	1	5,082	0%	0%
Canada	1	5,956	0%	0%
Bangaldesh	1	6,600	0%	0%
Columbia	1	7,413	0%	0%
Dutch	1		0%	0%
Egypt	1		0%	0%
Greece	1		0%	0%
Italy	1		0%	0%
Netherlands	1		0%	0%
U.A.E.	1		0%	0%
Venezuela	1	7,821	0%	0%
Japan	1	33,000	0%	0%
sum	3877	35,681,405	100%	100%

Source: Clarkson's demolition database, 2002. The three OECD countries with the highest number of demolitions are shown in bold. The Japanese record has been proven to be erroneous.

The statistics of 1999 show that the European vessels are demolished mainly on the Indian subcontinent, with the larger vessels sent to Bangladesh and Pakistan. Approx. 25% of the vessels were demolished in OECD countries representing only 7% of the GT. Again, it is Turkey, Mexico and Spain that account for the majority of the OECD demolition.

Table 2.2 Breaker countries for European ships above 100 Gross Tonnage (GT) – no. of ships, DWT, GT and average DWT of ships scrapped for each breaker country (CEC 2001).

Breaker Country	No.	DWT	GT	Average DWT
BANGLADESH	13	1099915	586633	84609
CHINA	3	162794	89814	54265
INDIA	89	2946300	1812492	33104
PAKISTAN	15	1507563	776157	100504
BRAZIL	1	4887	3384	4887
EGYPT	1	4810	9511	4810
LATVIA	1	305	452	305
OECD countries:				
MEXICO	2	60084	37827	30042
BELGIUM	5	6838	6879	1368
DENMARK	2	1745	10565	873
ITALY	1	850	493	850
NETHERLANDS	3	3899	0	1300
NORWAY	3	1231	964	410
SPAIN	14	63247	39689	4518
TURKEY	16	269546	176519	16847
UNITED KINGDOM	1	835	814	835
Total EUR scrapped 1999	**187**	**6147651**	**3562641**	**32875**
Hereof UNKNOWN	14	5073	3740	362

2.3 The price of a ship

This section includes information about which factors that are important in determining the price of scrapped ships.

The process of selling for scrapping

A ship owner contacts a sales and purchase broker, who finds a buyer for the vessel. This may be for continued operation or for scrapping depending on the market. If the case is demolition the buyer will most often be a cash-dealer, but could also be the ship breaker directly. The cash-dealer buys the ship in his own name ("pays for the ship in cash"). The cash-dealer then sells to the shipbreaking company. These are often owned by steel manufacturers. If not, the scrapped metal may be sold to a re-rolling mill or smelter.

If the buyer is the ship breaker company the owner must arrange transport to the breaking site. If it is a cash buyer the buyer arranges transport. The ship can be sold "as is", often implying that it must be towed to the site of dismantling.

The key driver for the price
The key factor for the price will be the price of scrapped steel. The global decommissioning volume is overall a function of the steel price and the freight rates. High steel prices and low freight rates will lead to a higher scrapping volume and *vice versa.* The relationship between the number of recycled ships

and the price of the steel is clearly seen in Figure below, emphasising this very important factor in determining the number of vessels scrapped.

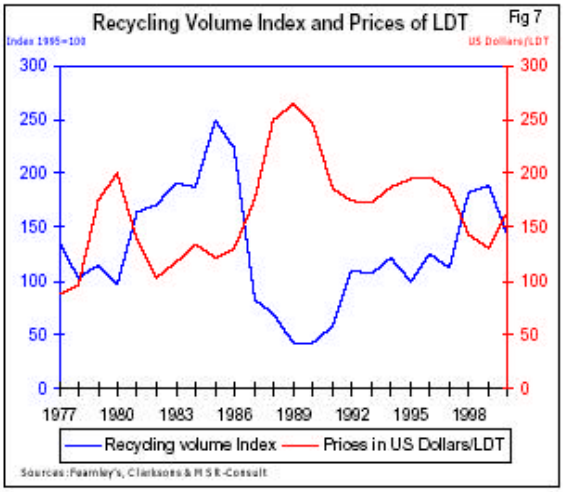


Figure 1. A clear relationship between the number of recycled ships (1995 = index 100) and the price of the steel of the vessel in US Dollars/LDT. Peak prices in 1989 correspond well with few vessels on the demolition market. From BIMCO (2002)

The prices offered by the various shipbreaking companies differ quite remarkably across regions of the world and vary considerably over time. This is due to differences in the costs as well as differences in demand and supply of scrapped steel in that particular region. Obviously, international regulations such as the IMO Regulation 13G requiring phase out of single-hulled tankers and other international agreements will also influence the supply.

How much each of these factors contribute to the specific market conditions of countries and regions is not a matter for this report, but a number of issues that influences the ship scrap value in a particular region can be listed, e.g.:

- availability and cost of labour
- import duties, levies and taxes
- regulations regarding health, safety and environment and their enforcement
- the local demand for used equipment
- infrastructure and capital costs

For some of the countries engaged in scrapping the raw materials supplied to the steel-industry for both re-rolling and re-melting can be a considerable part of the steel used in the country. The shipbreaking is in these countries often viewed upon as a cost-effective way of steel import in addition to the job creation effect. The breaking processes also supply second hand material and equipment for re-use locally and for export.

Price unit

The price unit of scrapped metal is US dollars per LDT. LDT is an abbreviation of Light Displacement Tonnes, which is a measure of the weight of the ship when it does not contain oil, water, fuel, cargo, crew etc. The part of a ship that is steel varies considerable with the type of the ship and the size, but in CEC (2001) as standard size relation is given:

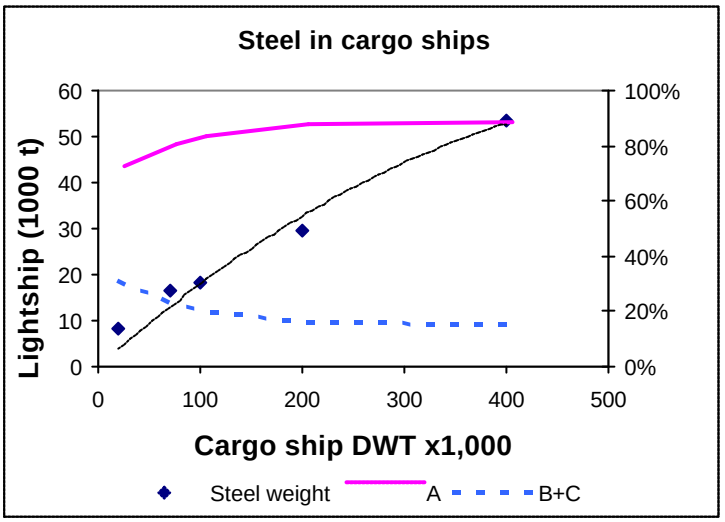
Standard tanker	**120,000 DWT.**	**21,487 LDT**	**15,998 t steel**
Standard bulker	**52,000 DWT.**	**15,158 LDT**	**9,562 t steel**

An equation for calculation of the steel weight of a ship is also given in CEC (2001) based on the contribution of steel from three parts of a vessel equipped and constructed in fundamentally different ways: the cargo (A), the machinery (B) and the accommodation spaces (C).

Lightship = 75% A + 12.5% B + 12.5% C

For a range of cargo ships up to 400,000 DWT the correlation is shown in the Figure below. Cruise ships, Ro-Ro ferries, fishing vessels have somewhat different LDT compared to their DWT (from CEC 2000).

Figure 2. The larger ships have more steel in the easy accessible cargo section (A) relative to machine and accommodation sections (B+C).



The relationships between DWT scrapped and the representing GT have been estimated for the two size categories respectively, and have been found to be (CEC 2001):

Vessels above 10,000 DWT: DWT/ GT = 1.729
Vessels below 10,000 DWT: DWT/ GT = 0.999

Thus, one can estimate the size of the standard bulk carrier of 52,000 DWT to approx. 30,000 GT, with an LDT of 15,000 and a steel weight of 10,000 tonnes.

Size classes

Generally, tankers were classified in 1974 for freight purposes as follows:

- Under 16,500 DWT - Coastal, Small, Harbour/Lake Tankers
- 16,500 - 24,999 DWT - General Purpose Vessels
- 25,000 - 49,999 DWT - Medium Range Vessels
- 50,000 - 79,999 DWT - LR1 (Large Range 1)
- 80,000 - 159,999 DWT - LR2 (Large Range 2)
- 160,000-320,000 DWT - VLCC (Very Large Crude Carrier)
- 320,000 DWT & above - ULCC (Ultra Large Crude Carrier)

In this report "large" will be taken as a tanker >50,000 DWT or corresponding dimension of other types of vessel. Other vessels' carrying capacity may be measured in various units: Bulk carriers also in DWT, container carriers in TEU, cruise ships in 1000 passengers and vessels in general in DWT or GT. The dimensions in terms of depth and length relative to the size unit differ somewhat between types, and also the steel weight per unit is different between types.

Type of ship

The ship type is important in determining the price offered by the ship breaker. Large ships with easily accessible surfaces, such as tankers, are easier to cut in pieces and are therefore more valuable to the shipbreaking companies. More compact vessels with different materials mixed and smaller free surfaces claim lower prices/unit. The value of per ton ship metal can vary up to around 40%, cf. Table 2.3. To a large extent this reflects the ratio of steel weight/LDT with some allowance for the demolition difficulties of the type of vessel.

Table 2.3 Type of ship and value of scrapped metal (to allow comparison only ships scrapped in India are included), 1994-2002

Vessel Type Group	Avg of sales price $/LDT	Index
Tanker	167.3	100.0
Other Dry Cargo	165.1	98.7
Combination Carrier	156.1	93.3
L.P.G.	154.4	92.3
Bulk Carrier	149.9	89.6
Bulk Ore Carrier	138.1	82.5
Offshore Service	102.0	61.0

Source: Clarkson's demolition database, 2002. Tankers are set to index 100. L.P.G. is an abbreviation for a special type of tanker carrying Liquid Petroleum Gas.

Included in the sample used to calculate the numbers in Table 2.3 are only ships from India. This is because the prices differs widely across regions (see below) and because there is a tendency that relatively smaller ships have a higher probability of being sent to an OECD country than do larger ships. It should be mentioned that e.g. in Turkey, the scrap metal price varies only around 10% across types of ships presumably because fewer types and generally smaller ships from a shorter time period are included in the data base.

Other factors

The main factor determining the price is simply the steel weight. Other factors, such as engines, second hand items, the amount of more valuable metals such as copper and aluminium etc. are not very important for the value of the ship. A “guestimate” is that non-steel accessories such as engine, pipes etc. account for 3-4% of the total value of scrapped ships (Personal communication, Clarkson). The possible content of oil and other valuable consumables also plays only a minor part in the price setting.

The management and disposal of hazardous materials plays a more significant role in the price setting at the OECD yards, maybe 5% of the cost. The lack of this cost in Asia does not explain the price difference between OECD and Asia, where it is not an issue at most scrapping facilities. However, for tankers to be broken in India a “gas-free”-certificate is required. This may be a factor

influencing the demolition of the large tankers. Bangladesh and Pakistan, who claims the lion's share of the VLCC and ULCC market, do not have this requirement.

However, it is important whether the ship can go by its own engine or must be towed, and whether it can carry cargo on its way to the demolition place etc. If self-propelled the length of the transport route is less important. Towing is expensive and a towed vessel simply does not come as far up on a beach as a self propelled, and it will be scrapped with less efficiency. Another transport cost is the reused steel to the re-roll mill or smelter, which also plays a role, particularly in EU/OECD, where fewer smelters may be buying steel.

2.3.1 Price differences across countries and regions

A ship broker company (Clarkson's in London) maintains a database, which includes almost all larger ships sent for demolition from January 1st 1994 to May 31st 2002[2]. In total the database has about 3,800 records of ships sent for demolition. Over such a long time span the scrap metal price has varied considerably, but it is still clear that the prices in Asia are generally much higher than the prices offered in OECD countries, cf. Table 2.4.

Table 2.4 Scrap metal prices for various countries with more that 10 recorded demolitions (average over time and types of ship), 1994-2002

Breakup location	Average of sales price US$/Ldt
Bangladesh	160
India	157
Vietnam	156
Pakistan	147
Indian Sub cont	144
China	134
Turkey	83
Spain	56
Mexico	52

Source: Clarkson's demolition database, 2002. "Indian Sub cont." means that it can be from any of the three countries India, Bangladesh or Pakistan.

The only three OECD countries with more than 10 demolitions in the covered period are Turkey, Spain and Mexico. These are also the three countries with the lowest average scrap metal prices offered. For the period 1994-2002 the level for these countries is around 50-80 US$/LDT while it is 140-160 US$/Ldt in Asia. China is slightly lower with 134 US$/LDT being the average price offered.

In the 1980's scrap prices were as low as 50 US/LDT in Asia. An Aframax tanker scrapped in the fall 2001 fetched only $130/LDT. A similar ship, sold to the same buyer one year earlier gave $180/LDT (Clarkson 2001).

[2] Clarkson's database of ships sold for demolition is by themselves estimated to contain >90% of all demolitions. A similar broker company, EA Gibson, estimate their own database to include 80-90% of all demolitions.

Table 2.5 Comparative price estimates for standard tanker (~21,500 LDT) and bulker (~15,100 LDT) in demolition countries.

	Price/LDT	Standard tanker mill. USD	Standard bulker mill. USD
Indian Sub	150	3,22	2,27
China	135	2,90	2,05
Spain	80	1,72	1,21
Mexico	55	1,18	0,83
Italy	70	1,50	1,06

The standard tanker and bulk carrier will command quite different prices in the various shipbreaking regions. Although it is difficult to compare the prices in Europe, which are based on interviews rather than actual market prices, with the Asian prices, the difference of up to 1.2 to 1.5 million USD is a considerable incentive, when the choice of demolition yard is taken.

3 Demand for shipbreaking

3.1 Danish demand

The average age of the Danish merchant fleet in tonnage was 7.0 years as of 1st October 2002 compared to the average age of 12.9 years of the World merchant fleet as of 1st July 2002 (DRF 2002). This implies that Danish owned vessels usually are sold for continued service in other countries rather than sold for scrapping.

Table 3.1 Age and size distribution of the Danish merchant fleet as of 1st October 2002. A subjective "old and large (>50,000 DWT)" category is shown in bold, and in italics "old" vessels larger than approx. 25,000 DWT.

Age yrs	<5		5-9		10-14		15-19		>20		Total	
Size GT	No. of vessels	GT (1000) (1,000)	No. of vessels	GT (1000) (1,000)	No. of vessels	GT (1000) (1,000)	No. of vessels	GT (1000) (1,000)	No. of vessels	GT (1000) (1,000)	No. of vessels	GT (1000) (1,000)
100-299	0	0	1	1	5	1	5	1	64	12	75	15
300-499	2	1	2	1	0	0	3	1	31	13	38	16
500-999	2	2	0	0	1	1	6	6	36	28	45	37
1,000-	2	4	8	12	18	27	28	41	46	68	102	152
2,000-	6	17	11	31	8	21	8	20	18	45	51	134
3,000-	1	3	4	15	7	23	3	11	3	10	18	62
4,000-	9	42	2	10	10	45	2	9	3	15	26	121
6,000-	7	45	2	16	1	8	2	13	1	7	13	89
8,000-	0	0	1	9	1	9	0	0	0	0	2	18
10,000-	6	79	7	91	8	103	3	37	7	86	31	396
15,000-	0	0	5	92	5	89	*2*	*33*	*4*	*67*	16	281
20,000-	14	354	4	98	6	148	*0*	*0*	*4*	*88*	28	688
30,000-	6	181	3	103	5	220	**0**	**0**	**1**	**34**	15	538
50,000-	32	2,364	9	688	12	626	**0**	**0**	**0**	**0**	53	3,678
100,000-	4	638	2	317	0	0	**0**	**0**	**0**	**0**	6	954
Total	91	3,730	61	1,484	87	1,321	62	172	218	473	519	7,180
GT in %		51.9		20.7		18.4		2.4		6.6		100.0

Ships are on average approx. 25 years old when scrapped based on data from 1992-1999 ranging from 22.4 to 26.9 depending on the type of vessel (CEC 2001).

A very important factor in determining the fate of an aging ship is the cost associated with taking the vessels through a survey (5th special survey), which is part of the phase-out mechanisms built into MARPOL Annex I (Regulation 13) to the convention. This is a condition for operating the ship beyond its

25th year (BIMCO 2002). The Danish fleet includes very few ships for which this scrap mechanism is relevant.

3.2 European and OECD demand

The following information is mainly derived from the feasibility study performed by DNV and Appeldore International on behalf of CEC (2001). In CEC (2001) the distribution of vessels scrapped in 1999 by flag state is provided. For the purpose of identifying tonnage for input to European scrapping facilities, this has been separated into geographical Europe and the European OECD member states. The large difference is due to the flag states Malta and Cyprus, which are not OECD members.

Table 3.2 European registered vessels compared to the global number reported scrapped in 1999 (from CEC 2001).

Ships	Number	DWT	GT
Global	630	17,303,964	10,256,797
Geographical Europe	186	6,146,516	3,554,791
European OECD members	84	2,404,184	1,348,261

The number of vessels scrapped undoubtedly exceeds the European capacity for shipbreaking. With an average size of some 30,000 DWT and common fleet profile, a number of vessels will be considerably larger than any of the present shipbreaking facilities in Europe and larger than most of the ship yards.

An increase in no./ tonnage of vessels requiring scrapping is predicted over a fifteen year timescale from 2001 – 2015 (CEC 2001). The predicted average annual scrap volumes for the merchant ship fleet in Europe are:

- 107 – 247 ships
- 4.3 – 11.1 million DWT
- 2.9 – 7.4 million GT
- 0.86 – 1.48 million tonnes steel

Of the number of European ships scrapped in 1999 66 % was scrapped in non-OECD countries. This represents some 93 % in terms of tonnage (CEC 2001).

3.3 Global demand forecast

In 1992-1999 between 2 and 4% of the world fleet was scrapped annually (CEC 2001).
The forecast of world demand for shipbreaking has been investigated in a recent report from the shipping association BIMCO (2002). Two scenarios for the future scrapping up to 2016 were outlined based primarily on the existing breaking capacity on the Indian subcontinent:

The "Base Case" scenario: Tankers are decommissioned continuously, e.g. due to "mixed" market conditions within the time frame defined by the revised IMO Regulation 13G.
The base case scenario toward 2016 predicts that the annual volume of ships for decommissioning (vessels >2000 GT) will range from 6 to 8 million LDT (the Base case scenario).

The "IMO Case" scenario: Tankers are decommissioned at the latest point in time according to the revised IMO Regulation 13G, increasing the tanker decommissioning in 2004-2007.
According to the BIMCO report the recycling of tankers during the first six months of 2002 has exceeded the level assumed in the IMO Case scenario. A continuation of this tendency as well as the possibility of decommissioned tankers being rebuilt into, e.g. off shore oil and gas production (FPSO or FSO ships) could remove sufficient tonnage before 2005 to eliminate the likely global capacity constraints in the IMO Case scenario.

3.3.1 Summary

A Danish "problem vessels" would be both large (>50,000 DWT or 30,000 GT roughly corresponding to 10-15,000 LDT) and more than 20 years old, because such a vessel statistically is up for demolition within a few years. Only one of the Danish owned vessels as of 1st October 2002 fulfil these criteria, whereas 15 are >20 years old and larger than 10,000 DWT.

The base case scenario toward 2016 predicts that the global annual volume of ships for decommissioning (vessels >2000 GT) will range from 6 to 8 million LDT (the Base case scenario).

4 Shipbreaking capacity

4.1 Danish capacity

The principle Danish ship breaker is Fornaes Shipbreaking with a yard in Grenaa. The annual capacity is up to 10,000 GT (17,000 DWT) with a maximum length of 100 m roughly corresponding to 4-5 vessels of 2,000 GT. Most vessels broken until now have been smaller fishing vessels.

Denmark has a dormant capacity, e.g. in the dry dock in Nakskov and in Frederikshavn. The companies have not performed shipbreaking.

4.2 OECD capacity

The capacity for shipbreaking in EU and Europe has been assessed in CEC (2001). It was shown that regarding active shipbreaking yards the capacity was much lower than the demand if native vessels were to be recycled in EU or geographical Europe. Both in terms of number of vessels and dimension the capacity was exceeded. For the largest vessels (tankers approaching 400,000 DWT) only the dock in Gdynia, Poland, is sufficiently large. It is engaged in new-buildings and has not performed shipbreaking.

In the OECD countries only little capacity is left. Here the results of the survey of European OECD countries, and of other OECD countries previously active in shipbreaking such as Mexico, Turkey, Japan and Korea. A report directly addressing the shipbreaking capacity in the OECD is mentioned on the DNV homepage, but due to client restrictions it is not yet available. The above information is based on summary information in CEC (2001). No investigation on the possible capacity of Canada, France, Germany, UK and other OECD countries has been since they have a "high-cost" profile and no record of shipbreaking. The authorities in USA responsible for the obsolete Navy vessels have licensed four companies to do ship scrapping.

The direct parameter governing the capacity is the physical dimensions of the pier or yard and the depth of the harbour. But also other issues influence the overall possibilities of operating a shipbreaking yard, amongst these the demand for recycled steel (re-rolled and re-melted), used ship equipment, the availability of skilled/unskilled labour force and other infrastructure necessities.

Through some of the interviews carried out during the inception phase it has become apparent that the facilities might be present even though there is no or only limited track record of shipbreaking at a given yard (or country), and vice versa. A series of interviews have therefore been carried out - either by email or via telephone.

4.3 Countries

4.3.1.1 Spain

In Spain several ship yards along the Northern coast (mainly Asturias province) offer shipbreaking, presently directed at demolishing obsolete vessels of the large Spanish fishing fleet. The activity has declined dramatically since mid 1980íes due to stronger competition from outside Europe and in particular outside OECD territory. At present, dismantling facilities still exists in Asturias (2), Santander (1-2), Bilbao (1-2), Galicia (1-2) and Coruna (1). A number of yards contacted had in fact limited recent experience, but were still on the market for shipbreaking.

The majority of the yards are relatively small with approx. maximum length of the vessel of 100 m. One yard *Desguaces de la Arena*, which was inspected, had a pier capacity of 200 m and a history of scrapping vessels of this size. However, depth in the approach canal limits the capacity to vessels with a draught of 6 m. With respect to handling the environmentally hazardous waste in a safe and sound manner most yards makes use of a licenced disposal company. The inspection suggested that several issues regarding environment and health must be addressed to comply with draft guidelines.

4.3.1.2 Mexico

Mexico is on the top 3 of OECD countries with respect to actual shipbreaking in OECD the last 8 years. The main cluster of ship breakers are in the Tampico and Tuxpan area. However, the Mexican shipbreaking industry is not very active at the moment. No inspection was performed due to time constraints and barriers at the yards.

One Mexican ship breaker appeared to have gone through an upgrade of the yard in order to be able to bid for the decommissioning programme for US Navy ships. The company was screened from the bidding and has recently ceased with shipbreaking and functions exclusively as a maintenance and repair yard. When it was active the company did pier breaking and were able to handle vessels up to 220 m long (Panamax size).

4.3.1.3 Turkey

The beach shipbreaking activities in Turkey are not very old and it was anticipated that a dormant capacity in terms of pier/dock breakers could be found. Despite the efforts of the Turkish Chamber of Shipping and the Turkish embassy in Denmark no information is available from the Turkish Association of Ship Breakers or the "Undersecretariat for Maritime" in Turkey. All listed ship breakers in Turkey are situated in association with Aliaga beach.

4.3.1.4 Portugal

It is apparently a very limited amount of shipbreaking that takes place in Portugal. Not only are two vessels recorded as scrapped and demolished in Portugal over the last 8 years. The company *Joao Luis Russo & Filhos Lda.* were interviewed but they are no longer active in shipbreaking and did not know of any other Portuguese company that is currently active. Furthermore, the two recorded demolitions were carried out in 1995 and 1996 so it could appear as if the capacity in Portugal no longer exists.

4.3.1.5 Italy

In Italy there are a few ship breakers with the capacity to do shipbreaking of oceangoing vessels. Most are clustered around Naples, which according to

one of the ship breakers interviewed is the only harbour in the country with a license to do shipbreaking. Two companies were interviewed, *Rotrafer* and *Simont*. Both companies employ pier breaking with breaking of the keel in a floating dock or dry dock. The quay length is approx. 200 with an option at *Simont* to rent up to approx 300 m length. The maximum vessel dimensions must be evaluated case by case.

Upon inspection at *Simont* in Naples it was stated that a 330 m dock is available. Their capacity is some 70-80 thousand tonnes steel per year corresponding to 14 vessels of 25,000 DWT (present turnover approx. 30 thousand tonnes by some 30 vessels). The company has an ISO 9001 certification. Most contact with authorities regards workers environment to agencies ASL and ISPESL and to local government of Regione Lombardia.

4.3.1.6 Greece

Several companies have been contacted in Greece as has the Greek Embassy in Copenhagen. Shipbreaking is reportedly very limited if it even exists. This is perhaps surprising given that the Greek hold by far the largest tonnage among BIMCO members and given that BIMCO represents about 66% of the world tonnage.

4.3.1.7 Netherlands

In the Netherlands a ship scrapping company, called *Scheeps Sloperij Nederland* is available at a location in Gravendeel. They are capable of handling (maily inland) vessels and coasters up till 100 meters length and a depth of about 6 meters. The Netherlands authorities report that the company scraps in an environmental sound way, including facilities to prevent water pollution, oil/watertreatment system, asbestoshandling (if necessary), etc.

There are no yards to dismantle large tankers or cargo ships in the Netherlands. In theory some repair yards might have the facilities to dismantle large sea going vessels in a dock, but these docks are not capable of handling the VLCC or ULCC types
(Luttikhuizen, 2002).

4.3.1.8 South Korea and Japan

South Korea and Japan, which were actively engaged in ship recycling in the early 1980's have completely withdrawn from the scene. No active shipbreaking could be identified in either country. One company in Hiroshima demolish salvaged wrecks and fishing boats, but does not have the capacity for larger vessels and have no wish to be inspected.

4.3.1.9 Poland

The large ship building and repair industry in Gdynia/Gdansk has the capacity, but there is no active shipbreaking in Polish yards. The ship building industry in Poland has recently been under financial reconstruction.

4.4 Global scale

The global current capacity can be estimated to range between 7.7 mill. LDT and 9.4 mill. LDT. On a global scale the capacity, including the all existing shipbreaking sites, no constraints in global shipbreaking capacity are foreseen. If additional tankers are phased out, according to the "IMO Case" scenario, capacity constraints could arise in 2005 and into 2006 depending on the possible mobilisation of dormant capacity.

4.4.1 Summary

Denmark has at present no capacity to demolish ships with the size profile of it's merchant fleet.

Within OECD the present capacity for shipbreaking is relatively small and the existing capacity cannot demolish large vessels (>50,000 DWT). Even breaking up of vessels larger than 25,000 DWT may require modifications at the demolition yards. Unless dormant capacity is revived in OECD larger vessels must be broken elsewhere. At present the only OECD potential capacity for large tankers e.g. VLCC and ULCC, is the beaching in Turkey, which may in reality not be suitable due to lack of tidal gauge, unconfirmed facilities in Mexico, and a yard in Poland, which is not engaged in demolition.

On a global scale the capacity, including the all existing shipbreaking sites, no constraints in global shipbreaking capacity are foreseen. If additional tankers are phased out, according to the “IMO Case” scenario, capacity constraints could arise in 2005 and into 2006 depending on the possible mobilisation of dormant capacity.

5 Inspection at two OECD yards

The HSE relevant conditions at the two companies offering have been assessed by inspection of the facilities, documentation available on site and interviews with the owners and employees.

The Basel Convention Draft Guideline, *Technical Guidelines on Environmentally Sound Management for Full and Partial Dismantling of Ships (draft May 2002),* have been prepared with the intention of providing guidance to countries which have or wish to establish facilities for ship dismantling. Recognising that OECD countries were not the prime target the facilities in OECD must nevertheless comply with the same demands for ESM. Table 11 of the Draft Guideline (*Generic checklist for closing the gaps – achieving ESM-compliance*) addresses the issues to be dealt with within one year, one to five years and five to ten years, and the two facilities in Spain and Italy has been evaluated relative to this table. In the case of the OECD yards the time scale mentioned in the column heads should only be taken as indication of urgency, not the actual time span allowed for complying with the ESM demands.

Although, no guideline for ship dismantling has been available in the past it was expected that no "violations" of column one would be found, very few in column two, while the issues of column three could be less stringent complied to. The use of "compliance" refers only to the issues of table 11 in the draft guideline.

5.1 Spain

A. IMPLEMENTATIION OF ACTIONS IMMEDIIATELY – AT THE LATEST WITHIN ONE YEAR	B. WITHIN ONE TO FIVE YEARS	C. WITHIN 5 TO 10 YEARS AT THE LATEST	Spanish demolition company, Asturias
Physical identification and labelling of hazardous materials on board	Adequate transfer operations facilities	Impermeable floors wherever hazardous materials and wastes are handled	A. Compliance B. Non-compliance C. Non-compliance
Cleaning of oil tanks/compartments before hot work commences	Spill containment boom	Adequate draining and pumping equipment	A. Compliance B. Non-compliance C. Non-compliance
Use solvents to dissolve heavyweight sludge so that most oil and sludge can be pumped out	Minimise use of manual labour inside the tanks for removal operations (use of pumps)	Provide adequate treatment/ disposal facilities for the different hazardous materials	A. Compliance B. Compliance C. Hazardous materials removed by licenced company
Ventilate compartments/tanks continuously	Provide adequate storm water discharge facilities, to avoid contamination of storm water runoff	Spill cleanup equipment	A. Compliance B. Non-compliance C. Non-compliance
Introduce a hot work certification system	Create an enclosed chamber in the ship where asbestos has been identified. Limit access. Filter air emissions	Create a separate area for paint removal operations, with impermeable floor. Cover and install air filtration	A. Compliance B. Compliance C. Non-compliance
Test compartments for presence of flammable vapours before hot work	Create dedicated area for asbestos removal. Limit access	Create a dedicated area for segregation of hazardous materials (e.g. PCBs)	A. Compliance B. Compliance C. Compliance
Provide adequate storage facilities for hazardous wastes	Collect and contain all wastes resulting from asbestos removal processes. Pack asbestos in approved packaging system	Complete containment/ impermeable floors	A. Non-compliance B. Compliance. Packaging not inspected. C. Non-compliance
Test compartments for presence of toxins, corrosives, irritants before entrance (manual cleaning)	Decontaminate workers when leaving the asbestos removal area		A. Compliance B. Non-compliance
Identify and remove toxic or flammable paint prior to metal cutting			A. Non-compliance
Collect and contain all wastes resulting from paint removal processes			A. Non-compliance
Spill cleanup and notification procedures			A. Non-compliance
Always wear rigid helmets, hard-toed shoes and gloves, as well as personal protective equipment for eyes, face and skin			A. Compliance. Equipment available, but use must be enforced

Use appropriate protective equipment against respiratory hazards			A. Compliance
Keep fire extinguishing equipment immediately available			A. Compliance
Implement appropriate asbestos management procedures in accordance with ILO code of practice			A. Compliance
Work with asbestos should be carried out by trained personnel only			A. Compliance
Determine pollutant concentrations prior to removal of bilge and ballast water			A. Non-compliance
Remove and dispose of PCB-containing material in a controlled manner			A. Non-compliance.

The overall impression is that most required safety and protective gear was in place, although not fully used in accordance with regulations. The facility was so small that no safety organisation was in place. The different waste fractions were separated, although only cables and certain types of metals were kept in bottom-closed containers. All other waste fractions were disposed directly on the ground. The facility operates presumably in accordance with Spanish regulations, but the overall impression is that the facility is under close-down due to constant stronger competition from non-OECD facilities on the commercial and much more profitable market for ship dismantling.

5.2 Italy

A. IMPLEMENTATIION OF ACTIONS IMMEDIIATELY – AT THE LATEST WITHIN ONE YEAR	B. WITHIN ONE TO FIVE YEARS	C. WITHIN 5 TO 10 YEARS AT THE LATEST	Italian demolition company, Napoli
Physical identification and labelling of hazardous materials on board	Adequate transfer operations facilities	Impermeable floors wherever hazardous materials and wastes are handled	A. Compliance B. Compliance C. Compliance
Cleaning of oil tanks/compartments before hot work commences	Spill containment boom	Adequate draining and pumping equipment	A. Compliance B. Compliance C. Compliance
Use solvents to dissolve heavyweight sludge so that most oil and sludge can be pumped out	Minimise use of manual labour inside the tanks for removal operations (use of pumps)	Provide adequate treatment/ disposal facilities for the different hazardous materials	A. Compliance B. Compliance C. Hazardous materials removed by licenced company
Ventilate compartments/tanks continuously	Provide adequate storm water discharge facilities, to avoid contamination of storm water runoff	Spill cleanup equipment	A. Compliance B. Storm water facilities not inspected C. Compliance
Introduce a hot work certification system	Create an enclosed chamber in the ship where asbestos has been identified. Limit access. Filter air emissions	Create a separate area for paint removal operations, with impermeable floor. Cover and install air filtration.	A. Compliance B. Compliance C. Cover and air filtration not used. Personnel protective equipment available
Test compartments for presence of flammable vapours before hot work	Create dedicated area for asbestos removal. Limit access	Create a dedicated area for segregation of hazardous materials (e.g. PCBs)	A. Compliance B. Compliance C. Compliance
Provide adequate storage facilities for hazardous wastes	Collect and contain all wastes resulting from asbestos removal processes. Pack asbestos in approved packaging system	Complete containment/ impermeable floors	A. Compliance B. Compliance C. Compliance
Test compartments for presence of toxins, corrosives, irritants before entrance (manual cleaning)	Decontaminate workers when leaving the asbestos removal area		A. Compliance B. Compliance
Identify and remove toxic or flammable paint prior to metal cutting			A. Compliance
Collect and contain all wastes resulting from paint removal processes			A. Compliance
Spill cleanup and notification procedures			A. Compliance
Always wear rigid helmets, hard-toed shoes and gloves, as well as personal protective equipment for eyes, face and skin			A. Compliance
Use appropriate protective equipment against respiratory hazards			A. Compliance
Keep fire extinguishing equipment immediately available			A. Compliance

Implement appropriate asbestos management procedures in accordance with ILO code of practice			A. Compliance
Work with asbestos should be carried out by trained personnel only			A. Compliance
Determine pollutant concentrations prior to removal of bilge and ballast water			A. Not assessed. Procedures of Porto di Napoli applies. Bilge water removed by licenced company.
Remove and dispose of PCB-containing material in a controlled manner			A. Compliance. Procedures available, no PCB identified yet.

The inspection did not take place during an actual demolition, and a case cannot be made regarding the organisation of the actual work. However, the manuals and procedures available apparently address all relevant issues regarding workers health and safety. The developed procedures have been driven by considerations for workers environment. Improvements in terms of environmental issues have not yet been addressed by local authorities and the screening carried out suggests that management of Halons, CFCs, HCFCs, PVC and PCB should be improved. However, the general impression is that the company has a good organisational structure, a competent back-up facility in the Port of Naples, that is complies with national regulations and that the improvements needed in terms of compliance with Basel Convention issues are minor.

6 Conclusions

Denmark
Denmark has a shipbreaking capacity working on smaller fishing vessels, but not for larger vessels. There is a dormant capacity in the existing dry docks.

OECD
Within OECD the present capacity for shipbreaking is relatively small and the existing capacity cannot demolish large vessels (>50,000 DWT). Even breaking up of vessels larger than 25,000 DWT may require modifications at the demolition yards. Vessels smaller than 25,000 DWT may be demolished without modifications to the facilities (annual capacity in Italy is approx. 14 vessels).

Demand/Capacity
The present possibilities for using OECD yards complying with environmentally sound management (EMS) in shipbreaking are limited. "Problem vessels" exceeding the dimensional capacity of the possible yards would be large (>30,000 GT roughly corresponding to 50,000 DWT and 15,000 LDT).

Danish demand
One of the Danish owned vessels as of 1st October 2002 fulfil these criteria for exceeding the available dimensions (of an Italian shipbreaker facility applying EMS). There are eight Danish vessels >20 years old and between 25,000 DWT (~15,000 GT) and 50,000 DWT as of 1st October 2002 for which modifications to the facility may be needed.

EU/OECD demand
The number of vessels from European OECD that is scrapped annually exceeds the European OECD capacity for shipbreaking by far. Although, the majority of the fleet (in numbers) can be scrapped in European OECD a number of the vessels will be considerably larger than any of the present shipbreaking facilities in Europe and larger than most of the ship yards.

Unless dormant capacity is revived in OECD larger vessels must be broken elsewhere. At present the only OECD capacity for large tanker e.g. VLCC, is the beaching in Turkey, which may in reality not be suitable due to lack of tidal gauge, and a yard in Poland, which is not engaged in demolition.

EMS
The guideline on Environmentally Sound Management of ship breaking activity recently approved by the Basel Convention addresses a number of issues related to the health and safety of workers, to the protection of the environment and the general management of hazardous waste. Two facilities, one in Spain and one in Italy, have been visited during the project, and the screening of compliance with the Basel Convention guidance document is given below.

Spain
The overall impression of the yard inspected in Spain is that most required safety and protective gear was in place, although not fully used in accordance with regulations. The different waste fractions were separated, although not stored according to the guidance document. All other waste fractions were stored directly on the ground. The facility operates presumably in accordance with Spanish regulations, but the overall impression is that ship dismantling is not followed closely by authorities. The improvements needed in terms of compliance with Basel Convention environmental issues will be significant.

Italy
The general impression of the company in Italy is that it has a good organisational structure addressing most of relevant issues, and that a competent back-up facility exist in the Port Authority of Naples. The procedures seems in compliance with national regulations and it is concluded that the improvements needed in terms of compliance with Basel Convention environmental issues are minor.

Value and cost
The scrap value of a ship is determined by the steel resale price and the size and type of the vessel. Engines, reusable items, bunker oil, the amount of more valuable metals such as copper and aluminium etc. account for only 3-4% of the total value of a scrapped ship. From this scrap value the buying price is determined by the costs: mainly labour, other operational costs, e.g. hazardous waste management and transport.

A main cost of breaking up a ship is the cost of labour. Capital costs play a role, but only limited investment takes place in the OECD. The management and disposal of hazardous materials plays a significant role in the price setting at the OECD yards, maybe 5% of the cost, in addition to other operational costs.

The lack of this cost alone does not explain the price difference between OECD and the Asian countries, where hazardous waste management is not an issue at most scrapping facilities. Lack of management of hazardous conditions may, however, have been a factor influencing the demolition of the large tankers. Bangladesh and Pakistan, who claims the lion's share of the VLCC and ULCC market, do not requires “gas-free”-certificates for tankers. This is mandatory in neighbouring India.

The transport distance to the demolition yard is a factor for the price, but it is far more important that the ship can go by its own engine. Otherwise the ship must be towed, which is expensive and complicates the beaching of vessels. Another transport cost is the reused steel to the re-roll mill or smelter, which also plays a role, particularly in EU/OECD, where fewer smelters may be buying steel.

In summary
The Danish demand for demolition of large ships may to a large extent be met by a facility in Naples, Italy, providing environmentally sound management of the ship breaking process. Based on the field trip to the facility it is able to accommodate the larger vessels with modifications to the facility, but this must be evaluated case by case. The present annual capacity corresponds presently to 14 vessels up to 25,000 DWT.

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Appendices

Spain

Inspection of Desguaces de la Arena ship dismantling facility, Northern Spain.

One of the identified ship dismantling facilities in Northern Spain was visited and audited on 18 September 2002. Along the Spanish coastline, dismantling of ships has long traditions. However, the activity has declined dramatically since mid 1980íes due to stronger competition from outside Europe and in particular outside OECD territory. At present, dismantling facilities still exists in Asturias (2), Santander (1-2), Bilbao (1-2), Galicia (1-2) and Coruna (1). None of these facilities are organised in association or similar industrial structures.

The company Desguaces de la Arena placed in Soto Del Barco in the Asturias Region of Spain was founded in 1975 as a family company. The facility was erected on nature land by establishment of new quarry areas with backfilling erecting a land surface of approximately 18,000 m2. In the period since 1975, the facility has dismantled more than 300 ships equal to approximately 8-10 ships a year in average. However during recent years most of the dismantling facilities in Spain have focussed on subsidised dismantling of fisherman ships. Back in 2001, the latest major ships was dismantled at the facility (80-m and 12-m width ship, totalling 2,110 tonnes). The primary dismantling has been concentrated to former Russian military ships in various classes and sizes with a maximum of 220-m in length. In peak period (1980-1990) more than 60 workers were employed at the facility. At present only 4 workers are permanently employed.

As the facility is placed as an inlet facility (access through an inlet channel from the Atlantic Sea - approximately 1.5 km), the depth of the inlet channel dimension the size of ships available for dismantling. At present, the inlet channel has a maximum depth of 6-m.

The facility is placed in an area of traditional dismantling activities. In 1970íes not less that 4 different facilities were placed side by side. However, the only existing facility - Desguaces de la Arena - has since the establishment been placed solely on the eastern bank of the inlet channel.

Auditing Procedure

The site visit/auditing procedure was performed as a combination of forwarded questionnaire (appendix A) and detailed interview by Managing Director Mr. Alberto Garcia in combination with a site walk-over.

The Managing Director was quite open sharing information, and provided whatsoever documentation on request (e.g. dates for authority site visit, air photos documenting former activities and names of waste recipients for further contacting if found necessary. The company has fulfilled the

forwarded questionnaire the best way possible as a family owned company with limited resources and in-depth knowledge on auditing procedures. The company ensures for updated information e.g. new regulations, standards, accounting principles etc. through their own managing board and through affiliated contracted consulting services.

General Impression

The overall impression of the facility is an inconsistency in good housekeeping, although recognising that this type of activities traditionally is in need of sufficient space for further processing of the dismantled plates, cables, etc. The site area was surrounded by fence, and immediate after entrance the auditor was approached by managing workers. The ownership structure - family owned company - makes the facility vulnerable for significant improvements due to limited human and financial resources. The close-down of the three neighbouring ship dismantling facilities through the last decade is an example hereof.

The capacity of the site range from 2-4 smaller fisherman ships as the lowest affordable level of activity (present level) to 10-12 pcs of up to 220-m length ships. However, due to lack of sufficient skilled working force, the maximum level will hardly be accessible without substantial education of works man in e.g. welding. The present capacity is also restricted due to decreasing possibilities for recycling of secondary waste (machineries, radars etc). These components have due to increasing state subsidiaries, hardly any value longer, why the attractiveness of dismantling ships are almost solely related to world market price on steel.

The 95%-fractile dimensioned income from dismantling of ships - recyclable steel - is sold through intermediate due to relatively minor annual production. In the past, the facility sold directly to recycling factories in the region. The revenue costs for recycled steel per tonnes was 90 EUR in August 2002 and 87 EUR in September 2002.
The facility operates under different procedures depending of the origin of the ships allocated for dismantling:

- Dismantling of fisherman ship, restricted market;
- Dismantling of other ships, free market.

Subject: Fisherman ships. Dismantling of fisherman ships are restricted market due to heavy state subsidies (EU support to lay-off of fisherman ships). The ships are received, but hardly any prepayment is launch until the dismantling is completed. The facility has 3-month from the incoming of the ship until the dismantling process must be completed by authority inspection.

The facility must initially make a certification of the ship, that no off-gasses are present before any dismantling activities. This certificate is performed by the facility through an authorised person. During the period of dismantling, the facility should accept to have both announced and non-announced inspections of the following authorities;

- Government of Asturias;
- Government of Spain;
- Police;

- Environmental authorities;
- People Control (working environment).

As an example of the regularity of these inspections, the auditor in below has presented a list of inspections carried out by the most frequent authorities visiting the facility - People Control (working environment, health and security) in the period of 1978-2002;

- 14 September 1978;
- 30 October 1981;
- 8 July 1987;
- 27 December 1987;
- 21 April 1989;
- 11 December 1989;
- 6 February 1990;
- 19 October 1990;
- 19 December 1990;
- 13 November 1995;
- 10 April 2000.

In the period from 1980-90, the authorities performed 8 visits, but in the decade 1990-2000 only 2 visits reflecting the dramatically fall in dismantling activities during that period.

The managing director of the facility emphasised that the company has not track record of any major problems with the authorities and has no track record of restricted orders for improvement during the entire period of operation (almost 30 years). The auditor made a control by looking through all official signed authorities record (copies to the facilities from above implemented inspections), and can confirm that no immediate restricted orders were outlined in the documentation.

Subject: Larger ships from the "commercial" market. Dismantling of larger vessels from the commercial market operates in a more "free form". The facility will and has only received vessels where all papers have been in accordance with "normal procedures". The facility only has to fulfil the gas free certification. Dismantling of such ships seems to be under slightly looser control by authorities due to less mandatory requirements informing authorities about such activities (start document, medium term inspections (often not carried out) and completion document (no inspections). In principle such activities can undergo with only one inspection beside whatsoever non-announced inspection which according to above listed dates can be in-between years.

The facility claimed to be in possession of a dry-dock, which was inspected. The "dry-dock" was an emptied side-channel which at low tide could allow cutting or larger fraction on dry land. There was no supportive facilities at the "dry-dock" area, which although could be connected to the fact, that this area in latest year main was used a reserve area for ships waiting for dismantling. The "dry-dock" area is not in a condition justifying allowances for dry-dock dismantling activities. Certain improvements are needed prior to such certification.

Waste handling

Dismantling of ship is a necessity due to constant ageing of ships, change of standards for bulk carrying etc. The dismantling activity will inevitably generate different kind of waste and waste streams. Depending of the magnitude of generated and/or produced waste dismantling facilities perform their own services or operate through intermediating companies. The visited facility works only through intermediating companies.

Initially, all content of oil is pumped to a 2 tank on-land system, which in emptied on regularly basis by an authorised company Vigon (subsidiary of the authorised and obligatory company Cogersa, which operates in the Asturias province under the supervision of the authorities). The oil also works as an income source for the company.
Any produced clean metal is sold through intermediating company for recycling (income source). The metal was placed on pure uncovered ground (originally infill material).

Wood (all kinds - clean, painted, impregnated) are sold directly to privates by the company (income source). The wood was kept in stables for further processing.
Steel - sold through intermediating company (largest income source). The steel was placed on pure ground.

Machinery and or auxiliaries are sold in case of profit; otherwise the items are more or less without any control (partly stored on the area alternatively presumably disposed off somewhere). The machineries and other auxiliaries were placed directly on the unprotected ground.

Cables are sold through intermediating company. The price on cables depends on the cleanness of the cables. No immediate information accessible on incentives to keep "dirty" cables instead of "clean" cables. The cables were stored in top opened iron containers.

Additional waste (insulation, various metals, wires etc) must be disposed of through an authorised company Cogersa, licensed to operate in the Asturias Province of Spain, which according to the managing director makes up a monopole situation leading to increasing prices and no competition. The additional waste were mixed together and stored directly on pure ground.

Mandatory reporting requirements

The facility must make the following annual reporting to relevant authorities.

- Annual MARPOL document for the Spanish authorities outlining which activities have been undertaken and waste disposed of;
- Annual report to Government of Spain outlining the amount of oil disposed of through Vigon (company of Cogersa) and amount of steel sold for recycling.
- In connection with dismantling activities the certification for hot work, completion certificate and normal track recording of waste streams is mandatory although it seems as the facility as such is not operated under a license outlining e.g. environmental demands for operation.

Occupational Health and Safety

The facility was during the auditing operating in lowest possible mode (4 workers and 2 managerial persons). The officers performing cutting was wearing gloves, boats, special clothing and partly helmet and air-breathing protective gear. They also wear eye protective gear while cutting. However, the equipment seemed old and not fully updated. The cutting was only performed in the free and partly on plan surfaces while others were working on unstable ground cutting up the dismantled steel plates.
At the facility in total 4 workers was performing dismantling of fisherman ships. The workers are divided into 3 categorises;

- 1st officer - Performs cutting and training of 2nd and 3rd officers;
- 2nd officer - also performs cutting, but are not in charge;
- 3rd officer - makes no cutting.

The pressure bottles were secure and areas for refilling fenced not allowing the larger central pressure tank to have physical contact with torch gas.
The overall impression is that most required safety and protective gear was in place, although not fully used in accordance with regulations. The facility was so small that no safety organisation was in place. The different waste fractions were separated, although only cables and certain types of metals were kept in bottom-closed containers. All other waste fractions were disposed directly on the ground. The facility operates presumably in accordance with Spanish regulations but the overall impression is that the facility is under close-down due to constant stronger competition from non-OECD facilities on the commercial and much more profitable market for ship dismantling. The owner (son of the original founder of the company) has no plans for future expansion or taken over by others. The company will most likely operate on dismantling of fisherman ships under the EU-regulations on fishing fleet, and ultimately close down the activities hereinafter.

The company is an excellent show case outlining the consequences and impacts on in-side OECD dismantling capacity from a competitive market mainly driven by non-OECD placed facilities with far less official control. The two-sided market with a subsidised programme for fisherman ships with the EU-region and a commercial market must be tighten up together in an OECD context allowing the remaining few facilities within OECD with a potential as host facilities for larger ships/vessels to operate on proper commercial conditions encouraging the companies to perform necessary investment into new equipment, still improving working conditions and waste handling procedures.

Options for Improvement

If the Desguaces de la Arena plot should serve as commercial and advisable facility for e.g. dismantling of Danish ships, the below mentioned recommendations for improvements should be enforced and implemented;

- Establishment of authorities procedures in a clear context and format, including clear agreements with not only National authorities, but also provincial authorities in e.g. Asturias;
- Improved documentation of waste streams;

- Establishment of a formal safety organisation on the plot;
- Improve house keeping strongly related to imposed guidelines for waste stream handling routines and dispose-off;
- Clear and consist cooperation between involved authorities and e.g. the Basel Secretariat due to possibilities for export of hazardous substances.

Assessment of Basel Draft Guideline (TWG 19, Revision 2) Compliance

Assessment of the compliance with Basel TWG 19, revision 2 technical guideline is performed in accordance with Table 11 on "Generic checklist for closing the gaps - achieving ESM-compliance".

Focus area	Existing practise and standards	Assessment of compliance with 1, 5 and/or 10 year recommendations for implementation actions.
Physical identification and labelling on boards	identification implemented, but labelling missing	Upgrading on labelling required for 1-year compliance. Substantial improvements in establishment of transfer operation facilities needed for 5-year compliance. Full lining required in HW management areas for 10-years compliance.
Cleaning of oil tanks/compartments before hot work commences	compliance due to oil collecting tanks and gas certification before hot work commencement	Establishment of spill boom needed for 5-years compliance. Improvement of draining and pumping facilities required for 10-years compliance.
Use solvent for dissolve heavyweight sludge (accessible for pumping)	Not immediate sludge treatment due to minor problem area	Facilities for containment of solvent and dissolved sludge required for both 1 and 5/10 years compliance.
Ventilate compartments/tanks continuously	Not active ventilation installed, only passive	Facilities for activated ventilation required for both 1 and 5/10 compliance. Furthermore establishment of storm water and oil spill boom required for 5 and 10-years compliance.
Introduce hot work certification	Has own system with 1st, 2nd and 3rd Officers	Official certification (closely related to OH&S in general) required for 5 and 10-years compliance.
Test of compartments for presence of e.g. off-gasses	Existing gas certification at commencement	More regular monitoring of gasses, compartmenting of e.g. asbestos material, and dedicate and facilitated areas for HW handling required for 5 and 10-years compliance.

Provide adequate storage facilities for hazardous wastes	Only oily and cables contained in separate containers	More consistent approach and container facilities needed for obtainment of both 5 and 10-years compliance.
Test of presence of e.g. toxics, corrosives, irritants prior to manual activities	No implemented procedure present at the site area	Establishment of testing procedures for identification of selected waste types for 1-year compliance. Separated procedures and supportive facilities for waste segregation (e.g. asbestos) need for 5 years compliance.
Identification and removal of flammable painting prior to cutting activities	No immediate procedures implemented	Procedures for identification and operational practise (including containment of residues from procedures) needed for 5-years compliance.
Spill clean up and notification	No oil spill equipment present and no notification procedures implemented beside annual MARPOL and central authorities reporting on recycled steel and disposed off oil products	Procurement and operational practise established is needed on oil spill. Review and improvement of notification procedures needed for 5-years compliance.
General occupational health	Personal protective gear present at the facility	Strengthening and improvement of procedures/purchasing of equipment for personal protective gear (rigid helmets, gloves, possibility for respiratory equipment, fire extinguishers, food wear etc) is needed for 1-years compliance.
Additional	Good housekeeping and improved workers safety and recipient monitoring	The facility need to further strengthen selected procedures related to special waste types and in particular asbestos waste, general improvement of workers safety and protective gear beside general concern related to unintended pollution of non-lined surface and nearby water inlet water bodies.

Additional visit to Dismantling facility in Gijon

The auditor performed an additional visit to a similar ship dismantling facility situation in the harbour area of Gijon - Muelle de la Osa on 19 September 2002. It was not possible for the auditor to meet with the managing director of the facility during the stay in the region, although the auditor did some observation of relevance for this study.

- The facility was fenced by concrete wall and the estimated size was 150 times 150-m, equal to approximately 20,000 m2;
- The facility was in activity dismantling a medium fisher man ship and a minor fisherman ship was waiting in line for dismantling;
- The facility was only able of performing dismantling along a quarry, not option for dry-dock or similar;
- During the visit approximately 10 persons were observed on the plot, of which 5-6 were cutting;
- The site area was kept in the same way as the Desguaces de la Arena site area, although there was no observation of any containers for safe keeping of waste fractions. Furthermore, a small fire was identified presumable disposing of wood and additional waste without clear identification.
- The overall impression was that the site was operated more or less similar to the Desguaces de la Arena site, although slightly more activity was observed.

Italy

Inspection of Simont, Napoli, Italy, carried out by COWI 10-11th October 2002.

Simont, S.p.a. invited COWI to visit the Simont offices and yard in the Port of Naples. The site visit took place 10-11th October 2002.
Simont is small family business that has operated in the demolition for a number of years. The new Simont is a privately owned company that has recently been converted from S.r.l. (?) to S.p.a. (stock company). The new Simont was formed in 1995 by Antonio Montagna who's family controls ownership.

Auditing Procedure

The site visit/auditing procedure was performed as a combination of forwarded questionnaire and detailed interview with Managing Director Antonio Montagna in combination with a site inspection.

The Managing Director was quite open sharing information, invited several of his senior technical managers to join our interview, and provided documentation on request (e.g. manuals and procedures, letters to authorities). The forwarded questionnaire was complete during the visit.

General impression of yard

The company itself is eight permanently employed people. The company does not own the demolition yard, which belongs to the Port of Naples, and rents most of its heavy equipment. It invests mainly in the personal machinery and equipment and in the procedures for work. On a need basis employees are hired from a pool of regularly associated labour force.

Simont operates by contractors on all major waste disposal issues. The contractors are often those already authorised by the Port authorities. The company requires authorisation/certificates from its contractors on waste management and disposal as this is a requirement from local authorities.

The present capacity of Simont in terms of recycling is 70-80 thousand tonnes steel per year (turnover approx. 30 thousand tonnes). The company was apparently founded to demolish five Italian naval vessels and has demolished some 40 vessels in all.

The capacity is governed by the length of the quay lease, the size of the dock and the depth of the harbour. Default is up to 220 m and 8 meters depth. If necessary, it was stated that additional quay can be leased (requires

movement of some repair barges) and the break up of the keel part can be taken to a larger dock in the harbour (330 m).

Since the company rents the quay length and pier area the "yard" is completely tidied up after each demolition. No permanent equipment is left at site once the lease expires. The company has several mobile cranes used for heavy loads. It was stated that all waste and recycled material is either containerised or moved by truck at finalisation.

Assessment with regard to questionnaire

General information
The company has a defined designation of responsibilities regarding EHS, management and operation.
It is moving into demolition of land based industries due to its experience in particular with asbestos removal.

Policy information There is no publicly available environmental statement, green accounts or similar, but an internal health and safety statement, which also contain issues on environment is available. However, records on the base data for such statements are available due to the requirements from the authorities on health and safety, environment and fiscal issues.

Materials management
The recycled materials are transported to buyers as soon as economically feasible for profitability reasons, since Simont is payed relative to deliverance.

Management of waste and wastewater
The non-hazardous waste is collected and disposed on a regular basis during demolition. Hazardous waste is stored in containers and drums (supply of contractors) until the containers are full and collected or until the end of demolition, where all hazardous waste is removed. The regulatory approval of demolition is for each specific vessel and based on a vessel specific manual of procedures that requires all activities, incl. hazardous waste management to be completed by the finalisation of the demolition.

Wastewater from asbestos removal incl. workers showers, is HEPA filtered and led to municipal sewage treatment system. Surface areas in the Port drain to the sea. New concrete on demolition pier apparently drain to land side. Bilge and oily water are collected by tank.

Paint is left on the steel plates except where cut, since no sandblasting is allowed in the Port of Naples. This includes paints with TBT and/or lead which are consequently disposed of via the steel mill.

Incidents, health and safety
Gas free certificates are required and issued by the Port Chemical Officer ("Chimico") before commencement of work.

The main focus on safety is in asbestos work and on lead in paints. A safety and risk assessment is part of the approval procedure of the local authorities. No major workers accidents have been reported during the seven years of operation.

No major chemical or oil spills have been reported. The company has a boom for containment of the vessel.

Usually, the health and safety officers (the local authority "ASL") inspect 1-3 times a year, but more often if much asbestos removal is carried out.

Improvements needed
The inspection did not take place during an actual demolition, and a case cannot be made regarding the organisation of the actual work. However, the manuals and procedures available apparently address all relevant issues regarding workers health and safety.

The developed procedures have been driven by considerations for workers environment. Improvements in terms of environmental issues have not yet been addressed by local authorities and the screening carried out suggests the following issues should be addressed:

- Identification, collection and disposal of Halons, CFCs and HCFCs
- Identification, collection and disposal of PVC and PCB

The company safety officer said they only rarely saw any PCB. When unknown potentially hazardous waste was discovered the Safety officer of the Port of Naples was called and the waste was disposed though the licensed companies according to his judgement.