



End-of-waste Criteria for Aluminium and Aluminium Alloy 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 aluminium 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 aluminium and aluminium alloy 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 aluminium and aluminium alloy recycling and an analysis of the economic, environmental and legal impacts when aluminium 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'.

TABLE OF CONTENTS

| | |
|--|-----------|
| PREFACE | 1 |
| GLOSSARY | 3 |
| INTRODUCTION | 5 |
| 1 ANALYSIS | 7 |
| 1.1 Scrap sources | 7 |
| 1.2 Secondary aluminium production | 11 |
| 1.3 Recycling processes | 11 |
| 1.4 Industry structure | 14 |
| 1.5 Economy and market | 15 |
| 1.6 Specifications and standards | 18 |
| 1.7 Legislation and regulation | 19 |
| 1.8 Environmental and health aspects | 20 |
| 2 END-OF-WASTE CRITERIA | 23 |
| 2.1 Rationale for end-of-waste criteria | 23 |
| 2.2 Conditions for end-of-waste criteria | 23 |
| 2.3 Outline of end-of-waste criteria | 24 |
| 2.4 Criteria on product quality | 25 |
| 2.5 Criteria on input materials | 33 |
| 2.6 Criteria on treatment processes and techniques | 34 |
| 2.7 Quality assurance | 36 |
| 2.8 Application of end-of-waste criteria | 38 |
| 3 IMPACTS | 39 |
| 3.1 Environmental and health impacts | 39 |
| 3.2 Economic impacts | 40 |
| 3.3 Legal impacts | 42 |
| 4 CONCLUSIONS | 51 |
| 5 REFERENCES | 53 |
| ANNEXES | 55 |
| Annex 1. Summarised standards en 13920 on aluminium and aluminium alloy scrap..... | 56 |
| Annex 2. Aluminium scrap categories according to Institute of Scrap Recycling Industries (ISRI)..... | 58 |
| Annex 3. Summarised criteria | 59 |

GLOSSARY

| | |
|----------|--|
| APEAL | Association of European Producers of Steel for Packaging |
| ASR | Automotive shredder residue |
| BIR | Bureau of International Recycling |
| CFCs | Chlorofluorocarbons |
| 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, the JRC-IPTS has conducted a study with the aim to prepare technical proposals for aluminium 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 aluminium 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 2 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 aluminium 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 aluminium 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, the 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 aluminium scrap.

1.1 Scrap sources

One way of classifying scrap is to distinguish it according to its source; from the aluminium processing (new scrap), and scrap from products after their use (old scrap).

New scrap is generated during the initial manufacturing processes. All secondary aluminium residues are treated by refiners or remelters. The composition of new scrap is well known and in principle new scrap does not need any pretreatment process before it is remelted, although cutting to size might be necessary. New scrap could be considered a by-product and not waste (Paragraph 1.7). New scrap with paint or coating, excluding cable and composite material of aluminium and plastic may require special processing.

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

According to industry, currently around 540 Mt of aluminium products are in use and nearly 8 Mt of old aluminium scrap were generated worldwide in the year 2004. Scrap generation has doubled since 1990 and is expected to increase further mainly due to the continuous increase of aluminium content in products such as vehicles over the last 15 years and the improved collection of packaging materials such as beverage cans. In the EU (data for EU-25), the total recycled old scrap was 2 Mt in 2004 and the total aluminium in use amounted to nearly 120 Mt. The key sources of aluminium scrap are shown in Figure 1.

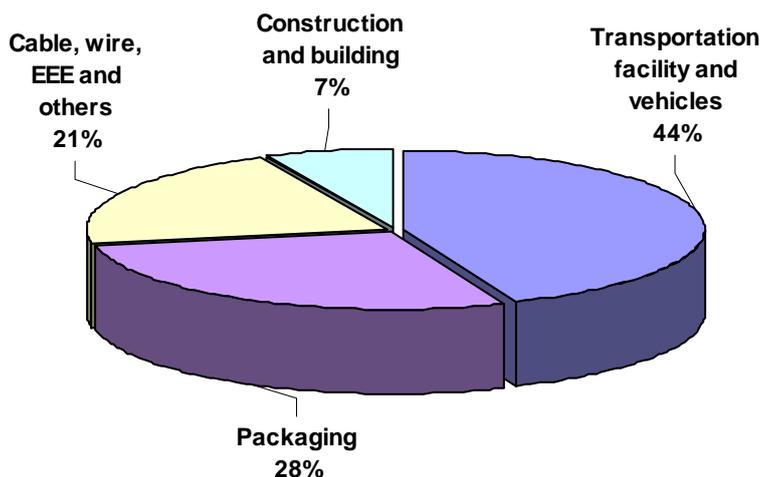


Figure 1: Sources of aluminium scrap.

Another way to classify scrap sources is according to the products in which the metal was used before it became a waste. The main aluminium scrap sources in this sense are vehicles, metal products for construction, cables and wires, electrical and electronic equipment and packaging.

Transportation facilities and vehicles

The automobile industry is the largest overall market for aluminium application and the largest source of aluminium scrap. When a car comes to its end of life, it is collected and dismantled. Approximately 9 million (according to Federación Española de la Recuperación y el Reciclaje (FER) the amount may be even higher around 12 million – 14 million) end-of-life vehicles (ELVs) are discarded every year. Cars are primarily composed of metal (about 75 %) 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 incinerated. The metallic parts are separated by physical processes and recovered as ferrous scrap (iron and steel, comprising 70 % of the total vehicle waste) and non-ferrous metals (5 %), all of which is recycled. The remaining 25 % is the automotive shredder residue (ASR), which is composed mainly of plastics, contaminated with any metallic and other parts that can not be separated.

Packaging

Aluminium packaging waste is a large short term source of scrap. Most of the products used in food packaging have a lifetime of less than one year. The current consumption is close to 5 Mt per year. The sector contributes nearly 28 % of recycled aluminium, second after the transportation sector. For used beverage cans alone, the collection rates are as high as 80 to 93 % in some European countries (the Benelux, Scandinavian countries and Switzerland). The mean collection rate of aluminium beverage cans in Western Europe, which has been monitored since 1991, has almost tripled from 21 % in 1991 to 57.7 % in 2006.

Cable and wire

When buildings and installations are demolished, renewed and/or upgraded, scrap is generated. However, no data is available to estimate a total amount. Since the current demand is mainly driven by new installations in developing countries, the available scrap from this sector may be expected to rise in future. According to Bureau of International Recycling (BIR), in 1997 worldwide, cables generated over one million tonnes of scrap metal, the majority being copper, although high voltage power transmission cable uses aluminium as the conducting metal.

Electrical and electronic equipment (EEE)

EEE includes a wide range of complex products: large household appliances (refrigerators, washing machines, stoves); small household appliances (vacuum cleaners, toasters, hair dryers); information and telecommunications equipment (computers and peripherals, cell phones, calculators); consumer equipment (radios, TVs, stereos); lighting (fluorescent lamps, sodium lamps); electrical and electronic tools (drills, saws, sewing machines); toys, leisure, and sports equipment (electric trains, video games); medical devices (ventilators, cardiology and radiology equipment); monitoring instruments (smoke detectors, thermostats, control panels); automatic dispensers (appliances that deliver hot drinks, etc).

It is estimated that each EU citizen currently produces around 17 – 20 kg per year of waste from electrical and electronic equipment (WEEE) which adds up to 9 million – 10 million tonnes at the Community level. Expected growth rates are between 3 and 5 % each year. This means that in five years time, 16 – 28 % more WEEE will be generated and in 12 years the amount is expected to double. This rapid growth rate is due to the fast pace of technological development, especially in information technology which has resulted in the more frequent replacement of electrical and electronic equipment by industry.

In Europe, the average estimated composition of aluminium in WEEE is approximately 4.7 %. The amount of aluminium scrap from e-waste can thus be estimated around 400000 tonnes per year in the EU. However, the collection rate is unknown, and the actual amount of scrap recovered is expected to be less.

Construction and building

In some countries, especially those without an automobile industry, the building and construction sector is probably the largest market for aluminium, consuming some 2 and 9 Mt of aluminium products per year in Europe and the world respectively. However, it may vary considerably from country to country due to the level and type of sector activities. The total stored aluminium product in the sector is the largest since the start of the industrial application of aluminium, amounting to nearly 170 Mt worldwide. However, as already mentioned, due to the very long lifetime of buildings, its contribution to recycled scrap was only 7 % in 2004, i.e. around 0.5 Mt in total.

The main use of aluminium in this sector is to provide materials for roofing and cladding, and window and door frames, as well as small size applications such as shutters, door handles, ceiling partitions, etc. The collection rate of aluminium scrap from building deconstruction and demolition in six European countries has been shown to be between 92 and 98 % even though the aluminium content in building (by mass) is below 1 %. While the collection of the small sized items depends largely on the demolition method, the large sized items are often collected separately to be sold directly for reuse or sent to a recycling plant.

Another way to classify scrap sources is according to waste categories. Waste which contains aluminium scrap is likely to be classified in one of the categories according to the European Waste List that are included in Table 1.

Table 1: Examples of waste categories according to the European Waste List that may contain aluminium scrap.

| |
|--|
| <p>Waste from agriculture, horticulture, aquaculture, forestry, hunting and fishing 02 01 10 waste metal</p> <p>Waste from shaping and physical and mechanical surface treatment of metals and plastics 12 01 03 non-ferrous metal filings and turnings 12 01 04 non-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</p> <p>Packaging (including separately collected municipal packaging waste) 15 01 04 metallic packaging 15 01 05 composite packaging 15 01 06 mixed packaging</p> <p>End-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08) 16 01 03 end-of-life tyres 16 01 04* end-of-life vehicles 16 01 06 end-of-life vehicles, containing neither liquids nor other hazardous components 16 01 16 tanks for liquefied gas</p> <p>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</p> <p>Construction and demolition waste, metals (including their alloys) 17 04 02 aluminium 17 04 07 mixed metals 17 04 11 cables other than those mentioned in 17 04 10</p> <p>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 12 bottom ash and slag other than those mentioned in 19 01 11 Waste from shredding of metal-containing waste 19 10 02 non-ferrous metals 19 10 06 other fractions than those mentioned in 19 10 05</p> <p>Waste from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified 19 12 03 non-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</p> <p>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 containing hazardous components 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 industrial and institutional waste, metals</p> <p>Other municipal waste 20 03 07 bulky waste</p> |
|--|

1.2 Secondary aluminium production

Secondary aluminium scrap is treated by refiners or remelters. Remelters accept only new scrap metal or efficiently sorted old scrap whose composition is relatively known. Refiners can work with all types of scrap as their process includes refinement of the metal to remove unwanted impurities (BIR, Report on the environmental benefits of recycling, 2008).

Old and new scraps are processed prior to melting by methods that depend on any contamination that may be present. Aluminium turnings are usually contaminated with oil, water and iron. They are therefore washed and dried to remove oil and water and then magnetically processed to remove iron. Aluminium beverage cans are processed to remove the lacquer coating that would otherwise lead to an increase in fume emission during melting. Several melting processes are used depending on the scrap quality.

Clean, uncoated scrap can be melted in a reverberatory furnace; finely divided scrap, such as turnings, are ideally melted in a coreless induction furnace; contaminated lower grades of scrap are melted under a flux cover in a rotary furnace and aluminium components contaminated with other metals such as steel bolts can be melted in a sloping hearth furnace.

The wrought remelts take good quality old and new scrap and convert this into extrusion billet or rolling slab, usually of the same alloy. Good examples are the conversion of old and new extrusion scrap into billet for extrusion production, and used aluminium beverage cans into rolling slab for the production of more aluminium beverage cans.

1.3 Recycling processes

In general, aluminium scrap recycling consists of collection, sorting, shredding and/or sizing, media separation and final melting at the refineries/remelters. Some scrap is already very clean when collected but other scrap needs various treatment steps to be fit for use in the re-melting process. This process can be summarised as the following:

- Scrap metal is collected either separately or mixed and then sorted in the scrap yard and then sold to scrap treatment plants or sent directly to a refiner/remelter.
- Arriving 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. First, while shredding and cutting, magnetic separation is used to single out the ferrous metal. Then, using several media separation technologies, the non-ferrous metal is separated first from non-metal elements and then different non-ferrous metals are separated.
- If shredded scrap metal is wet or dirty, it needs to be dried or to be further cleaned of possible contaminants such as oil, grease, lubricants, lacquers, rubber, and plastic laminates.

At the aluminium refinery, scrap metal is first cleaned, if necessary, from contaminants at below melting temperature in kilns and then charged to the furnace going through melting, fluxing/refining, and tapping.

Although not all the origins of scrap are included here, it is believed that their treatment process resembles those that are described in Figure 2.

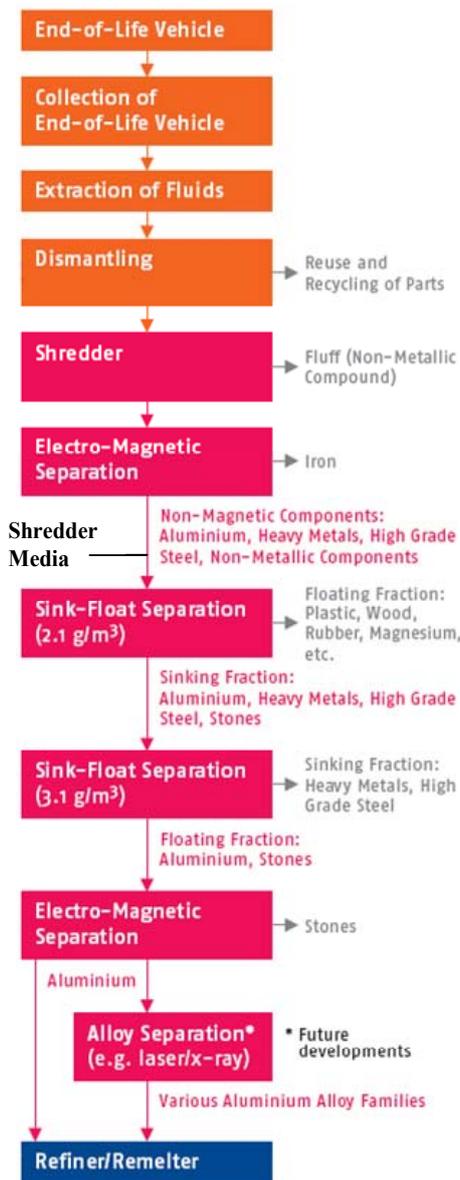


Figure 2: An example of metal treatment.

The dust and the separated residues together usually represent about 17 to 25 % of the weight of an average vehicle. In the past, they have been landfilled, representing no more than 0.2 % of total landfill waste in the EU. However, with the implementation of the ELV Directive, which requires 85 % (increasing to 95 % in 2015) of an ELV to be re-used, recycled, or recovered, these residues are progressively being reduced.

Whilst ‘sink-float’ separation is shown here in the diagram, where typically a ferrosilicon suspension is used to achieve the separation of materials of differing densities, followed by a washing stage, new alternative dry technologies are being developed using a variety of sensors and separation techniques.

Used beverage cans

In most countries, used beverage cans (UBCs) are made both from steel and aluminium and they 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 UBCs deposit, 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 refineries.

End-of-life vehicles:

Today in the EU when a passenger car (as 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 the ELV Directive, as shown in the diagram. 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 from another. The separated ferrous part contains as much as 98 % metal. More than 99 % of the non-ferrous metal can be recovered. Further advanced technology for the separation of alloys is being developed for industrial applications. To a certain extent, other recyclable fractions such as glass and plastics are also recovered at this stage.

There are two main types of residue generated in these processes: the airborne dust (fluff) caught by the shredder dust collection system (consisting of upholstery fibres, dirt, rust, paint, etc.) and the non-metallic residues separated from the recovered material streams by the media separation plant (consisting of unusable rubbers, plastics, stones, etc.).

On arrival at the refinery, the baled aluminium can is first shredded into small-sized pieces, and is then passed through a magnetic field to remove any remaining steel contaminants. Next, the shreds need to be cleaned of paint, ink, coating, etc. by blowing in hot air at a temperature of 500 °C. After the decoater, the shreds are fed into melting furnaces. At this stage, salt is usually added to remove the impurities and to improve the quality of the product. The molten aluminium is then cast into ingots.

Cables and wires

Demolition and civil engineering companies are the collectors of used cables and wires, which may be directly sold to a scrap treatment plant or to a scrap trader. There are many different types of cable. Outside power distribution uses aluminium core cable and most other type of cables used in building, communication, electronics and automotive normally use copper core. In general, cable and wire covered with thick plastic coating (often PVC) is not directly suitable for feeding to a melting furnace due to the plastic to metal ratio.

According to BIR, the predominant way of recovering the metal from cable scrap in developed countries is by automated cable chopping. Most cable chopping plants process only copper cable scrap, a few plants process aluminium cable scrap, and some operate both a line for aluminium and another for copper cable scrap.

The following steps are common in cable scrap chopping process:

- Pre-sorting: to separate cable scrap by type of insulation, by conductor diameter, etc. and to prepare it for feeding into the shredder. Pre-sorting also includes sorting copper from aluminium-containing cable and removing unsuitable cables before entering the automatic chopping system. As shown in the picture, pre-sorting can already result in fairly clean scrap. The pre-sorting allows the maximum value for the recovered metal scrap to be obtained and makes further separation of plastics easier.
- Cable chopping: usually desirable for processing long cable sections. It is the first step in reducing the size of the cable. Compared to shredding, cable chopping produces little, if any, filter dust.
- Granulation: carried out twice so that the cable chops are of a sufficiently fine size to ensure that most of the insulation is liberated from the cable. Inevitably however, small amounts of metal remain embedded in the plastic.
- Screening: to enhance the recovery of metal, some chopping lines also use vibrating screen to yield the desired chop size. The smaller the chop size is, the more efficient the removal of the metal.
- Density separation: similar-sized chop fractions that collect on the screens are discharged and fed to an air table being fluidised and separated into two fractions: clean metal products and essentially metal-free tailings. Generally, 'middling' fractions are reprocessed again in the system or can be re-tabled.

The metal content of residue streams can vary from less than 1 % to more than 15 %. If a dry electrostatic system is used, the metal content may be reduced to less than 0.1 %, which will consequently increase the value of the recovered plastic.

An example is the cable scrap, which is usually a mixture of copper or aluminium conductors with rubber, plastic or paper insulation. They may also have steel or lead armouring. Pre-sorting in such a case is very difficult.

Electronics and electrical equipment

This waste stream covers a wide variety of end-of-life products mainly from households and offices. The WEEE Directive defines the responsibility of producers in recycling and 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 proper technologies. This is

Analysis

done at different stages of the treatment process depending on the implementation of the Directive in Member States.

After de-pollution, 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 of: 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 (Figure 3).

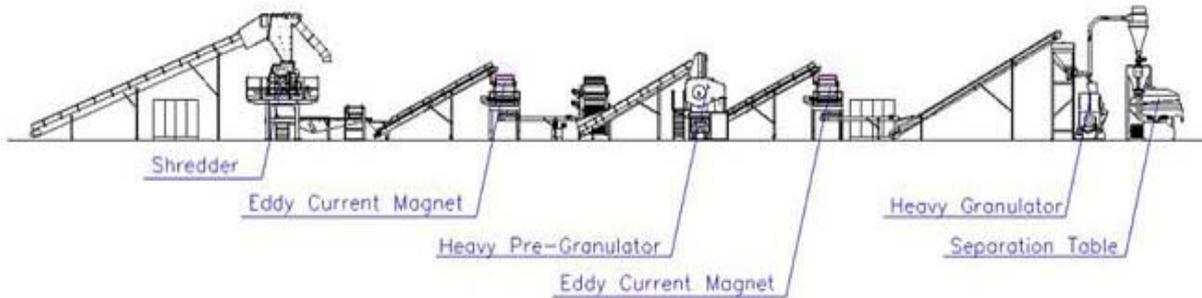


Figure 3: An example of WEEE treatment.

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 metal content in the plastic could be high; however it is possible to further recover these metals later during the plastic recycling process or, if the plastic is incinerated, from the bottom ash of the incinerators.

Scrap metal from construction and demolition

Regulation and standards related to construction and demolition have been developed in the past years mostly in favour of selective demolition, which has been proven to be most effective for recycling various types of waste streams. For cost reasons, metal scrap is separated whenever possible along the dismantling process and is sold for direct reuse or to traders or treatment plants. Since by weight aluminium and steel have different prices, further separation is often performed on site.

1.4 Industry structure

The aluminium scrap recycling industry consists of scrap collection and sorting, distribution, treatment and processing (Figure 4). Along this recycling chain, scrap is cleaned to become secondary material for final metal production. Secondary aluminium production can be clearly distinguished from primary aluminium production.

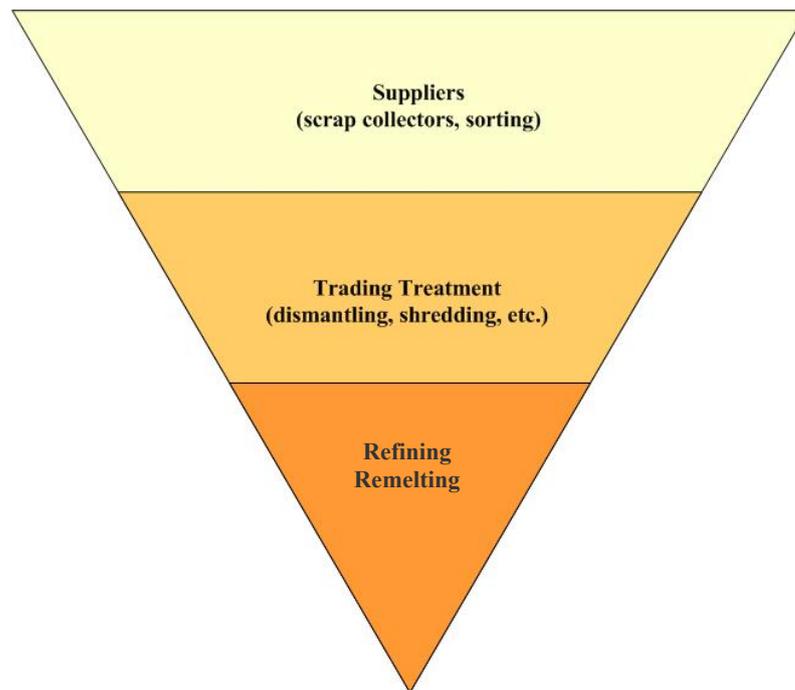


Figure 4: The inverted pyramid structure of the recycling sector.

Depending on the type of product and the country, the collection system can vary. Large-sized and quantity end-of-life products, such as those from construction and demolition, are usually transported directly to the scrap yard or scrap treatment plants. Both ELVs and WEEE place the responsibility of recycling, 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 taken in the case of UBCs, e.g. collection centre, scrap terminals, where aluminium cans are separated and baled for transportation to treatment plants or refineries.

EUROSTAT 2006 waste statistics recognise 50 682 recycling installations in the EU-27, of these the metal recycling federations estimate some 40000 will deal with aluminium. There are 307 shredders in the EU-27 and downstream media separation plants and most of them will have an output of shredded aluminium scrap. The secondary aluminium processors, i.e. refiners and remelters, are mostly small and medium in size and, according to EAA/OEA, there are 123 refining plants and the same number of remelting plants in Europe in 2009.

1.5 Economy and market

Aluminium scrap is recycled or reused whenever possible. According to EAA, in 2004 worldwide around 16 Mt of aluminium scrap were recycled annually, more than half of which were old scrap. The rest of the old scrap generated, about 7 Mt, was not registered statistically, however, it was expected that more than 50 % would be recycled and only a small amount of un-recoverable scrap would be landfilled. This was partly due to limitations of current treatment techniques.

The production of recycled aluminium and aluminium casting from 2003 until 2007 is shown in Table 2.

Table 2: Production of recycled aluminium and aluminium casting from 2003 to 2007 in Europe (in 1000 tonnes).

| Stream | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|--------|--------|--------|--------|--------|
| Recycled aluminium (¹)(²) | 2283.7 | 2264.3 | 2796.7 | 2882.4 | 3175.9 |
| Aluminium castings (²) | 2273.8 | 2491.3 | 2365.9 | 2124.3 | 1943.1 |
| Since 2007 EU-27. (¹) 'Recycled aluminium' mainly includes aluminium casting alloys and deox. aluminium. (²) Partially estimated. | | | | | |

Table 3 shows that in 2007 in the EU-15 there were 133 refiners producing casting alloys and deoxidation aluminium and 107 remelters producing wrought alloys in the shape of extrusion billets and rolling slabs, with the number of employees amounting to approximately 10000.

Table 3: Structure of the EU-15 refiners (Situation as of 2007).

| Production | Germany | Italy | UK | Spain | France | Europe |
|-----------------|---------|-------|----|-------|--------|--------|
| >100 000 t | 3 | 1 | | | | 4 |
| up to 100 000 t | 3 | 3 | | | 2 | 9 |
| up to 50 000 t | 2 | 1 | 1 | 3 | 1 | 10 |
| up to 40 000 t | 3 | 3 | 1 | | 2 | 8 |
| up to 20 000 t | 1 | 5 | 6 | 5 | 3 | 26 |
| up to 10 000 t | 1 | 7 | 10 | 4 | 3 | 29 |
| <5 000 t | 1 | 17 | 6 | 16 | 6 | 47 |
| Total | 14 | 37 | 24 | 28 | 17 | 133 |

Scrap trade within the EU as well as import and export to other countries has been established for decades. The amount of aluminium scrap (new and old) shipped within Europe was estimated being 5 Mt in 2004. According to EUROSTAT (intrastat and extrastat), the import and export in 2008 is shown in Table 4.

Table 4: Intrastat and extrastat aluminium scrap figures in tonnes for each of the EU-27 member states in 2008.

| COUNTRY | EU-27_EXTRA | | EU-27_INTRA | |
|----------------|---------------|----------------|----------------|----------------|
| | IMPORT | EXPORT | IMPORT | EXPORT |
| AUSTRIA | 23722 | 1929 | | 73244 |
| BELGIUM | 9091 | 41501 | 143101 | 111328 |
| BULGARIA | 52 | | 0 | 544 |
| CYPRUS | | 1518 | 1 | 2892 |
| CZECH REPUBLIC | 931 | 190 | 57493 | 59007 |
| DENMARK | 1424 | 20287 | 69302 | 36440 |
| ESTONIA | 124 | 2398 | 361 | 17496 |
| FINLAND | 25 | 8371 | 21953 | 28974 |
| FRANCE | 11677 | 17491 | 183344 | 324705 |
| GERMANY | 79186 | 78448 | 464652 | 624291 |
| GREECE | 22573 | 4763 | 6388 | 8499 |
| HUNGARY | 4920 | 37 | 51426 | 22060 |
| IRELAND | 132 | 3543 | 2 | 17497 |
| ITALY | 74108 | 9744 | 303337 | 46469 |
| LATVIA | 213 | 1165 | 7464 | 3038 |
| LITHUANIA | 647 | 1835 | 1286 | 3510 |
| LUXEMBOURG | 19473 | 1885 | 103933 | 9278 |
| MALTA | | 530 | 1 | 912 |
| NETHERLANDS | 35038 | 68217 | 166220 | 194067 |
| POLAND | 20 | 296 | 67156 | 123172 |
| PORTUGAL | 89 | 388 | 2321 | 39587 |
| ROMANIA | 336 | 1863 | 262 | 14157 |
| SLOVAKIA | | 0 | 4638 | 10109 |
| SLOVENIA | 4491 | 3077 | 19403 | 8813 |
| SPAIN | 13587 | 4489 | 87810 | 104783 |
| SWEDEN | 19898 | 18738 | 20228 | 87843 |
| UNITED KINGDOM | 37341 | 759792 | 110531 | 113235 |
| TOTAL | 359098 | 1052495 | 1892613 | 2085950 |

In last few years, before the financial crisis, the demand for scrap rose worldwide. The collection rate of non-ferrous 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 plant closures, production curtailments or reductions of employee working hours. The price of aluminium scrap decreased by half compared to spring 2008 (see Figure 5). However at the end of 2009 prices were still comparable to aluminium scrap prices in 2005. Prices recuperated somewhat in early 2009.

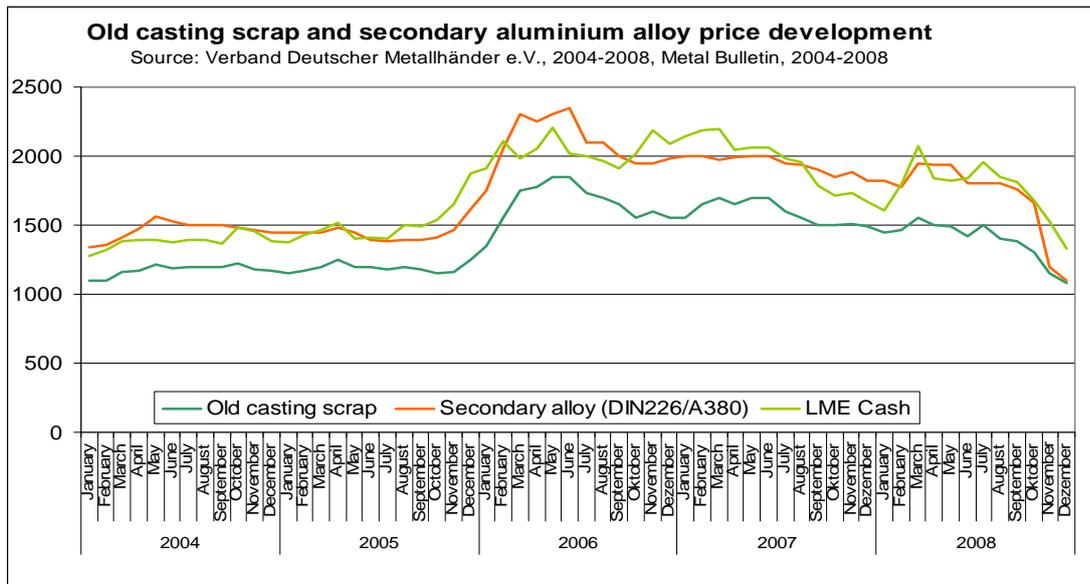


Figure 5: Prices of aluminium scrap from 2004 to 2008.

1.6 Specifications and standards

Currently, specifications and standard classifications for 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 a reference for classification and quality control. In many cases based on the production need, scrap is processed according to the bilateral specifications agreed upon between the scrap processor and smelters and refiners.

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 Standard EN 13920 on aluminium and aluminium alloy scrap

The EN standard covers all types of aluminium scrap and provides the norm for scrap classification. The summarised standards are described in Annex 1.

ISRI specifications

Developed by the USA Trade Association, the Institute of Scrap Recycling Industries (ISRI), this American specification classifies the following: non-ferrous Scrap, ferrous scrap, glass cullet, paper stock, plastic scrap, electronics scrap, tyre scrap; and is used internationally. The ISRI specification for aluminium scrap is shown in Annex 2.

National association specifications

Many trade associations in Member States have developed their own specifications for aluminium scrap over many years. Generally these national specifications have been agreed upon between scrap processors and the aluminium refiners and remelters in their respective Member States.

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.

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 aluminium 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 processing of the types of waste are described and they ensure the 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.

Waste shipment

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 are 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) and reclaimed electronic components suitable for base and precious metal recovery). However, some of the non-OECD countries failed to respond and where no reply is received, those 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).

⁽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.

Shipments of waste (e.g. waste metals) exceeding the limit values of radioactivity defined by the EC Directive 2006/117/Euratom, which refers to the concentration limits in Directive 96/29/Euratom, require the appropriate regulatory approvals in accordance with the radiation protection legislation and fall outside the scope of the Waste Shipment Regulation. However, scrap showing radioactivity below the thresholds of the radiation protection legislation fall within the scope of the Waste Shipment Regulation No. 1013/2006. Most Member States classify low radioactive waste as unlisted waste requiring notification, arguing that there is an increased risk associated with the waste.

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

By-products

If a certain metal scrap generated, for example by the metal processing industry, were regarded as being a by-product, and not being 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:*
 - 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).'*

What is noteworthy is 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 of 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 production of secondary aluminium is estimated to consume 5 – 7 GJ per tonne due to the improvement in recent years and the average total emission is about 350 kg of CO₂ emission per tonne of metal production. It has been reported that the production of one tonne of aluminium from scrap requires only 7 % of the energy required for primary production (excluding bauxite production).

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. In the EU such emissions are controlled according to permits under the IPPC directive. Emissions from furnaces 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, i.e. there are no environmental risks in the transportation and storage of the metal itself. There is also no convincing evidence of substantial leaching from coated or painted aluminium scrap metal. However, if metals are contaminated with oil or mixed with other wastes, 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.

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.

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

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 materials.

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 aluminium scrap recycling to be a well-functioning industrial practice today.

The main types of benefits that can be expected when EU-wide end-of-waste criteria for aluminium 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 aluminium scrap that a structured market exists (e.g. there are classifications of scrap metal used for trading). Aluminium scrap is commonly used as a feedstock in re-melting and refining to produce new aluminium (secondary aluminium). There is generally a demand by the aluminium industry for scrap that complies with specification or standard such as the 'EN 13920' and any other use than for the production of new aluminium is highly unlikely. This is also true in the case of exports from 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 use are fulfilled and the recycled material comply with applicable legislation and standards as product. In the case of aluminium scrap, this means that at the moment of end-of-waste, the scrap should fulfil standards/specifications that the secondary aluminium industry uses for the scrap it buys.

From a life cycle point of view, aluminium 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 aluminium 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 (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 aluminium 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 aluminium scrap. There should be a clear identification where scrap has attained a quality that is sufficient to ensure that 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, content of foreign materials or metal yield, that would serve as a check for the completeness of treatment and as a check that the metal is sufficiently pure for safe use. All types of aluminium 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 technical working group considered as 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 waste which contains non-hazardous metals to produce aluminium 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 the subsequent sections and are summarised in Annex 3.

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 the final uses (refinery/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 yield, metal content or content of foreign materials

A limit on metal yield, metal content or the content of foreign materials needs to be proposed in order to determine directly 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 with the scrap.

A limit value on metal yield, metal content or non-metallic components 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 aluminium scrap. (Stricter requirements in specifications, standards and commercial agreements for specific types of scrap will of course be possible.)

Bellow all three types of limit values are discussed, although not all of the options should ultimately be included in the end-of-waste criteria.

Definition of foreign materials

Foreign materials include:

- metals other than aluminium and aluminium alloys
- 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.

The definition of foreign materials could be similar to that of steriles (as defined in the case of iron and steel scrap). Steriles are defined in the European Steel Scrap Specification as non-ferrous metals, non-metallic materials, combustible non-metallic materials, larger pieces (brick-size) which are non-conductors of electricity such as tyres, pipes filled with cement, wood or concrete and by-products arising from steel melting, heating, surface conditioning, grinding, sawing, welding and torch cutting operations, such as slag, mill scale, baghouse dust, grinder dust, sludge). In case of aluminium scrap, for some grades, other metals are desired to some extent in order to produce the desired quality of aluminium alloy except for ferrous metals and lead.

Limits for foreign materials are not generally defined, however some categories of EN 13920 include equivalent limits in the range from 2 – 5 %. A summary of limitations on foreign materials is shown in Table 5.

Table 5: Summary of the EN 13920 limits on foreign materials.

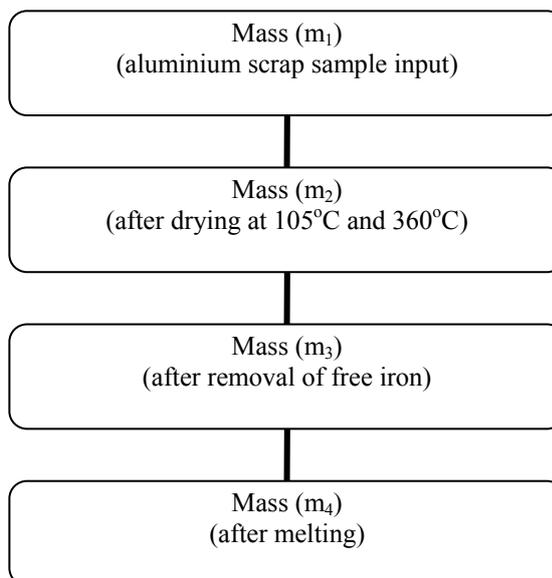
| | |
|-----------------|--|
| 13920-3 | The scrap shall be free from attachment devices, steel core wires, coiling spools of any material, bundling material and other components of electric lines other than aluminium cables and wires. The scrap shall not be coated and shall be free from burned wire, oil, grease, dust, plastics and any other type of foreign material. |
| 13920-4 | The scrap shall be free from oil, grease, powder, plastics and any other type of foreign material. |
| 13920-5 | The scrap shall not contain more than 5 % (mass fraction) of oil, grease, dust, plastics and any other type of foreign non-metallic material as a total. The scrap shall be free from foreign metallic materials. |
| 13920-6 | The scrap shall not contain more than 5 % (mass fraction) of oil, grease, dust, plastics, calcareous deposits and any other type of foreign non-metallic material as a total. The scrap shall be free from pieces of alloys of the 2xxx or 7xxx series and free from foreign metallic materials. |
| 13920-7 | The percentage of volatile substances shall not exceed 2 % (mass fraction). The total percentage of other non-metallic foreign material shall not exceed 2 % (mass fraction). The total percentage of foreign metallic material, either free or attached, shall not exceed 2 % (mass fraction). |
| 13920-9 | The sum of the percentages of oil, grease and other non-metallic materials in the scrap shall not exceed 2 % (mass fraction). The scrap shall be free from metallic foreign materials. |
| 13920-10 | The scrap shall not contain more than 2 % (mass fraction) of moisture and not more than 5 % (mass fraction) of total volatile substances. The scrap shall be free from any other foreign material, e.g. free iron and lead, and shall exclusively consist of beverage cans. It shall be free from burnt or oxidized cans and aluminium foil. |
| 13920-11 | The scrap shall consist of non-oxidized pieces free from moisture, oil, grease, dust, plastic, iron, brass and any other foreign material. |
| 13920-12 | The scrap shall be unoxidized and the following tolerances apply to the delivered mass: 0.5 % (mass fraction) of magnetic iron, 5 % (mass fraction) of moisture and oil, 3 % (mass fraction) of fines passing through a 20 mesh sieve (0.71 mm opening), after drying. The scrap shall not contain any other foreign materials. |
| 13920-13 | The scrap shall be unoxidized and the following tolerances apply to the delivered mass: 0.5 % (mass fraction) of magnetic iron, 5 % (mass fraction) of moisture and oil, 3 % (mass fraction) of fines passing through a 20 mesh sieve (0.71 mm opening), after drying. The scrap shall not contain any other foreign materials. |
| 13920-15 | The scrap shall not contain free iron. The scrap shall not be heavily oxidized by the adopted decoating process. The scrap shall not contain fines less than 1mm in size and shall be free from non-metallic materials. |

The analysis of the content of foreign materials would have to be based on manual sorting of non-metallic objects and particles. In the case of very fine particles (e.g. from WEEE), the analysis by hand sorting may not be practically possible, therefore an alternative could be to determine the metal yield. The metal yield analysis should be according to EN 13920-1:2002, which is summarised and clarified below:

1. removal and determination of moisture (according to 7.1. of the EN 13920-1:2002)
2. removal and determination of free iron (according to 7.2. of the EN 13920-1:2002)
3. determination of the metal yield (according to 7.3. of the EN 13920-1:2002)
4. the metal yield shall be calculated as a mass after melt (m_4) and the mass after determining the moisture content (m_2), according to Equation 1.

$$m [\%] = (m_4/m_2) \times 100$$

[1]



Definition of metal content

In the case of aluminium scrap, metal content would include metals other than aluminium. The reason for not excluding other metals is that they are in some cases desired when scrap is used for aluminium production. Oxides generated by 'normal' oxidation of macroscopic aluminium would also be included. Dust should, however, not be counted towards the metal content because it is undesired and will usually not contain much metallic aluminium.

The analysis of the metal content would have to be based on the manual sorting of metallic and non-metallic objects and particles. Non-metallic material adhering to metal objects would have to be detached. The smaller the objects or particles, the more difficult such an analytical procedure would be.

A limit on metal content is not proposed in the EN standard. Experts suggested metal content limits in the range 90 – 98 % and a limit of 95 % is considered ambitious yet realistic.

Definition of metal yield

The metal yield is defined under EN 13920-1:2002 and can be measured by melting small amounts of fine metal scrap in a laboratory furnace using a crucible.

The metal yield is usually lower than the metal content due to the other impurities being included in the metal scrap (e.g. oxide, fine dirt attached to the scrap). The metal yield according to standard EN 13920 varies from 80 – 90 % (except category 13920-14 scrap from post-consumer aluminium packaging and 13920-16 scrap consisting of skimmings, drosses, spills and metallic which have a lower metal yield). Based on the consultation with experts from the technical working group, a metal yield limit value of 90 % could be considered equivalent to a metal content limit value of 95 %.

Choice of parameter for the limit value

The proposal here is to set both a limit value for foreign materials and a limit value for metal yield, whereby it will be sufficient to comply with one of the two limit values. The owner of the aluminium scrap that applies the end-of-waste status would be allowed to choose if compliance is by metal yield or content of foreign materials. In order to establish clarity for inspections by authorities, the owner would have to declare which of the two parameters chosen.

The reason for this proposal is the practical feasibility of the measurement/testing.

End-of-waste criteria

Metal yield can be measured well for smaller particles or objects but it can be very hard or practically impossible to obtain a representative laboratory sample from a mixture of large objects.

Measuring foreign materials makes sense for larger objects that can be manually separated without disproportionate efforts but makes less sense for smaller particles. It also has to be considered that non-metallic materials adhering to the surface would potentially be much more relevant for smaller particles.

It is proposed not to set a limit value on the metal content because the concept of foreign materials as well as the value of the metal yield is already used by European standards EN 13920. The concept and measurement of foreign materials is practically equivalent to the reverse of the concept of metal content. However, for metal content it is conceptually slightly more complex than for foreign materials and therefore should be considered a second choice.

Furthermore, the scrap shall not contain excessive 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 to avoid the inclusion of metal scrap which will have a very low economic value due to the excessive metals oxidation.

Draft formulation of the requirement:

The total amount of foreign materials shall be ≤ 5 % by weight or the metal yield shall be ≥ 90 %;

Foreign materials include:

- *metals other than aluminium and aluminium alloys*
- *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.*

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

Oil, oily emulsions, grease and lubricants

Oil, oily emulsions, grease or lubricants are often used in products made of aluminium 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 aluminium production process.

The discussion of the TWG during the workshop in July 2009 in Seville led to the conclusion that a qualitative requirement was sufficient in the sense that the aluminium 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 would require extra analysis. Another disadvantage is the increased environmental risk caused by a 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.

Draft formulation of the requirement:

Scrap must be free of visible oil, oily emulsion, grease or lubricants.

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).

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 ('background level' as defined in UNECE recommendations).

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.

The technical working group strongly supported that the monitoring of aluminium scrap with respect to radioactivity should 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.

More specifically, the radiation of each load of metal scrap shall be monitored in accordance with the UNECE Recommendations and no radiation levels significantly in excess of natural radiation background in the local area shall be 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 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.

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.

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

End-of-waste criteria

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 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, which are small, lightweight instruments used to detect the presence of radioactive material and to inform the user about radiation levels.
- Hand-held instruments, which usually have greater sensitivity and can be used to detect, locate or (for some types of instruments) 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, which 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.

The following must be fulfilled:

- **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 be issued by the operator of the detection equipment.**

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

Certificates may be provided in electronic form. For multiple shipments to the same customer, and with the agreement of the customer, a single certificate may be supplied to demonstrate that all loads have been monitored.

Hazardous properties

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

This implies that aluminium 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.

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 following sections further below.)

Nevertheless, it has been 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 hazardous 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 aluminium 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 furnace.

Grading according to a standard or specification

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 industry specifications are those for direct input to one of the final uses (the production of metal substances or objects by smelters/refinery/foundries). The standards or specifications used may be of an agreed upon nature across an industry sector (e.g. EN 13920, ISRI) or may 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 transaction rather than a regulatory means and that the monitoring would be very burdensome

End-of-waste criteria

and that the details of specifications are very 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 aluminium 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 EN 13920:2002 (except EN 13920-14, 13920-16), the ISRI classifications or classifications used for aluminium product will generally be acceptable.

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 aluminium or aluminium alloy, as material or object, by remelting/refining).

The specifications used may be of an agreed upon nature across an industry sector (e.g. EN 13920, ISRI specification) or may be defined by one or more individual final use companies.

Coatings, paints, plastics

Only small amounts of organic paints, coatings and other organic substances can be tolerated for secondary aluminium production. Generally, plastics are covered under the definition of foreign materials. However, there is a particular concern that PVC and other halogenated substances may lead to higher emissions of dioxins and other toxic substances from the furnaces. An extra limitation on PVC would therefore be indicated to minimise the environmental impact.

Draft formulation of the requirement:

The scrap shall not contain PVC.

Considerations leading to the omission of proposals of separate product quality requirements

Requirements on chemical composition

The technical working group advised against including requirements regarding the chemical composition (other ferrous or non-ferrous metals such as steel, copper, zinc, etc.). This was deemed a matter for commercial agreements rather than for regulation because no particular environmental or market risks were to be addressed.

Dimension

According to the EN 13920 the scrap shall not contain objects of a dimension that does not fit into a metalwork furnace (i.e. generally not greater than 600mm × 600mm × 400mm). The 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 aluminium scrap in compliance with the product quality requirements. This implies that a waste can only be allowed if it contains aluminium metals that can be recovered for the production of new aluminium 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, in principle, all types of waste that contain recoverable aluminium scrap and for which treatments exist to obtain scrap metal with the required product quality should be allowed as input. The technical working group suggested that the criteria on input materials and treatment processes be explicit for those wastes that pose relevant hazards and that the criteria 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 waste which becomes suitable as new treatments become available. It was also pointed out that assigning a waste to a category under the European Waste List per se does not 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.) Basing the criteria on a negative list of unsuitable input materials would imply a high risk of 'forgetting' to exclude unsuitable waste types. However, it should be clear that no mixing with other wastes (i.e. wastes that do not contain recoverable aluminium) are allowed.

These considerations suggest that regarding non-hazardous waste, it would be sufficient to include a general requirement that they must contain recoverable aluminium. Regarding hazardous wastes, the points below need 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.

The monitoring and testing of product quality alone is not a workable approach to ensure that the resulting product does 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 the 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 chlorofluorocarbons, 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.

End-of-waste criteria

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 be provided and approved by the authorities (for example as part of the permit for the waste treatment facility) that suitable treatment has been applied to remove all hazardous properties.

Filings and turnings

Aluminium turnings usually contain oil, even when such a material is treated by centrifuging or pressing (to remove the oil). 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 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 aluminium 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 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 has been applied in a treatment process which is approved by authorities.**

2.6 Criteria on treatment processes and techniques

The purpose of the criteria on treatment processes 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 impacts 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 further considerations showed that the system of grouping is not essential in order to propose 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 all allowed hazardous waste types).

This reflects the discussions in the technical working group, 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 adapting to the specific circumstances or from innovation. Specific process requirements are however needed for the

treatment of hazardous wastes and certain complex waste and possibly also for certain special cases of input materials (such as turnings or cables) for which the direct product requirements are considered not stringent enough.

The general process requirements clarify the minimum treatment required and where in the treatment chain the point of end-of-waste is reached. The principle is that scrap should have completed all requirement treatment that makes it suitable for direct use in the production of new metal. Excepted from this are only pre-treatments that normally take place directly at the refiner/remelter. Some scrap may be obtained in pure form by segregating it from other waste at source or during collection. Any other wastes (that at the origin contain aluminium scrap and other material) must have been treated to separate the non-metal and if needed also other metals.

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, can not 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 technical working group that there should be no requirements on baling or compacting, as this might be counterproductive (e.g. 'hiding' of bad material inside bales).

Draft formulation of requirements:

The aluminium scrap shall have been segregated at the source or while collecting and shall have been kept separate; or the input wastes shall have been treated to separate the aluminium scrap from the non-metal and undesired metal 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 include the following:

- 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 shall 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 below) and certify that all end-waste criteria have been met and accepted by buyers and competent authorities. Such information may also be provided electronically.

Draft formulation of requirements:

Each consignment of the aluminium 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. 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;**
- 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;**
- e. whether or not the scrap complies with the limit for foreign materials or metal yield.**

2.7 Quality assurance

The technical working group has expressed very strong support for making quality assurance requirements part of the end-of-waste criteria. This 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 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 the 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 for deciding 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 detail on the verification, auditing or inspection of the quality assurance system can follow different national approaches.

Draft formulation of requirements:

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 each consignment shall at least be:

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

By means of representative sampling of consignments the monitoring shall also include testing of compliance with the limit value regarding the foreign materials or the metal yield.

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

The end-of-waste criteria including proposed systems of monitoring with explanations are summarised in Annex 3.

3 IMPACTS

In order to evaluate the soundness of end-of-waste criteria developed for 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 aluminium scrap, this will imply savings in energy use and GHG emissions associated with aluminium production. It is however not possible to calculate the size of this effect.

Other air emissions in scrap treatment

The treatment of metal scrap will remain 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 aluminium 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 effect on air emissions of aluminium 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 aluminium production outside the EU (notably the possible amounts of coatings present will be very limited by the limit value on foreign materials/metal yield and PVC limitation). An increase in air emissions should therefore not be expected.

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 had properties that would need such controls and if waste regulation were effective in providing it. There are however only moderate risks associated with end-of-waste scrap, mainly related to (invisible) residual oil. 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 100 000. 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; Slovakia 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.

Permits, licenses related to handling with metal scrap as waste

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 are described below.

In a Waste Treatment Authorisation, 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 and 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 authorisation. (There is a restricted market of carriers, transporters of scrap classified as waste.)

Impacts

- National laws implementing the Directive on ELV.
- National laws implementing the Directive on WEEE.
- 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 specialized 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, a staff will consist of 1 to 5 persons depending on the size of the company. In the Netherlands such a 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 aluminium 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 aluminium scrap cease to be waste according to Article 6 of the WFD, the exemption under Article 2.2 of the REACH Regulation no longer applies. A benefit of EU-wide end-of-waste criteria will therefore be to clarify when aluminium 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 aluminium 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 DG Environment, DG Enterprise 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 has been 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) 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.

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

Impacts

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 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 aluminium 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. The content of main metal must be $[Me1] \geq 80\%$. This substance may contain impurities, in principle below 20 % for the purposes of naming the substance. The 'foreign materials' (end-of-waste criteria $< 5\%$) should be covered by these 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, the range of concentration of the main constituent and the impurities overlap the 80 % criterion and the main constituent is only occasionally $\leq 80\%$).
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 aluminium scrap with end-of-waste status, the following technological aspects given below need to be considered. Aluminium scrap with end-of-waste status would:

- a. always contain aluminium 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 silicon or copper in certain cast aluminium 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 foreign components to about 5 % by weight and exclude any aluminium scrap that has hazardous properties included in Annex III of the Waste Framework Directive.)

From these considerations, it follows that aluminium scrap with end-of-waste status can often 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 impurities that need not 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 aluminium scrap with end-of-waste status

Following the argumentation above, the substances contained in aluminium scrap with end-of-waste status are recovered substances (metals). 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); and
- 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 aluminium scrap

Under REACH, recovered aluminium scrap can be considered either a single recovered substance (aluminium) or a mixture containing various recovered substances (aluminium and other alloying metals).

Wrought aluminium scrap meeting the end-of-waste criteria could often be considered a substance (aluminium). All other constituents would qualify as impurities, should the scrap not have been selected for their presence.

Cast aluminium scrap will, in most cases, consist of alloyed metal and therefore contains further metals with a function such as copper, silicon, iron or manganese. They would have to be considered substances subject to registration under REACH.

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

The meeting on 14 October in Brussels revealed that aluminium and the other main metals used in aluminium alloys will 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 also be registered by the time producers of aluminium 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.

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*

⁽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.

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. Aluminium scrap that complies with the end-of-waste criteria will contain only very limited amounts of substances other than aluminium and other metals. This will be ensured by the end-of-waste criteria by limiting the content of 'foreign materials' and by the process requirements. Foreign materials 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 aluminium scrap to be the same substances as the substances produced by the producers of aluminium and the other metals.

In this context it is useful to highlight again that impurities (whether from original impurities of the substance or from foreign materials 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 aluminium 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 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.

Regarding Article 2(7)(d)ii

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's 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.

Article 32 information will be sufficient for most of the other substances that may appear in aluminium 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

⁽⁸⁾ As stated in the CA document 24/2008/rev.2 on 'Waste and recovered substances': '[...] all 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.

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. 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 is required in the form of safety data sheets (SDS) according to Article 31. If SDS are not needed, safety information according to Article 32 must 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 assessment below discusses this in more detail.

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

1. An 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 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 not legally obliged to do so. Article 31(4) specifies that an SDS need not be supplied where dangerous substances or mixtures offered or sold to the general public are provided with sufficient information (Article 31(4) ie. SDSs are only for professional users (downstream user or distributor under REACH).
2. The supplier shall provide the recipient at his request with a SDS where mixtures do not meet the criteria for classification as dangerous but contains 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)).

Impacts

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 aluminium scrap with end-of-waste status

The cases where an SDS is needed will be very limited because the end-of-waste criteria for aluminium 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 aluminium scrap expressed that the users have no interest in demanding SDSs from the aluminium 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, and an SDS may be required in such a case.

A producer of aluminium 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 SDS 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 aluminium 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 technical working group 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 aluminium 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 aluminium scrap.

There is a clear need for Community-wide end-of-waste criteria for aluminium scrap. Aluminium 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 aluminium 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 good 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 aluminium scrap may cease to be waste when it has been mechanically processed and has obtained a sufficient quality 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 aluminium scrap as high-quality secondary raw-material.

The proposed end-of-waste criteria imply reinforcing the quality assurance for aluminium 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 aluminium 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

Conclusions

shown that it is possible for individual companies to avoid excessive burden under REACH. However, uncertainties remain, 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 to the Community under end-of-waste status. How widely the end-of-waste criteria for aluminium 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 aluminium scrap, no opinions were expressed that registration of the substances in the scrap was required to fulfil the objectives of REACH. Instead, the discussions were characterised by attempts 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 not within the scope of this report.

5 REFERENCES

BIR, Report on the environmental benefits of recycling, 2008

Commission document CA/24/2008 rev.3, which was produced as a follow up to the 5th Meeting of the Competent Authorities for the implementation of Regulation (EC) 1907/2006 (REACH)

Council Regulations 1420/1999 establishing common rules and procedures to apply to shipments to certain non-OECD countries of certain types of waste

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

Directive 94/62/EC on packaging and packaging waste

Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation.

End of waste criteria, report JRC-IPTS, 2008

EC Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel

ELV Directive; Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles, 2000

EN 13920-1:2002; Aluminium and aluminium alloys - Scrap- Part 1: General requirements, sampling and tests; CEN 2002

European Waste List, European Waste Catalogue, Commission Decision, 2002

ISRI specification, Scrap Specification Circular, Institute of Scrap Recycling Industries, Inc., 2008

REACH Regulation, Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

UNECE Recommendations on Monitoring and Response Procedures for Radioactive Scrap Metal; Report of an International Group of Experts convened by the United Nations Economic Commission for Europe (UNECE); United Nations Economic Commission for Europe; New York and Geneva, 2006.

Waste Framework Directive (WFD), Directive 2008/98/EC on waste

References

Waste Shipment Regulation, Regulation (EC) No 1013/2006 of the European Parliament and of the Council on shipments of waste

WEEE Directive, Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE)

ANNEXES

Annex 1. Summarised standards en 13920 on aluminium and aluminium alloy scrap.

- a 13920-2 (Unalloyed aluminium scrap)
Metal yield is typically 95 %. Composition (mass fraction) $Si_{max}=0.25\%$; $Fe_{max}=0.4\%$, $Cu_{max}=0.05\%$; $Mn_{max}=0.05\%$, $Mg_{max}=0.05\%$; $Zn_{max}=0.07\%$, $Ti_{max}=0.05\%$, others each max.0.05 %.
- b 13920-3 (Wire and cable scrap)
Metal yield shall be $\geq 95\%$. Composition (mass fraction) of unalloyed aluminium $Si_{max}=0.25\%$; $Fe_{max}=0.4\%$, $Cu_{max}=0.05\%$; $Mn_{max}=0.05\%$, $Mg_{max}=0.05\%$; $Zn_{max}=0.07\%$, $Ti_{max}=0.05\%$, others each max.0.03 %. Composition (mass fraction) of alloys of the 6xxx series $Si_{max}=0.6\%$; $Fe_{max}=0.3\%$, $Cu_{max}=0.05\%$; $Mn_{max}=0.05\%$, $Mg_{max}=0.06\%$; $Cr_{max}=0.05\%$; $Zn_{max}=0.07\%$, $Ti_{max}=0.10\%$, others each max.0.05 %, others total max. 0.15 %.
- c 13920-4 (Scrap consisting of one single wrought alloy)
Metal yield shall be $\geq 95\%$. Composition of a wrought alloy as specified in EN 573-3 or another registered alloy.
- d 13920-5 (Scrap consisting of two or more wrought alloys of the same series)
Metal yield shall be $\geq 88\%$. Composition (mass fraction) differs for different basis (multi-purpose base, basis for 2xxx series, basis for 3xxx series, basis for 5xxx series, basis for 6xxx series and basis for 7xxx series).
- e 13920-6 (Scrap consisting of two or more wrought alloys)
Metal yield shall be $\geq 88\%$. Composition (mass fraction) differs for chemical composition of grade A and grade B.
- f 13920-7 (Scrap consisting of castings)
Metal yield shall be $\geq 90\%$. Composition (mass fraction) $Si_{max}=13.5\%$; $Fe_{max}=1.1\%$, $Cu_{max}=3.5\%$; $Mn_{max}=0.5\%$, $Mg_{max}=0.3\%$; $Ni_{max}=0.3\%$; $Zn_{max}=1.2\%$, $Ti_{max}=0.15\%$; $Pb_{max}=0.2\%$; $Sn_{max}=0.1\%$, others each max.0.15 %.
- g 13920-8 (Scrap consisting of non-ferrous materials from shredding processes destined to aluminium separation processes)
Metal yield shall be $\geq 90\%$. Composition (mass fraction) $Si_{max}=9.0\%$; $Fe_{max}=1.1\%$, $Cu_{max}=3.5\%$; $Mn_{max}=0.5\%$, $Mg_{max}=0.5\%$; $Ni_{max}=0.3\%$; $Zn_{max}=1.2\%$, $Ti_{max}=0.15\%$; $Pb_{max}=0.2\%$; $Sn_{max}=0.1\%$, others each max.0.15 %.
- h 13920-9 (Scrap from aluminium separation processes of non-ferrous shredded materials)
Metal yield shall be $\geq 90\%$. Composition (mass fraction) $Si_{max}=9.0\%$; $Fe_{max}=1.1\%$, $Cu_{max}=3.5\%$; $Mn_{max}=0.5\%$, $Mg_{max}=0.5\%$; $Ni_{max}=0.3\%$; $Zn_{max}=1.2\%$, $Ti_{max}=0.15\%$; $Pb_{max}=0.2\%$; $Sn_{max}=0.1\%$, others each max.0.15 %.
- i 13920-10 (Scrap consisting of used aluminium beverage cans)
Metal yield shall be $\geq 88\%$. Composition (mass fraction) $Si_{max}=0.3\%$; $Fe_{max}=0.5\%$, $Cu_{max}=0.2\%$; $Mn_{max}=1.1\%$, $Mg_{max}=1.3\%$; $Ni_{max}=0.01\%$; $Zn_{max}=0.05\%$, $Ti_{max}=0.05\%$; $Pb_{max}=0.01\%$; $Sn_{max}=0.05\%$, others each max.0.05 %, others total max. 0.15 %.
- j 13920-11 (Scrap consisting of aluminium-copper radiators)
Metal yield not proposed. Composition (mass fraction) $Fe_{max}=0.7\%$, $Cu_{max}=40\%$; other impurities max. 0.2 %; Al_{min} =remainder.
- k 13920-12 (Turnings consisting of one single alloy)

Metal yield shall be $\geq 90\%$. The scrap shall be unoxidised and the following tolerances apply to the delivered mass: 0.5 % (mass fraction) of magnetic iron; 5 % (mass fraction) of moisture and oil; 3 % (mass fraction) of fines passing through a 20 mesh sieve, after drying.

- l 13920-13 (Mixed turnings consisting of two or more alloys)
Metal yield shall be $\geq 90\%$. The scrap shall be unoxidised and the following tolerances apply to the delivered mass: 0.5 % (mass fraction) of magnetic iron; 5 % (mass fraction) of moisture and oil; 3 % (mass fraction) of fines passing through a 20 mesh sieve, after drying.
- m 13920-15 (De-coated aluminium scrap from post-consumer aluminium packaging)
Metal yield shall be $\geq 80\%$. Composition (mass fraction) $Si_{\max}=1.0\%$; $Fe_{\max}=1.0\%$, $Cu_{\max}=2.5\%$; $Mn_{\max}=0.4\%$, $Mg_{\max}=0.2\%$; $Zn_{\max}=0.8\%$, $Pb_{\max}+Sn_{\max}=0.2\%$, other each max.0.1 %.
- n 13920-14 (Scrap from post-consumer aluminium packaging)⁽¹⁰⁾
Metal yield shall be $\geq 28\%$. Composition (mass fraction) $Si_{\max}=1.0\%$; $Fe_{\max}=1.0\%$, $Cu_{\max}=2.5\%$; $Mn_{\max}=0.4\%$, $Mg_{\max}=0.2\%$; $Zn_{\max}=0.8\%$, $Pb_{\max}+Sn_{\max}=0.2\%$, other each max.0.1 %.
- o 13920-16 (Scrap consisting of skimmings, drosses, spills and metallics)¹⁰
Metal yield shall be $\geq 30\%$. The scrap shall be free from moisture and other foreign material such as refractories, stones, plastics and wood.

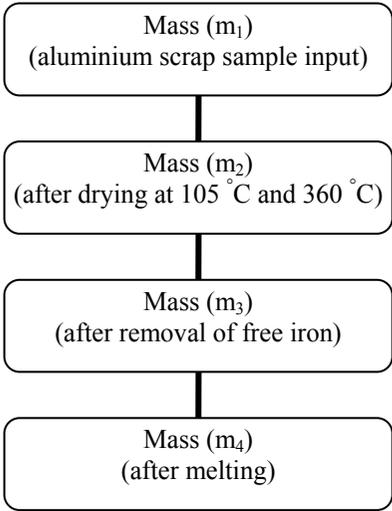
⁽¹⁰⁾ This scrap category should not be accepted for end-of-waste due to the low metal yield.

Annex 2. Aluminium scrap categories according to Institute of Scrap Recycling Industries (ISRI).

| |
|--|
| Tablet CLEAN ALUMINUM LITHOGRAPHIC SHEETS |
| Tabloid NEW, CLEAN ALUMINUM LITHOGRAPHIC SHEETS |
| Taboo MIXED LOW COPPER ALUMINUM CLIPPINGS AND SOLIDS |
| Taint/ CLEAN MIXED OLD ALLOY SHEET ALUMINUM |
| Take NEW ALUMINUM CAN STOCK |
| Talc POST-CONSUMER ALUMINUM CAN SCRAP |
| Talcred SHREDDED ALUMINUM USED BEVERAGE CAN (UBC) SCRAP |
| Taldack DENSIFIED ALUMINUM USED BEVERAGE CAN (UBC) SCRAP |
| Taldon BALED ALUMINUM USED BEVERAGE CAN (UBC) SCRAP |
| Taldork BRIQUETUED ALUMINUM USED BEVERAGE CAN (UBC) SCRAP |
| Tale PAINTED SIDING |
| Talk ALUMINUM COPPER RADIATORS |
| Tall E.C. ALUMINUM NODULES |
| Tally ALL ALUMINUM RADIATORS FROM AUTOMOBILES |
| Talon NEW PURE ALUMINUM WIRE AND CABLE |
| Tann NEW MIXED ALUMINUM WIRE AND CABLE |
| Tarry A CLEAN ALUMINUM PISTONS |
| Tarry B CLEAN ALUMINUM PISTONS WITH STRUTS |
| Tarry C IRONY ALUMINUM PISTONS |
| Tassel OLD MIXED ALUMINUM WIRE AND CABLE |
| Taste OLD PURE ALUMINUM WIRE AND CABLE |
| Tata NEW PRODUCTION ALUMINUM EXTRUSIONS |
| Toto ALUMINUM EXTRUSIONS "10/10" |
| Tutu ALUMINUM EXTRUSION DEALER GRADE |
| Teens SEGREGATED ALUMINUM BORINGS AND TURNINGS |
| Telic MIXED ALUMINUM BORINGS AND TURNINGS |
| Tense MIXED ALUMINUM CASTINGS |
| Tepid AIRCRAFT SHEET ALUMINUM |
| Terse NEW ALUMINUM FOIL |
| Tesla POST CONSUMER ALUMINUM FOIL |
| Tetra NEW COATED ALUMINUM FOIL |
| Thigh ALUMINUM GRINDINGS |
| Thirl ALUMINUM DROSSES, SPATTERS, SPILLINGS, SKIMMINGS AND SWEEPINGS |
| Throb SWEATED ALUMINUM |
| Tooth SEGREGATED NEW ALUMINUM ALLOY CLIPPINGS AND SOLIDS |
| Tough MIXED NEW ALUMINUM ALLOY CLIPPINGS AND SOLIDS |
| Tread SEGREGATED NEW ALUMINUM CASTINGS, FORGINGS AND EXTRUSIONS |
| Troma Aluminum Auto or Truck Wheels |
| Trump ALUMINUM AUTO CASTINGS |
| Twang INSULATED ALUMINUM WIRE SCRAP |
| Twist ALUMINUM AIRPLANE CASTINGS |
| Twitch FLOATED FRAGMENTIZER ALUMINUM SCRAP (from Automobile Shredders) |
| Tweak FRAGMENTIZER ALUMINUM SCRAP (from Automobile Shredders) |
| Twire BURNT FRAGMENTIZER ALUMINUM SCRAP (from Automobile Shredders) |
| Saves OLD ZINC DIE CAST SCRAP |
| Scabs NEW ZINC DIE CAST SCRAP |
| Scoot ZINC DIE CAST AUTOMOTIVE GRILLES |
| Scope NEW PLATED ZINC DIE CAST SCRAP |
| Score OLD SCRAP ZINC |

Annex 3. Summarised criteria

| Criteria | Remarks | Self monitoring | Explanation |
|---|---|--|--|
| <p align="center">Product quality</p> | | | |
| <p>Foreign materials The total amount of foreign materials shall be $\leq 5\%$ by weight or the metal yield shall be $\geq 90\%$</p> <p>The scrap shall not contain excessive metal oxide in any form, except for typical amounts arising from the outside storage of prepared scrap under normal atmospheric conditions</p> | <p>Foreign materials are</p> <ul style="list-style-type: none"> • metals other than aluminium and aluminium alloys • 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 | <p>Foreign materials should be determined by:</p> <ol style="list-style-type: none"> 1. Visual inspection for every load by qualified staff and 2. At appropriate intervals, sampling shall be carried out according to standard EN 13920-1. Foreign materials shall be determined by manual sorting of aluminium metallic particles or objects from non-metallic or other metallic particles or objects based on careful visual inspection or other means of detecting metal (analysis by magnet, based on the density of materials, etc.) <p>The determination of foreign materials could be optionally (e. g. for very fine particles) replaced by melting analysis, determining metal yield. Sampling and testing to determine the metal yield shall be carried out according to standard EN 13920</p> <p>The appropriate frequencies of monitoring shall be established by consideration of the following factors:</p> <ul style="list-style-type: none"> • 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 | <p>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</p> <p>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.</p> |

| Criteria | Remarks | Self monitoring | Explanation |
|---|---------|---|--|
| | | <p>end-of-waste condition</p> <p>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</p> <p>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</p> | <p>Analysing procedure to determine metal yield (e.g. for fine granulated aluminium scrap and turnings):</p> <ol style="list-style-type: none"> 1. removal and determination of moisture (according to 7.1. of the EN 13920-1:2002) 2. removal and determination of free iron (according to 7.2. of the EN 13920-1:2002) 3. determination of the metal yield (according to 7.3. of the EN 13920-1:2002) 4. the metal yield will be calculated as a mass after melt (m_4) and the mass after determining the moisture content (m_2); $m [\%] = (m_4/m_2) \times 100$  <pre> graph TD A["Mass (m₁) (aluminium scrap sample input)"] --> B["Mass (m₂) (after drying at 105 °C and 360 °C)"] B --> C["Mass (m₃) (after removal of free iron)"] C --> D["Mass (m₄) (after melting)"] </pre> |
| <p><u>Oil, oily emulsion, lubricants or grease</u> Scrap shall be free of visible oil, oily emulsion, lubricants or grease</p> | | <p>Visual inspection of each consignment by qualified staff</p> | <p>Oil, oily emulsion, 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</p> |

| Criteria | Remarks | Self monitoring | Explanation |
|--|---|--|---|
| <p><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)</p> | Properties of individual metal elements included in aluminium alloys are, however, not relevant for this requirement. | Visual inspection of each consignment by qualified staff | <p>load where oil is most likely (the bottom).</p> <p>Staff shall be trained on potential hazardous properties that may be associated with aluminium scrap and on material components or features that allow for recognising the hazardous properties.</p> <p>The procedure of recognising hazardous materials shall be documented under the quality assurance system</p> |
| The scrap does not contain any pressurised, closed or insufficiently open containers of any kind that could cause explosions in a metalwork furnace | | Visual inspection of each consignment by qualified staff | |
| <p><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</p> | | <p>It must be ensured that each consignment is monitored for radioactivity</p> <p>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.)</p> <p>This certificate shall have been issued by the operator of the detection equipment</p> <p>Certificates may be provided in electronic form. For multiple shipments to the same customer, and with the agreement of the customer, a single certificate may be supplied to demonstrate that all loads have been monitored</p> | 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 the most efficient detection equipment and within the limitations of accessibility to identify radioactive materials |
| <p><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</p> | | Each consignment shall be graded by qualified staff | The specification used may be of an agreed upon nature across an industry sector (e.g. EN 13920:2002, ISRI) or may be defined by one or more individual final use companies |

Annex 3

| Criteria | Remarks | Self monitoring | Explanation |
|--|----------------|--|--|
| the final uses (e.g. production of metal substance or objects by refining/remelting) | | | |
| Coatings, paints, plastics The scrap shall not contain PVC | | Visual inspection of each consignment by qualified staff | |
| Input materials | | | |
| <p>No other waste shall have been used as input to obtain the scrap than waste that contained recoverable aluminium at source</p> <p>No hazardous waste shall have been used as input to obtain the scrap except:</p> <ul style="list-style-type: none"> • wastes that are covered by the WEEE Directive or the ELV Directive • 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 authorities | | <p>Acceptance control of all input material received (visual inspection) and of the accompanying documentation by qualified staff</p> <p>The requirements on input materials shall be included in the specifications/contract with the suppliers</p> | <p>Acceptance control procedures shall be covered by the quality assurance system</p> <p>This would normally include that the undertaking applying the end-of-waste criteria requires certain quality assurance also by the supplier.</p> <p>Staff carrying out the acceptance control shall be trained on how to recognise operationally input material that does not fulfil the requirements</p> |
| Processes and techniques | | | |
| <p>The aluminium scrap shall have been segregated at the source or while collecting and shall have been kept separate; or the input wastes shall have been treated to separate the aluminium scrap from the non-metal and non-ferrous components.</p> <p>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</p> <p>Specific requirements:</p> | | <p>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</p> | |

| Criteria | Remarks | Self monitoring | Explanation |
|--|---------|-----------------|-------------|
| <ul style="list-style-type: none"> • 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 • 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 <i>inter alia</i> oil and paint drums, shall have been emptied and cleaned • hazardous substances shall have been efficiently removed | | | |
| <p>Quality assurance</p> <p>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</p> <p>The quality management system must at least include the following elements:</p> <ol style="list-style-type: none"> 1. the quality management system must be auditable and ready for inspection by the competent authority under waste law to satisfy itself that the system is suitable | | | |

| Criteria | Remarks | Self monitoring | Explanation |
|--|---------|-----------------|-------------|
| <p>for the purpose of demonstrating compliance with end-of-waste criteria</p> <p>2. must include a set of documented procedures addressing each key process relevant to compliance with the technical end-of-waste criteria, including:</p> <ul style="list-style-type: none"> ◦ 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. | | | |

| Criteria | Remarks | Self monitoring | Explanation |
|---|---------|-----------------|---|
| <p>Information provided with the product</p> <p>Each consignment of the aluminium 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:</p> <ul style="list-style-type: none"> • 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; • whether or not the scrap complies with the limit for foreign materials or metal yield. | | | <p>All information could be described in one or several documents</p> |

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Abstract

This report is the JRC-IPTS contribution to the development of the end-of-waste criteria for aluminium 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 aluminium and aluminium alloy recycling and an analysis of the economic, environmental and legal impacts when aluminium 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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