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End-of-waste Criteria for Iron and Steel Scrap:

Technical Proposals

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PREFACE

This report is the JRC-IPTS contribution to the development of the end-of-waste criteria for iron and steel scrap in accordance with Article 6 of Directive 2008/98/EC of the European Parliament and of the Council on waste (the Waste Framework Directive).

The purpose of end-of-waste criteria is to avoid confusion about the waste definition and to clarify when certain waste that has undergone recovery ceases to be waste. Recycling should be supported by creating legal certainty and an equal level playing field and by removing unnecessary administrative burdens. The end-of-waste criteria should provide a high level of environmental protection and an environmental and economic benefit.

The recitals of the Waste Framework Directive identify scrap metals as a possible category of waste for which end-of-waste criteria should be developed. Consequently, the Environment Directorate-General requested from the JRC-IPTS a study with technical proposals on end-of-waste criteria for iron and steel scrap.

This report delivers the results of the study. It includes a possible set of end-of-waste criteria and shows how the proposals were developed based on a comprehensive techno-economic analysis of iron and steel recycling and an analysis of the economic, environmental and legal impacts when iron and steel scrap cease to be wastes.

The report has been produced by the JRC-IPTS based on the contributions of experts from Member States and the stakeholders by means of a TWG. The experts contributed in the form of written inputs and through participation in a workshop organised by the JRC-IPTS in July 2009. The report also used the results of previous research carried out by the JRC-IPTS from 2006 to 2008 and described in the reports 'End-of-waste criteria' and 'Study on the selection of waste streams for end-of-waste assessment'.

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GLOSSARY

APEAL	Association of European Producers of Steel for Packaging
ASR	Automotive shredder residue
BIR	Bureau of International Recycling
BOF	Basic Oxygen Furnace
CFCs	Chlorofluorocarbons
EAF	Electric arc furnace
ECHA	European Chemical Agency
EEE	Electrical and electronic equipment
EFR	European Ferrous Recovery & Recycling Federation
ELVs	End-of-life vehicles
EoW	End-of-waste
EU	European Union
EUROFER	European Confederation of Iron and Steel Industries
FER	Federación Española de la Recuperación y el Reciclaje
GHG	Greenhouse gas
JRC-IPTS	Joint Research Centre- Institute for Prospective Technological Studies
LME	London Metal Exchange
PBT	Persistent, Bioaccumulative and Toxic chemicals
PVC	Polyvinyl chloride
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
SDS	Safety Data Sheet
TWG	Technical Working Group
UBCs	Used beverage cans
UNECE	United Nations Economic Commission for Europe
vPvB	very Persistent, very Bioaccumulative
VAT	Value added tax
WEEE	Waste electrical and electronic equipment
WFD	Waste Framework Directive

INTRODUCTION

Background

According to Article 6 (1) and (2) of the new Waste Framework Directive (WFD) 2008/98/EC, certain specified waste shall cease to be waste when it has undergone a recovery operation and complies with specific criteria to be developed in line with certain legal conditions, in particular when there is an existing market or demand for the material and the use is lawful and will not lead to overall negative environmental or human health impacts. Such criteria should be set for specific materials by the Commission in comitology. The end-of-waste criteria mechanism was introduced to further encourage recycling in the EU by creating legal certainty and an equal level playing field and removing unnecessary administrative burden.

A methodology guideline to develop end-of-waste criteria has been elaborated by the Joint Research Centre the Institute for Prospective Technological Studies (JRC-IPTS) and is documented in Chapter 1 of the JRC "End-of-Waste Criteria" report. The European Commission preparing proposals for end-of-waste criteria for specific waste streams according to the legal conditions and following the JRC methodology guidelines. As part of this work, JRC-IPTS has conducted a study with the aim to prepare technical proposals for iron and steel scrap.

Aim and objectives

Any proposal by the Commission of end-of-waste criteria needs substantial technical preparation. Therefore the JRC-IPTS has produced this report with the help of a Technical Working Group (TWG) composed of experts from the different Member States and involving experts from all relevant stakeholders. The study includes all the necessary information and as far as possible makes proposals of end-of-waste criteria for iron and steel scrap in conformity with Article 6 of the WFD. The study was guided by the methodology for setting up end-of-waste criteria that was developed by the JRC-IPTS.

Process

The technical proposals were developed based on the contributions of experts from Member States and the stakeholders by means of a TWG. The experts were requested to make their contribution in the form of written inputs and through participation in the expert workshop organised by the JRC-IPTS on 3 July 2009. Before the workshop, the JRC-IPTS submitted a background paper to the TWG in order to prepare for the work, to collect the necessary information from the experts and to have previously collected information peer-reviewed within the TWG. Shortly after the workshop, the JRC-IPTS wrote to the TWG with the request for additional inputs. A first draft of the final report was made available to the TWG for comments in September 2009. The final report was prepared by the JRC-IPTS based on the inputs and comments from the TWG throughout the whole process.

Structure of the report

The first part of the report provides a comprehensive overview of iron and steel scrap recycling. It analyses scrap sources, describes the scrap metal recycling processes depending on the source of the material, and identifies the environmental issues. It also includes a description of the industry structure, scrap type specifications used by industry, and related legislation and regulation.

The second part deals with the end-of-waste criteria as such. It identifies the reasons for developing the end-of-waste criteria for iron and steel scrap, i.e. the advantages they offer compared to the current situation. It then analyses how the basic general conditions for the end-of-waste criteria can be fulfilled and finally it proposes outlines of possible end-of-waste criteria including a quality assurance system.

The third part addresses potential environmental, economic and legal impacts of implementing the end-of-waste criteria.

1 ANALYSIS

The development of end-of-waste criteria requires consideration of the characteristics of waste streams, the structure of the industry, the economics, market situation and trade flows, the existing regulations and standards/specifications, and the environmental and health aspects. The following sections look at these issues throughout the entire recycling chain of ferrous scrap.

1.1 Scrap sources

One way of classifying scrap according to its source is to distinguish scrap from steel plants and rolling mills, scrap from the steel processing (new scrap), and scrap from products after their use (old scrap).

New scrap is generated during the initial manufacturing processes. The composition of new scrap is well known and in principle new scrap does not need any pre-treatment process before it is re-melted, although cutting to size might be necessary. Even new scrap with paint or coating (with the exception of cable which does need treatment prior to input into a furnace) does not generally need any waste-related pre-treatment before being sent to the furnaces, since many furnaces can melt such new scrap directly if required.

Old scrap is collected after a use cycle, either separately or mixed, and it is often contaminated to a certain degree, depending highly on its origin and the collection systems used. Since the lifetime of many metal products can be longer than 10 years and sometimes longer than 50 years, for instance products for building and construction, there is an accumulation of metal in use since the beginning of the industry.

Another way to classify scrap sources is according to the products in which the metal was used before it became a waste. The main iron and steel scrap sources in this sense are vehicles (including ships and aeroplanes), metal products for construction, machinery, electrical and electronic equipment and packaging.

<u>Vehicles and transportation</u>
Approximately 9 million end-of-life vehicles (ELVs) are discarded every year (according to Federación Española de la Recuperación y el Reciclaje (FER), the amount may be even higher around 12 million to 14 million). Cars are primarily composed of metal (about 75 per cent) and a range of other materials. Currently, the metal components can be separated and completely recycled but this leaves a mainly organic residue, which is disposed of in landfills or is incinerated. The metallic parts are separated by physical processes and recovered as ferrous scrap (iron and steel, comprising 70 per cent of the total vehicle waste) and non-ferrous metals (5 per cent), all of which are recycled. The 25 per cent remainder is the automotive shredder residue (ASR), which is composed mainly of plastics, contaminated with any metallic and other parts that could not be separated.

<u>Construction and building</u>
Steel has been used as beams, reinforcement bars, and other structural parts in building and construction since its industrial production. The amount of steel scrap generated during the demolition of a building varies greatly by type of building and geographical location. On average, steel accounts for slightly less than 1 per cent of the mass of a residential building. Almost all steel parts are recovered, with good quality beams for direct re-use and the rest for recycling in a steelworks.

<u>Large equipment and machinery</u>
This category covers the industrial and agricultural machinery and structure, such as earth-moving and quarrying equipment, cranes, farm vehicles and machinery, storage tanks, tools, etc.

<u>Electronics and electrical equipment</u>

On average, steel accounts for almost half of the content on a weight basis in electrical equipment and this potentially generates about 4 Mt of steel scrap each year in Europe. However, without information on collection rates, it is difficult to estimate the actual amount of steel scrap from waste electrical and electronic equipment (WEEE).

Packaging material

Steel packaging includes food cans, beverage cans, aerosols, etc. The Association of European Producers of Steel for Packaging (APEAL), show that 69 % of steel packaging is recycled in Europe. This represents over 2.5 million tonnes of food and drinks cans and other steel containers recycled in 2007.

A third way to classify scrap sources is according to waste categories. Waste which contains iron or steel is likely to be classified in one of the categories according to the European Waste List that is included in Table 1.

Table 1. Examples of waste categories according to the European Waste List that may contain iron or steel.

Waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing
02 01 10 waste metal
Waste from shaping and physical and mechanical surface treatment of metals and plastics
12 01 01 ferrous metal fillings and turnings
12 01 02 ferrous metal dust and particles
12 01 17 waste blasting material other than those mentioned in 12 01 16
12 01 21 spent grinding bodies and grinding materials other than those mentioned in 12 01 20
12 01 99 waste not otherwise specified
Packaging (including separately collected municipal packaging waste)
15 01 04 metallic packaging
15 01 05 composite packaging
15 01 06 mixed packaging
End-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-waste vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)
16 01 06 end-of-life vehicles, containing neither liquids nor other hazardous components
16 01 04* end-of-life vehicles
16 01 03 end-of-life tyres
16 01 16 tanks for liquefied gas
16 01 17 ferrous metal
Waste from electrical and electronic equipment
16 02 10* discarded equipment containing or contaminated by PCBs other than those mentioned in 16 02 09
16 02 11* discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 13* discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12
16 02 14 discarded equipment other than those mentioned in 16 02 09 to 16 02 13)
16 02 16 components removed from discarded equipment other than those mentioned in 16 02 15
Construction and demolition waste, metals (including their alloys)
17 04 05 construction and demolition waste, iron and steel
17 04 07 construction and demolition waste, mixed metals
17 04 11 cables other than those mentioned in 17 04 10
Waste from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use (waste from incineration or pyrolysis of waste)
19 01 02 ferrous metals removed from bottom ash

Waste from shredding of metal-containing waste
19 10 01 waste from shredding of metal-containing wastes, iron and steel waste
19 10 06 other fractions than those mentioned in 19 10 05
Waste from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 02 ferrous metals
19 12 11*other wastes including mixtures of materials from mechanical treatment of waste containing dangerous substances
19 12 12 other wastes including mixtures of materials from mechanical treatment of waste other than those mentioned in 19 12 11
Municipal waste (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions
20 01 23* discarded equipment containing chlorofluorocarbons
20 01 35* discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 cont. hazard. comp.
20 01 36 discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35
20 01 40 metals
Other municipal waste
20 03 07 bulky waste

1.2 Steel classes

Steel contains by mass more iron than any other single element, having a carbon content generally less than 2 % and containing other elements. A limited number of chromium steels may contain more than 2 % or carbon, but 2 % is the usual dividing line between steel and cast iron (Source: Steel Manual, Verlag Stahleisen, 2008).

The steel grades can be divided into three classes:

- unalloyed steels
- stainless steels
- other alloy steels.

Unalloyed steels
Unalloyed steels are steel grades in which the mass fraction of an alloying element remains below a certain critical value.

Stainless steels
Stainless steel is a generic term for a group of corrosion-resistant steel containing a minimum of 10.5 % chromium. Varying additions of nickel, molybdenum, titanium, niobium and other elements may be present. The mechanical properties and behaviour in service of the various types of steel depend upon their composition, and careful selection of the most appropriate steel grade is vital to success in any application.
There are several types of stainless steel – ferritic, martensitic, austenitic and duplex. The ferritic steels are magnetic, have low carbon content and contain chromium as the main alloying element, typically at the 13 % and 17 % levels. The martensitic steels are magnetic, containing typically 12 % chromium and moderate carbon content. They are hardenable by quenching and tempering like plain carbon steels and find their main application in cutlery manufacture, aerospace and general engineering. The austenitic steels are non-magnetic and, in addition to chromium typically at the 18 % level, contain nickel, which increases their corrosion resistance. They are the most widely used group of stainless steels. Duplex steels are used where

combinations of higher strength and corrosion-resistance are needed. Super austenitic grades and precipitation hardened grades of steel are also available.
Stainless steel consumption according to the end use sector is shown in Figure 1.

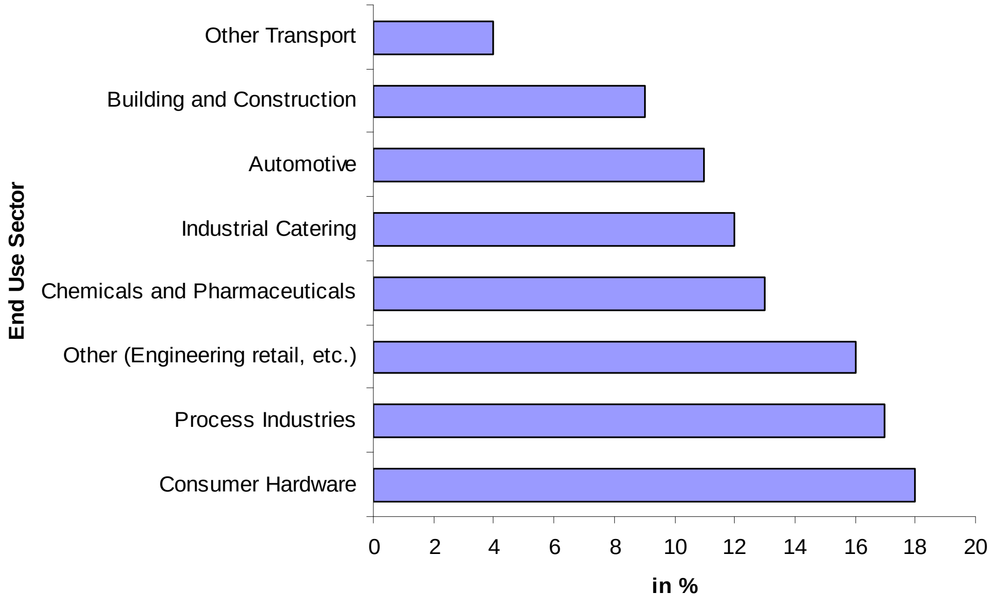


Figure 1. Stainless steel consumption by end-use sector.

Other alloy steels
Other alloy steels refer to steel grades that fall outside the definition of stainless steels, in which the mass fraction of at least one alloying element is present in the amount or beyond the extent indicated as the threshold content. In the case of the other alloy steels, alloy quality steels comprise steel grades required to meet certain requirements in relation to, e.g. fracture toughness, grain size and/or formability.

1.3 Recycling processes

In general, iron and steel scrap recycling involves collection, sorting, baling, packetting, cutting, shearing, shredding and/or sizing, possibly also cryogenic processes, and final melting at the steelworks. This process is summarised below.

- Ferrous scrap metal is collected either separately or mixed and is then sorted in the scrap yard and then sold to scrap treatment plants or is sent directly to a steelworks.
- Once the scrap arrives at the scrap treatment plant, different types of metals are further separated and prepared for shredding/sizing. Shredding and sizing is often needed for a further stage of separation. While shredding and cutting, magnetic separation is used to single out the ferrous metal (carbon steel).
- In the case of stainless steel, larger pieces are collected separately or sorted in the scrap yard before shredding. Smaller particles of stainless steel are separated by multiple-step separations. After separation by a magnet (where the magnetic ferrous scrap is separated out), the non-ferrous metals, stainless steel scrap and non-metal fractions need to be further separated by using combinations of density and eddy current separations. For example, fluids may be used with different densities to first single out the light metal and the heavy fraction and then to separate the heavy fraction by another density separation system. The final heavy fraction which usually contains mixtures of copper, zinc, lead and stainless steel should be manually hand-picked or sorted by sensors. At the steelworks, iron and steel scrap is usually charged directly to the furnaces.

Some more details on the processing are presented below according to the main scrap sources.

<u>End-of-life vehicles</u>
In the EU, when a passenger car (as the main example for end-of-life vehicles) reaches its end of life, it is brought to a specific collection point, which in some cases could also be a generic scrap-treatment plant. ELVs are treated (depolluted) according to a certain procedure guided by Directive 2000/53/EC of the European Parliament and of the Council (the ELV Directive). ELVs are first decontaminated by removing various fluids and parts. The rest of the car, including the body, the interior, etc. is fed into a shredder. In the shredding process, magnetic separation is used to remove the magnetic ferrous fraction, leaving non-ferrous metals and non-metallic materials to pass to further stages, i.e. dense media separation and eddy current separator, for the segregation of one type of material from another. The separated ferrous part may contain as much as 98 % metal.

<u>Used beverage cans</u>
In most countries, used beverage cans (UBCs) are made both from steel and aluminium and are collected by local authorities as part of the municipal solid waste, although increasingly industry is involved in the collection of the UBCs. For example, in the UK there are separate containers for the deposit of UBCs, as well as special collection points for bringing in UBCs which can be sold on a weight basis. At the collection point, steel cans are separated from aluminium cans, baled and then sent to the steelworks.

<u>Electronics and electrical equipment</u>
The waste stream of electronics and electrical equipment covers a wide variety of end-of-life products mainly from households and offices. Directive 2002/96/EC of the European Parliament and of the Council on waste electrical and electronic equipment (the WEEE Directive) identifies producers as being responsible for recycling and for waste prevention; however, users and local authorities play an essential role in waste collection and separation. The WEEE Directive also requires that hazardous components, such as batteries, printed circuit boards, liquid crystal displays, etc. be removed with the proper techniques. This is done at different stages of the treatment process depending on the implementation of the Directive in Member States.

After depollution, WEEE consists chiefly of a mixture of metal, plastics and glass. From here, the treatment of WEEE in general has the following steps, though the process may vary with different combinations: shredding, granulating (more than once), magnetic separation, and eddy current separation (more than once); there is also the possibility of density separation on the separation table and/or hand separation.

The stainless steel, aluminium and copper fractions are separated from other ferrous metal and other non-ferrous metal during these processes and can be sent directly to the steelworks or refineries.

The preparation and treatment of certain WEEE may have special requirements. For example a fridge containing chlorofluorocarbons (CFCs) needs to be treated in an enclosed environment to avoid the emission of CFC gases.

<u>Scrap metal from construction and demolition</u>
Regulation and standards related to construction and demolition have been developed in recent years mostly in favour of selective demolition, which has been proven to be most effective for recovering various types of waste streams. For cost reasons, metal scrap is separated whenever possible along the dismantling process and is sold for direct re-use or to traders or treatment plants. Since by weight aluminium and steel have different prices, further separation is often performed on site. Steel elements inside concrete may first be sent to recovery centres for crushing and separation with magnets before being returned to the metal industry.

1.4 Industry structure

The scrap recovery industry consists of scrap collection and sorting, distribution, treatment and processing. The European steel recovery industry (at the treatment stage) is fairly concentrated, with seven companies providing some 40 % of the total steel scrap delivered to the steelworks. According to Bureau of International Recycling (BIR) and European Ferrous Recovery & Recycling Federation (EFR), there are around 42 000 scrap yards across the EU-27, the scrap sector estimates of those that some 250 are of major company status, 9000 are medium- to large-sized companies processing over 120 000 tonnes per year. The rest, approximately 36 000 companies are of the middle- and small-sized. The overview of the scrap sector is shown in Table 2.

Table 2. Scrap sector, EU-27.

Number of companies	Size of companies by type or tonnage turnover
9000(*)	1 – 12 000 t/y
13500(*)	12 000 – 36 000 t/y
13500(*)	36 000 – 120 000 t/y
9000(*)	>120 000 t/y
307+	ELV shredders
10	(top 10 companies, 1 200 000 – 10 000 000 t/y

(*) Estimated number of companies.

Source: BIR, EFR.

The structure of the recycling industry, from collectors until using the scrap in steelworks and foundries, could be described as a pyramid structure (see Figure 2). Most of the companies are small collecting companies which are supplying the larger companies which are doing treatment and trading. These larger companies are delivering scrap to the steelworks or foundries.

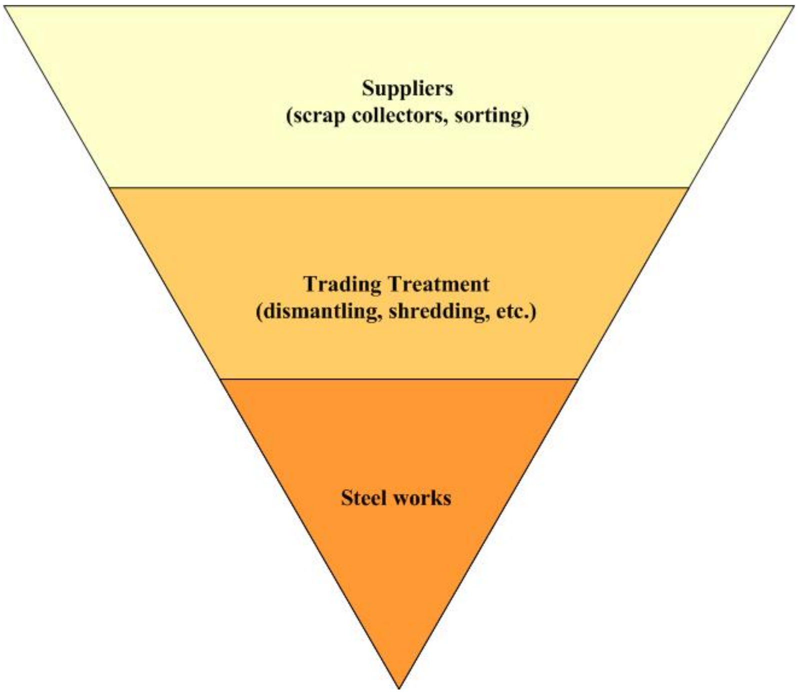
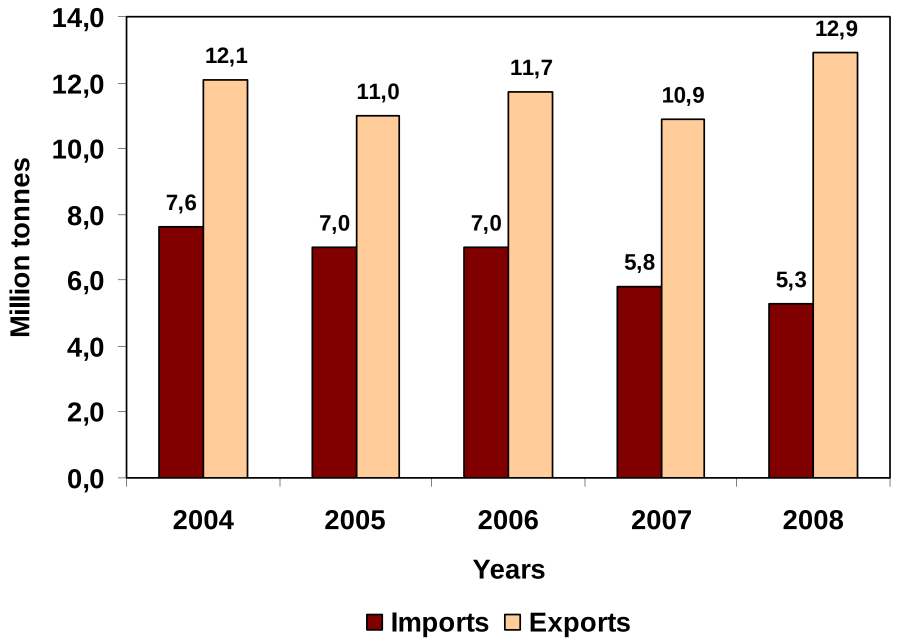


Figure 2. The inverted pyramid structure of the recycling sector.

The collection system can vary depending on the type of product and the country. Large-sized end-of-life products and those that are generated in high quantities, such as those from construction and demolition, are usually transported directly to the scrap yard or to scrap treatment plants. Both the ELVs Directive and the WEEE Directive place the responsibility of recovering, hence scrap collection, on the producers. Small products such as packaging materials are collected by the local authorities, which means that in this case, collection is not in the hands of the scrap metal industry, though some industry initiatives are made in the case of UBCs, e.g. collection centre, scrap terminals, where steel and aluminium cans are separated and baled for transportation to treatment plants or refineries.

Scrap trade within the EU as well as import and export to other countries has been established for decades. Within the EU it is difficult to estimate the total quantity of the scrap being shipped; the estimated import and export data are showed in Figure 3.



Source: Comext-Eurostat

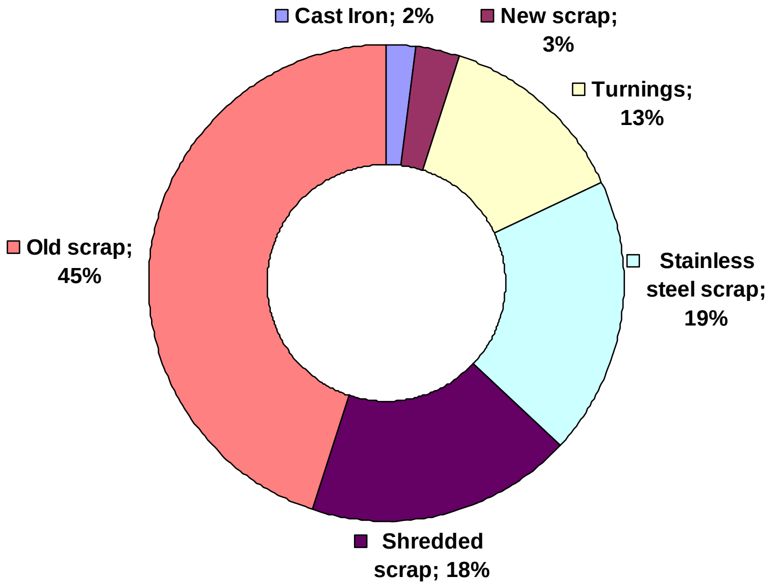
Figure 3. Scrap imports and exports for EU-27 in million tonnes.

The largest scrap buyer from the EU is Turkey (see Table 3); its scrap requirement increased by over 20 %, to 7 million tonnes during the first half of 2008. The key supplier to the EU is Russia.

Table 3. EU-27 Scrap Trade Balance (million tonnes) in 2008.

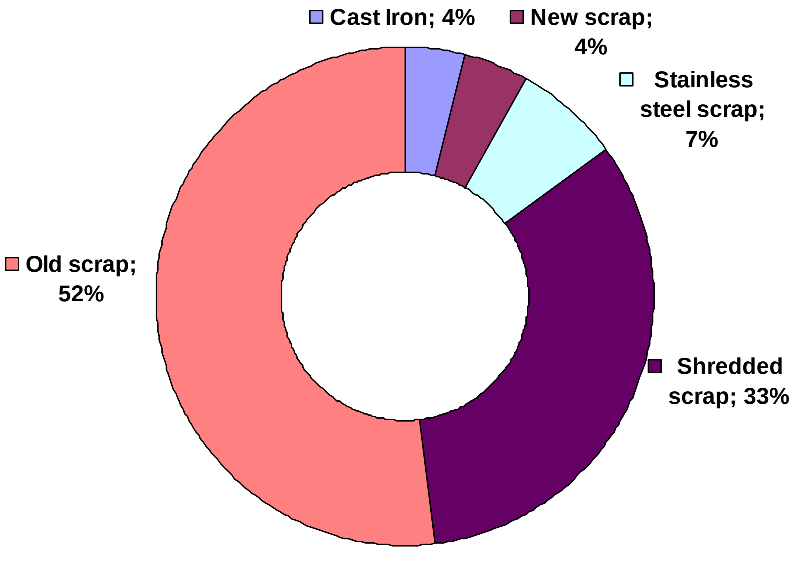
Exports Third Countries ex EU		**Imports Third Countries into EU**	
Total	12.900(+18.4 %)	**Total**	5.300(-8.6 %)
Biggest Buyers		**Biggest Suppliers**	
Turkey	6.885(+16.2 %)	**Russia**	1.479(-10.3 %)
India	1.279(+102.1 %)	**Switzerland**	0.658(+12.1 %)
Egypt	0.986(+9.9 %)	**USA**	0.585(-17.9 %)
Switzerland	0.528(+19.2 %)	**Norway**	0.313(+12.7 %)
China	0.436(-16.2 %)		
Taiwan	0.418(+83.3 %)		
Sources: EUROFER/Außenhandelsstatistik WV Stahl			

The main grades of the scrap which were imported and exported in EU-27 during 2008 are shown in Figure 4 and 5. The majority of the imported and exported scrap was old scrap followed by shredded scrap and stainless steel scrap.



Source: Comext-Eurostat

Figure 4. Imported scrap by grade for EU-27.



Source: Comext-Eurostat

Figure 5. Exported scrap by grade for EU-27.

Numbers on stainless steel scrap trade between and within the big world regions are shown in Table 4.

Table 4. Foreign trade flows of stainless steel scrap in 2007, exports in 1000 metric tonnes.

Origin	Destination								
	NAFTA	Latin America	Western Europe	Eastern Europe	Near/ Middle East*	Africa	Asia	Others	Total
NAFTA	148.5	6.8	172.2	0.3	0.9	2.7	915.6	0.1	1247.1
Latin America	1.0	0.5	29.8	0.0	0.0	0.0	7.0	0.0	38.3
Western Europe	0.7	0.0	1760.5	68.2	2.4	1.7	614.6	0.7	2448.8
Eastern Europe	0.1	0.0	475.1	48.5	0.1	0.0	46.2	0.1	570.1
Near/Middle East*	0.1	0.0	36.0	0.0	n/a	0.0	38.1	0.0	74.2
Africa	0.0	0.0	6.3	1.1	1.1	0.0	18.6	0.0	27.1
Asia	0.5	0.0	20.1	0.0	0.5	0.0	655.3	0.0	676.4
Others	0.2	0.2	4.2	0.0	0.1	0.2	93.4	0.3	98.6
Total	151.1	7.5	2504.2	118.1	5.1	4.6	2388.8	1.2	5180.6

*Imports from that region.
Source: International Stainless Steel Forum, Brussels

1.5 Economy and market

The total scrap consumption in the EU amounted to approximately 112 million tonnes in 2008. In the last few years, before the financial crisis, the demand for scrap rose worldwide. The collection rate of metals increased in all sectors in the EU. In the second half of 2008, with the onset of the global financial and economic crisis, falling output among many metal processing companies has resulted in low levels of demand for scrap; many consumers have announced temporary plant closures (few had closed permanently), production curtailments or reductions of employee working hours. After a peak in summer 2008, the price of steel scrap decreased to half of the price at the beginning of 2009 (Figure 6). However at the end of 2008 they were still comparable to the steel scrap prices in 2003. Prices have recuperated somewhat in early 2009.

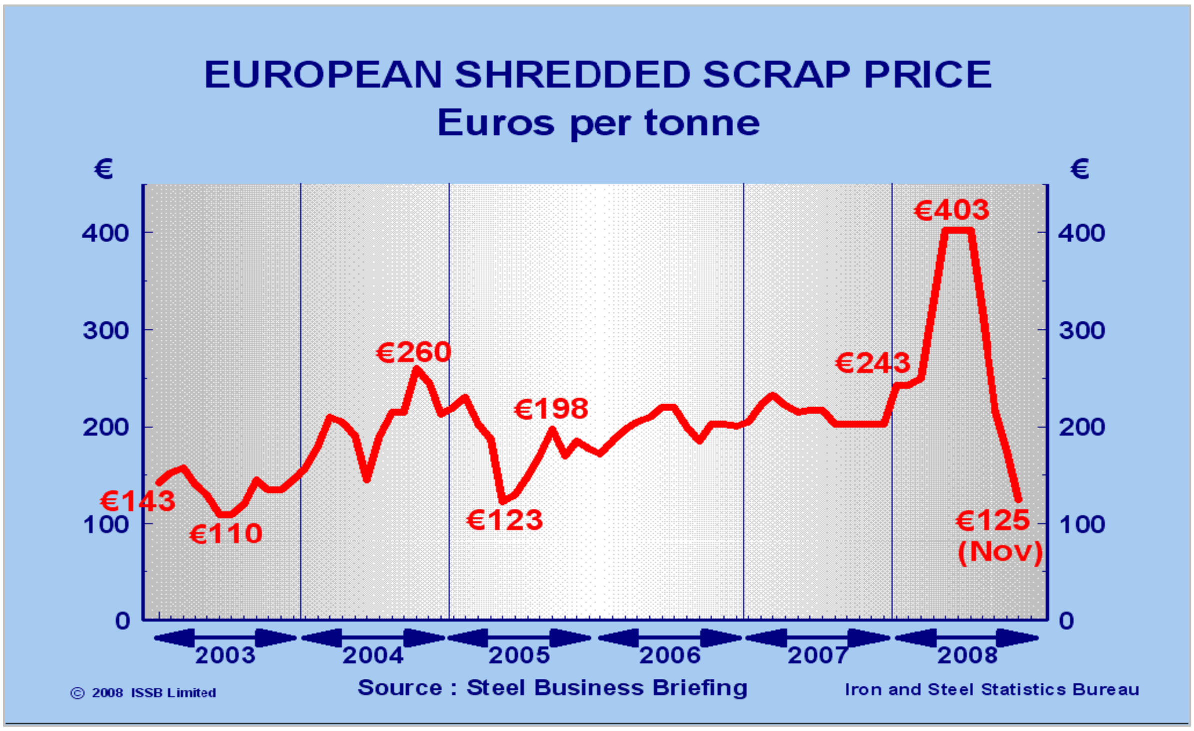
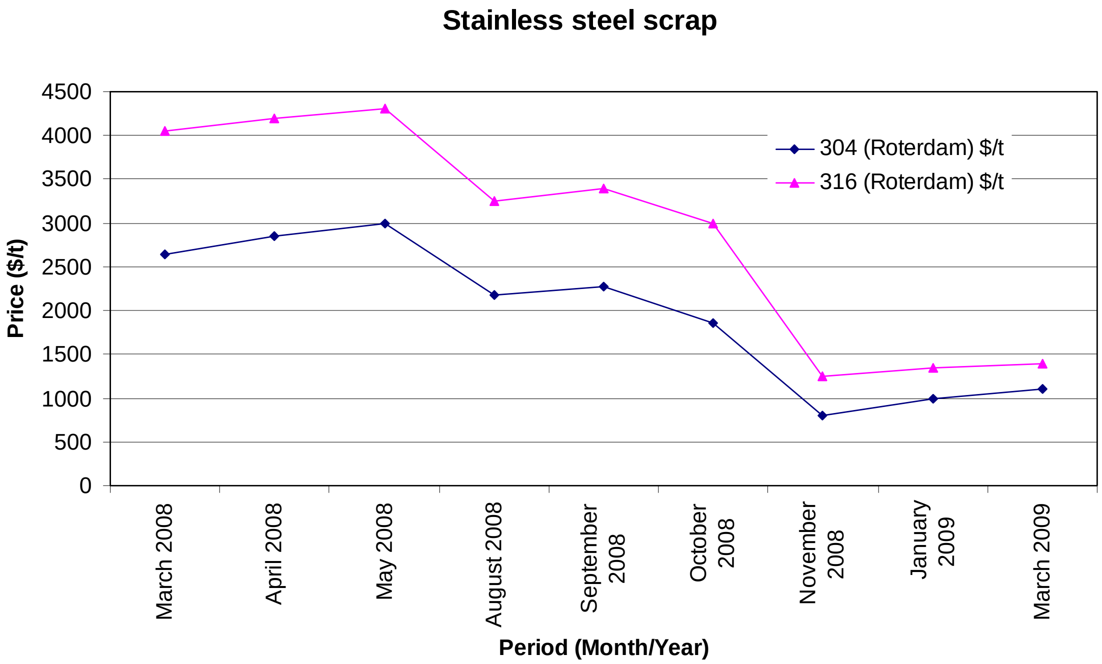


Figure 6. Prices of ferrous scrap from 2003 until 2008.

Similar development also occurred with the stainless steel market. Stainless steel scrap prices decreased rapidly. The overview of stainless steel scrap prices for two kinds of stainless steel scrap are shown in Figure 7.



Source: **http://www.recyclinginternational.com**

Figure 7. Stainless steel scrap prices from January 2008 until March 2009 for two kinds of scrap (304 and 316 from Rotterdam).

1.6 Specifications and standards

Specifications and standard classifications for ferrous metal scrap exist at all levels: international, European, national, as well as between individual parties. It is clear that for the reason of marketing and trading, standards and specifications are needed not only to set the price but also to be used as reference for classification and quality control. In many cases based on the production need, iron and steel scrap is processed according to the bilateral specifications agreed upon between the scrap processor and smelters.

Traded scrap metal is basically classified according to several properties, most notably:

- chemical composition of metals;
- level of impurity elements;
- physical size and shape;
- homogeneity, i.e. the variation within the given specification.

European Steel Scrap Specification
European Ferrous Recovery & Recycling Federation (EFR) and European Confederation of Iron and Steel Industries (EUROFER) developed the European Steel Scrap Specification (Annex 1). The Specification covers the requirements from the safety perspective, the excluded elements for all grades from a cleanliness point of view, and the tolerance for residual and other metallic elements. It also provides a detailed description of these specifications by category, which corresponds to the type of scrap.

Steriles in the sense of the European Steel Scrap Specification are 'non-ferrous metals and non-metallic materials, earth, insulation, excessive iron oxide in any form, except for nominal amount of surface rust arising from outside storage or prepared scrap under normal atmospheric conditions. All grades shall be free of all but negligible amounts of combustible non-metallic materials, including, but not limited to rubber, plastic, fabric, wood, oil, lubricants and other chemical or organic substances. All scrap shall be free of large pieces (brick-sized) which are non-conductors of electricity such as tyres, pipes filled with cement, wood or concrete. All grades shall be free of waste or of by-products arising from steel melting, heating, surface conditioning (including scarfing), grinding, sawing, welding and torch cutting operations, such as slag, mill scale, baghouse dust, grinder dust, and sludge.

European Packaging Scrap Specification
EUROFER is preparing a specification for packaging. The draft of the specification is shown in Annex 2 and 3.

European Alloyed Steel Scrap Specification
EUROFER is also preparing a specification for alloyed steel scrap. The draft of the specification is shown in Annex 4.

ISRI specifications
Developed by the USA trade association, the Institute of Scrap Recycling Industries (ISRI), this American specification classifies non-ferrous metal scrap, ferrous scrap, glass cullet, paper stock, plastic scrap, electronic scrap, tyre scrap, and is used internationally. The ISRI categories for iron and steel scrap are shown in Annex 5.

National standard classification
Some countries have their own classifications for steel developed by the national industry associations, for example, the UK, Spain, Belgium, France, and Germany.

Bilateral contract/specification
As already mentioned, there are also specifications made as agreements or contracts in trade between two parties. Such specifications are usually based on a standard classification with additional requirements suitable for the desired production process or product. In this case, the specifications are being continuously reviewed and if necessary modified.
The steel industry is also using grades of steel which are not related to metal scrap but to metal products. In many cases in Europe this code is used especially for stainless steel because there is no European specification yet such as for carbon scrap. (The new draft proposal on a European Alloyed Steel Scrap Specification may however become relevant in the future.)
The grades of steel are divided into grades based on the chemical composition of the metal. The grades were proposed for example by US (A.S.T.M, SAE, AISI) or in Europe (CEN), Germany (DIN), England (BS), Italy (UNI) or Japan (JIS). These grades were compared and are shown in Annex 6.

1.7 Legislation and regulation

In the EU the management of waste scrap metal is currently under the waste regulations, e.g. the Waste Framework Directive and EU Waste Shipment Regulation.

Scrap treatment plants (e.g. shredders, dismantlers, media separation plants) as well as scrap collectors and sorting plants are operated under a permit for waste treatment, although the details of their permits vary across member states.

The production of secondary metal at steelworks and the associated treatment of scrap metal on site are subject to the IPPC Directive. The current discussion on the possible extension of the scope of Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control (the IPPC Directive) in relation to waste treatment activities has suggested the inclusion of separate installations for scrap metal treatment.

Certain metal-containing waste streams are regulated under specific directives, such as the WEEE, the ELV Directive and the Directive on packaging and packaging waste. In these directives, the following elements regarding the treatment and process of the types of waste are described and they ensure proper handling of the waste stream:

- The WEEE Directive includes compliance with minimum standards for recycling and treatment;
- The ELV Directive includes minimum technical requirements for the treatment.

<u>Waste Shipment</u>
On 12 July 2007, Regulation (EC) No 1013/2006 (the new Waste Shipment Regulation) came into force. Accordingly, most metal scrap is under the List B of Part 1 of Annex V (also referred to as the 'green list'), which are not covered by Article 1(1) (a) of the Basel Convention, and therefore not covered by the export prohibition.

Export of waste under the 'green list' within the OECD countries is not subject to notification and consent procedure and is done under normal commercial transactions; however, the new Waste Regulation does require the completion of an Annex VII form.

For 'green list' exports to non-OECD countries, the Regulations require the Commission to obtain a new declaration from the receiving country as to whether it will accept each kind of waste; it may also require pre-notification.

In List B, the possibly affected wastes are some metal scrap under B1010 (ferrous and aluminium) GC010 (electronic assemblies consisting of only metals or alloys) and GC020 (electronic scrap e.g. printed circuit boards, electronic components, wire, etc.) and reclaimed electronic components suitable for base and precious metal recovery). However, some of the non-OECD countries failed to respond and in such as cases the countries are to be regarded as having chosen a procedure of prior written notification and consent. Default controls of prior written notification and consent are applied.

When scrap is traded under the procedure of prior notification and consent, exporters of scrap metals to non-OECD countries are required to pre-notify, which requires administration and payment of a fee as well as the establishment of a financial guarantee(1).

In any case, the Waste Shipment Regulation allows exports from the Community only if the facility that receives the waste (i.e. the secondary metal/steel production plant) is operated in accordance with human health and environmental standards that are broadly equivalent to standards established in Community legislation (IPPC).

The end-of-waste will affect metal scrap that has fulfilled the criteria and become product/secondary material in the way that the trading will be not under the waste shipment regime. The impact on waste shipment is described in Chapter 3.

<u>By-products</u>
If a certain metal scrap generated, for example by the metal processing industry, were regarded as being a by-product, and not a waste as defined by Article 5 of the WFD, then end-of-waste criteria would not apply unless the by-product were later to become waste.

Article 5 of the WFD on by-product reads as follows:

1. *A substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste referred to in point (1) of Article 3 but as being a by-product only if the following conditions are met:*

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(1) A financial guarantee is not required in cases of shipment of green listed waste to EU-Member States with transitional provisions to control such waste under the Amber control procedure.

a. *further use of the substance or object is certain;*
b. *the substance or object can be used directly without any further processing other than normal industrial practice;*
c. *the substance or object is produced as an integral part of a production process; and*
d. *further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.*

2. *On the basis of the conditions laid down in paragraph 1, measures may be adopted to determine the criteria to be met for specific substances or objects to be regarded as a by-product and not as waste referred to in point (1) of Article 3. Those measures, designed to amend non-essential elements of this Directive by supplementing it, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 39(2).'*

It is notable that Article 5 of the WFD says '…*may* be regarded…', which appears to leave a certain freedom of choice even if the four conditions of Article 5 are met, at least as long as measures under Article 5.2 have not been adopted.

REACH
When metal scrap ceases to be waste, it becomes subject to the provisions the REACH Regulation. The implications of this are discussed in detail in Chapter 3.

1.8 Environmental and health aspects

Energy use and GHG emissions
The treatment of ferrous scrap metal, mainly due to shredding consumes electricity and therefore has indirect GHG emissions. The production of steel from scrap is integrated in the steelworks and thus the use of energy and emissions are not reported separately. However, energy use in the processing of ferrous scrap is much lower in comparison with the production of metal from ore. One tonne of steel scrap saves 1.86 tonnes of CO_2 and 1.89 tonnes of iron ore (*Source*: World Steel Association).

Other air emissions
Dust and air emissions from scrap processing are generally at a low level. However, emissions of hazardous air pollutants may be generated by the secondary metal production in a furnace, e.g. dioxins and furans, metals/metal oxides (such as lead, zinc). In the EU such emissions are controlled according to permits under the IPPC Directive. Emissions from basic oxygen furnace (BOF) and electric arc furnace (EAF) are being managed by process control and special flue-gas treatment.

Risks related to scrap transportation and storage
Scrap metal in itself does not pose any risk to the environment therefore there are no environmental risks in the transportation and storage of metal. There is also no convincing evidence of substantial zinc leaching from galvanised steel. However, if metals are contaminated with oil or mixed with other waste, this may create hazards in relation to transportation or storage. For example, oil or any other liquid attached to scrap metal, when exposed to rain, may cause contamination to its surrounding environment. Also other hazardous contaminants of scrap such as asbestos (e.g. resulting from wrecked old railway wagons) shall be taken into account (airborne emissions of asbestos fibres).

Coatings and paints
Coatings can be divided into organic coatings (powders, pastes, liquids, film or sheeting), inorganic coatings (manufactured from ceramics and cement mortar) and metallic coatings. Zinc is often used as the metallic coating for protecting steel from corrosion.

The mechanical handling of scrap and scrap processing removes some coatings as an effect of the processing. In the case of shredding scrap metal, the processing in the hammer mill removes most of the paint/coatings from the metal except for zinc coatings which remain mainly on the scrap fragments after shredding. The removed paint/coatings are separated from the scrap metal and are collected into the shredder residue.

Some processes have a specific decoating step, for example detinning is sometimes used as a pretreatment for the recycling of tinned steel; another example is dezincing as a pretreatment for recycling galvanised steel.

Residual paint/coatings are removed in the metal works as part of the process, either by contributing to slag generation or air emissions (e.g. zinc). PVC and other halogenated coatings may contribute to the generation of dioxins and furans. However, a link between the composition of the input materials and the emissions of these substances has not been proved. The emissions are determined by the process and by treatment of the flue-gas.

Sustainability and efficiency of recycling

In order to conserve the alloying elements in steel, effective separation and sorting of steel qualities in the fragmentation process is desirable. The improved scrap quality by better sorting or separation can achieve less material input, which in turn reduces the need for virgin material. The copper content in ferrous scrap is considered an undesirable trace element which is, in many cases, limited to 0.2 % in ferrous scrap. When the EAF process is used, 90–95 % of the copper remains in the crude steel. An important driving force for separation is also the price of copper. Other metals elements such as tin also influence the quality of ferrous metals negatively.

Radioactive metal scrap

Scrap metal can contain sources of radiation with the associated environmental and health risks. Higher levels of radiation are possible and may stem from losses, accidents or the inadvertent disposal of radioactive material.

Radioactive scrap metal can occur in a number of different ways. Some of the main origins are the demolition or decommissioning of industrial facilities processing raw materials containing naturally- occurring radionuclides, the decommissioning of nuclear installations (such as nuclear power plants and other nuclear fuel cycle facilities) and other facilities, loss of sources (sealed radioactive sources are sometimes lost or mislaid and they may be collected as scrap metal), demolition of facilities in which radioactive sources have been used, incorporation of old radioactive devices into scrap (items such as timepieces and compasses covered with radioluminous paint, lightning rods, thoriated lenses, etc. may be collected as scrap).

In order to minimise the risks, radioactivity needs to be measured systematically. The United Nations Economic Commission for Europe (UNECE) has released recommendations to monitor and reduce the risks involving radioactivity in scrap metal. While these recommendations are not legally binding, they provide guidance based on existing best practice to all interested parties (scrap yards, metal smelters, customs, regulatory authorities and transporters, amongst others).

2 END-OF-WASTE CRITERIA

2.1 Rationale for end-of-waste criteria

The end-of-waste criteria should be such that the material has waste status if and only if regulatory controls under waste legislation are needed to protect the environment and human health; otherwise the material should have end-of-waste status to facilitate recycling and recovery. The criteria should be developed in compliance with the legal conditions, should be operational, should not create new disproportionate burdens and should reflect that iron and steel scrap recycling is a well-functioning industrial practice today.

The main types of benefits that can be expected when EU-wide end-of-waste criteria for iron and steel scrap are introduced are given below.

- Improved functioning of the internal market (simplified and harmonised rules across countries).
- Clearer differentiation between high-quality scrap and low-quality scrap. Only high-quality scrap will cease to be waste.
- Reduction of administrative burdens, especially related to shipment and transport.

2.2 Conditions for end-of-waste criteria

According to the Waste Framework Directive, Article 6, '*certain specified waste shall cease to be waste within the meaning of point (1) of Article 3 when it has undergone a recovery operation and complies with specific criteria to be developed in accordance with the following conditions:*

a. The substance or object is commonly used for a specific purpose;
b. A market or demand exists for such a substance or object;
c. The substance or object fulfils the technical requirements for the specific purpose referred to in (a) and meets the existing legislation and standards applicable to products; and
d. The use of the substance or object will not lead to overall adverse environmental or human health impacts.'

Regarding the first two conditions, it is evident in the case of iron and steel scrap that a structured market exists (e.g. there are classifications of scrap metal used for trading). Iron and steel scrap is commonly used as a feedstock for the production of new iron and steel (mainly as an input to BOF and EAF). There is generally a demand by the steel and foundry industry for scrap that complies with specifications such as the 'European Steel Scrap Specification' and any other use than for the production of new iron or steel or for the production of cast products is highly unlikely. This is also true in the case of exports outside the EU, including to non-OECD countries.

The third condition implies that end-of-waste criteria need to ensure that, at the point of ceasing to be waste, any technical requirement related to the use are fulfilled and the recycled material should comply with applicable legislation and standards as product. In the case of iron and steel scrap, this means that at the moment of end-of-waste, the scrap should fulfil specifications that iron and steel producers use for the scrap that they buy.

From a life cycle point of view, iron and steel scrap metal recycling as such has overall environmental benefits (especially the energy-related air emissions). The use of scrap metal in the furnace is regulated as far as emissions are concerned by the IPPC Directive regardless of whether the scrap is a waste or not. Also outside the EU, process emission control of secondary metal production does not depend on the waste status of the scrap.

The main areas where the waste status of iron and steel scrap can potentially make a difference for the environmental and health impacts is transport and trade (waste shipment). If scrap has end-of-waste status it can in principle be transported by any transport undertaking and not only those that are permitted to transport waste. It is important that only scrap without waste-specific hazardous properties cease to be waste.

Regarding waste shipment, it is important that only scrap for which it is highly likely that it will actually be used for secondary metal production be exported and imported outside waste regulatory controls (especially those under the waste shipment regulation). It is therefore also important regarding the fourth condition that the scrap be processed to comply with the standards and specifications of the scrap-using industry so that a demand by the metal industry effectively exists.

2.3 Outline of end-of-waste criteria

According to the JRC methodology guidelines, the ultimate aim of end-of-waste criteria is product quality and end-of-waste criteria will therefore usually include direct product quality requirements. In addition, a set of end-of-waste criteria may include elements that check product quality indirectly, in particular requirements on input materials and requirements on processes and techniques. Usually, there will also be supportive requirements on quality assurance and regarding the provision of information (e.g. on product properties).

The TWG confirmed the appropriateness of this approach for the case of iron and steel scrap and that the approach of combining different types of requirements in a set of end-of-waste criteria corresponds well to the good industrial practice of ensuring the product quality of the scrap. The TWG also supported the view that the existing recycling system should not be disturbed by end-of-waste criteria for iron and steel scrap. There should be a clear identification where scrap has attained a quality that is sufficient to ensure no environmental risks occur when scrap is transported, further processed or traded without being controlled as waste.

During the workshop in July 2009 and by other input, many experts stressed the need to keep the criteria clear, as simple as possible and enforceable. It was suggested to reinforce the role of the direct product quality requirements, in particular to provide criteria that are useful in the case of spot checks of traded material and which would allow demonstrating non-compliance with the end-of-waste criteria directly. As already proposed in earlier papers, the direct product requirements should address certain direct hazards for the environment and human health such as related to radioactivity and oil content. In addition, strong support was widely given to the concept of a general quantitative criterion, such as a limit on metal content or steriles content, that would serve as a check for completeness of treatment and as a check that the metal is sufficiently pure for save use. All types of iron and steel scrap would have to meet this limit value in order to benefit from end-of-waste status.

Quality assurance was another element of the end-of-waste criteria that the TWG considered to be especially important and useful because it is needed to establish sufficient confidence in the end-of-waste status.

At the same time, the discussions of the TWG showed that the requirements on input materials and treatment processes should mainly address and be stringent regarding those materials that pose a specific hazard if not treated adequately. Since the use and treatment of non-hazardous metal containing wastes to produce iron or steel scrap was less of a concern, many experts suggested that the end-of-waste criteria could be less specific regarding these aspects.

The different possible elements of the end-of-waste criteria, the main considerations made by the TWG and the resulting proposals are discussed in subsequent sections and are summarised in Annex 7.

2.4 Criteria on product quality

Product-quality criteria are needed to check for direct environmental and health risks and if the product is suitable as direct input to final use (steel work/foundry). They also should allow for deciding if the metal in the scrap is sufficiently pure and has been separated effectively from other types of materials.

Limit on metal content or steriles content

The end-of-waste criteria should include a limit value on metal content or steriles content in order to check directly on the material if the separate collection and/or treatment of the waste has been effective in producing a scrap which is sufficiently pure. Such a limit value would also restrict the possibilities of having other wastes mixed into the scrap.

A limit value on metal content or steriles content can be used in compliance testing by the producer of end-of-waste scrap (at the site of the processor) as well as in on the spot checks for example by regulatory authorities.

For the sake of clarity, the same limit value should apply to all types/categories of iron and steel scrap. (Stricter requirements in specifications, standards and commercial agreements for specific types of scrap will of course be possible.)

Below, both steriles and metal content are discussed, although only one of the two options should be included in the end-of-waste criteria.

Definition of steriles

Steriles are:

- non-ferrous metals and non-metallic materials such as earth, dust, insulation and glass;
- combustible non-metallic materials such as rubber, plastic, fabric, wood and other chemical or organic substances;
- larger pieces (brick-size) which are non-conductors of electricity such as tyres, pipes filled with cement, wood or concrete;
- by-products arising from steel melting, heating, surface conditioning (including scarfing), grinding, sawing, welding and torch cutting operations, such as slag, mill scale, baghouse dust, grinder dust, sludge.

In principle, steriles can be determined as proposed in the European Steel Scrap Specification, namely as material not adhering to the scrap, remaining at the bottom of the vehicle after unloading by magnet. However, in some cases, determining the steriles content will also require manual sorting, for example in the case of stainless steel which is not or not sufficiently magnetic.

Another issue is that if substantial amounts of materials considered steriles adhere to iron or steel objects, these would have to be accounted for. This means they would have to be detached (except when negligible in weight) before determining the steriles content or their weight would have to be estimated otherwise.

Limits for steriles content are included for many categories in the European Steel Scrap Specification and vary from 0.3 % up to 1.5 %. Some of the experts from the TWG proposed for the end-of-waste criteria a steriles content of <1.5 or <2 %.

Definition of metal content

In the case of iron and steel scrap, metal content would best be defined in a narrow sense so that it includes only iron (in a macroscopic sense) and steel. This would include other metals besides ferrous ones only if they form part of an iron or steel alloy. Defined in this way metal content would de facto be 100 % minus the steriles content. In this sense, iron and steel content may be more precise as a term than metal content. The reason for excluding other metals is that they are in most cases undesired when scrap is used in iron or steel production.

The metal content can be measured practically as the material that can be unloaded with a magnet. However if the iron and steel objects have coatings that cannot be neglected or other materials attached to them, these would have to be made loose. In the case of steel that is not or is only slightly ferromagnetic, such as certain stainless steels, manual separation would be required.

Dust should not be counted towards metal content because it is undesired nor shall the scrap contain excessive ferrous oxide in any form, except for typical amounts arising from the outside storage of prepared scrap under normal atmospheric conditions. This requirement is used in order the avoid the inclusion of metal scrap which will have very low economic value due to the excessive metals oxidation.

In the discussions of the TWG it was proposed that the metal content should be > 98% for all iron and steel scrap. According to some stakeholders, the metal content of 98% or the steriles content of 2% is too restrictive because it would exclude the category ‘fragmentised scrap’ from incineration which must have a ferrous content ≥ 92% and also will exclude packaging scrap which must have a ferrous content ≥ 92% or 93%. On the other hand, allowing a higher percentage of steriles in the steel scrap could increase the environmental risk.

The sterile parameter shows the most support from the associations and stakeholders. The concept of steriles is understood and used by sellers and customers in their daily business.

<u>Draft formulation of the requirement:</u>
The total amount of steriles shall be ≤ 2% by weight;

Steriles are:

- ***non-ferrous metals (excluding alloying elements in any ferrous metal substrate) and non-metallic materials such as earth, dust, insulation and glass;***
- ***combustible non-metallic materials such as rubber, plastic, fabric, wood and other chemical or organic substances;***
- ***larger pieces (brick-size) which are non-conductors of electricity such as tyres, pipes filled with cement, wood or concrete;***
- ***by-products arising from steel melting, heating, surface conditioning (including scarfing), grinding, sawing, welding and torch cutting operations, such as slag, mill scale, baghouse dust, grinder dust, sludge.***

Steriles shall be determined by weighing after magnetic or manual separation (as appropriate) of iron and steel particles and objects under careful visual inspection.

The scrap shall not contain excessive ferrous oxide in any form, except for typical amounts arising from outside the storage of prepared scrap under normal atmospheric conditions.

<u>Oil, oily emulsions, grease and lubricants</u>

Oil, oily emulsions, grease and lubricants are often used in products made of iron or steel and for the working of these materials. If they are present in scrap, except negligible amounts, they present a direct environmental risk to water and soil, especially if not handled with protective measures during transport and storage. In larger amounts, they are also undesired in the steel production process.

The discussion of the TWG during the workshop in July 2009 in Seville lead to the conclusion that a qualitative requirements was sufficient in the sense that the iron and steel scrap should be free of visible oil. This means that oil, oily emulsions, grease, or lubricants in general should not be visible in any part of the scrap load with special attention to the bottom of the scrap load where the oil can be accumulated. Each load/consignment of scrap should be inspected visually regarding this requirement, especially in those parts of the load where oil is most likely to accumulate (the bottom). An additional proposal of some of the TWG experts was to use the formulation of 'dripping oil' instead of 'visible oil'. However, the criterion on dripping oil could cause confusion and will require extra analyses. Another disadvantage is the increased environmental risk caused by higher content of oil compared to the definition of 'visible oil'. In order to guarantee the appropriate quality of scrap without a negative environmental impact, 'visible oil' is the preferable formulation.

This formulation corresponds closely to the requirement in the European Steel Scrap Specification that, as part of the qualitative requirements on steriles, demand that all grades be free of all but negligible amounts of combustible non-metallic materials, including, but not limited to rubber, plastic, fabric, wood, *oil, lubricants* and other chemical or organic substances.

Draft formulation of the requirement:
Oil, oily emulsions, lubricants or grease should not be visible in any part of the scrap load, except negligible amounts that will not lead to any dripping. Visual inspection shall give particular attention to those parts of the load where oil is most likely (the bottom).

Radioactivity

The end-of-waste criteria need to address radioactivity because of the direct environmental and health risks of incidents involving radioactive scrap. In addition, the financial consequences of such incidents for the metal processing industry are always very serious, and the incidents can lead to a loss of trust in the recycled metal industry and the associated products due to unnecessary radiation emanating from consumer purchases.

It is very important to detect the presence of radioactive material as early as possible in the supply chain and scrap with end-of-waste status must not show any detectable radioactivity above background level.

The TWG strongly supported that the monitoring of iron and steel scrap with respect to radioactivity be carried out in accordance with the UNECE Recommendations on Monitoring and Response Procedures for Radioactive Metal scrap([2]) and that the scrap metal should show no detectable radioactivity above background level.

All scrap grades shall be checked as early as possible, preferably at the origin of the material source when scrap enters the material chain, and in all subsequent stages of the scrap supply chain, in strict compliance with state-of-the-art and most efficient detection equipment and within the limitations of accessibility.

More specifically, the radiation of each load of metal scrap shall have been monitored in accordance with the UNECE Recommendations and no radiation levels significantly in excess of natural radiation background in the local area shall have been detected. This should be demonstrated by the owner of the scrap metal that declares compliance with the end-of-waste criteria for example by providing for each consignment of scrap supplied a Radioactivity Test Certificate in accordance with the UNECE Recommendations. The test certificate has to be issued (or stamped) by the operator of the detection equipment, which needs to be a reliable and qualified organisation/company.

More information on the UNECE Recommendations:
The Recommendations (or 'Protocol') were agreed upon after the second meeting of the Group of Experts on the Monitoring of Radioactive Scrap Metal held in June 2006 under the auspices of the UNECE.

([2]) http://www.unece.org/trans/radiation/docs/recommendations_e.pdf

The Recommendations are ‘intended to assist Governments, industry and all concerned parties to counter the problem of radioactively contaminated scrap metal, activated scrap metal and scrap metal with radioactive source(s) or substances contained within it (termed ‘radioactive scrap metal’ […]) by seeking to prevent its occurrence, by effectively monitoring metal shipments and facilities, and by intercepting and managing any radioactive scrap metal that is detected.’ The Recommendations set out ‘the responsibilities of all concerned parties and the actions required of them to fulfil the objectives’.

The owner or seller of the material that applies the end-of-waste criteria should arrange for radiation monitoring to be performed on the scrap metal (each load or consignment) and to provide a certificate indicating the results of that monitoring. (An example of a certificate of shipment monitoring is attached as Annex 1 to the UNECE Recommendations.) The owner/seller should ensure appropriate training of involved staff.

The Recommendations also contain specific recommendations regarding radiation monitoring at scrap yards, processing facilities and melting plants, including that the owners of major scrap yards, processing facilities and melting plants should carry out the measures listed below.

- Ensure that incoming and outgoing shipments are checked by administrative and visual means.
- Provide radiation monitors at the entrance/exit to the premises and, as appropriate, on conveyors and grapples. All entrances and exits should be monitored.
- Ensure the effectiveness of the radiation monitors by appropriate quality assurance procedures to verify the ability to detect changes in radiation intensity.
- Arrange for periodic calibration and testing of the detectors (at least annually) to ensure optimum performance.
- Provide appropriate training in radiation monitoring and initial response procedures for personnel likely to be involved in the monitoring of scrap metal shipments.
- Establish a response plan for action in the event of radioactive material being discovered.
- Make a formal arrangement with the national organisation with experience in radiation monitoring and radiation protection to provide:

    - training of personnel on radiation detection and response procedures, and;
    - assistance in the event of a radiation incident involving the detection of radioactive scrap metal.

- Require that contracts for the supply of scrap metal include the condition that any cost associated with radioactive material discovered in shipments will be accepted by the seller unless the original owner of the radioactive source or material can be found.

Instruments for detecting radioactive material can be divided into three categories and any of them could be used for measuring radioactivity.

- Pocket-type instruments are small, lightweight instruments used to detect the presence of radioactive material and to inform the user about radiation levels.
- Hand-held instruments usually have greater sensitivity and can be used to detect, locate or (for some types of instrument) identify radioactive material. Such instruments may also be useful for making more accurate dose rate measurements in order to determine radiation safety requirements.
- Fixed, installed, automatic instruments are designed to be used at checkpoints. Such instruments can provide high sensitivity monitoring of a continuous flow of vehicles whilst minimising interference with the flow of traffic.

Draft formulation of the requirement:
The following must be excluded: material presenting radioactivity in excess of the ambient level of radioactivity; and radioactive material in sealed containers even if no significant exterior

radioactivity is detectable due to shielding or due to the position of the sealed source in the scrap delivery.'

- **To demonstrate that the scrap has been checked, each consignment/shipment of scrap shall be accompanied by a completed certificate according to Annex I of the 2006 UNECE Recommendations on Monitoring and Response Procedures for Radioactive Scrap Metal or an equivalent certificate according to national rules)([3]).**
- **This certificate shall have been issued by the operator of the detection equipment.**

Hazardous properties

Condition (d) of Article 6 of the WFD demands that end-of-waste criteria ensure that the use (understood here as including also transport, handling, trade) of scrap not lead to overall adverse environmental or human health impact.

This implies that iron and steel scrap should not obtain end-of-waste status if it has any of the hazardous properties included in Annex III of the WFD (properties of waste which render it hazardous). (It is understood for example that asbestos should not be included in end-of-waste scrap.)

The reason is that in this case general waste regulatory controls as well as the specific provisions of the WFD on hazardous waste (in particular Articles 17 to 19 regarding control, ban on the mixing and labelling of hazardous waste) are needed to protect the environment and human health.

However, in the case that a metal scrap contains steel alloyed with nickel or other metals, this per se does not mean that specific provisions of the WFD on hazardous waste are needed or that the material should not cease to be waste.

Comprehensive direct monitoring of the 'product' regarding all of the possible hazardous properties by specific tests is, however, not a feasible approach. The best approach to exclude hazardous properties of the product is to rely on a combination of requirements on input materials, treatment processes and techniques, and quality assurance. (These requirements are presented in the sections below.)

Nevertheless, it is suggested to also include in the product quality requirement a clause that clearly establishes that scrap with hazardous properties does not cease to be waste. This is needed not only to establish clarity in principle but has also a practical value in cases when certain types of hazardous properties are detected as part of a visual inspection, especially when hazard criteria are further harmonised within the EU (e.g. ecotoxicity, leachate criteria).

A particular aspect that should also be addressed is pressurised, closed or insufficiently open containers of all origins. Such containers represent a specific hazard because they could cause explosions in the metalwork furnace. This hazard is not addressed explicitly by Annex III of the WFD. A specific clause would therefore have to be included in the end-of-waste criteria.

Draft formulation of the requirement:

The scrap does not have any of the properties included in Annex III of the Directive 2008/98/EC of the European Parliament and of the Council on waste (properties of waste which render it hazardous). ***(Properties of individual metal elements included in iron and steel alloys are, however, not relevant for this requirement.)***

The scrap does not contain any pressurised, closed or insufficiently open containers of any origin that could cause explosions in a metalwork furnace.

Grading according to a standard or specification

([3]) The certificate may be included in other documentation accompanying the consignment/shipment.

Grading according to a standard or specification is needed to demonstrate that the scrap fulfils the technical requirements for a specific purpose and it also indicates that there will be a market and demand.

The relevant standards or specifications are those used by the final users (steel work/foundries) when buying scrap. The specifications used for grading may be of an agreed upon nature across an industry sector (e.g. European Steel Scrap Specification, ISRI) or be defined by one or more individual final use companies.

The TWG has advised against demanding strict compliance with a closed list of grades, standards or specifications. Reasons are that the specifications are a matter of commercial transactions rather than a regulatory means, that the monitoring would be very burdensome and that the details of specifications vary greatly, for example across countries and individual user firms.

The TWG also advised against obliging the metal scrap supplier to produce proof that the graded scrap will actually be accepted by a user (e.g. by systematically producing commercial contracts). This was deemed too burdensome and disproportionate.

However, it is considered proportional and useful to demand a grading according to a specification and standard that can be freely chosen as long as the specification or standard is one that is actually used by a user to define the needs for scrap input materials. For each consignment of iron and steel scrap, the supplier should assign a grade (or category) according to an 'authentic' user specification or standard. The identification of the specification should be sufficiently clear so that it will be possible for the competent authorities, in the case of an inspection, to verify, by own investigation, that the specification corresponds to authentic user requirements.

The scrap categories of the European Steel Scrap Specification, the ISRI classifications or classifications used for the product will generally be acceptable (as authentic). Also newly developed European specifications for alloyed steel or packaging steel are likely to become generally acceptable (Annex 1, 2, 3 and 4).

Draft formulation of the requirement:
The scrap shall be graded according to a customer specification, a standard or an industry specification for direct input to one of the final uses (the production of metal substance or objects by steel work/foundries).

The specification used may be of an agreed upon nature across an industry sector (e.g. European Steel Scrap Specification, ISRI) or be defined by one or more individual final use companies.

Considerations not leading to proposals of separate product quality requirements

The presence of certain non-ferrous metals

The presence of tin and, to some extent, copper has a negative effect on the properties of steel. Only very small quantities of these metals can (sometimes) be tolerated. These elements are difficult to remove from the melt and are undesired by the users of iron and steel scrap. They should therefore be separated out before melting as far as is reasonably possible. Opinions of experts diverge regarding if there is a problem of copper gradually accumulating in the steel recycling streams and if end-of-waste criteria should address this.

Lead and zinc contained in the scrap are emitted to a large extent from the furnace as vapour or metal oxide particles. They can be captured from the flue-gas if it is adequately treated, which can generally be expected to be the case for steelworks in the EU. In many cases, this will also be the case if the scrap is exported and melted outside the EU. Under waste status, the waste shipment regulation provides a means to control these risks.
Accordingly, the European Steel Scrap Specification demands that all scrap grades be free of visible copper (such as electric motors, sheets and copper-coated materials, bearing shells,

winding and radiator cores, wire, cable tubing), and brass items attached to or coating ferrous scrap. In addition, all categories must be free of tin (such as tin cans, tin-coated materials, etc.), bronze elements (such as rings, bearings shells, etc.), lead in any form (such as batteries, solder, wheel weights, terne plate, cable ends, bearings, bearing shells, etc.). The European Steel Scrap Specification does not generally exclude zinc.

From a technical point of view it is optional to include qualitative exclusion criteria for these metals in the end-of-waste criteria, or not. Incentives for separating these metals out already exist without end-of-waste criteria (user specifications and price incentives) The main effect of including such exclusion criteria would be to avoid that the export of scrap containing the metals in question will be facilitated compared to the current situation. If and how this would affect the overall environmental or health impacts remains unclear.

Most of the comments from the TWG do not support the criterion on copper limitation due to a lack of evidence of environmental or health impacts but only a difference in the price of the scrap.

A general exclusion of tin, however, would be problematic because it would exclude much of the packaging steel from end-of-waste. The lead and zinc in the scrap are emitted to a large extent from the furnace as vapour of metal oxide particles but the proposed techniques and limits are under the IPPC Directive.

Coatings, paints, plastics
Small amounts of organic paints, coatings and other organic substances can be tolerated in steel furnaces. (The European Steel Scrap Specification for example tolerates ‘negligible amounts’ of combustible non-metallic materials such as rubber, plastic and other organic substances.) Generally, the requirements on metal content or steriles content are sufficiently strict to prevent iron and steel scrap that contain too much of the organic materials or substances from ceasing to be waste.

There is a theoretical concern that PVC and other halogenated substances might lead to higher emissions of dioxins and other toxic substances from the steel furnaces. However, there is no clear technical evidence for this. At least when iron and steel scrap according to the European Steel Scrap Specification is used, the emission levels achieved by steel plants depend mainly on the process conditions and the flue-gas treatment.

Dimension
According to the European Steel Scrap Specification, the scrap must not contain objects of a dimension that does not fit into a metalwork furnace (i.e. generally not greater than 1.5 m × 0.5 m × 0.5 m). However the draft version of the European Alloy Steel Scrap Specification has a different dimension requirement (2.0 m × 2.0 m × 1.0 m). This dimension is related to the technical limitation of the process and does not have a direct effect on environmental or health issues. Therefore the size limitation need not be included as one of the criteria and can remain a matter for the specifications and commercial agreements between the seller and buyer.

2.5 Criteria on input materials

The purpose of criteria on input materials is to check product quality indirectly.

The end-of-waste criteria should allow as input only waste types for which it is practical to obtain ferrous scrap in compliance with the product quality requirements. This implies that a waste can only be allowed if it contains iron or steel that can be recovered for the production of new iron, new steel or cast products and, after appropriate treatment, can be used without overall adverse environmental or human health impacts.

The discussion in the TWG showed that the criteria on input materials should not be unnecessarily restrictive and that, as a principle, all types of waste that contain recoverable iron or steel and for which treatments exist to obtain scrap metal with the required product quality should be allowed as input. The TWG suggested that the criteria on input materials and treatment processes should be explicit for those wastes that pose relevant hazards and that the criteria can be more general for other types of wastes.

It was pointed out during the discussion with the TWG, that an approach based on a 'positive list' of allowed waste input materials held the risk of 'omitting' suitable wastes, or excluding wastes which become suitable as new treatments become available. It was also pointed out that assigning a waste to a category under the European Waste List does not per se give any guarantees on the nature and suitability of that waste. (The waste categories listed in Table 1 are examples of wastes which may contain metal that can be recovered). While it is likely that a metal-containing waste would correspond to one of the categories/codes of the European Waste List identified in Table 1, the assignment of such a category/code would not always imply that the waste actually contains iron or steel. However, it should be clear that no mixing with other wastes (i.e. wastes that do not contain recoverable iron and steel) should be allowed.

These considerations suggest that regarding non-hazardous waste, it would be sufficient to include a general requirement that they must contain recoverable iron or steel.

Regarding hazardous wastes, the following needs to be considered in addition:

Hazardous wastes pose substantial risks to the environment and human health. Waste law includes specific regulatory controls to deal with these risks. A hazardous waste can only cease to be waste if it can be established that it has been treated in a way that reliably removes all hazardous properties.

For example, drained tight-head drums that contain oils or other hazardous viscous substances constitute hazardous waste by reason of the residual contamination (not completely drained) and should be excluded from the input.

The monitoring and testing of product quality alone is not a workable approach to ensure that the resulting product do not have any hazardous properties as sufficient confidence could only be obtained with disproportionate testing efforts. Instead, the monitoring of product quality should be complemented by controlling that whenever a hazardous waste is used as an input, it has undergone a suitable treatment. Which type of treatment is suitable depends on the type of hazardous waste used as input.

As part of end-of-waste criteria, the choice of suitable treatment to deal with hazardous waste cannot be left open to case-by-case industry decisions but must follow clearly defined and legitimated treatment requirements for the specific type of hazardous waste. In the EU such treatment requirements have been established in ELV Directive and the WEEE Directive. Hazardous wastes that are covered by the provisions of one of these Directives could therefore be allowed as input materials.
If discarded equipment containing chlorofluorocarbons is considered a hazardous waste only due to the content of chloroflurocarbons they can be rendered non-hazardous by removing these substances in a controlled process. This is a clearly defined process that can be included in the process requirements. This type of hazardous waste may therefore also be allowed as input material.

Further types of hazardous waste could be allowed as input at a later stage if their treatment is legally regulated in an equivalent manner.

An alternative approach, which would prevent the need for updates of the end-of-waste criteria, would be to generally allow hazardous waste as input material under the condition that proof is provided and approved by the authorities (for example as part of the permit for the waste treatment facility) that suitable treatment is applied to remove all hazardous properties.

Filings and turnings
Steel turnings usually contain oil and even when such material is treated by centrifugation or pressing (to remove the oil) the remaining oil content will often still be relatively high because of the high surface/weight ratio. During transport and storage, the turnings will oxidise relatively quickly. However, not allowing filings and turnings to reach end-of-waste status would exclude a quantitatively important type of scrap from this mechanism and introduce a certain fragmentation in the metal scrap market. Altogether there is no clear technical conclusion as to whether or not filings and turnings are suitable input materials for a scrap to reach end-of-waste status.

Draft formulation of requirements:
No other waste shall have been used as input to obtain the scrap than wastes that contained recoverable iron and steel at source.

No hazardous waste shall have been used as input to obtain the scrap except:

- **wastes that are covered by the WEEE Directive or the ELV Directive; and**
- **discarded equipment containing chlorofluorocarbons (CFC) that does not have any hazardous properties except those due to the chlorofluorocarbon content,**
- **other hazardous waste for which proof is provided that suitable treatment to remove all hazardous properties is applied in a treatment process which is approved by authorities.**

2.6 Criteria on treatment processes and techniques

The purpose of criteria on treatment processes and techniques is to check product quality indirectly.

When reaching end-of-waste status, the material must have gone through all necessary treatment processes that make it suitable as direct input material for the final users of scrap and allow for transporting, handling, trading and using the scrap without increased environmental and health impact or risks.

The required treatment processes to achieve this differ depending on the waste types from which the scrap has originally been obtained. Some details on the treatment processes and techniques for different types of waste are described in Chapter 1.3.

The metal scrap case study in the JRC 'End-of-Waste Criteria' report suggested process requirements according to the three groups of scrap sources, however the further consideration of the groups showed that the system of grouping was not essential in order to develop the criteria.

Instead, the criteria on processes and techniques can include:

- basic general process requirements that apply in all cases (for all types of waste);
- specific process requirements for specific types of waste (including for all allowed by hazardous waste types).

This reflects the discussions in the TWG, which showed that for non-hazardous waste, there is a preference for generic requirements that do not prescribe a specific technology. The reason is that industry should not be prevented from adjusting processes to specific circumstances and from innovation in general. Specific process requirements are, however, needed for the treatment of hazardous wastes and certain special cases of input materials (such as WEEE, ELV, turnings or cables) in order to complement the direct product quality requirements.

The purpose of the general process requirements is to clarify the minimum treatment required and where in the treatment chain the point of end-of-waste is reached. Regarding minimum treatment it should be considered that some scrap may be obtained in pure form by segregating it from other waste at source or during collection. Any other wastes must have been treated to separate the non-metal and non-ferrous materials off. The point of end-of-waste is reached when the scrap has gone through all required treatments that make it suitable for direct use in the production of new metal in the steelworks.

ELV and WEEE are complex wastes for which treatment requirements have been established by European Directives. The wastes covered by these Directives, whether hazardous or non-hazardous, cannot cease to be waste unless they have fulfilled the provisions of the Directives.

Specific treatment requirements are also needed for discarded equipment containing chlorofluorocarbons because they are hazardous waste and not in all cases covered by the requirements of the ELV or WEEE Directives.

If filings and turnings are allowed as input materials, special treatment requirements are needed for the removal of cutting fluids such as oil because the related qualitative product quality requirement alone may not be stringent enough for this particular kind of waste.

Requirements of how to treat cables and containers can be seen as optional as a reinforcement of the set of criteria. To some extent the relevant issues are already addressed by the product quality requirements.

There was a broad consensus in the TWG that there should be no requirements on baling or compacting, as this might be counter-productive (e.g. ‘hiding’ of bad material inside of bales). However, these processes are commonly used for improved material handling, therefore the requirements on baling or compacting could be used based on the commercial agreement between the seller and buyer.

Draft formulation of requirements:
The iron or steel scrap shall have been segregated at source or while collecting and shall have been kept separate; or the input wastes shall have been treated to separate the iron and steel scrap from the non-metal and non-ferrous components.

All mechanical treatment (like cutting, shearing, shredding or granulating; sorting, separation, cleaning, de-polluting, emptying) needed to prepare the material for direct input into final use shall have been completed.

Specific requirements:

- **a.** **Input materials that originate from end-of-life vehicles or waste electronic or electric equipment shall have completed all treatments as required by the ELV Directive (Article 6) and the WEEE Directive (Article 6).**
- **b.** **Discarded equipment containing chlorofluorocarbons (CFCs) must have been captured in an approved process.**
- **c.** **Filings and turnings that contain cutting fluids such as oils shall have been treated to remove these fluids by processes like centrifugation or pressing.**
- **d.** **Cables must have been stripped or granulated. If a cable contains organic coatings (plastics), the organic coatings must have been removed according to the best available techniques.**
- **e.** **Barrels and containers including inter alia oil and paint drums, shall have been emptied and cleaned.**
- **f.** **Hazardous substances have been efficiently removed.**

Information provided with the product

The owner of the material that invokes the end-of-waste status must provide information about the product to characterise the product technically, produce a radioactivity test certificate as required by the end-of-waste criteria, identify the external verifier of the quality assurance system (see bellow) and certify that all end-of-waste criteria have been met and accepted by buyers and competent authorities. Such information may also be provided electronically.

<u>Draft formulation of requirements:</u>
Each consignment of the iron and steel scrap or multiple loads to the same customer shall either be accompanied by the following information or be available in electronic form to the customer and upon the request of any competent authority:

- **a.** **he name or code of the scrap category according to a specific product standard or specification and a declaration of compliance with the standard or specification;**
- **b.** **a radioactivity test certificate in accordance with the UNECE Recommendations on Monitoring and Response Procedures for Radioactive Scrap Metal or similar certificate according to national rules);**
- **c.** **identification of the external verifier or the certification of the quality assurance system;**
- **d.** **statement of conformity to the end-of-waste criteria;**

2.7 Quality assurance

The TWG has expressed very strong support for making quality assurance requirements part of the end-of-waste criteria. Quality assurance is needed to create confidence in the end-of-waste status. The owner of the material applying the end-of-waste status will have to rely on a quality assurance system to be able to demonstrate compliance with all the end-of-waste criteria for the material to cease to be waste.

A quality management system must be in place and cover the key areas of operation where compliance with end-of-waste criteria will have to be demonstrated.

Whilst the implementation of an internationally recognised quality management system such as ISO 9001 would be suitable, it is not considered appropriate for end-of-waste criteria to specify a particular quality management system which must be implemented.

It is considered appropriate and proportional for end-of-waste criteria to require that a quality management system be implemented and externally verified. Such verification should assess if the quality management system is suitable for the purpose of demonstrating compliance with the end-of-waste criteria applicable to the case in question.

A suitable quality management system for scrap metal is expected to include:

- procedures to decide about the acceptance of input materials;
- monitoring of processes to ensure they are effective at all times;
- procedures for monitoring product quality (including sampling and analysis) that are adjusted to the process and product specifics according to good practice;
- procedures that ensure the effectiveness of the radiation monitoring and the ability of the radiation monitors to detect changes in radiation intensity;
- actively soliciting feedback from customers in order to confirm compliance with product documentation;
- record keeping of main quality control parameters;
- measures for the review and improvement of the quality management system;
- training of staff.

The competent waste authority must be able to commission an independent second party audit of the implemented quality management system to satisfy itself that the system is suitable for the purpose of demonstrating compliance with end-of-waste criteria.

The details on the verification, auditing or inspection of the quality assurance system can follow different national approaches.

<u>Draft formulation of requirements:</u>
The acceptance of input materials, all treatment steps and product quality checks (including any sampling and testing or visual inspections) according to the end-of-waste criteria must be carried out under a fully implemented and externally verified quality management system.

The quality management system must at least include the following elements:

1. **the quality management system must be auditable and ready for inspection by the competent authority under waste law to ensure that the system is suitable for the purpose of demonstrating compliance with end-of-waste criteria;**
2. **must include a set of documented procedures addressing each key process relevant to compliance with the technical end-of-waste criteria, including:**

   a. **acceptance of input materials;**
   b. **monitoring of processes to ensure they are effective at all times;**
   c. **monitoring product quality (including sampling and analysis) that are adjusted to the process and product specifics according to good practice;**
   d. **procedures that ensure the effectiveness of the radiation monitoring and the ability of the radiation monitors to detect changes in radiation intensity;**
   e. **actively soliciting feedback from customers in order to confirm compliance with product documentation;**
   f. **record keeping of main quality control parameters;**
   g. **measures for review and improvement of the quality management system;**
   h. **training of staff.**

Specific requirements regarding Point 2.c (monitoring product quality)

It must be assured that <u>each consignment</u> shall at least be:

- **monitored for radioactivity;**
- **inspected visually regarding all other product quality requirements.**

By means of <u>representative sampling of consignments</u> the monitoring shall also include:

- **Testing of compliance with the criterion that the total amount of materials mentioned under steriles shall be ≤ 2 % by weight.**

  The appropriate frequencies of sampling shall be established by consideration of the following factors:

  - **the expected pattern of variability (for example as shown by historical results);**
  - **the inherent risk of variability in raw material input quality and any subsequent processing;**
  - **the inherent precision of the monitoring method; and**
  - **the proximity of actual results to the limit of compliance with the relevant end-of-waste condition.**

  The process of determining monitoring frequencies should be documented as part of the overall quality assurance scheme and as such should be available for auditing.

2.8 Application of end-of-waste criteria

For the application of end-of-waste criteria laid out above it is understood that a consignment of iron and steel scrap ceases to be waste when the owner of the scrap certifies that all of the end-of-waste criteria have been met.

It is understood that iron and steel scrap that does not meet the end-of-waste criteria still can be used for the production of iron and steel. In this case, the recycling or recovery is completed when the scrap is melted in a furnace and new metal has been produced and the new metal will not be considered waste.

The end-of-waste criteria including proposed systems of monitoring with explanations are summarised in Annex 7.

3 IMPACTS

In order to evaluate the soundness of end-of-waste criteria developed for iron and steel scrap, it is necessary to assess the possible impacts of removing the waste status from these materials. The impact assessment covers environmental, economic and legal impacts that may result once the scrap ceases to be waste. Many member states have different operational rules and permits used for waste handling. As a result, since there are different existing approaches, the impact of end-of-waste would be different from country to country.

3.1 Environmental and health impacts

Energy use and GHG emissions

When the end-of-waste criteria facilitate more recycling of iron and steel scrap, this will imply savings in energy use and GHG emissions associated with iron and steel production. It is however not possible to calculate the size of this effect.

Other air emissions

The treatment of metal scrap will remain to be covered under waste regulations and the specific air emissions and dust created during the treatment of metal scrap are unlikely to be changed by introducing the end-of-waste criteria.

Also the specific air emission from the iron and steel production in the EU are not expected to change because the relevant processes and flue-gas treatments (under IPPC permits) will not be affected.

It is unlikely that facilitated export of end-of-waste scrap outside the EU would have any substantial effects on air emissions of iron and steel production outside the EU. Because of the strict product quality requirements it can be expected that exported end-of-waste scrap will on average not be more polluted than the scrap used today for iron and steel production outside the EU. This applies also to zinc coating. The end-of-waste criteria do not exclude scrap which is galvanized. The use of such scrap is normal industrial practice in steel production inside and outside the EU and it is not expected that the end-of-waste criteria would lead to increased zinc-related air emissions.

Risks related to scrap transportation and storage

Storage and transport of end-of-waste scrap will no longer be covered by waste regulatory controls. Theoretically this could imply an increased risk for the environment if the end-of-waste scrap has properties that need such controls and if waste regulation is effective in providing it. There are however only moderate risks associated with end-of-waste scrap, mainly related to (invisible) residual oil and to the fact that zinc emissions to water or soil from galvanised steel cannot fully be ruled out. Normal good practice of transport and storage seem to be appropriate to control these types of risks and in most cases waste regulatory controls would not lead to additional measures to further reduce these risks. (In practice it can be expected that metal scrap as a product will in most cases be stored under the same conditions as it used to be as waste).

Radioactive metal scrap

The end-of-waste criteria include strict requirements on radioactivity monitoring which are likely to improve the risk control related to radioactive metal scrap.

3.2 Economic impacts

The economic and market impacts are expected mainly due to the:

- avoidance of costs related to the shipment of waste;
- benefits of harmonisation of waste status for end-of-waste criteria;
- avoidance of costs of handling the scrap in terms of permits and licenses;
- REACH compliance (see separate section 3.3).

Shipment

The waste status of metal scrap affects the exportability by increasing the administrative and economic burdens. The costs to the recycling sector in the wider sense are higher under the waste regime. The total involved costs related to international shipment are difficult to estimate however, the European Ferrous Recovery and Recycling Association (EFR) and the British Metals Recycling Association (BMRA) gave practical examples of possible complications due to the 'waste' status of scrap metal and these are given below.

- Requirement to obtain certain information from overseas (non-EU) re-processors to satisfy 'broad equivalence' obligations set out in the Packaging Directive, WEEE Directive and Waste Shipments Regulation.

With 'end-of-waste' status, it would be possible to produce the necessary evidence based on the end-of-waste criteria concept, rather than having to track the material through the docks and across the world. According to one large UK metal recycling company, the costs in 2007 associated with obtaining this information from around 200 facilities was GBP 100000. This figure includes administrative and translation (of supporting documents/licences) costs.

- Notification and insurance costs on financial guarantees for waste shipments sent to countries where pre-notification is required (including certain 'green list' shipments) under the Waste Shipments Regulations.

Each notification requires a financial guarantee, except to countries under treaty of accession arrangements. Several Dutch companies at one time have had a total of up to EUR 10 million tied up in financial guarantees. This is 'financed' by the bank at certain costs and also means a lesser liquidity for the companies. Because of this there is a limit to the number of notifications a company can handle/'absorb'. In other words, there is an artificial (trade) barrier and companies can not sell to all potential customers after their financial limit has been reached. Also in the UK, the cost of a single notifiable ship has been qualified as high, plus insurance premiums on a financial guarantee (typically several thousand pounds).The shipment of green listed wastes to EU Member States with transitional period do not require a financial guarantee (insurance). However, administrative fees for notification might be high and vary from country to country. End-of-waste would facilitate the free trade of scrap that meets the set end-of-waste conditions and criteria where there are metal works in Latvia up to 31 December 2010; Poland up to 31 December 2012; Slovak up to 31 December 2011; Bulgaria up to 31 December 2014; and Romania up to 31 December 2015.

- Administration costs for maintaining Annex VII Waste Shipments Regulation tracking forms and domestic waste movement forms.

In addition to the direct administration costs associated with form filling, there is an issue of having to supply commercially sensitive data. The British Metals Steel Association received evidence that companies have lost customers due to this requirement. Customers outside the EU jurisdiction are not willing to have their commercial transactions recorded and made available to public authorities. Therefore they turn to non-EU suppliers, such as exporters from the US, Russia or Japan.

- Loss of business where customers fail to provide appropriate information.

The Waste Shipment Regulations require that non-OECD countries reply to the Commission's 'note verbale', indicating which 'wastes' they are prepared to accept and what control procedures they wish to apply. If they do not reply (and very many do not – or give a negative reply for waste from the EU, whilst they import scrap from elsewhere but do not consider such metal scrap to be 'waste'), then notification controls apply by default. In these circumstances, either: the business incurs the additional costs of notification; or since notification documentation from the receiving country is difficult and time-consuming to obtain, in the meantime the buyer may turn to a non-EU supplier. On average the notification procedure takes 3 to 6 months. Where notifications are not required, the current 'waste' status may still affect exportability in terms of the waiting time for buyers to receive import licenses. As price and demand change quickly, these waiting times lead to market distortions and inefficiency.
Evidence from published notifications show, despite the cost, that non-hazardous waste are exported under such costly controls that were not originally intended to be applied to non-hazardous wastes at all. Industry absorbs the costs and regulatory relief is sought to reduce costs.

A number of Member States allow waste to cross only at designated border crossings which restricts transport routes. The recycling sector explained that it worked with the Council and Commission Regulations (EC) No 1420/1999 and No 1547/1999 from 1998 to 2006 to obtain well over a dozen amendments to keep recyclables flowing to customers in non-OECD countries. However, due to the response or lack of response of certain non-OECD countries those secondary metal markets are instead fed for example by the USA. However, comparison of the exports of the USA (where scrap is not waste) with exports of the EU (where scrap is waste), since there is a great overlap of the major trading partners, reinforces that the markets will adjust and flows may change slightly, but no great market changes would be forecast on the end-of-waste of the EU. Furthermore, end-of-waste criteria may not affect how importing countries view EU-origin scrap. For example: the Chinese CCIC pre-inspections use their own parameters to accept or refuse shipments regardless of EU terminology; and
the Indian port authorities inspect according to their own regulations.

It has also been mentioned that a number of Member States are now asking for pre-notification for non-hazardous green list wastes, e.g. scrap shipments to other EU Member States.

<u>Permits, licenses related to handling with metal scrap as waste</u>
The situation for waste collectors and processors regarding permits or licenses will not change. A relief is expected mainly for traders which will not need any waste licenses when they trade only scrap which has ceased to be waste. The relief from the 'waste' status being for example in the permits, licenses and administration described below:

In a Waste Treatment Authorization a scrap company may have to complete the administration paperwork indicated below every year:

- An annual report (company-specific reporting of all transactions and EWC code-specific reporting of all transactions). This usually requires administration time of 5 person months/year).
- Monthly reports of incoming and outgoing materials.
- Record books.
- Special activity license for the yard, for transport for processing (for the yard approval, as an example, the license renewal is every 10 years. The procedure takes at least 6 months to 1 year. The costs of the reports are substantial.
- Environmental impacts assessment of the scrap yard activity if handling over 5 tonnes/day.
- Environment responsibility insurance.

- Waste transport authorization (there is a restricted market of carriers, transporters of scrap classified as waste).
- National laws implementing the ELV Directive.
- National laws implementing the WEEE Directive.
- National laws implementing the Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators.

Most companies that are active in the export market have specialised staff for environmental issues. The waste status/legislation is the main reason for this as well as the necessity for quality management because of the strict legislation. On average staff will consist of 1 to 5 persons depending on the size of the company. In the Netherlands such staff will represent a cost of anywhere between EUR 50 – 250 000 in costs. This can however be much higher for larger companies.

The considered estimate of the administrative burden associated with the legislative requirements of handling of scrap metal as a waste material may have had a cost in the region of GBP 262 885 in 2008 for one major company in the EU.

3.3 Legal impacts

REACH

Article 2.2 of the REACH Regulation([4]) specifies that waste is not a substance, mixture or article within the meaning of Article 3 of this Regulation. As long as iron and steel scrap has the status of waste it is therefore not a substance, mixture or article for REACH and most obligations under the REACH Regulation do not apply.

When iron and steel scrap cease to be waste according to Article 6 of the WFD, the exemption under Article 2.2 of the REACH Regulation does not apply anymore. A benefit of EU-wide end-of-waste criteria will therefore be to clarify when iron and steel scrap has to be considered a substance, mixture or article under REACH and when not.

However, concerns have been raised that the end-of-waste criteria may lead to disproportionate regulatory burdens under REACH, especially for the companies that produce iron and steel scrap with end-of-waste status. The main potential burdens are related to the registration of the substances in end-of-waste scrap and to the obligations to provide safety information to downstream users.

On 14 October 2009, the Commission organised a meeting in Brussels to discuss end-of-waste criteria for iron and steel scrap and aluminium scrap and REACH. The meeting brought together experts from European and national industry associations of all the affected sectors (metal producers, processors and recyclers, as well as the waste management sector) and staff of the Environment DG, the Enterprise DG and the Joint Research Centre (the IPTS). A draft version of this chapter of the report was distributed to the participants in advance of the meeting and the meeting allowed to further clarify the link between end-of-waste and REACH, which is taken into account in this chapter.

Mixtures, substances and impurities

The main reference regarding waste and recovered substances is the Commission document CA/24/2008 rev.3, which was produced as a follow up to the Fifth Meeting of the Competent Authorities for the implementation of Regulation (EC) No 1907/2006 (REACH). The CA/24/2008 rev.3 document states the following regarding recovered metals:

([4]) EC 1907/2006

'Under REACH, pure metal (even if containing a certain amount of impurities) is considered as a substance. Recovered pure metal (even if containing a certain amount of impurities) is also a substance. Registration requirements for the substance will depend on whether the substance has been registered before and the relevant safety information is available (see Article 2 (7)(d)) of REACH.
Alloys are considered as (special) preparations ([5]) *and the substances in those preparations are subject to registration. Recovered metal made from mixed alloy metal scrap will normally be a preparation but it could in certain cases also be a substance with impurities (e.g. when the purpose of recovery is only to reclaim one main metal and all other constituents can be seen as impurities). In general, all components which have been intentionally selected for recovery and which have a main function in the recovered material should be seen as separate substances (e.g. steel will next to iron normally always contain manganese; the recycled steel is therefore a preparation). Constituents which only occasionally occur in parts of the waste from which the recovered metal originates or which do not have a particular function in the recovered material can be seen as impurities (e.g. molybdenum may occur in certain types of steel but not in others).'*

The CA/24/2008 rev.3 document states the following on impurities (in general terms on waste and recovered substances):

*'The guidance on substance identification defines an impurity as "*an unintended constituent present in a substance as produced. It may originate from the starting materials or be the result of secondary or incomplete reactions during the production process. While it is present in the final substance it was not intentionally added.*"*

Recovered substances may contain impurities which may distinguish them from corresponding materials not deriving from recovery processes. This is in particular the case when recovered materials contain unintended constituents which have no function for the recovered material and the only reason for their presence in the recovered material is that they were part of the input waste for the recovery process. The content and nature of such unintended constituents may vary significantly from batch to batch (e.g. in time and location). Full knowledge of the exact composition in each such case may require substantial analytical efforts. While such constituents may have originally been intentionally added as substances to form a preparation, their presence in the recovered material may be unintended (depending on whether these constituents have a specific function or not) and therefore, they can be considered as impurities, which do not require separate registration.

Constituents present in quantities above 20 %(w/w) should, however, in general not be considered as impurities but as separate substances in a preparation. However, in the case that recovered material is intentionally selected for the presence of certain constituent(s), those constituents should also be considered to be separate substances, even if they are present in smaller quantities than 20 %(w/w) (e.g. if PVC is selected for the presence of softeners, it may be necessary to register these softeners, unless they have been registered before).

During the mechanical separation of mixed waste it is often impossible to reach 100 % purity free of alien elements. These alien elements often are either extraneous to the waste stream per se (for example, and depending on the waste stream, stones, plastics, pieces of rubber, sand, etc.) or extraneous to the material object of the recovery but part of the final product that became waste (for example, paints, coatings, etc.), of which the composition and total amount are difficult to precise. After appropriate sorting and separation, these fractions should be present in the recovered material only in very small fractions. In this case, *such elements can be considered as impurities that do not need to be registered.*

Even if impurities do not have to be registered separately, they may be relevant for the hazard profile as well as the classification and labelling of the substance or mixture in which they

([5]) The term 'preparation' has meanwhile been superseded by the term 'mixture'.

occur. Relevant risk management measures may need to be recommended in SDS or information according to Art. 32. These risk management measures can consist e.g. in further purification steps to eliminate impurities or measures to ensure the safe handling of the substance with the impurities in it.'

Substances in iron and steel scrap with end-of-waste status

Under REACH only substances are subject to registration. According to REACH, a recovered metal may be as defined below.

1. A mono-constituent substance. Content of main metal [Me1] ≥ 80 %. This substance may contain impurities, in principle below 20 % for the purposes of naming the substance. The steriles (end-of-waste criteria < 2 %) should be covered by this 20 %. As mentioned in the guidance for substance identification (Section 4.2.1.2), deviation from this 80 % rule (i.e. content below 80 %) has to be justified (e.g. it has the same physicochemical properties and the same hazardous profile, range of concentration of the main constituent and the impurities overlap the 80 % criterion and the main constituent is only occasionally ≤ 80 %);
2. A mixture. When the metal scrap is an alloy (special mixture of metals) or the metal scrap is intentionally selected for the presence of several metals [Me1], [Me2], [Me3], mixtures are composed of two or more substances. In the particular case of scrap metals, the majority of substances, if not all, are metals. As in this case, each substance can bring to the mixture a maximum of 20 % impurities and, thus, the theoretical maximum of impurities should be 20 % (only in the case that each substance brings 20 % of impurities in the mixture). However, in reality the percentage of impurities would be less.

Note: Producers of scrap applying the end-of-waste status (as manufacturers) have the obligation under REACH to decide which of the above two cases applies. This rather short summary should not prevent recyclers from reading and using the guidance for substance identification (available in ECHA web pages).

To understand which substances, as defined by REACH, there are in iron and steel scrap with end-of-waste status, the technological aspects given below need to be considered. Iron and steel scrap with end-of-waste status would:

a. always contain iron as a component that has been intentionally selected for recovery and that has a main function in the recovered material;
b. sometimes contain other components that have been intentionally selected for recovery and that have a main function in the recovered materials:

    - for example carbon and manganese in steel scrap according to the European Steel Scrap Specification;
    - for example chromium, nickel, or molybdenum in alloyed steel scrap.

c. always contain small amounts of elements that do not have a particular function in the recovered material. These elements may be metals or non-metals, which occasionally occur in parts of the waste from which the recovered material originates. (The proposed end-of-waste criteria limit the possible total content of components that do not originate from iron (in a macroscopic sense) or steel to below 2 % by weight and exclude any iron and steel scrap that has hazardous properties identified in Annex III of the Waste Framework Directive.)

From these considerations, it follows that iron and steel scrap with end-of-waste status can normally be considered a mixture under REACH which contains several metals. The components mentioned under a) and b) above, for example, can be considered substances under REACH. More specifically, they can be considered recovered substances. The elements mentioned under c) can be considered as impurities that do not need to be registered. Irrespective of whether those impurities are original impurities of the substance or whether they are steriles in the metal scrap, they will need to be allocated as impurities of the substance(s) in the mixture. This is needed if there are impurities that are relevant in terms of the naming of the substances and the sameness question for the purposes of the application of Article 2(7) (d)([6]).

Registration of substances in iron and steel scrap with end-of-waste status

Following the argumentation above, the substances contained in iron and steel scrap with end-of-waste status are recovered substances (metals or carbon). REACH registration of recovered metals is not required when they comply with the conditions of Article 2(7)(d) of REACH:

- the metals have been registered (Article 2(7)(d) i);
- the relevant safety information is available (Article 2(7)(d)ii).

As the following assessment will show, it can be expected that these conditions can normally be met without disproportionate efforts. This implies that in practice processors will not have to register any substances under REACH. Industry associations can contribute decisively to keep the burden low for companies that want to demonstrate compliance with these conditions.

Regarding Article 2(7) (d)i

Recovered substances in iron and steel scrap

Under REACH, recovered iron or steel scrap can be considered either a single recovered substance (iron) or a mixture containing various recovered substances (iron, one or more other metals or carbon).

In the case of carbon steel scrap meeting the end-of-waste criteria, only iron and possibly manganese and carbon would have to be considered substances subject to registration under REACH. All other constituents, such as those included in steriles as defined in this report, would qualify as impurities should the scrap have not been selected for their presence. (It should also be noted that the content of steriles would be limited to < 2 % by the end-of-waste criteria proposed in this report.)

Other steel scrap may contain several metals (e.g. scrap containing alloyed steel). Such steel scrap will in most cases also contain chromium, nickel or molybdenum as substances subject to registration under REACH. Some specific types of alloyed steel scrap will furthermore also contain vanadium, tungsten, cobalt, titanium or niobium as substances.

Will a substance be registered or has it already been registered?

The European steel industry (EUROFER) has announced that it will register iron used in European steel production by December 2010. The meeting on 14 October in Brussels revealed that the other main metals used in iron and steel alloys as well as carbon will also be registered by the December 2010 deadline. Metals used only for special and rarer alloys may be manufactured and imported in lower quantities so that registration may happen according to later deadlines. In any case, industry representatives expect that these metals will also be registered by the time producers of iron and steel scrap with end-of-waste status are faced with the need to apply the Article 2(7)(d)exemption.

In summary, industry expects that all relevant substances in metal scrap will be registered when this is needed for the application of the exemption under Article 2(7) (d)([7]).

Sameness

The CA document 24/2008/rev3 explains that in assessing whether the recovered substance is the same as a substance that has already been registered or whether the substances are different, recovery installations need to apply the rules of the guidance on substance identification and the guidance on data sharing.

([6]) Failing this, the scrap metal as a whole would be seen as one substance and hence could be subject to registration.
([7]) This assumes that the end-of-waste criteria will not enter into force until December 2010.

The CA document notes that variations in the composition and the impurity profile, including a variation in the percentage of impurities, do not necessarily mean that substances are different. According to the guidance on data sharing, *'for substances with a well-defined composition (i.e. mono-constituent and multi-constituents substances) the sameness of the naming is in principle sufficient to be able to share data even though certain impurities might lead to a different classification/hazard profile. Only in cases where all data is clearly not suitable for the other substance these substances can be regarded as different (e.g. in case of very different physical properties which have essential impact on the hazard properties, like water solubility).'*

It should be noted that the possible amounts and variation of impurities are limited by the end-of-waste criteria. Iron and steel scrap that complies with the end-of-waste criteria will contain only very limited amounts of substances other than iron, other metals and carbon. This will be ensured by the end-of-waste criteria by limiting the content of 'steriles' and by the process requirements. Steriles that would change the hazardous properties of the recovered metal scrap are excluded by the end-of-waste criteria. This facilitates considering the metals contained in iron and steel scrap to be the same substances as the substances produced by primary producers of iron and steel and the other metals.

In this context it is useful to highlight again that impurities (whether from original impurities of the substance or whether from steriles in the metal scrap) will need to be allocated as impurities of the substance(s) registered and identified in the metal scrap as subject to registration. This is needed in terms of the naming of the substance and the sameness for the purposes of the application of Article 2(7)(d). Failing this, the scrap metal as a whole would be seen as one substance, which could mean that identifying sameness with the registered substance could be more difficult.

The responsibility for determining sameness lies in the hands of the producers of iron and steel scrap that apply the end-of-waste status as the 'manufacturers' of the substances ([8]). There is no confirmation given on 'sameness' by the European Chemicals Agency. The manufacturer will need to have information on the substance itself and its impurities ([9]).

European recycling industry associations have announced that they will prepare standard documents with the necessary information (including on the chemical composition of the different scrap categories) and guidance that will allow individual companies to decide about the sameness of substances. The guidance may also explain how to allocate any impurities in mixtures to the individual substances. It is therefore not expected that individual companies will have to carry any testing or chemical analysis in order to demonstrate the sameness of the substances.

<u>Regarding Article 2(7)(d)ii</u>

Article 2(7)(d)ii provides that *'the information required by Articles 31 or 32 relating to the substance that has been registered in accordance with Title II is available to the establishment undertaking the recovery'*. Such an establishment will normally not receive safety data sheets (SDS) or other safety information in the framework of Title IV of REACH, so to benefit from the registration exemption, the required information must be available by other means. The manufacturer can use any available information, starting with the information on the ECHA website and published in accordance with Article 119, but must make sure that no property rights are violated. When using an existing SDS, legitimate access to the information must be ensured. The same applies to other safety information, if required.

([8]) As stated in the CA document 24/2008/rev.2 on 'Waste and recovered substances': "[…] <u>all</u> forms of recovery are […] considered as a manufacturing process whenever, after having undergone one or several recovery steps, they result in the generation of one or several substances that have ceased to be waste."

([9]) If the manufacturer has pre-registered the substance, discussions within the SIEFs will allow companies to address sameness and refine and if necessary correct substance identity, as long as it is clear that the pre-registration was done for the concerned substance.

It appears that an SDS may be required at least for nickel. Article 32 information will be sufficient for most of the other substances that may appear in iron and steel scrap. The information required under Article 32 (i.e. if no safety data sheet is required) is rather limited (registration number, information on authorisation and restriction if any, and any other available and relevant information to enable appropriate risk management measures).
Industry associations have expressed that they will prepare standard information for their members. EUROFER for example has already stated on behalf of the European steel industry in its position paper dated 23/02/2009: '*In order to comply with requirement […] of Articles 2(7)(d), the scrap recovery industry needs information about the substances it recovers and that information will be provided by the European steel and non-ferrous industry.'* Having access to such standard information will allow individual companies to show that the required information under Article 2(7)(d) 'is available to the establishment undertaking the recovery'.

Imports
The exemptions under Article 2(7)(d) apply only to substances which are recovered in the Community. It should be noted that Recital 22 of the WFD says that for 'the purposes of reaching end-of-waste status, a recovery operation may be as simple as the checking of waste to verify that it fulfils the end-of-waste criteria.' If the waste is checked to verify that it fulfils the end-of-waste criteria after it has been imported in the Community and not before, then it would have waste status when it is imported and it seems logical then to consider that the substances it contains are recovered in the Community.

Provision of information required under Articles 31 or 32 of REACH
According to Articles 31 and 32 of the REACH Regulation, suppliers of substances or mixtures have to provide the recipients with safety information. This requirement is not exempted under Article 2(7)(d) for recovered substances. For certain substances and mixtures, safety information has to be provided in the form of SDSs according to Article 31. If SDSs are not needed, safety information according to Article 32 has to be provided. Normally an SDS will not be needed for end-of-waste scrap unless the scrap has to be classified as dangerous because of the content of certain alloys, because the end-of-waste criteria do not allow the scrap to have hazardous properties for other reasons. The following assessment discusses this in more detail.

When is it necessary to provide a SDS (Article 31)?

1. A SDS, including,where relevant (> 10 t/yr) exposure scenarios, must be provided when:

   a. The substance/mixture meets criteria for classification as dangerous in accordance with Council Directive 67/548/EEC (Dangerous Substances Directive) or Directive 1999/45/EC of the European Parliament and of the Council (Dangerous Preparations Directive) (Article 31(1)(a) of REACH); or
   b. The substance on its own or in a mixture is a persistent, bioaccumulative and toxic chemicals (PBT), very persistent, very bioaccumulative (vPvB) in accordance with the criteria set out in Annex XIII (Article 31(1)(b) of REACH); or
   c. The substance on its own or in a mixture is on the REACH Candidate list (Article 31(1)(c) of REACH); or
   d. The customer has requested an SDS (Article 31(4) of REACH). For commercial reasons, a recycler may choose to produce an SDS at the request of a customer, even if he is not legally obliged to do so. Article 31(4) specifies that an SDS need not to be supplied where dangerous substances or mixtures offered or sold to the general public are provided with sufficient information (Article 31(4), i.e. SDSs are only for professional users (downstream user or distributor under REACH).

2. The supplier shall provide the recipient upon request with an SDS where mixtures do not meet the criteria for classification as dangerous but which contain an individual concentration of ≥ 0.1 % by weight for non-gaseous mixtures at least one substance that is PBT or vPvB in accordance with the criteria set out in Annex XIII or has been included

in the list established in accordance with Article 59(1) or a substance for which there are Community workplace exposure limits (Article 31(3)).

Obligations under Article 32

In the case where a supplier is not required to provide an SDS, the supplier still needs to comply with Article 32 of REACH: the duty to communicate information down the supply chain for substances on their own or in mixture for which an SDS is not required. The information to be provided includes:

a. registration number(s), if available;
b. if the substance is subject to authorisation;
c. details on any restriction imposed;
d. any other available and relevant information about the substance that is necessary to enable appropriate risk management measures to be identified and applied.

Such information should be provided free of charge and at the time of delivery (Article 32(2)). The information should be updated in cases where new information on hazards or risk management measures are available or in cases where the substance is subject to authorisation or restriction. (Article 32(3)).

Information requirements for iron and steel scrap with end-of-waste status:

The cases where an SDS is needed will be limited because the end-of-waste criteria for iron and steel scrap will exclude a scrap which ceases to be waste that has any of the properties which render waste hazardous (Annex III WFD), with the exception mentioned in the next paragraph. For most of the properties the same criteria have to be applied as according to the Dangerous Substances Directive and the Dangerous Preparations Directive. It should also be noted that, in the meeting on 14 October 2009, industry associations representing the users of iron and steel scrap have expressed that the users have no interest in demanding SDSs from the iron and steel scrap suppliers because they would regard this as ‘unnecessary paperwork’.

The end-of-waste criteria will, however, allow metals contained in metal scrap even if they are dangerous substances (such as nickel), and an SDS will be required for steel scrap that contains nickel in concentrations at and above 1 % w/w.

Conversely, it is likely that carbon steel scrap with low nickel contents (< 1 % w/w) will not require any SDS.

A producer of iron and steel scrap that applies the end-of-waste status does not have to generate a chemical safety report or exposure scenario for a substance (or substance in a mixture) that is exempted from registration (under Article 2(7)(d)). The same safety information that must be available to fulfil the condition under Article 2(7)(d)(ii) can usually be used for communicating the information down the supply chain.

The information required under Article 32, i.e. if no safety data sheet is required, will be limited to any other available and relevant information to enable appropriate risk management measures. For recovered substances that have not been registered (Article 2(7)(d) exemption) no registration numbers or information on authorisation or restriction have to be supplied.

Compilation of information to comply with safety information requirements

Producers of iron and steel scrap with end-of-waste status are generally not downstream users under REACH and will therefore not automatically receive safety information together with the waste materials intending to be processed. The information chain stops at the last downstream user and, consequently, post-consumer waste does not come with safety information.

European industry associations have, however, committed themselves to preparing guidance and standard documents for the provision of information in the supply chain and an SDS for recovered substances and mixtures in accordance with Articles 2(7)(d), 31 and 32 of REACH. The use of such standard information would allow for minimising the burden individual companies may face.

Such standard documents should cover all relevant (downstream) uses of the scrap. The standard documents should consider fully any guidance developed by ECHA on this issue in order to ensure the acceptance by the competent authorities of information provided by individual suppliers according to the standard documents.

The same safety information that must be available to fulfil the condition under Article 2(7)(d)(ii) can be used for communicating the information down the supply chain. (It is understood that this applies also to the exposure scenarios, if these are required for a substance.)

Reverse VAT (Value Added Tax)

Concerns were raised in the TWG that the end-of-waste status of scrap may in certain countries affect the applicability of reverse VAT charges on scrap. It should be noted that the end-of-waste criteria are not intended to change the way in which VAT is payable on scrap. It would therefore be preferable that scrap-specific provisions in national VAT law refer directly to scrap as a good, regardless of the status as waste or not (end-of-waste).

4 CONCLUSIONS

Thanks to the strong support from the TWG it has been possible to develop proposals for end-of-waste criteria for iron and steel scrap that:

- are in compliance with all the conditions given by Article 6 of the Waste Framework Directive;
- would be operational in practice; and
- would deliver clear benefits.

The main concerns that were raised, to different degrees by different experts and stakeholders, were about the implications and possible burdens under REACH. An in-depth assessment of the impacts related to REACH was carried out and has shown that REACH allows solutions so that disproportionate burdens for the industries can be avoided.

- It can be expected that recycling markets will benefit strongly from harmonised, EU-wide end-of-waste criteria for iron and steel scrap.

There is a clear need for Community-wide end-of-waste criteria for iron and steel scrap. Iron and steel scrap represents one of the major material recycling flows and is traded across the EU and worldwide. Under the old Waste Framework Directive and the corresponding case law iron and steel scrap was considered waste until it was melted in a furnace for the production of new metal. The new Waste Framework Directive introduced the concept of end-of-waste status and the possibility to develop end-of-waste criteria at the community level. Where end-of-waste have not been set at the Community level, Member States may decide case by case whether certain waste has ceased to be waste taking into account the applicable case law. However, many experts and stakeholders believe that case-by-case decisions are not desirable for materials that are traded internationally in substantial amounts and that Community-wide end-of-waste criteria are needed in such cases for the proper functioning of the internal market and also for the protection of the environment and human health.

- Early end-of-waste' allows for reducing administrative burden and compliance costs.

Most of the experts in the TWG have supported the 'early end-of-waste approach', i.e. that iron and steel scrap may cease to be waste when it has been mechanically processed and obtained a sufficient quality so that regulatory controls under waste regulation are no longer needed to protect the environment and human health. A direct advantage, compared to 'late end-of-waste' as under the old Waste Framework Directive, is that the administrative burden and paperwork under the waste regulation will be eliminated for compliant material. Such an advantage weighs especially high when scrap demand in Europe is relatively weak and prices are lower, such as in times of economic crisis.

- The end-of-waste criteria allow for consolidating the status of compliant iron and steel scrap as high-quality secondary raw-material.

The proposed end-of-waste criteria imply reinforcing the quality assurance for iron and steel scrap. This will further improve its reliability as high-quality raw material and strengthen consumer confidence in the product.

- Disproportionate burden under REACH is avoidable, but support by the different industry associations, guidance by the relevant European bodies and as much legal certainty as possible are needed.

The main concerns regarding 'early end-of-waste' for iron and steel scrap are related to REACH and the fact that the general exemption of waste from most obligations under the REACH Regulation will not apply to scrap with end-of-waste status. The REACH impact assessment has shown that it is possible for individual companies to avoid excessive burden under REACH. However, a degree of uncertainties remains, notably about the guidance that will be provided by industry associations and its acceptance by the authorities. Furthermore, under current law, registration would be required for scrap that is imported in the Community under end-of-waste status. How widely the end-of-waste criteria for iron and steel scrap will be accepted, will to a large extent depend on the degree of legal certainty that can be established about the obligations and non-obligations under REACH.

Guidance by the relevant European bodies could make an important contribution in this sense. It is also notable that during the intensive discussion of the REACH implications of end-of-waste for iron and steel scrap, nobody expressed the opinion that registration of the substances in the scrap was required to fulfil the objectives of REACH. Instead the discussions were characterised by the attempt to find a solution to the REACH 'problem'. There seems therefore to be a case for considering a legal exemption of end-of-waste scrap from registration obligations. Such an assessment is, however, clearly outside the remit of this report.

5 REFERENCES

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Commission Regulation 1547/1999 determining the control procedures under Council Regulation (EEC) No 259/93 to apply to shipments of certain types of waste to certain countries to which OECD Decision C(92)39 final does not apply

Directive on Batteries and Accumulators, Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC

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ANNEXES

Annex 1. Summarised European Steel Scrap Specification.

Category	Specification	Dimensions	Density (t/m^3)	Steriles	Aimed analytical contents (residuals) in %				
					Cu	Sn	Cr, Ni, Mo	S	P
Old scrap	E3	Thickness ≥6mm <1.5 x 0.5 x 0.5 m	≥0.6	≤1 %	≤0.250	≤0.010	Σ≤0.250		
	E1	Thickness <6mm <1.5 x 0.5 x 0.5 m	≥0.5	<1.5 %	≤0.400	≤0.020	Σ≤0.300		
New scrap (low residual, uncoated)	E2	Thickness ≥3mm <1.5 x 0.5 x 0.5 m	≥0.6	<0.3 %	Σ≤0.300				
	E8	Thickness <3mm <1.5 x 0.5 x 0.5 m (except bound ribbons)	≥0.4	<0.3 %	Σ≤0.300				
	E6		≥1	<0.3 %	Σ≤0.300				
Shredded scrap	E40		>0.9	<0.4 %	≤0.250	≤0.020			
Steel turnings	E5H			(*)	Prior chemical analysis could be required				
	E5M			(*)	≤0.400	≤0.030	Σ≤1	≤0.100	
High residual scrap	EHRB	Max. 1.5 × 0.5 × 0.5 m	≥0.5	<1.5 %	≤0.450	≤0.030	Σ≤0.350		
	EHRM	Max. 1.5 × 0.5 × 0.5 m	≥0.6	<0.7 %	≤0.400	≤0.030	Σ≤1.0		
Fragmentized scrap from incineration	E46		≥0.8	Fe content ≥92 %	≤0.500	≤0.070			

(*) No clear method to determine these values.

Annex 2. European Packaging Scrap Specification (draft Version).

Specification	Description	Dimensions	Density (t/m^3)	[Steriles ([1])]
EHRP47	Old and new shredded. Tin-coated packaging scrap. Old and new tin-coated sheets and tin cans fragmentised into pieces from 50 to 70 mm containing not more than 5 % of material smaller than 5 mm. Should be prepared in a manner to ensure direct charging. The scrap shall be free of excessive moisture and must be free of incinerated material, metallic copper, tin devices (and alloys) lead (and alloys) and steriles to meet the aimed analytical contents. Refer to point B and C of the general conditions	50 – 70mm max.	≥0.9	92 % Fe
EHRP76	Old and new tin-coated packaging scrap compressed or firmly baled in manner to ensure direct charging. The scrap shall be free of excessive moisture and must be free of metallic copper, tin devices (and alloys), lead (and alloys) and steriles to meet the aimed analytical contents. Refer to point B and C of the general conditions	Max. 0.6 × 0.6 × 1.5 m	≥1.3	≥93 % of metallic packaging scrap

([1]) Corresponds to the weight of steriles, not adhering to the scrap, remaining at the bottom of the vehicle after unloading by magnet.

Annex 3. Analytical content of specifications in percentage according to the European Packaging Scrap Specification (draft version).

Specification	Aimed analytical contents (residuals) in %		
	Cu	Sn	Cr, Ni, Mo
EHRP47	≤0.100	≤0.300	≤0.200
EHRP76	≤0.100	≤0.300	≤0.200

Annex 4. European Alloyed Scrap Specification (draft version).

Category	Specification	Description	Dimensions	Density	Steriles ([1])
ALLOYED SCRAP	LA (low alloy)	Low-Alloyed Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 0.5 – 3.0 % Cr, Ni, Mo. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Scrap may consist of new and old scrap. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %
	MA	Medium-Alloyed Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 3.0 – 11.0 % Cr, Ni, Mo. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Scrap may consist of new and old scrap. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %
	SS	Stainless Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 11 and 39 % Cr, Ni, Mo. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Scrap may consist of new and old scrap. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %
	HA	High Alloyed Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 39 and 100 % Cr, Ni, Mo. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Scrap may consist of new and old scrap. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %

ALLOYED STEEL SCRAP TURNINGS	AT	Alloyed Steel Scrap Turnings not exceeding 2.0 × 2.0 ×1.0 m, containing between 0.3 and 95 % Cr, Ni, Mo. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %
ALLOYED FOUNDRY STEEL SCRAP	AF	Alloyed Foundry Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 0.5 and 99 % Cr, Ni, Mo, V, W, Co, Ti, Nb, uniform in quality, composition and content. This steel scrap must be uncoated unless permitted by joint agreement. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %
SPECIAL ALLOYED STEEL SCRAP	SA	Special Alloyed Steel Scrap not exceeding 2.0 × 2.0 × 1.0 m, containing between 0.5 and 99 % Cr, Ni, Mo, V, W, Co, Ti, Nb, in single or different compositions. This steel scrap must be uncoated unless permitted by joint agreement and free of unbound ribbons to avoid trouble when charging. Must be free of metallic copper, tin, lead, mechanical pieces and steriles to meet the aimed analytical contents. Refer to points B) and C) of the general conditions except for clause 'Chromium, Nickel, Molybdenum'	Max. 2.0 × 2.0 × 1.0 m	> 0.4	< 1.0 %

([1]) Corresponds to the weight of steriles, not adhering to the scrap, remaining at the bottom of the vehicle after unloading by magnet.

Annex 5. List of ISRI categories for iron and steel scrap.

200 No. 1 heavy melting steel
201 No. 1 heavy melting steel 3 feet × 18 inches
202 No. 1 heavy melting steel 5 feet × 18 inches
203 No. 2 heavy melting steel(*)
204 No. 2 heavy melting steel(*)
205 No. 2 heavy melting steel 3 feet × 18 inches
206 No. 2 heavy melting steel 5 feet × 18 inches
207 No. 1 busheling
207A New black sheet clippings
208 No. 1 bundles
209 No. 2 bundles
210 Shredded scrap
211 Shredded scrap
212 Shredded clippings
213 Steel can bundles
214 No. 3 bundles
215 Incinerator bundles
216 Terne plate bundles
217 Bundled No. 1 steel
218 Bundled No. 2 steel
219 Machine shop turnings
220 Machine shop turnings and iron borings
221 Shoveling turnings
222 Shoveling turnings and iron borings
223 Iron borings
224 Auto slabs
225 Auto slabs
226 Briquetted iron borings
227 Briquetted steel turnings
228 Mill scale
229 Billet, bloom and forge crops
230 Bar crops and plate scrap
231 Plate and structural steel, 5 feet and under
232 Plate and structural steel, 5 feet and under
233 Cast steel
234 Punchings and plate scrap
235 Electric furnace bundles
236 Cut structural and plate scrap, 3 feet and under
237 Cut structural and plate scrap, 2 feet and under
238 Cut structural and plate scrap, 1 foot and under
239 Silicon busheling
240 Silicon clippings
241 Chargeable ingots and ingot butts
242 Foundry steel, 2 feet and under
243 Foundry steel, 1 foot and under
244 Springs and crankshafts
245 Alloy free turnings
246 Alloy free short shoveling steel turnings
247 Alloy free machine shop turnings
248 Hard steel cut 30 inches and under
249 Chargeable slab crops
250 Silicon bundles
251 Heavy turnings
252 Cupola cast
253 Charging box cast
254 Heavy breakable cast
255 Hammer block or bases
256 Burnt iron

257 Mixed cast
258 Stove plate, clean cast iron stove
259 Clean auto cast
260 Unstripped motor blocks
261 Drop broken machinery cast
262 Clean auto cast, broken, not degreased
263 Clean auto cast, degreased
264 Malleable
265 Broken ingot molds and stools
266 Unbroken ingot molds and stools
267 No. 1 chemical borings
268 Briquetted cast iron borings, hot process
269 Briquetted cast iron borings, cold process
270 Malleable borings
271 No. 2 chemical borings
272 Pulled bead wire (Truck)—Grade 1
273 Pulled bead wire (Truck)—Grade 2
274 Pulled bead wire (Truck)—Grade 3
275 Pulled bead wire (Passenger)—Grade 1
276 Pulled bead wire (Passenger)—Grade 2
277 Pulled bead wire (Passenger)—Grade 3
278 Processed tire wire (Ferrous)—Grade 1
279 Processed tire wire (Ferrous)—Grade 2
280 Processed tire wire (Ferrous)—Grade 3
281 Processed tire wire (Ferrous)—Grade 4
282 Processed tire wire (Ferrous)—Grade 5
(2), (2A), (3), (3A) Axles, Steel
(4) Spikes, track bolts and nuts, and lock washers, may include rail anchors
(5) Tie plates
(6) Rail joints, angle and/or splice bars
(9) Bolsters and/or truck sides, frames: uncut
(11) Cast steel, No. 2
(11A) Cast steel, No. 1
(12) Cast iron, No. 1
(13) Cast iron, No. 2
(14) Cast iron, No. 3
(15) Cast iron, No. 4
(16) Cast iron brake shoes
(17) Couplers and/or knuckles
(18) Frogs and/or switches, uncut
(18A) Railbound manganese frogs and switch points with manganese inserts that have not been cut apart
(23) Malleable
(24) Melting steel, railroad No. 1.
(27) Rail, steel No. 1.
(28A) Rail, steel No. 2 cropped rail ends
(28B) Rail, steel No. 2 cropped rail ends
(28C) Rail, steel No. 2 cropped rail ends
(29) Rail, steel No. 3
(30) Sheet scrap, No. 1
(31) Sheet scrap, No. 2
(32) Steel, tool
(33) Steel, manganese
(34) Steel, spring
(34A) Steel, spring
(35) Structural, wrought iron and/or steel uncut
(36) Tyres
(38) Turnings. No. 1
(38A) Turnings, drillings and/or borings No. 2
(40) Wheels, No. 1
(42) Wheels, No. 3

(45) Destroyed steel cars
(45A) Destroyed steel car sides and box car roofs

Annex 6. An international comparison of steel standards.

USA	EUROPE	GERMANY		ENGLAND	ITALY	JAPAN
A.S.T.M. S.A.E. A.I.S.I.	Euronorm	Werkstoff W.-Nr	Kurzname DIN	BS 970	UNI	JIS
CARBON						
1018	C15D	1.1141	CK15	040A15	C15	S15
1018	C18D	1.0401	C15	080M15	C16	S15CK
1018		1.0453	C16.8	080A15	1C15	S15C
1018				EN3B		
1045	C45	1.0503	C45	060A47	C45	S45C
1045		1.1191	CK45	080A46	1C45	S48C
1045		1.1193	CF45	080M46	C46	
1045		1.1194	CQ45	EN8D	C43	
1140/1146	35S20	1.0726	35S20	212M40		
1140/1146	45S20	1.0727	45S20	En8M		
1215	11SMn37	1.0715	9SMn28	230M07	CF9SMn28	SUM 25
1215		1.0736	9SMn36	En1A	CF9SMn36	SUM 22
12L14	11SMnPb30	1.0718	9SMnPb28	230M07Leaded	CF9SMnPb28	SUM 22L
12L14	11SMnPb37	1.0737	9SMnPb36	En1A Leaded	CF9SMnPb36	SUM 23L
12L14						SUM 24L
ALLOY						
4130		1.7218	25CrMo4	708A30	25CrMo4 (KB)	SCM 420
4130			GS-25CrMo4	CDS110	30CrMo4	SCM 430
4130					30CrMo4	SCCrM1
4140/4142	42CrMo4	1.7223	41CrMo4	708M40	41CrMo4	SCM 440
4140/4142		1.7225	42CrMo4	708A42	38CrMo4 KB	SCM 440H
4140/4142		1.7227	42CrMoS4	709M40	G40 CrMo4	SNB 7
4140/4142		1.3563	43CrMo4	En19	42CrMo4	SCM 4M
4140/4142				En19C		SCM 4
4340	34CrNiMo6	1.6582	34CrNiMo6	817M40	35NiCrMo6 KB	SNCM 447
4340		1.6562	40 NiCrMo8 4	En24	40NiCrMo7 KB	SNB24-1-5
8620	20NiCrMo2-2	1.6543	21NiCrMo22	805A20	20NiCrMo2	SNCM 220 (H)
8620		1.6523	21NiCrMo2	805M20		
STAINLESS						
303	X8CrNiS18-9	1.4305	X10CrNiS18-9	303S 21	X10CrNiS 18 09	SUS 303
303				En58M		
304		1.4301	X5CrNi 18 9	304S 15	X5CrNi 18 10	SUS 304
304	X2CrNi19-11		X5CrNi 18 10	304S 16		SUS 304-CSP
304	X2CrNi18-10		XCrNi 19 9	304S 18		
304				304S 25		
304				En58E		
304L	X2CrNi19 11	1.4306		304S 11		SUS304L
316	X5CrNiMo17-12-2	1.4401	X5CrNiMo17 12 2	316S 29	X5CrNiMo17 12	SUS 316
316	X5CrNiMo18-14-3	1.4436	X5CrNiMo17 13 3	316S 31	X5CrNiMo17 13	SUS 316TP
316			X5CrNiMo 19 11	316S 33	X8CrNiMo17 13	
316			X5CrNiMo 18 11	En58J		
316L	X2CrNiMo17 12 2	1.4404		316S 11		SUS316L
316Ti		1.4571	X6CrNiMoTi17 12	320S 33		
321		1.4541	X6CrNiTi18 10	321S 31		SUS321
430		1.4016	X6Cr17	430S 17		SUS430
430F		1.4104	X14CrMoS17			SUS430F
TOOL STEEL						
A-2	X100CrMoV5	1.2363	X100CrMoV51	BA 2	X100CrMoV5 1 KU	SKD 12
D-2	X153CrMoV12	1.2379	X155CrVMo12 1	BD 2	X155CrVMo12 1	SKD 11
O-1		1.2510	100MnCrW4	BO 1	95MnWCr 5 KU	

Source: http://metricmetal.com/standards_comparison.htm

Annex 7. Summarised criteria.

Criteria	Remarks	Self monitoring	Explanation
Product quality			
<u>Steriles</u> The total amount of steriles shall be ≤ 2% by weight The scrap shall not contain excessive ferrous oxide in any form, except for typical amounts arising from the outside storage of prepared scrap under normal atmospheric conditions	Steriles are: • non-ferrous metals (excluding alloying elements in any ferrous metal substrate) and non-metallic materials such as earth, dust, insulation and glass • combustible non-metallic materials such as rubber, plastic, fabric, wood and other chemical or organic substances • larger pieces (brick-sized) which are non-conductors of electricity such as tyres, pipes filled with cement, wood or concrete • residues arising from steel melting, heating, surface conditioning (including scarfing), grinding, sawing, welding and torch cutting operations, such as slag, mill scale, baghouse dust, grinder dust, sludge	Steriles shall be monitored by: 1. Visual inspection of every load by qualified staff and 2. At appropriate intervals: analysis of representative samples of steriles by weighing after magnetic or manual (as appropriate) separation of iron and steel particles and objects under careful visual inspection. The appropriate frequencies of monitoring by sampling shall be established by consideration of the following factors: • the expected pattern of variability (for example as shown by historical results) • the inherent risk of variability in raw material input quality and any subsequent processing • the inherent precision of the monitoring method and • the proximity of actual results to the limit of compliance with the relevant end of waste condition The process of determining monitoring frequencies should be documented as part of the overall quality assurance scheme and as such should be available for auditing The scrap should be investigated by visual inspection for the presence of oxides; a typical amount arising from outside storage of prepared scrap under normal atmospheric conditions is acceptable	Frequency of monitoring includes both the number of times a parameter is monitored over any given time period and the duration of each monitoring event so that it is a representative sample of the total. In the absence of historical results for any relevant parameter, it is considered good monitoring practice to carry out an intensive monitoring campaign over a short period (e.g. a month or a few months) in order to characterise the material stream and provide a basis for determining an appropriate, longer-term monitoring frequency. The process of determining monitoring frequencies should be documented as part of the overall quality assurance scheme and as such should be available for auditing. The result of the monitoring frequency determination should provide a stated statistical confidence (often a 95 % confidence level is used) in the ultimate set of monitoring results. The Commission adopted a reference document in July 2003 entitled 'Reference Document on Best Available Techniques for General Principles of Monitoring' which was developed under the provisions of the IPPC Directive but which remains a relevant reference document for the determination of appropriate monitoring frequencies in this respect.. It is available for download from the web site at: http://eippcb.jrc.es/reference/_download.cfm?twg=mon&file=mon_bref_0703.pdf.

Criteria	Remarks	Self monitoring	Explanation
Product quality			
<u>Oil, oily emulsion, lubricants or Grease</u> Scrap shall be free of visible oil, oily emulsion, lubricants or grease		Visual inspection of each consignment by Qualified staff	Oil, oily emulsions, lubricants or grease should not be visible in any part of the scrap load, except negligible amounts that will not lead to any dripping. Visual inspection shall pay particular attention to those parts of the load where oil is most likely (the bottom)
<u>Hazardous materials</u> The scrap does not have any of the properties included in Annex III of the Directive 2008/98/EC of the European Parliament and of the Council on waste (properties of waste which render it hazardous)	Properties of individual metal elements included in iron and steel alloys are, however, not to be considered for this requirement	Visual inspection of each consignment by qualified staff	Staff shall be trained on potential hazardous properties that may be associated with iron and steel scrap and on material components or features that allow for recognising the hazardous properties The procedure of recognising hazardous materials shall be documented under the quality assurance system
The scrap does not contain any pressurised, closed or insufficiently open containers of any origin that could cause explosions in a metalwork furnace		Visual inspection of each consignment by qualified staff	
<u>Radioactivity</u> The following must be excluded: material presenting radioactivity in excess of the ambient level of radioactivity; and radioactive material in sealed containers even if no significant exterior radioactivity is detectable due to shielding or due to the position of the sealed source in the scrap delivery		It must be assured that each consignment shall be monitored for radioactivity Each consignment/shipment of scrap shall be accompanied by a completed certificate according to Annex I of the 2006 UNECE Recommendations on Monitoring and Response Procedures for Radioactive Scrap Metal or an equivalent certificate according to national rules). (The certificate may be included in other documentation accompanying the consignment/shipment.) This certificate shall have been issued by the operator of the detection equipment Certificates may be provided in electronic form. For multiple shipments to the same	All scrap grades shall be checked as early as possible, preferably at the origin of the material source when scrap enters the material chain, and in all subsequent stages of the scrap supply chain, in strict compliance with state-of-the-art and most efficient detection equipment and within the limitations of accessibility to identify radioactive materials

Criteria	Remarks	Self monitoring	Explanation
Product quality			
		customer, and with the agreement of the customer, a single certificate may be supplied to demonstrate that all loads have been monitored	
<u>Grading</u> The scrap shall be graded according to a customer specification, a standard or an industry specification for direct input to one of the final uses (e.g. production of metal substance or objects by steel work/foundries)		Each consignment shall be graded by qualified staff	The specification used may be of an agreed upon nature across an industry sector (e.g. European Steel Scrap Specification, ISRI) or may be defined by one or more individual final use companies
Input materials			
No other waste shall have been used as input to obtain the scrap than waste that contained recoverable iron and steel at source No hazardous waste shall have been used as input to obtain the scrap except: • wastes that are covered by the WEEE Directive or the ELV Directive; and • discarded equipment containing chlorofluorocarbons (CFC) that do not have any hazardous properties except those due to the chlorofluorocarbon content • other hazardous waste for which proof is provided that suitable treatment to remove all hazardous properties is applied in a treatment process which is approved by		Acceptance control of all input material received (visual inspection) and of the accompanying documentation by qualified staff The requirements on input materials shall be included in the specifications/contract with the suppliers	Acceptance control procedures shall be covered by the quality assurance system This would normally include that the undertaking applying the end-of-waste criteria requires certain quality assurance also by the supplier Staff carrying out the acceptance control shall be trained on how to recognise operationally input material that does not fulfil the requirements

Criteria	Remarks	Self monitoring	Explanation
Product quality			
authorities			
Processes and techniques			
The iron or steel scrap shall have been segregated at source or while collecting and been kept separate; or the input wastes shall have been treated to separate the iron and steel scrap from the non-metal and non-ferrous components All mechanical treatment (like cutting, shearing, shredding or granulating; sorting, separation, cleaning, de-polluting, emptying) needed to prepare the material for direct input into final use shall have been completed Specific requirements: • input materials that originate from end-of-life vehicles or waste electronic or electric equipment shall have completed all treatments as required by the ELV Directive (Article 6) and the WEEE Directive (Article 6) • discarded equipment containing chlorofluorocarbons, (CFCs) must have been captured in an approved process • filings and turnings that contain cutting fluids such as oils must have been treated to remove these fluids by processes like centrifugation or pressing		All required treatments shall have been completed. Compliance to be assessed by the undertaking applying the end-of-waste criteria based on knowledge on the treatment applied to the input materials and on the own treatments	

Criteria	Remarks	Self monitoring	Explanation
Product quality			
• cables must have been stripped or granulated. If a cable contains organic coatings (plastics), the organic coatings must have been removed according to the best available techniques • barrels and containers including inter alia oil and paint drums, shall have been emptied and cleaned • hazardous substances shall have been efficiently removed			
Quality assurance			
The acceptance of input materials, all treatment steps and product quality checks (including any sampling and testing or visual inspections) according to the end-of-waste criteria must have been carried out under a fully implemented and externally verified quality management system The quality management system must at least include the following elements: 1. the quality management system must be auditable and ready for inspection by the competent authority under waste law to ensure the system is suitable for the purpose of demonstrating compliance with end-of-waste criteria; 2. a set of documented procedures addressing each key process			

Criteria	Remarks	Self monitoring	Explanation
Product quality			
relevant to compliance with the technical end-of-waste criteria, including: • acceptance of input materials; • monitoring of processes to ensure they are effective at all times; • monitoring product quality (including sampling and analysis) that are adjusted to the process and product specifics according to good practice; • procedures that ensure the effectiveness of the radiation monitoring and the ability of the radiation monitors to detect changes in radiation intensity; • actively soliciting feedback from customers in order to confirm compliance with product documentation; • record keeping of main quality control parameters; • measures for review and improvement of the quality management system; • training of staff.			
Information provided with the product			
Each consignment of the iron and steel scrap or multiple loads to the same customer shall either be accompanied by the following information or be available in electronic form to the customer and			All information could be described in one or several documents.

Criteria	Remarks	Self monitoring	Explanation
Product quality			
upon the request of any competent authority: • the name or code of the scrap category according to a specific product standard or specification and a declaration of compliance with the standard or specification; • a radioactivity test certificate in accordance with the UNECE Recommendations on Monitoring and Response Procedures for Radioactive Scrap Metal or similar certificate according to national rules); • identification of the external verifier or the certification of the quality assurance system; • statement of conformity to the end-of-waste criteria.			

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Abstract

This report is the JRC-IPTS contribution to the development of the end-of-waste criteria for iron and steel scrap in accordance with Article 6 of Directive 2008/98/EC of the European Parliament and of the Council on waste (the Waste Framework Directive).

This report includes a possible set of end-of-waste criteria and shows how the proposals were developed based on a comprehensive techno-economic analysis of iron and steel recycling and an analysis of the economic, environmental and legal impacts when iron and steel scrap cease to be wastes. The purpose of end-of-waste criteria is to avoid confusion about the waste definition and to clarify when certain waste that has undergone recovery ceases to be waste. Recycling should be supported by creating legal certainty and an equal level playing field and by removing unnecessary administrative burdens. The end-of-waste criteria should provide a high level of environmental protection and an environmental and economic benefit.

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