NIMS-EMC Materials Data for the Environment, No. 5

Aluminium Material Flow in Japan

EcoMaterials Center
National Institute for Materials Science

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March, 2004

Authors

Masanori Shimada

Yoichi Tanimura

Tadashi Sawatani

Kiyoshi Ijima

Kohmei Halada

EcoMaterials Center
National Institute for Materials Science

EcoMaterials Center
National Institute for Materials Science

1-2-1 Sengen, Tsukuba, Ibaraki, 3050047 Japan
Tel: +81-29-859-2668
Fax: +81-29-859-2601
e-mail: emc@wotome.nims.go.jp
home page: http://www.nims.go.jp/emc/

Preface

The 21st century, which is being hailed as the "environment century," is becoming an age where the global environment is being considered from every possible aspect, such as daily and economic activities. Against this backdrop, raw and processed materials are being used to make all types of products. As resources, these materials are being extracted from the earth's environmental sphere, and returned to this sphere as waste, so they are very closely tied with the global environment. Therefore, not only the producers of materials, but also all the people who produce, use, and dispose of the products, have a vested interest in learning about the environmental load and recyclability of these materials to improve productivity and make the right choices for creating a sustainable society for the future.

Unfortunately, there is still relatively little processed information available regarding the environmental load and recyclability of these materials. Sometimes, information that has been "fleshed out" can be found here and there, but it is still often not sufficient to make informed decisions.

To address these issues, the EcoMaterials Center, as a core organization for the acquisition and processing of reliable information on substances and materials, is working hard to issue NIMS-EMC Data as a series. NIMS, it should be noted, is the acronym for the National Institute for Materials Science, and EMC refers to the EcoMaterials Center. While there may be slight differences in procedures for collecting data and creating databases, we would like to use detailed surveys by experts and other vehicles to provide essential material data which can be used to create product materials which cannot be derived from statistical data, and which includes data on such considerations as recyclability and LAC, or Life Cycle Assessment.

March, 2004

Dr. Kohmei Halada
Director of the EcoMaterials Center
National Institute for Materials Science

Acknowledgement

We are grateful for the Japan Aluminium Association and the Japan Aluminium Alloy Refiner Association for providing nearly all of the hard information and data on aluminium used in this report. In addition, we are grateful for the Japan Research and Development Center for Metals for the method and procedure in the surveys.

Membership Roster

Kohmei Halada	EcoMaterials Center, National Institute for Materials Science
Katsutoshi Yamada	EcoMaterials Center, National Institute for Materials Science
Kenichi Nakajima	EcoMaterials Center, National Institute for Materials Science
Kyoichi Tashiro	Shinko Research Co., Ltd.
Kazuya Yano	Shinko Research Co., Ltd.
Fujio Murata	The Furukawa Electric Co., Ltd
Nozomu Katagiri	Chuo-Aoyama Audit Cooperation
Kenji Sugiyama	Japan Aluminium Association

(Secretariat)

Tadashi Sawatani	EcoMaterials Center, National Institute for Materials Science
Yoichi Tanimura	Hosesi University
Masanori Shimada	EcoMaterials Center, National Institute for Materials Science

Contents

1. Overview

1.1 Background

Up to and including 2001, statistics on supply and demand for aluminium in Japan were listed in the Yearbook of Minerals and Non-Ferrous Metals Statistics published by the Ministry of Economy, Trade and Industry (hereafter, METI). Most of these values were entered as values that had been transferred from Reference[4] (the original data were from a yearbook of materials statistics). However, beginning in 2002, statistics on the supply and demand for aluminium were extinguished due to the restructuring of the METI, making it difficult to make direct data entries. The continued data were taken from Reference[5] and the missing data were estimated in an attempt to depict the flow of aluminium materials.

1.2 Purpose

This survey was taken to provide data for the "Material Flow Analysis (MFA) for Iron, Aluminium and Copper" that was commissioned by the Japan Science and Technology Agency.

1.3 Method

1.3.1 Aluminium materials

(1) The most widely cited source is the Yearbook of Aluminium Statistics published by the Japan Aluminium Association. Up until 1999, aluminium statistical yearbooks were divided into the following two types:

- Yearbook of Rolled Aluminium Products, published by the Japan Aluminium Association (former Japan Aluminium Federation)
- Yearbook of Light Metal Industry Statistics, also published by the Japan Aluminium Association (former Japan Aluminium Federation)

These statistics include citations from the METI's "Yearbook of Minerals and Non-Ferrous Metals Statistics," "Yearbook of Machinery Statistics," and "Yearbook of Ceramics and Construction Materials Statistics," among other references. They cover the entire spectrum of aluminium statistics. Other statistics are also cited when needed.

1.3.2 Proceeding with the survey

(1) Interviews were conducted with such industry-related organizations as Japan Aluminium Association, Japan Aluminium Alloy Refiners Association、and Japan Light Metal Association (Keikinzoku Doyukai). There were also interviews with relevant parties such as non-ferrous metals dealers and metal recyclers.

(2) Research committees were formed and convened 4 times. The committee members are listed on the Membership Roster

1.3.3 Method for data creation

(1) Using the supply and demand statistics of the METI, the Japan Aluminium Association created the first "Aluminium Supply and Demand Flow" that included net consumption of aluminium scrap in rolling in 1999 and 2000. The method was studied and utilized to create the aluminium supply and demand flow of the present study.

(2) Net consumption of aluminium scrap in rolling

Utilizing information from "Scrap Generated During Aluminium Rolling" provided by the Japan Aluminium Association, the net scrap consumption for 2002 was calculated to create material flow. The values obtained were nearly the same as those listed in the Survey Report[1] of previous interviews.

(3) Estimate of new aluminium material consumed in rolling

From 1992 to about 1998, the amount of aluminium metal consumed in rolling was about equal to the amount of new aluminium metal consumption in the supply and demand statistics plus the

amount of imported brillet (statistics of Japan Aluminium Association). Although there is a gap in these 2-3 years, we used the proportional relationship to estimate the amount of aluminium metal consumed in rolling in 2002.

(4) Estimated consumption of secondary aluminium ingot

Estimates of the consumption (supply and demand) of secondary aluminium ingot were made referring to the statistics[3)] of the Japan Aluminium Alloy Refiners Association (hereafter, JARA) which cover about 80% of production.

(a) Estimate from averages from 1992 to 2001

In other words, "the METI/JARA ratio" refers to the respective ratio of these two organizations' statistical values. The average ratio for 1992-2001 was calculated and used to estimate the 2002 values for JARA.

(b) The latest data for 1992-2001 were extrapolated (regression line approximation). In other words, "the METI/JARA ratio" refers to the respective ratio of these two organizations' statistical values. This ratio for 1998-2001 was calculated by regression line approximation to estimate the 2002 values for JARA. The procedure was as follows:

- Estimate the supply of secondary aluminium ingot (aluminium metal, secondary aluminium ingot, scrap). The results are shown in Table 2-3-6.
- Estimate the consumption of recycled materials (rolling, casting, die-casting, steel, exports). The results are shown in Table 2-3-7.

(5) Estimated consumption of materials besides secondary aluminium ingot

The results of estimating the consumption of materials besides secondary aluminium ingot are shown in Table 5. The method was different from that used for the secondary aluminium ingot estimates. METI stopped publishing supply and demand statistics in 2002, so they were estimated based on past ratios between the amount of aluminium metal/secondary aluminium ingot and scrap (rolling, casting, die-casting, etc.) and the amount of production. The method was the same as that for the secondary aluminium ingot, that is:

(a) Estimate from averages from 1992 to 2001.

In other words, the average ratio of the amount of supplied material for products to the amount of production for 1992-2001 was calculated and applied to estimate the 2002 values for production.

(b) The latest data for 1992-2001 were extrapolated (regression line approximation). In other words, the ratio of the amount of material for products to amount of production for 1998-2001 was calculated by regression line approximation to estimate the 2002 values for production.

1.4 Conclusions

1.4.1 Trends in the supply and demand of aluminium

In production by sector, sheet production is growing, even in rolling, but extrusion, especially for window frame, has been stagnant or in decline due to a decline in construction. Die-casting is growing due to increased exports of automobile parts, except for cast parts used in automobile engines, which have been stagnant.

Other areas (steel, wire, forging, powder) have been stagnant.

1.4.2 Overview of Aluminium Material Flow in 2002

1.4.2.1 Quantitative estimation of the demand side

(1) Amount of aluminium consumed in rolling

The values of the blank spaces in Fig. 2-1-3 were estimated and used to make Fig. 2-1-4. First, the roughly 35,000 tons listed in the "average differences between new aluminium consumption in

supply and demand statistics and aluminium metal and brillet consumption in the Japan Aluminium Association's statistics" for 1999-2001 was subtracted from the 1,620,984 t of aluminium metal consumed in the rolling process to estimate the amount of aluminium metal for rolling in 2002. The values for aluminium metal and secondary aluminium ingot for rolling were previously known; the value for hitherto unknown scrap was calculated to be -5,266 t. The amount of material consumed in rolling (aluminium metal+ secondary aluminium ingot) was added to the amount of scrap generated during the process (1,623,288) to derive a total amount of 3,564,448t of materials for rolling. The reason for the negative value of scrap may have been that amount of sold scrap exceeded the amount of purchased scrap.

(2) Consumption of secondary aluminium ingot by sector

The ratios of data from supply/demand statistics and the JARA's statistics for 7 years (1995-2001, inclusive) were averaged, and JARA's value was divided by the resulting value to estimate the consumption of secondary aluminium ingot for each sector. As a result, the amounts of casting (324,066 t), die-casting (792,053 t), rolling (324,441 t) for which estimation was not needed, and others (126,713 t) were estimated by averaging ratios between JARA's statistics and supply/demand statistics of METI for each year. The amounts of steel (105,863 t) and base metal (308,520 t) were estimated by approximation equations.

(3) Consumption of aluminium metal and scrap aluminium by sector

The ratios of intermediate goods to the amount of materials consumed in their production for the past 7 years (1995-2001, inclusive) were averaged and then the production volume of intermediate goods was divided by this value to estimate the amounts of aluminium metal and scrap aluminium consumed by sector.

All of these values were derived by interpolating from the average of the ratio of JARA statistics to METI statistics for each year. The results were as follows:
Casting: 137,695 t metal, 22,789 t scrap
Die-casting: 42,375 t metal, 37,144 t scrap
Other products: 133,905 t metal, 40,229 t scrap.

(4) Demand for each type of material production process

The demand for materials in 4 process (rolling, casting, die-casting, other) was calculated by adding the amount exported to the amount of aluminium metal consumed. The totals for aluminium metal and secondary aluminium ingot were 2,020,437 t, and 1,578,551 t, respectively. However, scrap was calculated to be 1,445,240 t by adding "scrap for recycling" (calculated below) to the values for aluminium metal consumption and amount exported for the 4 process (rolling, casting, die-casting, other).

1.4.2.2 Quantitative estimation of the supply side

(1) Aluminium metal for secondary aluminium ingot

Aluminium metal for secondary aluminium ingot was calculated to be 83,311 t. Since 1998, METI's supply and demand statistics for this sector have been lower than actual value, so the data for this period have been corrected by using the statistical values of the JARA.

(2) Base metals and scrap for secondary aluminium ingot

The figure of 1,294,980 t of scrap for secondary aluminium ingot was derived by averaging the ratio of JARA to METI statistics for 1994-2001 and then JARA's figure was divided by this value.

The figure of 1,294,980 t in the statistics includes 308,520 t of base metals that were scrap for secondary aluminium ingot (This value was derived by averaging the ratios between the JARA and METI's statistics for each year, then JARA's statistics was divided by this value). However, actuallybase metals production include figures for materials besides scrap-- for example, there are reports that of the use of metallic aluminium recovered from dross. The figure of 40,000 t was added to base metals, and the total was listed in the material of secondary aluminium ingot.

(3) Production of secondary aluminium ingot

According to METI statistics, secondary aluminium ingot is produced by both specialty and non-specialty companies. In recent years, production by non-specialized companies have been listed as "generation." Almost all (80%) of the non-specialized producers are rollers. In 2002, METI stopped listing aluminium statistics. The production numbers include 1,238,929 t for specialized companies and 100,945 t for non-specialized, rolling companies, but this latter figure does not include the data other than rolling for non-specialized. As a result, it was necessary to make estimates, in this case by averaging the production ratio of specialized to non-specialized companies for each year from 1999 to 2001, then the numerical value for specialized companies was divided by this value. This resulted in a figure of 127,079 t. Total production of secondary aluminium ingot was 1,366,008 t.

(4) Recovery of scrap

The "collection" of scrap was calculated in the supply side of METI's statistics by adding "collection" plus "generation" and subtracting "scrap generated during the (rolling) process." Since METI extinguished aluminium supply and demand statistics in 2002, it became necessary to estimate the amount of "recovered" scrap. Using the least squares method for scrap recovered data for 1999-2001, an estimate of 1,327,061 t was obtained.

1.5 Discussion

1.5.1 Comparison with past survey reports

The figure of 989,000t in the "Survey on Trends in the Supply and Demand of Aluminium Scrap"[1)] is the sum total of scrap consumption based on data tabulated from the market questionnaire that was administered in FY 1993.

The scrap supply for FY 1993 taken from this survey was estimated from statistical data, the collected (supply side) amount estimated from this data was a high 1,145,650 t, but the corrected value for demand (imports subtracted from demand) was 954,758 t, and the past value mentioned above was somewhere between these two values. Therefore, it appears that the value for estimated here is close to the actual value.

1.5.2 Discrepancy between scrap collected and scrap discarded

Figure 3-1 shows a comparison between the statistical values for scrap collected and the estimated amount of scrap discarded, in other words, an estimate based on past production. Here we can see that around 1998, the two values began to separate compared with the value estimated from production, the statistical value of supply and demand became about 300,000 t lower. There are 4 possible explanations for this discrepancy.

(a) The statistics for supply and demand have been inaccurate since 1998.
(b) There might be cases where increasing exports of aluminium scrap are not included in the statistics.
(c) Scrap from automobile manufacturing, etc., is not reported in the statistics.
(d) There might be cases where there might be errors in the conditions set for generation and discard of scrap.

A conclusion needs to be made after ample consideration that there might be a combination of these factors involved. At least, it should be considered a problem for further investigation. Currently, the collapse of aluminium prices in 1998-99 seems to be a likely reason, but we should also consider that exports of aluminium scrap to China began to increase in 2000 or 2001. In other words, the trade statistics show 50,000 t of scrap exports, there was also probably about 100,000 t of scrap mixed with other materials that was considered to be "miscellaneous" and was not included as aluminium in the trade statistics. Moreover, there may have been lapses in the reporting of statistics on scrap consumption. Data are currently being accumulated.

1.5.3 Overestimated values in rolling and underestimated values in casting/die-casting in statistics

In the aluminium material flow shown in Figure 2-1-3, numerical values are listed in the totals for net material consumption (the actual degree of accuracy is unknown) for casting, die-casting and others. The figures for net consumption of materials in rolling are shown in Figure 3-2-1. Here we can see that the supply of materials is less than the production; there is a difference of about 200,000 to 350,000 tons. The reason for this may be that when the data for scrap generated during the process are tabulated, the amount of materials moving between factories are mistakenly counted as external transactions; the figures for scrap produced during the process become inflated, leading to excessive subtraction in some cases. Another possible reason is that, in cases such as with rolling, there might be different manufacturers involved with the upstream and downstream processes and the materials are double-counted. For example, we could expect double-counting in cases involving sheet materials, foil, billet and extruded products.

On the other hand, as we can see in Figure 3-2-2, the statistical value for secondary aluminium ingot for 2002 is 1,366,008 t, which is about 100,000-250,000 t lower than the production amount of 1,627,106 t (estimated production is listed in parentheses) estimated from the supply of raw materials (yield 92.5%). This has a very large effect on casting, die-casting, etc., which consume enormous amounts of recycled aluminium. Furthermore, the statistics on casting and die-casting production are tabulated as mechanical statistics but are not counted for companies with 25 or fewer employees. However, there are many small-scale companies, so we can expect there to be gaps in the data. In the case of copper casting, tabulated figures for production have sometimes been about 20% lower than the supply of materials. When production figures are lower than real, this can have an effect of "reducing" the amount of discarded scrap, and there is a great risk of making the wrong judgment with the recycled material flow.

It should be noted that in Table 3-2-2, “base metal consumption” refers to the equivalent amount of base metal consumed by secondary aluminum ingot producers in the METI statistics. This value includes about 100,000 t consumed by domestic base metal companies. These statistics have been interpreted to mean both that base metal production in Japan is rising, and that it is decreasing, so it is necessary to take a definitive survey. In addition, the imported base metals include statistics on base metal lumps imported from former COMECON countries, which are treated as imports from Russia. There are reports that lumps imported from Russia are not only consumed as material for secondary aluminum ingots but are consumed in rolling. Therefore, it is necessary to get an understanding of the actual amounts. The amount of metal recovered from dross was derived from interviews. Also according to interviews, the amount of base metals directly shipped to the automobile industry has been decreasing recently. Figures were derived from proportional allotment between 1994-2002.

Table 3-2-3 represents an attempt to calculate the difference between the supply of materials and the production of intermediate goods. Recently, this difference has been increasing. The amount of discarded scrap began to increase around 1996, which may have been affected by scrap discarded from aluminium window frame. There is a sense that the maximum difference of 480,000 t is unexpectedly small. Maybe, the expansion of rolling and contraction of casting and die-casting may have canceled each other out. In any case, it would be desirable to provide the correct figures for production and create an accurate material flow.

1.5.4 The ratio between old scrap and processed scrap in recovered aluminium scrap

The amount of scrap generation estimated from production statistics in the present study, and data from the Light Metal Association (Keikinzoku Doyukai) were used to obtain information on the proportion of processed scrap to old scrap. In the equation to estimate scrap generation, the ratio was 2:6, with old scrap being higher. Using the Light Metal Association data, the ratio was estimated to be 4:6. It is currently hard to interpret this difference. Ratios for other metals show varying results. For example, in the case of iron, the ratio of old scrap to processed scrap is 8:2[9)], but in the case of copper, it is the opposite, at 5:6, with processed scrap having a slight edge[10)]. Copper scrap is easy to process and is used as functional materials and in many small articles like valves and connectors. Furthermore, copper is used in smaller amounts than aluminium and steel in structural materials.

1.5.5 The need to add dross to material flow

There are no public statistics on dross. At the very least, it is necessary to investigate the amount of dross (first squeezed dross, given to dross processing companies) that is generated (estimated to be 200,000 t, 100,000 t of which is metal), recycled, and disposed of, and the applications for recycled dross.

1.5.6 Petition to resume METI'supply and demand statistics for aluminium

Among non-ferrous metals, only aluminium does not have continuous statistics on supply and demand in authoritative sources.

Statistics on secondary aluminium ingot are reported voluntarily by JARA. Although a relatively accurate estimate can be made of the consumption of secondary aluminium ingot in intermediate products such as rolling, nobody knows the proportion of aluminium metal and scrap that is being consumed in intermediate processing fields, and no one knows how much scrap is being generated. The problem with discontinuity of supply and demand statistics is that there are limits to the periods for which estimates can be made using current trends, and we are reaching the stage where it will be impossible to make estimates. Therefore, it is our sincerest hope that supply and demand statistics be resumed for aluminium.

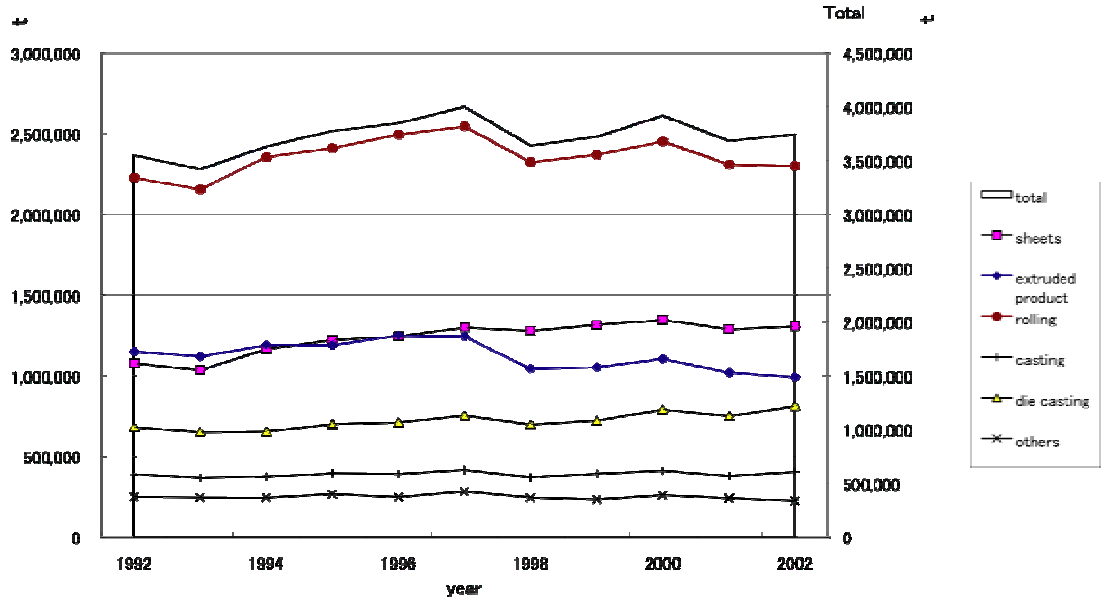
2. Main subject

2.1 Overview of material flow

2.1.1 Recent supply and demand trends for aluminium

Figure 2-1-1 shows production trends by sector. In the rolling sector, sheet production is growing, but extruded products, especially window frame are stagnant or in decline due to the decline of new construction. Die-casting is growing due to increased exports of automobile parts. The exception is cast products used in automobile engines, which are stagnant. Other sectors (steel, electrical wire, forging, powder) are also stagnant.

Figure 2-1-1 Recent supply and demand trends for aluminium



Note: The total of rolling is the sum total of sheets and extruded products.

Source: Sheets, pressed products, and others are taken from Yearbook of Aluminium Statistics. Die-casting and casting are taken from Yearbook of machinery statistics

2.1.2 Draw of material flow

Since 2002, there have been none METI statistics for supply and demand of aluminium, so an attempt was made to determine whether or not it was feasible to make a supply and demand flow using the remaining statistical data and estimated values.

2.1.2.1 Material flow when statistics are available for supply and demand

Table 2-1-1 shows METI's supply and demand statistics for 2001. The flow that was drawn up based on these statistics is shown in Figure 2-1-2, Aluminium Material Flow for 2001.

Material supply and inputs for intermediate products were taken from supply and demand statistics.

The remainder were obtained as follows: Production and shipment of intermediate products (rolling goods, miscellaneous) were taken from the Yearbook of Aluminium Statistics of the Japan Aluminium Association. Other statistics were obtained straight from the original source; for example, the Yearbook of Machinery Statistics provided the data for "Casting and die-casting."

Table 2-1-1 Aluminium supply and demand statistics for 2001

Alumimium metal	Alumimium metal	Secondary aluminium ingots	Scrap	Total 1 (1)	Total 2 (2) (1)-(3)	Scrap generated during process, remarks (3)
Supply	2,482,725	1,870,224	3,163,266	7,516,215	5,885,191	1,631,024
Product at the beginning of a year	289,624	145,742	115,861	551,227	551,227	
Production	6,632	1,170,668				
Generation		132,681	1,795,160	1,927,841	296,817	1,631,024
Collection			1,131,416	1,131,416	1,131,416	
Imports	2,186,469	421,133	120,829	2,728,431	2,728,431	
Demand	1,992,281	1,742,085	3,057,092	6,791,458	5,160,434	1,631,024
Domestic demand	1,990,294	1,731,503	3,004,419	6,726,216	5,095,192	1,631,024
Rolling product	1,608,777	317,470	1,632,882	3,559,129	1,928,105	1,631,024
Castings	142,097	290,939	25,440	458,476	458,476	
Die-cast	44,070	714,527	42,157	800,754	800,754	
Electric Wire	38,014	0	2,592	40,606	40,606	
Forging	-	-	-	0	0	
Steel	31,005	100,876	17,895	149,776	149,776	
For secondary aluminium ingots	60,333	283,588	1,261,686	343,921	343,921	To avoid double-counting
Others	65,998	24,103	21,767	111,868	111,868	
Exports	1,987	10,582	52,673	65,242	65,242	

Source: Yearbook of Minerals and Non-Ferrous Metals Statistics for Calendar Year 2001

Note:

1) The total of 421,133t of imported secondary aluminium ingot = 268,441t of base metal + 152,692t of secondary aluminium. ingot
2) Scrap recovery: The total of 1,295,552t = 1,795,160t (generated) +1,131,416t (collected) －1,631,024t (scrap generated during process.)
3) Alumimium metal "for secondary aluminium ingot" was revised to 76,665t from the 60,333t listed in the supply and demand data in Table 2-3-6.
4) The sum total of demand for aluminium metal in Figure 2-1-2: 2,006,613t ＝1,608,777t (for rolling) + 142,097t (casting) + 44,070t (die-casting) + 135,017t (miscellaneous) + 1,987t (exports) + 76,665t (for secondary aluminium ingot).
5) Demand for secondary aluminium ingot (Figure 2-1-2): To avoid double-counting "for secondary aluminium" in the demand price column, it was deleted from the calculation. 1,458,497t ＝ 317,470t (rolling) + 290,939t (casting) + 714,527t (die-casting) + 124,979t (others) + 10,582t (exports).
6) Demand for scrap (Figure 2-1-2): 1,426,068t ＝1,858t (rolling) + 25,440t (casting) + 42,527t (die-casting) + 42,254t (other) + 52,673t (exports) + 1,261,686 (material for secondary aluminium ingot).

2.1.2.2 Material flow for periods for which no supply and demand statistics exist

(1) What can be directly listed from the statistical values

METI's supply and demand statistics was discontinued in 2002. The data that can be directly listed from the other statistics are listed in Figure 2-1-3 as known values for 2002 aluminium material flow.

The upper part of the flow was derived from production and trade statistics.

a) Imports of aluminium materials for 2002: Aluminium metal, 2,032,822 t; alloy ingots, 542,872 t[6]; scrap, 133,375 t (Taken from trade statistics)

b) Exports of aluminium materials for 2002: New aluminium, 2167 t; alloy ingots, 10,278 t; scrap, 55,364 t (Taken from trade statistics, Reference[7])

c) Domestic production of aluminium metal for 2002: 6,400 t (Taken from production statistics, Reference [5]: Normal Purity)

d) Total consumption of aluminium materials for rolled goods, casting, die-casting, and miscellaneous production, and the consumption of these materials in the market fields (transport, public works, metal products, foods, miscellaneous, exports) are shown from the middle stage downward in Figure 2-1-3. The data for consumption in these market fields were listed in Reference[3]. These original data were directly taken from METI's "Yearbook of Machinery Statistics," "Yearbook of Ceramics and Construction Materials Statistics," and other sources.

(2) Data that cannot be listed directly from statistical values

Next, the results derived from various estimates are shown in Figure 2-1-4, aluminium material flow for 2002. Some of these data were from previous years, and there were no longer supply and demand data for 2002, so some sort of calculation was needed to derive numerical values. Generally speaking, estimates were made according to one of the following two procedures. Estimates made for other items are described in the aluminium metal, secondary aluminium ingot, and scrap sections of the next chapter.

a) Amount of secondary aluminium ingot consumed by sector

As we can see in Table 2-3-7, the ratios between supply and demand statistics, and the statistics of the JARA for the past 8 years were averaged. The JARA's values were divided by the resulting ratio to estimate the amount of secondary aluminium metal consumed by sector. The resulting estimates made from average of the yearly ratios between the JARA's values and METI's statistics were as follows: 324,066 t of cast products; 792,053 t of die-cast products; 324,441 t of rolled products (estimate unnecessary); and 20,850 t of miscellaneous products. Estimates were also made using an approximation equation for the previous 5 years: 105,863 t for steel; 308,520 t for base metals.

b) Consumption of aluminium metal and scrap by sector

As we can see in Table 2-2-3, the ratios between the volume of intermediate production and the material consumption for intermediate goods for the past 8 years were averaged. The volume of intermediate production was divided by the resulting ratio to estimate the amount of aluminium metal and scrap consumed by sector. All of the estimates were made from the averaged values of the yearly ratios between the JARA's values and METI's statistics. The results were as follows: 137,695 t of aluminium metal for cast; 22,789 t of scrap for cast; 42,375 t of aluminium for die-cast; 37,144 t of scrap for die-cast; 133,905 t of aluminium metal for others products; and 40,229 t of scrap for others.

Figure 2-1-2 Supply and demand flow for aluminium metal, secondary aluminium ingot, and scrap for 2001

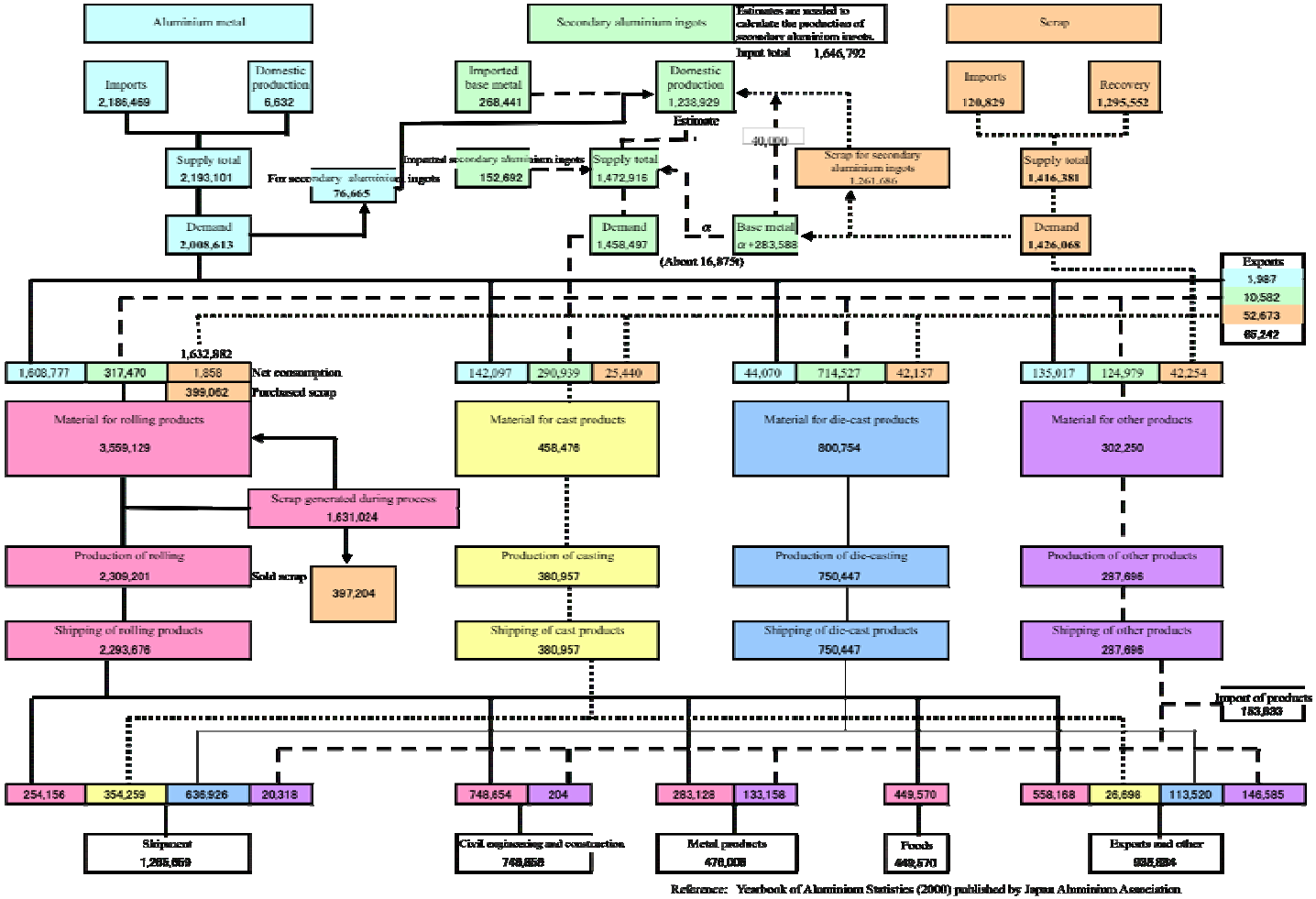


Figure 2-1-3 Supply and demand flow for aluminium metal, secondary aluminium ingot, and scrap for 2002 (known values only)

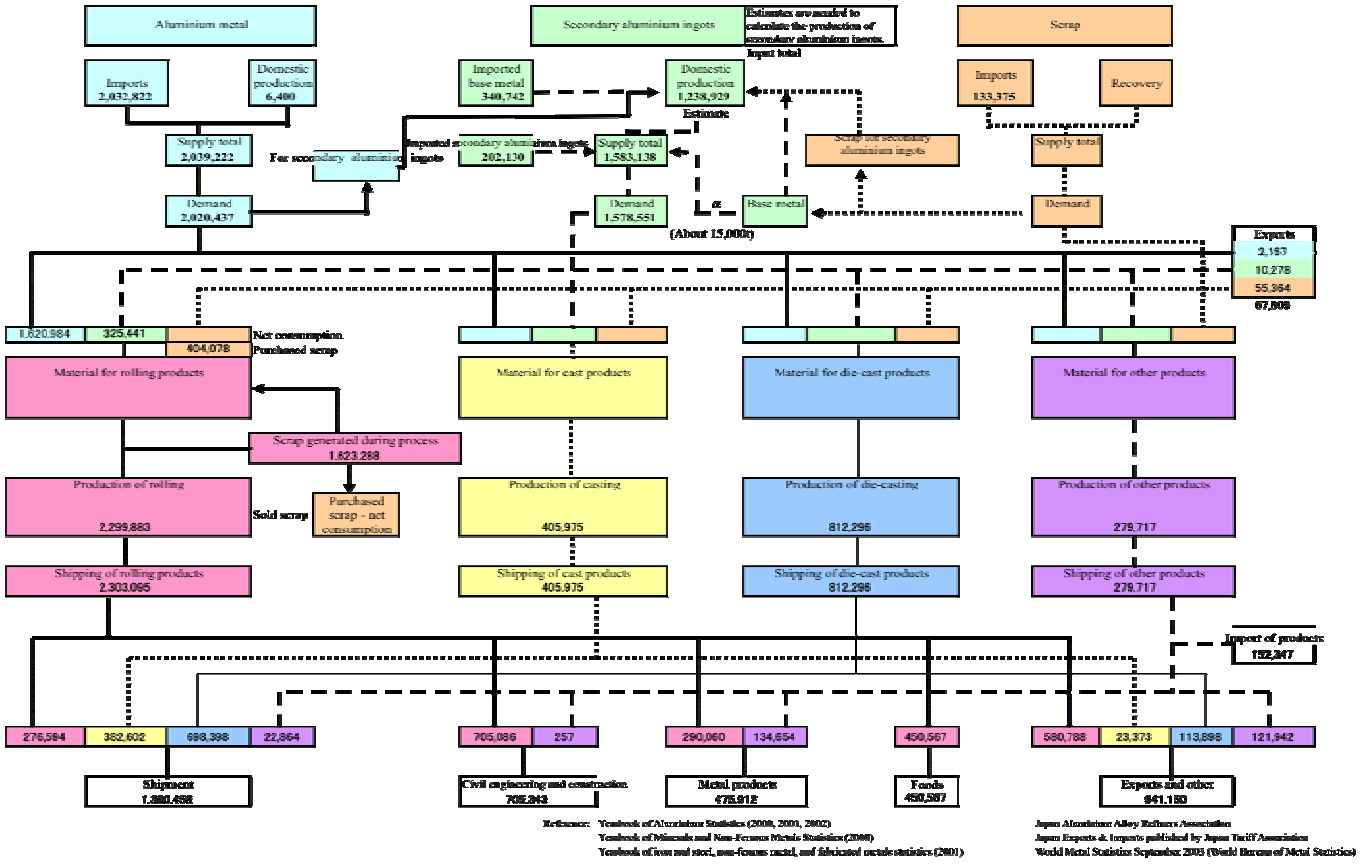
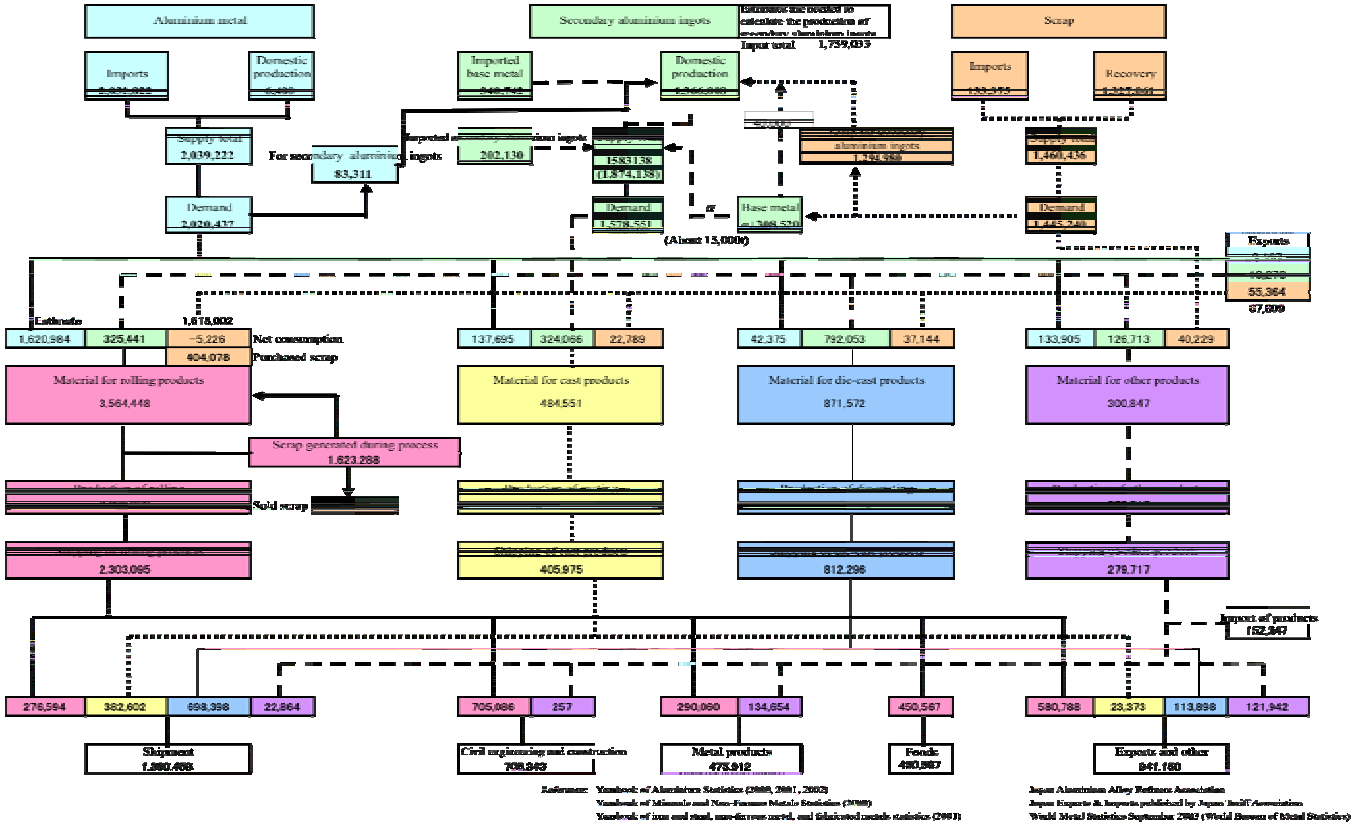


Figure 2-1-4 Supply and demand flow for aluminium metal, secondary aluminium ingot, and scrap for 2002 (1)



2.2 Aluminium metal

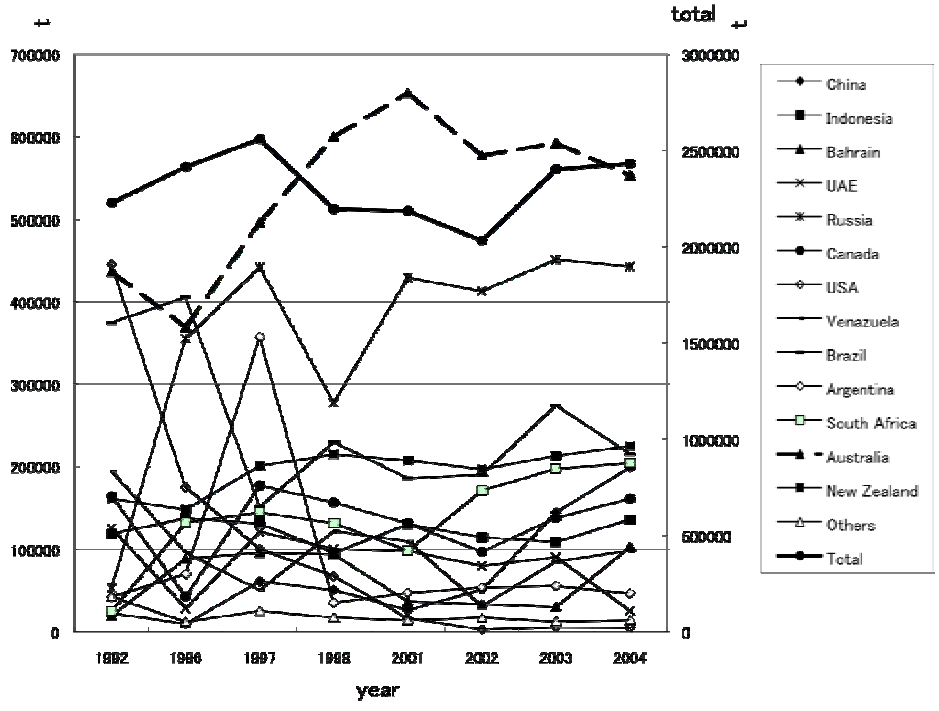
2.2.1 State of imports of aluminium metal

Aluminium metal is not only of the type HS No. '760110000,' but also include the type of HS No. '760120000.' The value is transferred from HS No. '760120000' aluminium alloy ingots based on the selected countries and the proportion which is determined between Japan Aluminium Association and JARA.

Table 2-2-1 Imported aluminium metal (Unit: tons)

	1992	1996	1997	1998	2001	2002	2003	2004
China	22,781	9,762	61,247	50,804	26,285	51,406	144,812	199,505
Indonesia	119,125	137,706	131,391	96,077	130,544	114,908	109,193	136,251
Bahrain	19,668	88,816	96,124	94,031	36,846	33,649	30,316	103,162
UAE	125,846	28,578	121,678	100,625	98,329	80,064	90,761	25,510
Russia	53,430	355,435	442,240	277,696	429,385	413,219	451,236	442,940
Canada	164,477	42,771	177,724	156,795	131,476	97,203	138,240	161,517
USA	445,364	175,279	100,608	67,743	16,637	3,085	5,555	5,141
Venezuela	194,457	96,295	50,767	122,300	109,833	31,253	85,644	98,621
Brazil	374,949	405,863	151,703	230,220	186,258	190,514	274,857	215,786
Argentina	42,643	70,102	357,482	35,238	47,274	53,985	55,823	46,575
South Africa	25,242	132,394	144,992	131,655	98,603	171,325	197,757	204,770
Australia	436,585	369,558	496,303	600,534	652,978	577,518	592,492	553,539
New Zealand	161,495	148,252	201,366	215,030	207,940	197,343	213,506	225,131
Others	42,723	12,102	25,678	17,509	14,083	17,350	12,662	14,215
Total	2,228,785	2,415,219	2,559,305	2,196,257	2,186,470	2,032,822	2,402,854	2,432,663

Figure 2-2-1 Imported aluminium metal (Unit: tons)



The proportion and names of countries selected are 40%: Bahrain, UAE, France, Spain, and 50%: Austria, Canada, USA, Brazil, Argentina, Australia, and New Zealand.
Table 2-2-1 and Figure 2-2-1 show the state of imports of aluminium metal by country.

In 1992, the top importer of Japanese aluminium metal, the USA, began to reduce its imports so that today, Japan imports very little from it. Japan's largest customer of aluminium metal is now Russia.

Very recently, imports of aluminium metal from China has been increasing. The demand there for aluminium is growing, and China should not have enough reserves to export. The same thing is happening with zinc. While the reason for this phenomenon still is not clear, it may be that overland transport in China is very expensive while port facilities are well developed, making it cheaper to export these goods to Japan.

2.2.2 Rolling
(1) Aluminium metal for rolling

Table 2-2-2 Consumption of aluminium metal in rolling (Unit: tons)

	Aluminium metal consumed		Imported volume of billet	Estimated volume of aluminium metal consumed	Difference
	Supply and demand statistics	Japan Aluminium Association			
	(1)	(2)	(3)	(4)	(5)
				(2)+(3)	(4)-(1)
1992	1,816,697	1,141,832	674,865	1,816,697	0
1993	1,713,316	1,111,958	601,358	1,713,316	0
1994	1,872,897	1,259,939	612,958	1,872,897	0
1995	1,874,741	1,263,083	612,324	1,875,407	666
1996	1,945,816	1,298,141	648,746	1,946,887	1,071
1997	1,974,397	1,304,211	670,186	1,974,397	0
1998	1,712,161	1,158,855	558,457	1,717,312	5,151
1999	1,715,372	1,269,405	488,304	1,757,709	42,337
2000	1,783,506	1,291,850	513,949	1,805,799	22,293
2001	1,608,777	1,178,095	472,332	1,650,427	41,650
2002	Not available	1,202,436	453,975	1,656,411	
‘2002				1,620,984	

Sources: (1) Supply and demand statistics from the Yearbook of Minerals and Non-Ferrous Metals Statistics
(2), (3) Yearbook of Aluminium Statistics (Japan Aluminium Association)

As we can see in the above Table 2-2-2, the amount of aluminium metal consumption in supply and demand statistics is equal to the amount of aluminium metal consumed plus the amount of billet imported in Japan Aluminium Association. From 1992 to 1998, the statistics are in agreement, but in 1999 the supply and demand statistics are lower by about 40,000t. So, the 2002 data on aluminium metal for rolling was obtained by subtracting the average difference from 1999-2001 of about 35,000t. It should be noted that data on billet imports were obtained from manufacturers' reports. (Source: Japan Aluminium Association original statistics)

2.2.3 Casting, die-casting, others

The ratios between volume of and amount of materials consumed in intermediate production for the past 7 years (2 years for miscellaneous) were averaged and intermediate production volume was

Table 2-2-3 Comparison between the volume and amount of materials used in intermediate production, and estimated consumption of new ingots and scrap.

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Production of rolling (known value)	2,227,703	2,155,839	2,355,110	2,411,522	2,494,869	2,545,114	2,324,524	2,369,851	2,452,399	2,309,201	2,299,883
	Material for rolling products	3,439,579	3,342,214	3,648,629	3,734,043	3,873,397	3,956,629	3,630,916	3,667,535	3,777,284	3,559,129	3,564,448
	Production / material (rate)	64.8%	64.5%	64.5%	64.6%	64.4%	64.3%	64.0%	64.3%	64.9%	64.9%	64.5%
	aluminium metal (known value)	1,816,697	1,713,316	1,872,897	1,874,741	1,945,816	1,974,397	1,712,161	1,715,372	1,783,506	1,608,777	1,620,984
	aluminium metal / material (rate)	52.8%	51.3%	51.3%	50.2%	50.2%	49.9%	47.2%	46.5%	47.2%	45.2%	45.5%
Rolling	secondary aluminium ingots (known value)	203,020	230,158	278,548	292,676	340,352	326,905	325,779	324,684	320,571	317,470	325,441
	Scrap	1,419,862	1,430,813	1,497,184	1,566,626	1,587,229	1,655,327	1,592,976	1,647,479	1,673,207	1,632,882	1,618,022
	Scrap / material (rate)	41.3%	42.8%	41.0%	42.0%	41.0%	41.8%	43.9%	44.7%	44.3%	45.9%	45.4%
	Net consumption	0	−66	0	−362	83	−434	−81	108	32,354	1,858	−5,266
	Purchased waste (known value)	238,574	245,641	328,893	345,491	350,611	346,290	352,593	441,530	386,988	399,062	404,078
												Average of 1995-2001
	Production of casting (known value)	391,439	367,564	375,893	396,635	393,163	417,697	371,708	394,487	412,825	380,957	405,975
	Material for casting	424,146	395,832	408,949	454,424	470,590	503,773	437,417	473,389	507,526	458,476	484,551
	Production / material (rate)	92.3%	92.9%	91.9%	87.3%	83.5%	82.9%	85.0%	83.3%	81.3%	83.1%	83.8%
	aluminium metal	125,878	119,143	125,352	138,149	134,244	143,964	132,539	152,187	158,400	142,097	137,695
Casting	aluminium metal / material (rate)	29.7%	30.1%	30.7%	30.4%	28.5%	28.6%	30.3%	32.1%	31.2%	31.0%	30.3%
	secondary aluminium ingots	276,884	254,973	265,439	299,200	313,272	329,097	282,819	301,923	320,247	290,939	324,066
	Scrap	21,384	21,716	18,158	17,075	23,074	30,712	22,059	19,279	28,879	25,440	22,789
	Scrap / material (rate)	5.0%	5.5%	4.4%	3.8%	4.9%	6.1%	5.0%	4.1%	5.7%	5.5%	5.0%
												Average of 1995-2001
	Production of die-cast (known value)	680,895	650,974	655,037	700,897	711,245	754,204	698,142	722,721	791,468	750,447	812,296
	Material for die-cast	738,722	707,383	715,269	749,269	762,854	806,327	738,159	765,221	849,826	800,754	871,572
	Production / material (rate)	92.2%	92.0%	91.6%	93.5%	93.3%	93.5%	94.6%	94.4%	93.1%	93.7%	93.2%
	aluminium metal	32,747	33,949	38,262	42,807	47,421	45,650	38,378	39,106	44,440	44,070	42,375
Die-casting	aluminium metal / material (rate)	4.4%	4.8%	5.3%	5.7%	6.2%	5.7%	5.2%	5.1%	5.2%	5.5%	5.7%
	secondary aluminium ingots	674,624	637,925	646,062	675,092	681,295	722,651	670,095	694,191	758,045	714,527	792,053
	Scrap	31,351	35,519	30,945	31,370	33,938	38,026	29,686	31,924	47,341	42,157	37,144
	Scrap / material (rate)	4.2%	5.0%	4.3%	4.2%	4.4%	4.7%	4.0%	4.2%	5.6%	5.3%	5.0%
												Average of 1995-2001
	Production of other products (known value)									294,706	287,696	279,717
	Material for other products	346,571	325,007	322,488	349,370	331,499	310,636	272,802	272,165	324,679	302,250	300,847
	Production / material (rate)									90.8%	95.2%	93.0%
	aluminium metal	190,069	172,067	182,642	187,440	170,093	142,125	121,058	111,680	138,775	135,017	133,905
Other products	aluminium metal / material (rate)									42.7%	44.7%	43.7%
	secondary aluminium ingots	112,365	118,050	106,846	128,233	124,996	129,658	115,783	121,085	146,028	124,979	126,713
	Scrap	44,137	34,890	33,000	33,697	36,410	38,853	35,961	39,400	39,876	42,254	40,229
	Scrap / material (rate)									12.3%	14.0%	13.1%
												Average of 2000-2001

divided by the value to estimate the consumption of aluminium metal in the sectors of casting, die-casting, and others. The reason why "others" was limited to 2 years is that data on applications for steel, wire, forging could be obtained from the Aluminium Statistical Yearbook, but no data was available for powder applications.

2.2.4 Others

Table 2-3-6 shows production of secondary aluminium ingots and their materials. Some of the materials come from "aluminium metal for secondary aluminium ingots" Recent values from the supply and demand statistics on the production of such aluminium metal were divided by the JARA's value to raise the value (denoted by the *) of aluminium metal used as materials for secondary aluminium ingots.

2.3 Secondary aluminium ingots

2.3.1 State of imports of ingots

(1) State of imports of recycled secondary aluminium ingots

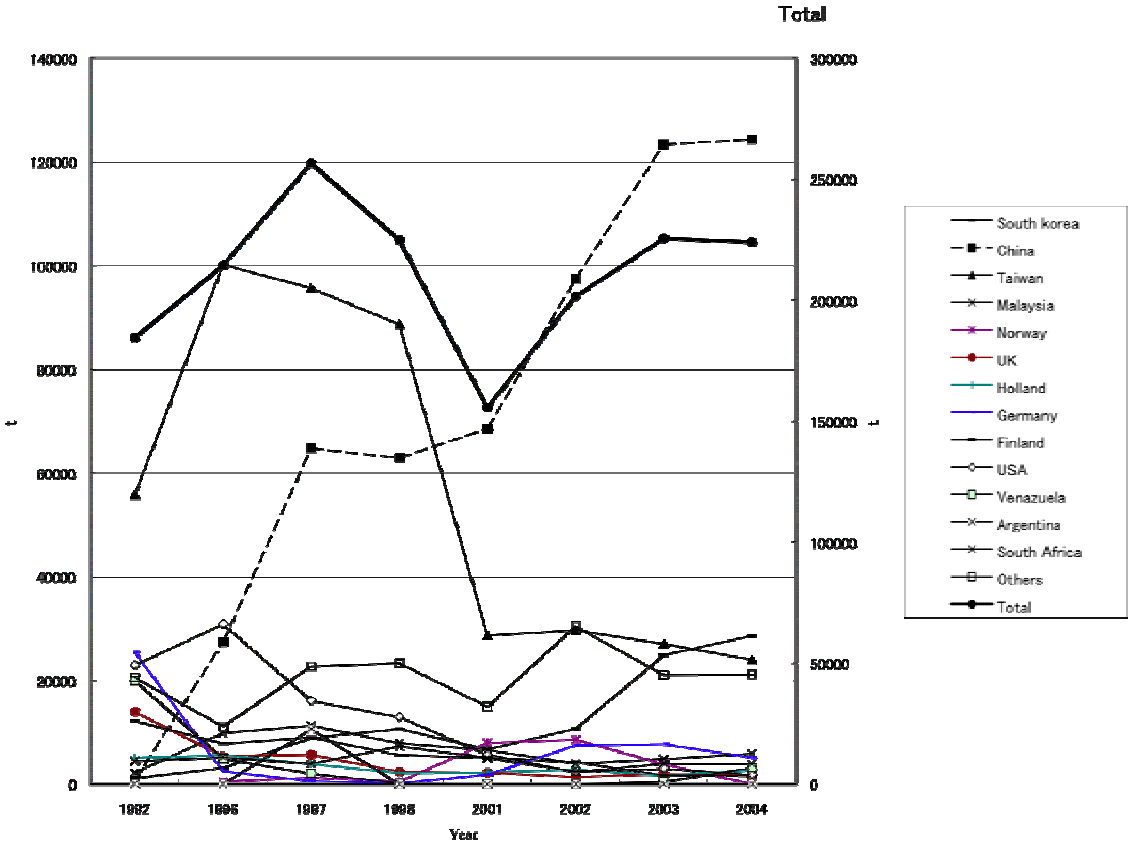
From the data in HS No. '760120000' under "imports of aluminium alloys ingots," countries and their proportions were selected and transferred to "aluminium metal" as well as solid base metal alloy ingot(mainly materials for secondary aluminium ingots) imported from Russia, Ukraine and other former Soviet republics, were deducted to get the value for "secondary aluminium ingots." These materials are competing with secondary aluminium ingots produced here in Japan.

The state of these imports is shown in Table 2-3-1 and Figure 2-3-1. Here we can see that imports of secondary aluminium ingots from Taiwan are declining, while imports from China are increasing. Domestic demand for aluminium in China is also increasing, so there should not be any reserves for export. However, it appears that imports from China are increasing because it is cheaper to ship it out of the country from ports, than to ship it to locations in the interior. It should be noted that countries like Japan and the United States probably supply a lot of the scrap that is used to make secondary aluminium ingots, and the producers seem to be transplanted companies from Taiwan, but these conjectures will have to be confirmed.

Table 2-3-1 Imports of secondary aluminium ingots (Unit: tons)

	1992	1996	1997	1998	2001	2002	2003	2004
South Korea	1,183	3,145	8,925	10,666	6,713	10,713	24,913	28,623
China	796	27,378	64,775	62,951	68,573	97,455	123,352	124,329
Taiwan	55,792	100,201	95,668	88,686	28,670	29,695	27,067	24,031
Malaysia	2,233	9,873	11,302	7,922	6,592	3,972	4,848	5,857
Norway		491	1,263	491	7,980	8,595	3,881	13
UK	13,956	5,405	5,683	2,409	2,216	1,423	1,942	1,786
Holland	5,075	5,584	3,887	2,168	2,293	2,825	1,633	2,706
Germany	25,477	2,521	568	177	1,848	7,499	7,728	5,114
Finland	12,169	7,826	9,023	5,619	5,085	4,247	1,674	1,555
USA	22,950	30,853	16,066	12,951	5,660	2,334	2,990	1,772
Venezuela	19,915	4,869	2,030	117	0	0	434	3,151
Argentina	0	0	10,577	0	0	0	0	0
South Africa	4,471	5,111	3,939	7,308	5,075	2,358	3,950	3,899
Others	20,554	11,156	22,736	23,334	14,987	30,455	21,086	21,170
Total	184,571	214,413	256,440	224,799	155,691	201,571	225,500	224,006

Figure 2-3-1 Imports of secondary aluminium ingots (Unit: tons)

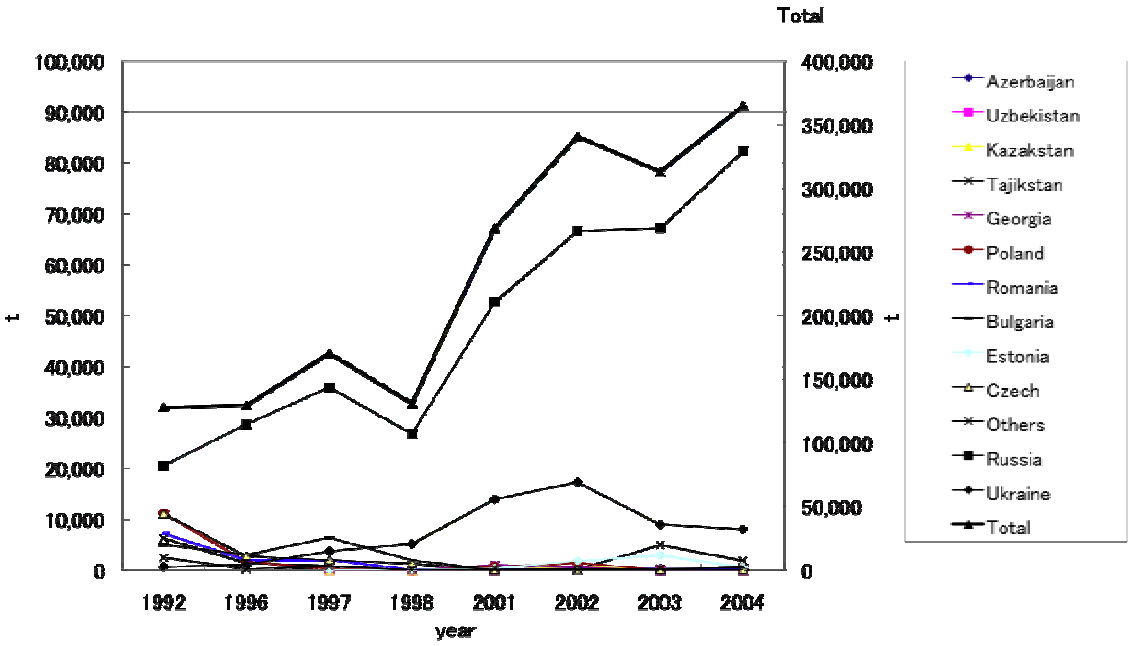


(2) State of imports of base metals

Table 2-3-2 Imports of base metals (Unit: tons)

	1992	1996	1997	1998	2001	2002	2003	2004
Azerbaijan			0	0	162	404	290	258
Uzbekistan			0	0	0	220	0	0
Kazakhstan			0	0	42	594	100	40
Tajikistan	6,222	1,336	785	0	0	79	4,917	1,802
Georgia			0	0	938	479	27	0
Poland	11,153	1,602	184	0	569	1,343	0	451
Russia	82,132	114,560	143,545	107,018	210,503	266,414	268,587	329,042
Romania	7,208	1,894	1,974	59	208	248	109	102
Bulgaria	4,978	2,966	6,386	1,892	0	123	0	0
Estonia			0	0	307	1,699	2,906	518
Ukraine	2,620	3,962	14,802	20,553	55,666	69,030	35,790	32,044
Czech	11,006	2,684	1,914	1,225	0	109	5	4
Others	2,438	217	681	0	44	0	200	473
Total	127,757	129,221	170,271	130,748	268,440	340,742	312,930	364,733

Figure 2-3-2 Imports of base metals (Unit: tons)



The term "base metals" seems to be a high-class image, but the reality is that they are rather crude materials that are used in secondary aluminium ingots. Imports of secondary aluminium ingots in solid alloys ingot in HS No. '760120000' came from Russia, Ukraine, and other former Communist bloc countries.

Table 2-3-2 and Figure 2-3-2 show the state of base metal imports. Here we can see that Russia and the Ukraine are by far the biggest suppliers to Japan, with the amounts from other countries being negligible. As we can see in the line (7) of Table 3-2-2, there was a rapid increase in imports from beginning in 1999.

These base metals are normally called "Russian solid alloy ingot." They have unstable chemical compositions that make them difficult to use. However, because they are cheap, some sources report that they are consumed not only as materials for secondary aluminium ingots, but also in rolling sheets. However, because it is unclear how much base metal is consumed in sheet rolling, the flow chart that we created assumed that all imported base metals were consumed as materials for secondary aluminium ingots, so this item will need further study.

At any rate, the base metal is not only imported, but also domestic production. Base metals produced in Japan were estimated to be 100,000 t, but this is another items that should be studied further.

2.3.2 Rolling

Regarding the amount of secondary aluminium ingots consumed during rolling, the past values from the supply and demand statistics were the same as those listed in the Aluminium Statistical Yearbook, so the yearbook values for the consumption of secondary aluminium ingots under the trading conditions of main raw materials were used as is. Table 2-3-7 shows that the value for 2002 was 325,441 t.

2.3.3 Casting, die-casting, others

Table 2-3-7 shows the amount of secondary aluminium ingots consumed.

(1) Casting

The ratios of data from the METI's statistics and the JARA's statistics for 1995-2001 in the

"Casting" line of Table 2-3-7 were averaged, and JARA's figure of 258,726 t was divided by the resulting value to produce the figure of 324,066 t for "Casting."

(2) Die-casting

The figures for the "Die-casting" line in Table 2-3-7 were treated the same way as above. JARA's figure of 496,364 t was divided by the average ratio to produce the figure of 792,053 t for "Die－casting."

(3) Others

The value for "Steel" in Table 2-3-7 is listed as 105,863 t. As listed below, this is the numerical value estimated from the figures for crude steel production.

JARA's values for the "Others" line in Table 2-3-7 have many discrepancies. Using averaged proportions for the 1995-2001 for lines besides Others (i.e., Casting, Die-casting, Rolling, Steel, Base metals, Exports, Total), JARA's figures were tallied. A difference of 20,850 between METI's statistics and the JARA's figures was added to the figure of "Steel" to produce a sum total of 126,713 t.

(a) Secondary aluminium ingots for steel use

Regarding the deoxidization of steel, it was calculated using per unit use of steel (Table 2-3-4) derived from crude steel production (Table 2-3-3) and used to estimate the demand of aluminium for steel production in Table 2-3-5. The reason why this estimate was necessary was because of the increasing number of shipments of secondary aluminium ingots for steel applications from companies, etc., that were not members of JARA.

Table 2-3-3 Amount of aluminium used per ton of crude steel, 1999-2001 average (previous 3 years)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Aluminium metal	357	248	279	280	254	262	281	281	298	301	294
Secondary aluminium ingots	766	861	759	891	883	925	919	967	1,000	980	983
Scrap	139	133	115	130	179	183	159	187	152	174	171
Total	1,262	1,242	1,153	1,301	1,316	1,370	1,359	1,436	1,450	1,456	1,447

Table 2-3-4 Production of crude steel (Unit: kt), 1999-2001 average (previous 3 years)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Calendar year	98,132	99,632	98,295	101,640	98,801	104,545	93,548	94,192	106,444	102,886	107,745
Fiscal year	98,937	97,095	101,363	100,023	100,793	102,800	90,979	97,999	106,901	102,064	109,789

Table 2-3-5 Demand for aluminium in steel production (Unit: tons)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Aluminium metal	35,039	24,721	27,471	28,508	25,102	27,426	26,309	26,508	31,742	31,005	31,640
Secondary aluminium ingots	75,134	85,828	74,566	90,537	87,256	96,663	85,991	91,097	106,444	100,876	105,863
Scrap	13,664	13,238	11,272	13,223	17,647	19,180	14,849	17,630	16,181	17,895	18,429
Total	123,837	123,787	113,309	132,268	130,005	143,269	127,149	135,235	154,367	149,776	155,932

2.3.4 Other (materials for secondary aluminium ingots)

2.3.4.1 Estimated materials destined for secondary aluminium ingots

For (consumption of) materials for secondary aluminium ingots, please see Table 2-3-6.

Both METI and JARA have statistics on new ingots provided for recycling (about 70% is covered by JARA, which also covers 80% of production). The statistics of METI have not agreed with those of JARA since 1994. Therefore, JARA's statistics were divided by the ratio between JARA's and METI's

statistics for 1994-2001 to estimate the JARA's figure.

(1) Aluminium metal materials for secondary aluminium ingots

The JARA's amount of aluminium metal for secondary aluminium since 1998 should be low generally, as should the covering rate. However, they approach, or even surpass METI's values. The averaging ratio between JARA's data and METI's data in the "New ingot" line is 0.865 for 1994-1997. JARA's figure is divided by this value to produce "Corrected value (*)."

(2) Consumption of base metals

Secondary aluminium ingots (base metals) for secondary aluminium ingots have tended to increase since 1999. However, interviews with major aluminium scrap dealers made it clear that the base metals is used as Class B products that meet ADC12 guidelines for die-cast products used in the automotive sector (95% of die-cast production has these components), the consumption of base metals has been increasing. As a result, the amount of base metals shipped in 2002 was not the 221,808 t estimated from the averaging ratios between the JARA's data and supply and demand statistics, but 308,520 t, which was derived from regression line approximation of the 1998-2001 supply and demand statistics in the "Base metal" line. In this case, it was not suitable to divide the averaging values of the ratios because the members of the JARA had not produced much base metal and their data was not considered to reflect the actual conditions. Even in the JARA's data, the amount of base metal purchased (consumed) by members was increasing, so it could naturally be expected that there would be an increase in the supply of base metals.

(3) Scrap consumption

Ratios of the JARA to METI data in the "Scrap" lien for 1994-2001 were averaged. The JARA's value of 814,972 was divided by this value to get a total value of 1,294,980.

2.3.4.2 Production of secondary aluminium ingots

METI's statistics list both specialized and non-specialized companies involved in the production of secondary aluminium ingots; recently, what produced by the non-specialized companies have been listed as "genaration."in the statisitics. Nearly all (about 80%) of the non-specialized companies are rollers. METI stopped releasing statistics on aluminium in 2002; production statistics show that specialized companies produced 1,238,929 t, while non-specialized (rolling) companies produced 100,945 t. There were no statistics for non-specialized companies that were not rollers. Thus, it was necessary to estimate.

The value for non-specialized companies, 127,079t, was estimated by averaging the production ratios of specialized and non-specialized companies for the years 1999-2001, and the value for specialized companies was divided by the value. Total production of secondary aluminium ingots was 1,366,008 t.

Table 2-3-6 Production of secondary aluminium ingots and their materials (aluminium metal, secondary aluminium ingots, scrap)

Ministry of Economy, Trade and Industry: METI Japan Aluminium Alloy Refiners Association: JARA

Production of secondary aluminium ingots Unit : t

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI		1,073,730	1,005,639	1,174,587	1,180,824	1,191,484	1,277,056	1,155,419	1,157,668	1,213,661	1,170,668	1,238,929	
JARA		974,355	911,301	938,557	922,398	924,620	957,977	857,415	866,430	917,842	921,406	966,027	
JARA / METI (rate)		0.907	0.906	0.799	0.781	0.776	0.750	0.742	0.748	0.756	0.787	0.780	

aluminium metal (for secondary aluminium ingot) Unit : t

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI		108,190	99,818	125,877	93,308	88,488	98,445	54,943	69,971	73,586	60,333		
Corrected value (*)								72,543	74,835	84,848	76,665	83,311	78078
JARA		85,418	81,406	89,441	89,594	79,433	87,641	62,746	64,729	73,390	66,312	72,060	
JARA / METI (rate)		0.804	0.816	0.712	0.960	0.898	0.890	1.142	0.925	0.998	1.099	0.865	
								0.865	0.865	0.865	0.865	Average of 1994-1997	

Corrected value (*): Since 1998, METI's supply and demand statistics have been lower than actual value, so the data of aluminium metal for secondary aluminium ingot have been corrected by using the statistical values of the JARA.

Base metal (secondary aluminium ingots for secondary aluminium ingot) Unit : t

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI		208,136	207,729	212,579	213,928	222,102	221,643	211,453	232,711	261,311	283,588	330,007	308,520
JARA		138,578	140,967	126,020	122,240	130,544	129,583	118,965	133,193	152,622	174,533	192,687	
JARA / METI (rate)		0.666	0.679	0.593	0.571	0.588	0.585	0.563	0.572	0.584	0.615	0.584	
										Average of 1994-2001		Estimate equation	

Scrap (for secondary aluminium ingot) Unit : t

		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI		1,114,321	1,004,828	1,228,233	1,274,230	1,309,825	1,388,102	1,264,873	1,249,886	1,301,416	1,261,686	1,294,980	1,279,935
JARA	Aluminium scrap	105,127	96,587	102,112	93,768	94,841	107,872	97,492	91,745	91,230	92,966	91,468	
	Sheets	348,820	307,717	335,895	337,887	368,632	374,299	344,092	324,289	342,035	349,318	357,701	
	Casting	293,593	283,203	291,108	291,273	284,332	296,669	277,621	277,310	279,103	268,544	286,264	
	Dross and ash	91,465	89,041	84,382	83,141	84,038	84,491	76,882	78,349	80,479	79,910	79,538	
	Total	839,005	776,548	813,497	806,069	831,843	863,331	796,087	771,693	792,847	790,738	814,971	
JARA / METI (rate)		0.753	0.773	0.662	0.633	0.635	0.622	0.629	0.617	0.609	0.627	0.629	
										Average of 1994-2001		Estimate equation	

Table 2-3-7 Consumption of secondary aluminium ingots by sector (rolling, casting, die-casting, steel, recycled ingots, exports)

Casting Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI	Casting products	276,884	254,973	285,439	299,200	313,272	328,097	282,819	301,923	320,247	290,939		
METI	Forging	3,711	3,396	3,773	3,821	3,752	–	–	–	–	–		
METI	Total	280,595	258,369	289,212	303,021	317,024	328,097	282,819	301,923	320,247	290,939	324,066	316,699
JARA	Casting	270,722	258,470	260,902	252,715	261,922	260,318	224,188	237,013	239,140	242,818	259,726	
Rate	JARA / METI (rate)	0.965	1.000	0.969	0.834	0.826	0.791	0.793	0.785	0.747	0.835	0.801	

Average of 1995-2001 Estimate equation

Die-casting Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI	Die-casting	674,624	637,925	648,082	675,092	681,295	722,651	670,095	694,191	756,045	714,527	792,053	736,350
JARA	Die-casting	495,945	457,141	475,016	453,473	437,553	444,292	413,624	419,689	452,094	457,129	496,364	
Rate	JARA / METI (rate)	0.735	0.717	0.735	0.672	0.642	0.615	0.617	0.605	0.598	0.640	0.627	

Average of 1995-2001 Estimate equation

Rolling Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
METI	Rolling	203,020	230,156	278,548	292,676	340,352	326,905	325,779	324,684	320,571	317,470	325,441
JARA	Sheets	83,563	80,563	82,949	92,243	105,604	111,544	105,210	87,476	85,229	83,072	77,257
JARA	extruded products	57,129	53,432	57,746	56,049	60,203	73,918	55,174	56,657	72,681	70,659	69,567
JARA	Total	140,692	133,995	140,695	148,292	165,807	185,462	160,384	144,133	157,910	153,731	146,824
Rate	JARA / METI (rate)	0.693	0.582	0.505	0.507	0.487	0.567	0.492	0.444	0.493	0.484	0.451

Steel Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	Calculated using crude steel production
METI	Steel	75,134	85,828	74,566	90,537	87,256	96,663	85,991	91,097	106,444	100,876	89,388	105,863
JARA	Steel	37,231	32,817	34,697	34,862	31,259	33,855	29,628	30,073	30,830	31,638	30,283	
Rate	JARA / METI (rate)	0.496	0.382	0.465	0.385	0.358	0.350	0.345	0.330	0.290	0.314	0.339	

Base metal Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI	Destined for recycling	208,136	207,729	212,579	213,928	222,102	221,643	211,453	232,711	261,311	283,588	221,808	309,520
JARA	Destined for aluminium	38,224	34,639	35,394	35,164	35,780	36,943	35,501	34,681	32,816	32,301	33,225	
Rate	JARA / METI (rate)	0.184	0.167	0.166	0.164	0.161	0.167	0.168	0.149	0.126	0.114	0.150	

Average of 1995-2001 Equation extrapolated from the past 4 years

Exports Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
METI	Exports	3,206	7,101	9,539	9,695	10,200	8,727	8,207	9,332	8,575	10,582	10,278
JARA	Exports	441	799	1,085	1,220	1,210	1,296	355	324		222	361
Rate	JARA / METI (rate)	0.138	0.113	0.114	0.126	0.119	0.149	0.056	0.035		0.021	0.035

Others Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
METI	Others	33,520	26,826	28,507	33,875	33,988	32,995	29,792	29,989	39,584	24,103	20,850	23,674
JARA	Others	1,574	1,267	1,600	1,464	1,272	486	36	461	61	83	4	
Rate	JARA / METI (rate)	0.047	0.044	0.056	0.043	0.037	0.015	0.001	0.015	0.002	0.003	0.017	

Average of 1995-2001

Total Unit : t

	Industrial section	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	① 2002	②
METI	Total	1,478,235	1,455,936	1,519,013	1,618,814	1,692,217	1,738,681	1,612,236	1,683,926	1,814,777	1,742,085	1,800,357	1,826,825
JARA	Total	984,829	919,128	949,389	927,190	934,803	962,652	863,716	866,374	912,851	917,922	966,787	
Rate	JARA / METI (rate)	0.666	0.631	0.625	0.573	0.552	0.554	0.536	0.514	0.503	0.527	0.537	

Average of 1995-2001 Estimate equation

2.3.4.3 Gaps in the statistics for production of secondary aluminium ingots

The value of 308,520 t (base metal) in the statistics is contained within the 1,294,980 t of "Scrap for secondary aluminium ingots." However, the production of these base metals also involves materials besides scrap, external materials; for example, there are reports of metal recovered from dross being used to produce base metal, and this additional amount of about 40,000t was transferred as a material for secondary aluminium ingots.

As materials for secondary aluminium ingots, an addition 340,742 t was consumed in the form of imported base metal. Thus, the total inputs into recycled ingots was 1,759,033 t. Usually, the production yield of secondary aluminium ingots is 92.5%. Thus, multiplying the previous value by this percentage gave a product of 1,627,105 t, which is shown in parentheses under the 1,366,008 t for secondary aluminium ingots listed in Figure 2-1-4. Thus, the statistical value is about 250,000 t lower than the actual production value, and it appears that even METI considers this discrepancy to be a problem.

This statistical gap may have occurred because data for casting and die-casting, which consume huge amounts of secondary aluminium ingots, were taken from the Yearbook of Machinery Statistics, but in this case no statistics were collected from companies having fewer than 20 employees. However, there are numerous small- to medium-sized companies in this industrial sector, but their data was not counted.

2.4 Scrap

2.4.1 State of scrap imports and exports

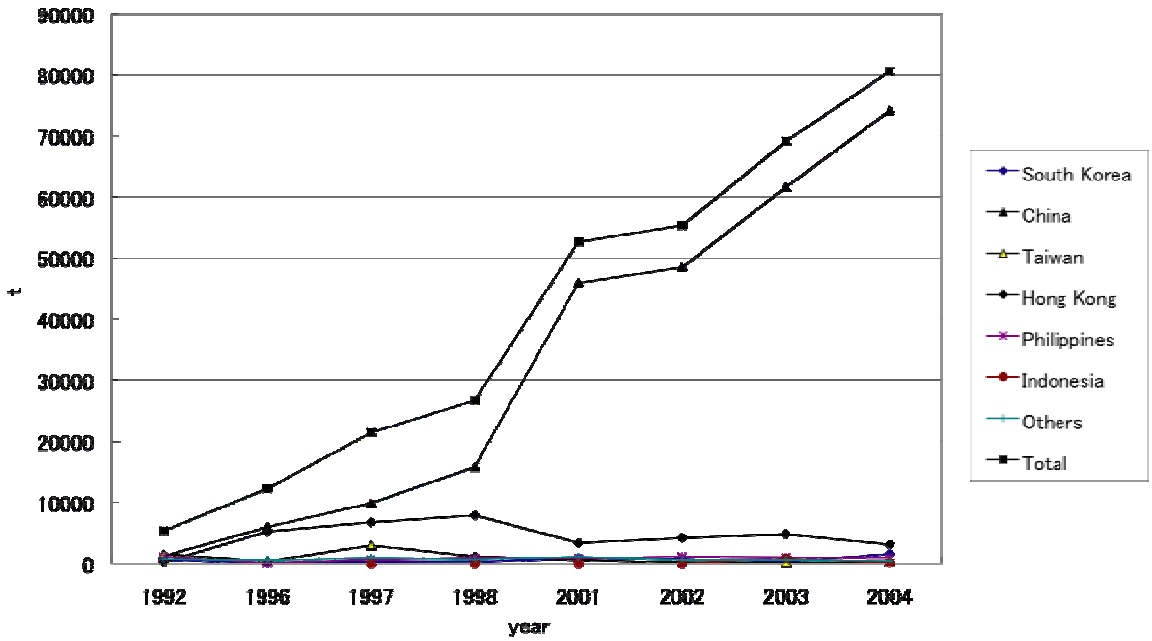
(1) Scrap exports

In 1992, Japan exported about 5,000 t of aluminum scrap, but around 1997 exports began to increase, exceeding 50,000 t in 2001, and 80,000t in 2004. Nearly all of this scrap was for China (including Hong Kong).

Table 2-4-1 Exported aluminium scrap (Unit: tons)

	1992	1996	1997	1998	2001	2002	2003	2004
South Korea	659	72	281	307	849	748	233	1,592
China	1,216	5,988	9,898	15,810	45,961	48,498	61,652	74,130
Taiwan	1,507	372	2,971	1,163	585	209	114	246
Hong Kong	206	5,241	6,759	7,902	3,390	4,209	4,830	3,118
Philippines	1,067	72	644	858	830	1,095	986	943
Indonesia			0	0	0	0	784	131
Others	704	528	879	655	1,059	604	551	403
Total	5,359	12,273	21,431	26,695	52,674	55,363	69,150	80,562

Figure 2-4-1 Exported aluminium scrap (Unit: tons)



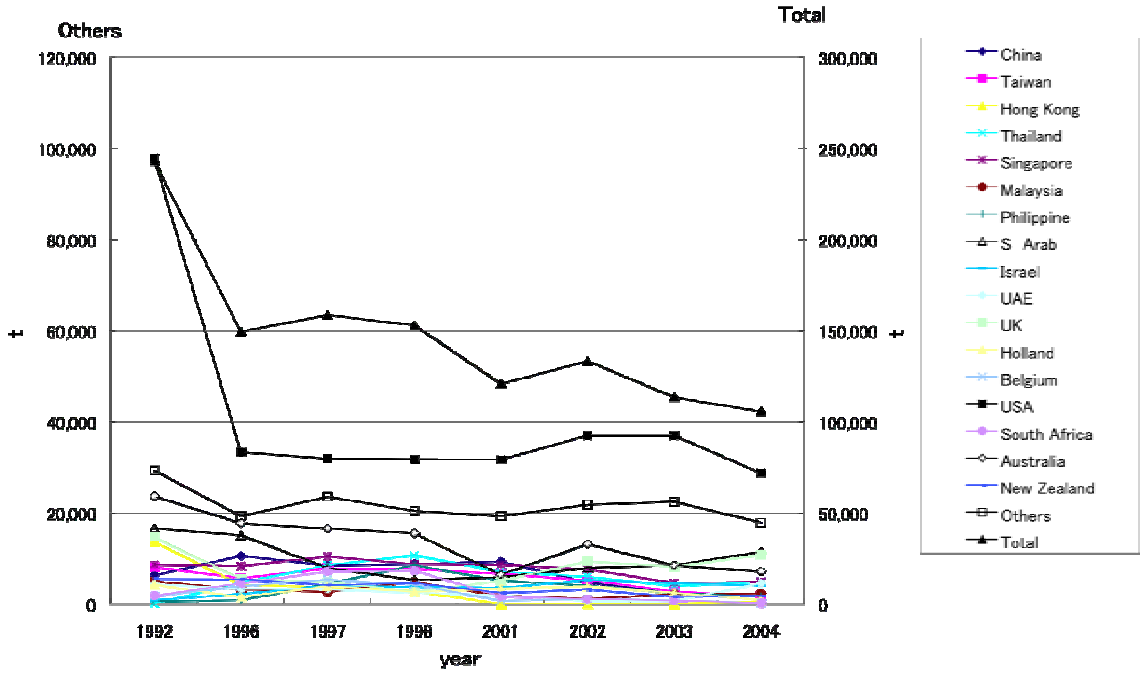
(2) Scrap imports

In 1992, Japan imported 245,000 t of aluminum scrap, but by 2004 that figure had declined by about 40%, to 105,000 t. Presently, the largest source of scrap imports is the USA, but imports from all countries including the USA are declining. The reason for this decline may be traceable to the surge in scrap imported by China; that is, the proportional decline in imports has been greatest from China, Hong Kong, etc. Imports from Hong Kong since 2001, for example, have been approaching 0, indicating a significant change in trade roles.

Table 2-4-2 Imported aluminium scrap (Unit: tons)

	1992	1996	1997	1998	2001	2002	2003	2004
China	6,344	10,577	8,493	8,772	9,350	4,697	2,356	1,791
Taiwan	8,126	5,678	7,888	7,726	6,653	5,193	2,740	1,822
Hong Kong	13,650	4,182	3,723	2,854	0	32	0	540
Thailand	112	4,706	8,516	10,695	7,107	6,021	3,912	4,867
Singapore	8,629	8,345	10,432	8,751	8,634	7,673	4,630	4,890
Malaysia	4,981	3,197	2,720	4,795	1,887	1,117	2,182	2,294
Philippines	574	854	4,453	8,529	5,115	4,052	2,395	1,657
S Arab	16,619	15,119	7,886	5,300	5,912	7,956	8,499	11,486
Israel	850	2,237	3,970	3,787	3,525	5,281	4,487	4,131
UAE	4,340	3,277	3,219	2,515	1,916	648	687	4,510
UK	14,641	5,520	4,784	2,688	5,095	9,399	8,164	10,784
Holland	4,212	1,529	3,848	2,652	3,393	3,910	2,454	941
Belgium	1,800	3,863	5,307	4,221	730	1,082	763	195
USA	97,829	33,346	31,930	31,777	31,707	37,004	36,996	28,748
South Africa	1,809	4,526	7,173	7,376	1,607	1,049	708	161
Australia	23,640	17,750	16,586	15,564	6,439	13,194	8,460	7,194
New Zealand	5,521	5,427	4,122	4,513	2,446	3,230	1,594	1,762
Others	29,327	19,309	23,553	20,467	19,314	21,816	22,469	17,911
Total	243,004	149,442	158,602	152,983	120,829	133,355	113,495	105,684

Figure 2-4-2 Imported aluminium scrap (Unit: tons)



2.4.2 Scrap consumption during intermediate production processes

Intermediate production processes include rolling, casting, die-casting, and others.

Table 2-2-3 shows a comparison between volume of intermediate production and materials used, and estimated amounts of aluminium metal and scrap consumed during intermediate production.

(1) Rolled products

(a) Scrap generated during process

"Scrap generated during process" is the value listed as "amount consumed" in the subtotal for calendar year scrap under trading conditions of main raw materials. In 2002, this value was 1,632,288 t.

"Scrap generated during process" is scrap that is returned within the process. In order to get a true picture of scrap consumption(that is not true consumption of scrap), it is necessary to delete the values for this from METI's supply and demand statistics.

There are no data on the amount of scrap generated during aluminium casting and die-casting. There are tabulated data for rolling. Since the yield of rolling is a low 50-60%, the value for scrap is high. Thus, there is much significance in using these values to calculate the amount of scrap consumption.

It should be noted that in the case of copper as well, the rolling and copper wire industries compile their own statistics, which include data on net consumption of scrap. However, there are few makers of copper cast products (alloy ingot) and the market is very small, so there are no tabulated data on generated scrap.

However, the statistics of the Japan Aluminium Association indicate that they may be included in intra-industry transactions (between factories), and there might be a problem with accuracy.

(b) Net consumption of scrap

The net consumption of scrap for 2002 was calculated as follows: 1,618,022 t (scrap demand in supply and demand statistics[4]) minus 1,623,288 t (the amount of scrap generated during processing mentioned above) equals -5,266 t.

The reason for the negative value is that, in order to obtain a profit, there is more scrap sold than purchased (There are surveys that indicate that these are not pressing-related makers that are included in rolling industries). As a result, in some years the net consumption is a negative number or zero.

(2) Casting

The value 484,551 (casting materials) in the "Casting" line in Table 2-2-3 was derived by dividing 405,975 (casting production) by 83.8% (the average proportion from 1995-2001). From this amount was subtracted 137,695 (aluminium metal) and 324,066 (secondary aluminium ingots). The remainder, the amount of scrap materials was divided by 5% (average proportion from 1995-2001) to get an estimated value of 22,789.

(3) Die-casting

The value 871,572 (die-casting materials) in the "Die-casting" line in Table 2-2-3 was derived by dividing 812,296 (die-casting production) by 93.2% (the average proportion from 1995-2001). From this total was subtracted the values of 42,375 (aluminium metal) and 792,053 (secondary aluminium ingots). The remainder, the amount of scrap materials was divided by 5% (average proportion from 1995-2001) to get an estimated value of 37,144.

(4) Others

The value 300,847 (other materials) in the "Others" line in Table 2-2-3 was derived by dividing 279,717 (others production) by 93.0% (the average proportion from 2000-2001). From this total was subtracted the values of 133,905 (aluminium metal) and 126,713 (secondary aluminium ingot). The remainder, the amount of scrap materials was divided by 13.1% (average proportion from 2000-2001) to get an estimated value of 40,229.

2.4.3 Recovery of scrap

The value for scrap re4covery from 1999-2001 shown in line (5) of Table 2-4-3 was subjected to least squares approximation to derive 1,311,865 t.

Table 2-4-3 Supply side and demand side of aluminium supply and demand statistics

			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
1		Generation (supply side)	1,495,532	1,456,916	1,534,619	1,603,564	1,644,151	1,701,554	1,608,214	1,666,691	1,745,328	1,795,160	
2		Collection (supply side)	1,045,374	975,587	1,456,916	1,235,300	1,280,810	1,391,381	1,289,654	1,209,519	1,252,250	1,131,416	
3	1+2	Subtotal	2,540,906	2,432,503	2,991,535	2,838,864	2,924,961	3,092,935	2,897,868	2,876,210	2,997,578	2,926,576	
4		Scrap generated during process	1,419,862	1,398,806	1,497,184	1,566,988	1,587,146	1,655,761	1,593,057	1,647,371	1,640,853	1,631,024	1,623,288
5	3-4	Recovery (supply side)	1,121,044	1,033,697	1,494,351	1,271,876	1,337,815	1,437,174	1,304,811	1,228,839	1,356,725	1,295,552	1,311,865
6		Demand	1,216,552	1,103,315	1,320,065	1,369,026	1,415,603	1,516,691	1,379,194	1,368,332	1,484,538	1,426,068	
7		Scrap imports	243,004	236,446	217,252	175,997	149,442	158,601	152,983	160,640	130,423	120,829	
8		Scrap exports	5,359	6,428	9,729	13,016	12,273	21,432	26,696	27,635	34,672	52,673	
9	6-7	Corrected demand (demand side)	973,548	866,869	1,102,813	1,193,029	1,266,161	1,358,090	1,226,211	1,207,692	1,354,115	1,305,239	

Note: Recovery of scrap from 1999-2001 was estimated with least squares approximation.

2.4.4 Aluminium recovered by the Light Metal Association

Table 2-4-4 Aluminium Scrap Statistics conducted by the Light Metal Association for 2001 and 2002 (including scrapped cars) (Unit: tons)

	Product names	2001	%	2002	%
O	Cutting of aluminium scrap	9,723		9,676	
O	63S	12,995		12,254	
X	Printing plate	9,326		9,892	
O	Alloy process scrap	8,657		8,873	
O	Machinery casting scrap	14,774		14,083	
Δ	Alloy including scrap	7,871		8,765	
X	63S with screws	18,715		19,597	
X	Pressed scrap	1,929		2,071	
X	Aluminium cans	23,683		25,274	
O	Swarf	11,829		11,785	
X	Base metal	3,384			
X	Aluminium metal of alloy, etc.	999		5,093	
X	Others	9,219		8,267	
X	Scrapped cars	23,896		25,418	
	Total	133,284		135,900	
		157,000		161,048	
	Scrap	95,087	60.6%	99,994	62.1%
	Processed scrap	61,914	39.4%	61,054	37.9%

Note: Scrap classification is according to the questionnaire by the Tokyo Aluminium Center, as follows:
O: processed scrap; X: old scrap; Δ: the value is divided equally into processed scrap and old scrap

In 2001, the Light Metal Association (covering about 10% of production) resumed aluminium scrap recovery surveys which has been discontinued in 1991. However, the aluminium scrap recovery surveys conducted by the Light Metal Association since 2001 have not included items for scrapped automobiles, so those values were estimated from aluminium units of automobiles. This estimate was added to the existing figures to get an estimate for scrap.

The amount of scrap collected by the Light Metal Association was multiplied by 10 to estimate the amount of scrap recovered nationwide in 2002. The estimated value was 1,359,000t.

2.4.5 Scrap discarded and recovered from end use products and production

Using the scrap collection coefficients in Tables 2-4-5 (1) and 2-4-5 (2) listed in Reference[8)], the total amount of collected scrap and processed scrap was calculated, and the results shown in Tables 2-4-6 (1) (processed scrap) and 2-4-6 (2) (old scrap). The value estimated for scrap discarded in 2002 was 1,650,483. It should be noted that this does not simply show the amount discarded by sector in the number of life time (years) but is an average value from the amount discarded for each year, more of less. In addition, figures on the collection of "body" materials and "end tabs" of aluminium cans were taken from the statistics of the Japan Aluminium Can Recycling Association.

Table 2-4-5 (1) Amount of demand, discarded, collection, etc., by aluminium industrial sector (1/2)

Unit: ton

Designated statistical classification			Specified classification		Demand of raw material (FY 1997)			Amount of discarded and collected of old scrap (FY 1997)									Remark
					Sheets	Extruded products	Total	Life-time (X years)	Demand before X years	Production yield rate	Exporting rate (%)	Importing rate (%)	Correction (%)	Discarded	Collection rate (%)	Collection	Non-collection	
Foods	Bodies, end tabs		Beverage cans	Body	244,505		244,505	3 months	238,110	85		7		216,561				"Collection" implies the demand in 1997 and the aluminium can value from the Japan Aluminium Can Recycling Association. Discharge is 274,550t of aluminium cans and about 90,000t of steel cans and end tabs.
				End tab	165,465		165,465	3 months	165,465	85		7		150,781				
			Subtotal		409,970	0	409,970		403,895					367,343	54.3	199,460	167,883	
	Packing material, containers, etc.		Caps		16,337		16,327	3 months	17,687	85	0	0		15,034	0	0	15,034	
			Small beer bottles		721		721	3 months	642	85	0	0		546	20	109	437	
			Other containers		78	2,024	2,102	3 months	2,233	85	0	0		1,898	20	380	1,518	
			Other food industries		34	61	95	3 months	92	85	0	0		78	20	16	63	
			Subtotal		17,160	2,085	19,245		20,654					17,556	2.9	504	17,052	
	Total				427,130	2,085	429,215		424,549					384,898	52	199,964	185	
Chemicals			Petroleum, petrochemical industries		393	157	550	25	–									
			Other chemical industries		1,066	250	1,316	25	–									
			Subtotal		1,459	407	1,866		7,641	90	0	0		6,877	90	6,189	688	
Metal products	Household commodities		Kitchenware		11,173	810	11,983	10	22,125	90	0	0		19,913	30	5,974	13,939	
			Other daily necessities		620	2,290	2,910	10	2,868	90	0	0		2,581	30	774	1,807	
			Subtotal		11,793	3,100	14,893		24,993					22,494		6,748	15,746	
	Foil use		Foil rolling		168,843	0	168,843	1～25	111,165	93				103,383	0	0	103,383	Refer to attachment for demand by use
	Other metal products		Furniture, utensils, and materials for exhibit		904	12,200	13,104	10	14,799	90	0	0		13,319	20	2,664	10,655	
			Kitchen instruments		170	370	540	10	786	90	10	0		637	30	191	446	
			Gas or oil equipment		1,147	624	1,771	5	1,992	90	10	0		1,614	30	484	1,129	
			Sporting or leisure goods		469	2,453	2,922	5	3,480	90	0	0		3,132	30	940	2,192	
			Metal fittings for building, rivets, and screws		175	2,120	2,295	25		90	0	0		0	0	0	0	
			Name plates		3,621	12	3,633	10	8,690	90	0	0		7,821	30	2,345	5,475	
			Printing plate		53,245	150	53,395	1	45,511	95	0	0		43,235	100	43,235	0	
			Slag		13,436	17	13,453	1	14,182	90	0	0		12,764	20	2,553	10,211	
			Importing goods		85,278		85,278	10	62,091	90				55,882	20	11,176	44,706	
			Others		13,804	22,600	36,404	10	29,518	90	0	0		26,566	20	5,313	21,253	
			Subtotal		172,245	40,545	212,790		181,049					164,970		68,903	96,067	
	Total				346,885	43,646	390,531		317,207					290,847	26	75,651	215,196	
Electric instruments	Consumer electric instruments		Refrigerators and freezers		3,376	1,222	4,598	10	7,533	90	30			4,746	0	0	4,745	
			Air conditioners (other than fins)		578	1,735	2,313	10	4,844	90	30			3,052	70	2,136	916	Aluminium rolling material used in air conditioners (other than fins) for household and business use
			Fins		40,830	4,114	44,944	10	33,351	90	30			21,011	70	14,708	6,303	Fins used in air conditioners for household and business use
			Other electric equipment		12,582	4,241	16,823	10	14,119	90	30			8,895	70	0	8,895	
			Subtotal		57,366	11,312	68,678		59,847					37,704	0	16,844	20,860	
	Other electric instruments	Electronic communication equipment	Audio products		7,501	12,416	19,917	5	23,192	90	30			14,611	0	0	14,611	
			Communication products		3,957	4,905	8,862	5	7,189	90	30			4,529	0	0	4,529	
			Electronic applied instruments and electric equipment		16,518	2,105	18,623	5	10,007	90	30			6,304	0	0	6,304	
			Subtotal		27,976	19,425	47,401		40,388					25,444		0	25,444	
		Other electric equipment	Lighting equipment		4,861	1,643	6,504	25		90					0		0	
			Facilities and equipment for generation, transmission, and supply of electricity	Facilities and equipment for generation, transmission, and supply of electricity	5,452	2,638	8,090	25		90					90		0	
				Bus bar	1,566	1,957	3,523	25		95					90		0	
			Other electric instruments		3,904	4,153	8,057	25		90					40		0	
			Subtotal		15,783	10,391	26,174		24,867	90				22,380	40	8,952	13,428	
	Total of rolling products				101,125	41,129	142,254		125,102					85,528		25,796	59,732	
	Casting, die-casting, and forging						45,825	10	47,620	90				42,858	30	12,857	30,001	
	Total				101,125	41,129	188,079		172,722					128,386	30.1	38,654	89,733	

"Before X years" corresponds to the following: 5 years before : FY 1992; 10 years before : FY 1987; 15 years: FY 1982; 20 years before : FY 1977; and 25 years before : FY 1972.
Discharge = Demand before X years x Production yield rate / 100 x (1 – Exporting rate / 100) x (1 + Importing rate / 100) x Correction / 100

Table 2-4-5 (2) Amount of demand, discarded, collection, etc., by aluminium industrial sector (2/2)

Unit: ton

Designated statistical classification		Specified classification	Demand of raw material (FY 1997)			Estimate of discarded and collected for old scrap (FY 1997)										Remark
			Sheets	Extruded products	Total	Life-time (X years)	Demand before X years	Production yield rate (%)	Exporting rate (%)	Importing rate (%)	Correction (%)	Discarded	Collection rate (%)	Collection	Non-collection	
Transport machinery	Automobiles	Two-wheeled vehicles	1,268	7,065	8,333	9							90			Discarded is corrected based on the number of exported used cars and scrapped cars. X years: average useful life of automobiles.
		Passenger cars	10,257	36,046	46,303	9	59,133	93	54	1	78	19,929	90	17,936	1,993	
		Trucks and buses	12,356	23,136	35,492	9							90			
		Heat exchangers	66,461	46,065	112,526	9	58,508	93	54	1	78	19,718	90	17,747	1,973	
		Wheels	6,509	101	6,610	9	9,962	93	15		78	6,153	100	6,153		
		Subtotal	96,851	112,413	209,264		127,603					45,801		41,836	3,965	
	Ships, planes, trains, etc.	LNG ships	6,017	50	6,067	20			30				0			
		Other ships	2,459	1,646	4,105	20			30				0			
		Planes	1,215	1,433	2,648	15			80				0			
		Trains	3,112	7,326	10,438	20			0				90			
		Containers	2,153	4,359	6,512	20			0				90			
		Bicycles	484	2,997	3,481	5	5,041		0				20			
		Others	1,886	2,321	4,207	20			0				50			
		Subtotal	17,326	20,132	37,458	20	30,795	90	15		78	18,375	50	9,188	9188	
	Total of rolling products		114,177	132,545	246,722		158,398					64,176		51,024	13,152	
	Casting, die-casting, and forging				993,601	9	781,377	90	54	1	78	254,845	90	229,361	25,485	
	Total		114,177	132,545	1,240,323		939,775					319,022	87.9	280,385	38,637	
Precision instruments		Optical equipment	402	7,315	7,717	10	11,974	90	50	0		6,388	10	539	4,849	
		Other precision instruments	547	5,458	6,005	10	4,452	90	20	0		3,205	0	0	3,205	
		Medical, physical, and chemical equipment	401	1,184	1,585	10	1,016	90	20	0		457	0	0	457	
		Subtotal	1,350	13,957	15,307		17,442					9,051		539	8,512	
General machinery		Industrial machinery	2,902	16,410	19,312	10	10,698	90	20			7,703	10	770	6,932	
		Other machinery	14,156	38,998	53,154	10	20,864	90	20			15,022	10	1,502	13,520	
		Agriculture, forestry, fishery, and textile machinery	238	7,935	8,173	10	8,553	90	0			7,698	10	770	6,928	
		Total of rolling products	17,296	63,343	80,639		40,115					30,422		3,042	27,380	
		Casting, die-casting, and forging			65,033	10	60,754	90	20			43,743	10	4,374	39,369	
		Total	17,296	63,343	145,672		100,869					74,165		7,417	66,749	
Construction	Window sashes and doors	Wooden products	125	387,223	387,348	25										
		Non-wooden products (including curtain wall)	253	199,064	199,317	30										
		Doors	2,959	27,469	30,428	25										
		Subtotal	3,337	613,756	617,093	25										
	Interior and exterior finishing material, etc.	Interior finishing material	8,667	38,817	47,484	25										
		Exterior finishing material	51,332	84,699	136,031	25										
		Others	12,648	52,153	64,801	25										
		Construction equipment	7,434	15,260	22,694	30										
		Subtotal	79,469	190,929	270,398											
	Total		82,806	804,685	887,491	25	372,524	75	0	0		260,767	80	208,613	52,153	
Miscellaneous		Other manufacturing industry	17,061	51,063	68,124	10	39,520	90				35,568	30	10,670	24,898	
		Wholesale and retail	63,853	17,687	81,540	10	48,063	90				43,267	30	12,977	30,280	
		Protection and security industry	247	996	1,243	10	1,433	90				1,290	30	387	903	
		Tobacco manufacturing industry	287	6	293	10	278	90				250	0	0	250	
		Import products			79,183	10	23,874	90				21,487	30	6,446	15,041	
		Total of rolling products	81,448	69,651	230,282		113,168					101,851		30,480	71,371	
		Casting, die-casting, and forging			75,907	10	66,193	90				50,574	30	15,172	35,402	
		Total	81,448	69,651	306,189		169,361					152,425		45,652	106,772	
Electric power		Electric wire			68,537	30	39,680	90				35,712	90	32,141	3,571	
Total of domestic demand			1,173,676	1,171,448	3,673,210		2,561,770					1,562,150	54	895,205	766,945	Collection rate: 895,205/1,662,150=53.9%
Export		Destined for export	228,559	8,433	236,992											
Total			1,402,235	1,179,881	3,910,202											

"Before X years" corresponds to the following: 5 years before : FY 1992; 10 years before : FY 1987; 15 years before : FY 1982; 20 years before : FY 1977; 25 years before : FY 1972; 30 years before : FY 1967
Discharge = Demand before X years x Production yield rate / 100 x (1 – Exporting rate / 100) x (1 + Importing rate / 100) x Correction / 100. If the correction column is blank, the value is not corrected.

Table 2-4-6 (1) Amount of processed scrap

Sectors	Classifications	Production yield rate (%)	Processed scrap rate (%)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Foods	Rolling		15%	46,491	51,022	54,477	51,809	60,312	62,286	64,565	63,682	63,200	62,992	64,848	67,440	67,585
Chemicals	Rolling		10%	291	219	168	147	131	178	198	170	151	100	89	110	137
Metal products	Rolling		9%	27,046	28,121	25,115	24,809	25,574	25,284	15,113	26,086	21,437	22,254	23,390	21,081	21,331
Electric machinery	Rolling		10%	15,196	16,379	13,473	11,829	13,008	13,768	13,964	14,482	12,383	12,726	13,848	12,134	11,908
	Die-casting		10%	4,984	4,932	4,357	3,982	3,869	4,295	4,339	4,620	4,012	3,921	4,625	3,701	3,428
				20,180	21,311	17,830	15,810	16,877	18,062	18,303	19,102	16,394	16,647	18,473	15,835	15,337
Transport machinery	Rolling		7%	17,041	18,237	18,301	16,576	16,706	14,222	15,460	16,385	15,068	15,139	16,230	16,524	18,094
	Die-casting		10%	90,151	89,778	90,924	86,346	87,515	92,864	93,876	99,710	91,050	95,128	105,000	101,113	110,352
	Total			107,192	108,015	109,225	102,921	104,221	107,086	109,337	116,095	106,118	110,267	121,230	117,636	128,446
Precision instruments	Rolling		10%	1,750	1,666	1,339	1,313	1,350	1,458	1,357	1,498	1,368	1,375	1,700	1,227	1,129
General machinery	Rolling		10%	5,164	5,750	5,023	5,018	5,485	6,438	6,786	8,015	7,030	7,136	8,593	7,132	7,616
	Die-casting		10%	6,688	6,389	6,142	5,869	6,138	6,689	6,287	6,601	5,972	6,756	6,503	5,750	6,139
	Total			11,851	12,139	11,165	10,887	11,623	13,127	13,073	14,616	13,002	13,892	15,096	12,881	13,755
Construction	Rolling		15%	139,975	140,651	134,903	132,944	142,400	139,465	146,621	141,453	118,619	118,938	120,493	112,298	105,763
	Rolling		20%	186,633	187,534	179,871	177,259	189,867	185,954	195,495	188,604	158,159	158,584	160,658	149,731	141,017
Others	Rolling		10%	12,367	13,724	11,122	10,930	11,753	12,370	13,771	15,449	12,068	12,583	16,024	12,513	12,507
	Die-casting		10%	6,771	6,163	5,810	5,658	5,572	5,906	5,939	6,259	5,951	5,916	7,087	5,489	5,162
	Total			19,138	19,887	16,932	16,588	17,325	18,276	19,710	21,708	18,019	18,499	23,111	18,002	17,668
Rolling product total (construction 15%)				265,321	275,768	263,919	255,374	276,720	275,469	277,835	287,210	251,324	253,243	265,216	250,459	246,069
Rolling product total (construction 20%)				311,979	322,651	308,887	299,689	324,187	321,957	326,709	334,361	290,864	292,889	305,380	287,891	281,324
Die-casting total				108,594	107,262	107,234	101,854	103,093	109,753	110,441	117,190	106,985	111,721	123,214	116,053	125,081
Total (construction 20%)				420,572	429,913	416,121	401,543	427,280	431,710	437,150	451,551	397,849	404,610	428,595	403,944	406,405

Processed scrap

Table 2-4-6 (2) Amount of collected scrap

Sectors	Classifications	Production yield rate (%)	Remarks	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Foods	Rolling	85%		102,886	108,868	114,693	117,024	152,088	174,497	191,089	200,085	202,234	217,009	214,292	234,666	243,186	
Chemicals	Rolling	90%		2,442	3,098	3,958	4,578	5,508	6,378	6,847	6,590	6,767	6,958	6,440	5,750	5,338	
Metal products	Rolling	91%		73,869	74,882	70,522	68,218	67,798	66,363	65,026	66,300	67,822	72,290	77,695	83,933	87,247	
Electric machinery	Rolling	90%		24,835	24,499	26,343	27,843	29,525	29,992	29,300	31,283	33,238	35,955	37,517	38,287	39,895	
	Die-casting	90%		10,559	10,369	9,817	10,274	10,254	10,102	9,260	9,744	10,498	11,912	12,687	12,845	12,540	
	Total			35,395	34,868	36,160	38,117	39,779	40,094	38,560	41,027	43,736	47,867	50,204	51,133	52,435	
Transport machinery	Rolling	93%		55,730	56,827	70,207	83,306	92,920	100,302	110,444	124,681	142,408	158,082	165,452	164,084	159,341	
	Die-casting	90%		168,336	164,825	173,621	185,788	198,084	209,693	222,798	242,679	265,621	281,081	288,572	284,518	283,300	
	Total			224,066	221,652	243,828	269,072	291,004	309,995	333,242	367,360	408,030	439,162	454,024	448,602	442,640	
Precision instruments	Rolling	90%		659	746	733	728	718	649	580	544	502	483	441	390	351	
neral machin	Rolling	90%		1,756	1,816	1,993	2,253	2,536	2,663	2,752	2,932	3,183	3,537	3,897	4,030	4,083	
	Die-casting	90%		4,285	4,140	4,026	4,229	4,424	4,472	4,328	4,264	4,421	4,588	4,670	4,613	4,511	
	Total			6,041	5,956	6,020	6,482	6,959	7,135	7,079	7,196	7,604	8,125	8,566	8,643	8,595	
Construction	Rolling		The rate is set to 3/5.	19,155	23,316	36,778	56,516	78,251	99,702	123,456	163,232	185,241	191,685	193,283	201,714	216,008	
		70%		31,925	38,860	61,296	94,193	130,419	166,170	205,760	272,053	308,736	319,475	322,139	336,189	360,014	
Others	Rolling	90%		3,187	2,943	2,922	3,090	3,642	4,174	4,625	5,042	5,521	5,951	5,855	5,623	5,388	
	Die-casting	90%		24,845	26,098	24,697	24,138	24,131	23,881	24,776	27,728	31,643	35,757	38,924	39,073	38,886	
	Total			28,032	29,041	27,619	27,229	27,772	28,055	29,401	32,770	37,164	41,709	44,779	44,697	44,274	
Total (construction 3/5)				492,544	502,427	540,308	587,964	669,877	732,886	795,082	885,104	959,101	1,025,288	1,049,724	1,079,526	1,100,073	
Total (construction 3/5)				505,315	517,971	564,826	625,641	722,045	799,354	877,388	993,925	1,082,595	1,153,078	1,178,580	1,214,002	1,244,079	Collected scrap
Total of processed scrap (only rolling: construction 20%) + collected scrap (construction 5/5)				925,887	947,884	980,947	1,027,184	1,149,324	1,231,064	1,314,535	1,445,477	1,480,444	1,557,688	1,607,174	1,617,946	1,650,483	Gathered scrap
Total of processed scrap (only rolling: construction 15%) + collected scrap (construction 3/5)				866,459	885,457	911,461	945,192	1,049,690	1,118,108	1,183,358	1,289,504	1,317,410	1,390,252	1,438,154	1,446,038	1,471,224	
Total of processed scrap (only rolling: construction 20%) + collected scrap (construction 3/5)				913,117	932,340	956,429	989,507	1,097,157	1,164,596	1,232,231	1,336,655	1,356,949	1,429,898	1,478,319	1,483,470	1,506,478	

3. Conclusion

3.1 Comparison with past survey reports

To make a comparison with past survey reports, the 989,000 t for scrap in the "Survey on Trends in the Supply and Demand of Aluminium Scrap"[1)] was the scrap consumption calculated from the market questionnaire in FY 1993.

The amount of scrap supply for the 1993 accounting year from this survey was estimated from the statistical data. The value for collection (supply side) of 1,145,650 t was high, but the corrected demand value (imported amount subtracted from demand) was 954,758 t. The above value was between these two values. Therefore, the values estimated for scrap here is considered to be close to the actual value.

3.2 Discrepancy between scrap recovered and scrap discarded

Figure 3-2-1 Comparison between aluminium statistics and estimated values

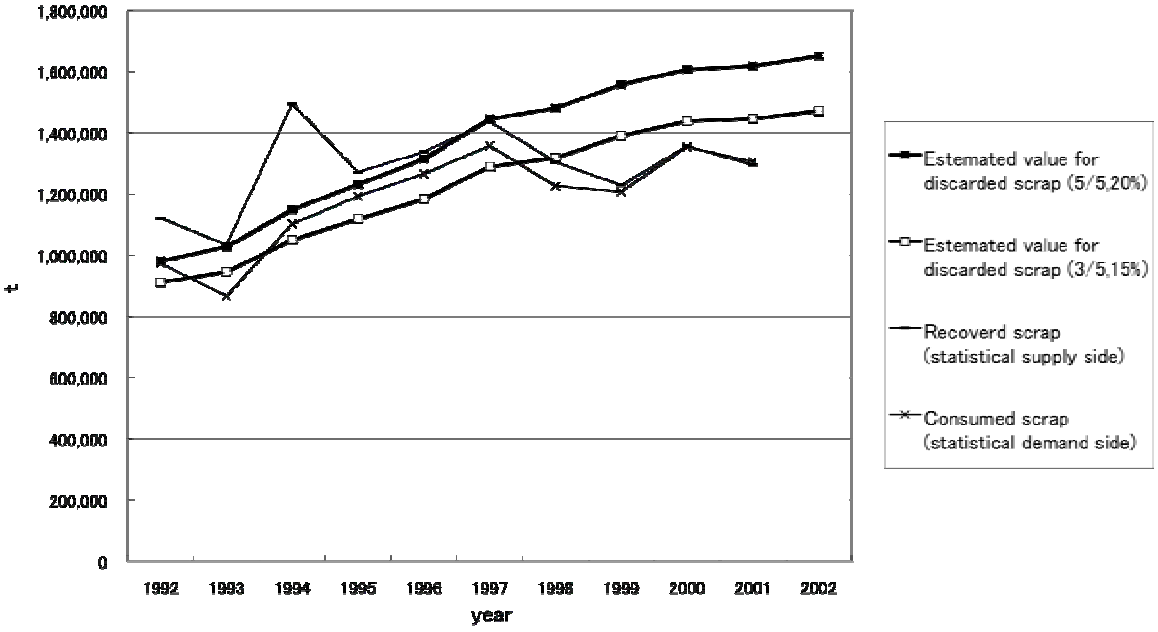


Figure 3-1 shows a comparison between the statistical value for scrap recovered and the estimated value for scrap discarded. The statistical value is actually listed as two values: collected scrap (line (5) in Table 2-4-3 / Statistical Supply Side) and scrap demand (line (9) in Table 2-4-3 / Statistical Supply Side). The differences between these values is as follows: 150,000 t for 1992-1993; 80,000t for 1995-1998; 20,000 t for 1999; and no difference for 2000-2001.

There is no clear reason to explain why these differences gradually decreased. However, one reason why the former value is higher than the latter value is that the providers of the supply-side data for the former value were non-ferrous metal wholesalers, intermediate processors (rolling, casting, die-casting, etc.), and so on while the providers of demand-side statistics were intermediate producers (rolling, casting, die-casting, etc.), so the companies were different. In the distribution processes between companies on the supply side there may be a high possibility that the statistics were double-counted, making them higher than the demand-side statistics. Accordingly, the demand-side values in the statistics were used to make comparisons with estimated discard of scrap.

Next, there are also two ways of estimating scrap discarded. One is the uncorrected scrap discarded amounts shown in Table 2-4-6 (1) and Table 2-4-6 (2). The other is a model of the recovered volume of the Light Metal Association. The amount of scrap from window frame was corrected, as described below.

Comparison of scrap from window frame (Unit: tons)

		2001	2002
Light Metal Association	a	206,440	216,680
Estimate	b	336,189	360,014
Corrected estimate	c = b x 3/5	201,714	216,008

In other words, the values were corrected by "reducing the collected scrap to 3/5, and reducing the processed scrap from 20% to 15%. Here, the uncorrected values for discarded scrap were closer to the statistical values, so the uncorrected values were compared with the statistical values.

Discrepancies in the two sets of values began to occur around 1998. Compared with the value estimated from the production value, the supply and demand statistics are lower (difference of about 300,000 t). There are 4 possible reasons for this difference.

(1) The supply and demand statistics since 1998 have been inaccurate.

(2) In some cases, the amount of scrap exported to other countries has not been included in the statistics.

(3) Processing scrap from automobiles was not reported and thus not included in the supply and demand statistics.

(4) There may have been mistakes in the conditions for setting scrap generation and discarded coefficients.

It is necessary to make a conclusion after sufficiently considering whether or not there may be multiple reasons involved. At least, it should be a topic of future investigation.

At the present time, it is believed the cause was the decline in the aluminium price in 1998-99. From 2000 or 2001, there was an increase of exports of aluminium scrap to China. In other words, there are 50,000 t that do not appear in the trade statistics, and another 100,000t that are mixed I n with miscellaneous items. There was also an estimated 100,000-150,000 t the scrap consumption that was not reported in the statistics. The data are presently being tabulated.

3.3 Overestimate of statistical values for rolling and underestimate of statistical value for casting and die-casting

Figure 2-1-3 shows aluminium material flow. The net consumption in casting, die-casting, and others (the degree of accuracy is unknown) are listed as unmodified numerical values. For rolling, the values are listed in line (3) of Table 3-2-1. Here, we can see that the material supply is lower than the production volume. In other words, the negative values in line (5) of Table 3-2-1 accounts for about 200,000-350,000 t.

One cause of this situation is that when the data for scrap during the process were tabulated, the movement of materials between factories may have been counted incorrectly, that is the scrap value during the process was higher than the actual value, or there may have been cases of excessive subtractions. Another possible reason is that companies might have been confused about upper and lower processes, such as with rerolling, and may have double-counted the data. For example, it is assumed that there are cases where sheet materials, foil, billet-rolled and extruded goods, etc., were counted twice.

On the other hand, as we can see in line (3) of Table 3-2-2, the statistical value for secondary aluminium ingots of 1,366,008 for, say, 2002, was about 100,000-250,000 t lower than the production of 1,627,106 (line (10) of Table 3-2-2, and the number in parentheses for the estimated production in Figure 2-1-4) estimated from the raw material supply (yield 92.5%). Casting, die-casting, etc., which consume large amounts of secondary aluminium ingots, are greatly affected by this.

Table 3-2-1 Excessively negative values for rolling in Statistics (Unit: tons)

			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Material destined for rolling products	①		3,439,579	3,342,214	3,648,629	3,734,043	3,873,397	3,956,629	3,630,916	3,687,535	3,777,284	3,559,129	3,564,448
Scrap generated during process	②		1,419,882	1,398,808	1,497,184	1,566,988	1,587,146	1,655,761	1,593,057	1,647,371	1,640,853	1,631,024	1,623,288
Net consumption of material	③	①-②	2,019,717	1,943,408	2,151,445	2,167,055	2,286,251	2,300,868	2,037,859	2,040,164	2,136,431	1,928,105	1,941,160
Production of rolling products	④		2,227,703	2,155,838	2,355,110	2,411,522	2,494,869	2,545,114	2,324,524	2,369,851	2,452,399	2,309,201	2,299,883
Excessively negative values in Statistics	⑤	④-③	207,986	212,431	203,665	244,467	208,618	244,246	286,665	329,687	315,968	381,096	358,723

Table 3-2-2 Comparison of statistical and estimated values of supply of secondary aluminium ingots

			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Specialty companies of secondary aluminium ingots	①		1,073,730	1,005,839	1,174,587	1,180,824	1,191,484	1,277,058	1,155,419	1,157,668	1,213,861	1,170,688	1,238,829
Non-specialty companies of secondary aluminium ingots	②		71,834	88,566	100,040	91,507	97,245	92,842	100,129	98,176	132,983	132,661	127,079
Production of secondary aluminium ingots (statistics)	③	①+②	1,145,564	1,094,205	1,274,627	1,272,331	1,288,729	1,369,898	1,255,548	1,255,844	1,346,844	1,303,349	1,366,008
Scrap for secondary aluminium ingots	⑤		1,114,321	1,004,828	1,228,233	1,274,230	1,309,825	1,398,102	1,264,873	1,249,986	1,301,416	1,261,686	1,294,980
Aluminium metal for secondary aluminium ingot	⑥		106,190	99,818	125,677	93,308	88,488	98,445	72,543	74,835	84,848	76,665	83,311
Imported base metal	⑦		127,757	182,554	142,499	141,291	129,221	170,271	130,748	253,022	313,524	268,441	340,742
Recovered metal from dross	⑧		10,000	10,000	15,000	15,000	150,000	20,000	25,000	30,000	40,000	40,000	40,000
Material for secondary aluminium ingots	⑨	⑤+⑥+⑦+⑧	1,358,268	1,297,200	1,511,409	1,523,827	1,677,534	1,676,818	1,493,164	1,607,843	1,739,788	1,646,792	1,759,033
Production of secondary aluminium ingots (estimate)	⑩	⑨×0.925	1,256,398	1,199,910	1,398,053	1,409,540	1,551,719	1,551,057	1,381,176	1,487,255	1,609,304	1,523,283	1,627,106
Base metal for direct supply	⑪		30,000	30,000	30,000	28,125	26,250	24,375	22,500	20,625	18,750	16,875	15,000
Imported secondary aluminium ingots	⑫		157,481	154,877	170,478	233,983	206,819	241,779	220,998	240,250	248,720	152,692	202,130
Supply of secondary aluminium ingots (statistics)	⑬	③+⑪+⑫	1,333,045	1,278,882	1,475,105	1,534,439	1,521,798	1,636,052	1,499,046	1,516,719	1,614,114	1,472,916	1,583,138
Supply of secondary aluminium ingots (estimate)	⑭	⑩+⑪+⑫	1,443,879	1,384,587	1,598,531	1,671,648	1,784,788	1,817,211	1,624,674	1,748,130	1,876,774	1,692,850	1,844,236
Difference	⑮	⑭-⑬	110,834	105,705	123,426	137,209	262,990	181,159	125,628	231,411	262,660	219,934	261,098
Consumption of base metal	⑯		208,136	207,729	212,579	213,928	222,102	221,643	211,453	232,711	261,311	283,589	308,520

Table 3-2-3 Comparison of supply of materials and the amount of intermediate production

Year			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Supply of ingots	①	②+③+④	2,590,873	2,642,879	2,875,312	2,840,844	2,794,787	3,021,416	2,586,407	2,683,037	2,920,312	2,822,867	2,590,498	2,956,212	3,038,205
Imported aluminium metal	②		2,255,875	2,267,129	2,326,429	2,427,507	2,422,613	2,573,981	2,200,059	2,165,958	2,342,995	2,186,468	2,032,822	2402854	2432798
Produced aluminium metal	③		18,884	19,283	16,956	19,034	16,958	16,894	16,302	10,904	6,538	6,632	6,400	6469	6400
Imported alloy metal	④		285,238	337,231	312,977	375,274	336,040	412,050	351,746	493,272	582,244	421,133	542,872	536,429	586,803
Estimate of recovered scrap	⑤		873,714	925,330	1,046,231	1,121,311	1,204,095	1,328,286	1,373,459	1,445,967	1,453,960	1,501,893	1,525,402		
Supply total	⑥	①+⑤	3,464,587	3,568,209	3,721,543	3,962,155	3,998,882	4,349,702	3,959,866	4,129,004	4,404,272	4,124,760	4,115,898		
Production of intermediate goods	⑦		3,550,199	3,421,161	3,531,746	3,776,478	3,848,470	4,000,779	3,640,913	3,722,501	3,917,969	3,683,535	3,744,387		
Difference	⑧	⑥-⑦	-85,612	147,048	89,797	185,677	150,392	348,923	318,956	406,503	486,303	441,225	371,511		

Note: The production of new ingots for 2004 is estimated.

Furthermore, the data for casting and die-casting are mechanically tabulated, and are not tabulated by companies with 25 or fewer employees. We can assume that since there are a lot of small-scale companies, a lot of data are missing. For example, with copper casting, we have experience tabulating data where production volume was 20% lower than material supply. Because the value is lower than the actual value and there is a decreasing effect on scrap discarded volume, there is a high risk of making a wrong conclusion about the recycling material flow.

It should be noted that the base metal consumption in line (16) of Table 3-2-2 is the amount of equivalent base metal product consumed by secondary aluminium ingot companies in the METI statistics. This value includes the 100,000 t share of domestic base metal companies. There is no consensus about whether domestic base metal production is increasing or decreasing, so a survey is necessary to make a definitive judgment. In addition, imported base metals in the imported alloy ingots are imports from former Communist countries and are equivalent to Russian ingot products. Russian equivalent ingot products are apparently not only consumed in recycled ingots; there are reports of them being consumed in rolling as well. Finding out the volume of this consumption is a topic for future study.

Table 3-2-3 shows an attempt to calculate the difference between supply of materials and the volume of intermediate production. The difference has been increasing recently. This began around 1996, when discharge started to increase, like due to the effect of scrapped window frame. The largest difference, 480,000 t, appears to be a little too low. Perhaps this is about the expansion of rolling and compression of casting and die-casting canceling each other out. We would like to find some way to determine the true production volume and draw an accurate material flow.

3.4 The ratio between old scrap and processed scrap

The production statistics provided information for making estimates of the amount of scrap recovered, and the Light Metal Association data provided information about the ratio between processed scrap and old scrap. The formula for the estimates showed that there was more old scrap by a ratio of 6:2. The ratio from the Light Metal Association's data was 6:4. At the present time, it is unclear how this difference can be interpreted. Incidentally, the ratio of iron, for example, is 8:2 old to processed scrap[9]. However, in the case of copper, processed scrap has a slightly higher proportion, at 6:5[10]. This may be because copper is relatively easy to process and is used in many small objects such as functional materials, valves and connectors, and is used in less quantity than iron and aluminium as a structural material.

3.5 Rapid increase in dross consumption

Reference[1], which also lists data for dross, shows that 11,000 t of dross were consumed in 1993. In 1996, the Japan Aluminium Association (formerly Japan Light Metal Association) conducted a survey on dross[11]. According to the results, the amount of "dross" (80% aluminium) produced at melters of intermediate producers (rollers, etc.) was 400,000t/year. This "dross" was produced by intermediate makers/processors; 200,000t of the first dross (aluminium 40-50%) was sold to outside dross companies. The most effective application of this first dross is removing sulfur and acid during the wrought iron production process, and the amount is listed as at least 60,000-70,000 t (gross volume). The residual ash (which is disposed of) amounted to about 175,000 t, meaning that nearly all ash was simply thrown away.

However, demand for dross began to rapidly increase in early 2002. Demand for steel was 160,000 tons, and the amount of wasted dross was reduced to 30,000 t. While there was not much change in the amount of metal recovered, it is believed to be about 50,000 t.

Furthermore, there is an intense need for recovered metals. Demand for materials in China has been rising in recent years, and imports of aluminum scrap from Japan have been increasing. As a result, there are shortages of inexpensive materials, and demand for dross appears to have been rising. At the very least, there is increasing demand for dross for steel and recycled metals (metal recovered).

It should be noted that the figure of 40,000t of metal collected from dross in Fig. 2-1-4 was

taken from interviews. The interviews also provided a figure of 15,000 t for directly supplied base metals; however, in recent years, the amount of base metals directly supplied to automobile makers has been decreasing. The figures for the years from 1994 to 2002 were derived from proportional allotments.

3.6 Petition for the resumption of METI'supply and demand statistics for aluminium

Aluminium is the only non-ferrous metal for which continuous official supply and demand statistics are not available.

Considerably accurate values of consumption of secondary aluminium ingots in intermediate processes (rolling, etc.) can be estimated because the JARA has its own statistics on secondary aluminium ingots. The reason why the disappearance of supply and demand statistics causes problems is that neither the consumption ratio between aluminium metal and scrap in the intermediate process, nor statistics on the generation of scrap, are available.

The years for which we can make estimates based on current trends are limited, and we are approaching a time when it will not be possible to make any estimates. Therefore, it is our hope that METI'supply and demand statistics for aluminium be reinstated.

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