

# **Scrap Metal Recycling**

## **Executive Summary**

Scrap metal recycling is one of the most recyclable products. Most metals only have to be melted down and then reformed into other products, making its life cycle potentially endless. Recycling makes a substantial saving on landfill space requirements and it helps conserve the world's resources. Refer section – Health and Environmental Impacts.

Metals should not be dumped or burnt in fires, but should be collected and recycled or reused as storage containers. Some metals are coated with plastic and the quick and easy option of burning to recover the metal inside, should not be practiced. Refer section – Undesirable Practices and Desirable Practices.

There are many scrap metal collectors operating across the Pacific, as it is generally the most viable recycling commodity. Refer section – Present Situation.

To prepare scrap metal for shipment for recycling, the metal will need to be reduced in size either by cutting or by crushing. Thin pieces of metal may only require cutting with equipment such as tin snips or heavier duty equipment such as shears from NZD6,250 (USD3,359). Shredders, from AUD25,600 (USD14,902) are required for large pieces of metal and are effective for vehicles. The most common equipment for metal preparation is the baler, from NZD10,250 (USD5,509). The metals must also be clean to reduce the chance of requiring fumigation upon arrival at the receiving country's port. Refer section – Management Options.

There are many companies that will readily buy scrap metal in Australia and New Zealand. Refer section – Recyclers.

Average weights of containers for non-ferrous scrap metal (steel), depending on the metals included in the container, range between 11 to 16 tonne generally, averaging 12.6 tonne. Average weights of containers containing ferrous scrap metals are on average heavier ranging between 21 – 24 tonne. These weights were taken from a recycler in the region. Refer section – Economics.

A case study for sending scrap metal from American Samoa to New Zealand is detailed, revealing a profit of almost USD13,000 for a single shipment. This profit will depend on the metals chosen for collection and selling. Refer section – Case Study of Fees.

## Introduction

Scrap metal recycling is one of the most valuable recycling markets in the South Pacific (and the world). Unlike some other recyclables, metal can be recycled endlessly.

What is included in the term 'scrap metal'? The most commonly traded metals internationally include:

- aluminium copper radiators
- brass small arms and rifle shells
- brass shell cases without primers
- clean, aluminium lithographic sheets
- coated scrap
- cocks and faucets,
- copper wire,
- hard/soft scrap lead
- hot dip galvanisers slab zinc dross
- lead acid batteries – drained
- manganese bronze solids
- mixed aluminium borings and turnings
- mixed aluminium castings
- mixed clean alloy sheet aluminium
- mixed unsweated auto radiators
- new or old pure aluminium wire and cable
- red brass composition turnings
- segregated new aluminium alloy clippings
- shredded mixed non ferrous scrap
- soft scrap lead
- stainless steel scrap
- stainless steel turnings
- Used Beverage containers (UBC) in different forms ie baled, briquettes
- Yellow brass scrap
- Yellow brass rod turnings

([www.riversidemetals.com.au](http://www.riversidemetals.com.au))



Figure 1: left -  
Aluminium  
scrap

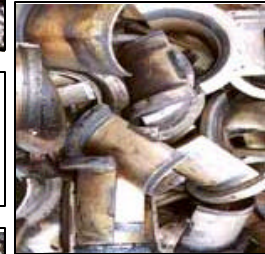


Figure 2: Right  
- Bronze  
Bushing



Figure 3 & 4:  
left and below:  
Steel parts and  
Aluminium



Some of the scrap metal being recycled in the Pacific include:

- copper bright and shiny,
- copper no 1
- copper burnt
- copper domestic
- gunmetal solids
- gunmetal – swarf
- 70-30 brass
- cast brass
- brass swarf
- flywire (briquette)
- radiators/copper

- extruded aluminium
- aluminium/copper radiator
- aluminium cans (briquette)
- clean aluminium wire
- clean sheet aluminium
- clean cast aluminium
- domestic/painted aluminium
- aluminium remelt ingots
- aluminium foil (briquette)
- aluminium swarf
- electric motors
- stainless steel
- soft lead
- iron aluminium

### **Health and Environmental Impacts**

Scrap metal recycling is one of the most recyclable products. Most metals only have to be melted down and then reformed into other products, making its life cycle potentially endless. Recycling makes a substantial saving on landfill space requirements and it helps conserve the world's resources.

To take steel as an example, melting down one tonne of recycled steel cans uses only 25% of the energy needed to melt enough ingredients to make one tonne of all-new steel. Using old steel cans to make new steel also preserves energy and resources. For every tonne of scrap steel recycled, around 1.5 tonnes of iron ore, one tonne of coke and half a tonne of limestone are saved in the production of a tonne of steel.

Illegally dumped metals are not only unsightly but once they start to degrade and rust can create health and safety issues for scavengers and children as they may easily cut themselves on sharp edges.

### **Undesirable Practices**

- ~~✘~~ burning metals in open fires,
- ~~✘~~ burning plastic-coated metals in open fires to recover metal component,
- ~~✘~~ illegal dumping of metals in streams, the ocean or by the roadside.

### **Desirable Practices**

- ~~✘~~ collection of metals, removal of contaminants,
- ~~✘~~ reuse of metals for other uses ie. drums as storage containers,
- ~~✘~~ shipping metals overseas for recycling.

## Present Situation

Metal recycling is operating in the majority of Pacific Island Countries, whether it is the collection of aluminium cans or scrap non-ferrous metals. It has the most potential for cost recovery out of any recyclable commodity in the South Pacific (at current values).

**Table 1:** Amount of aluminium and steel cans available in each.

Country	In area in country	Amount (tonnes/year)
Fiji	Lautoka	630
Kiribati	Tarawa	320
Papua New Guinea	Port Moresby	5300
Samoa	Apia	800
Solomon Islands	Honiara	660
Tonga	Nuku'alofa	95
Tuvalu	Funafuti	70
Vanuatu	Port Vila	320

\* Note: Unfortunately, separate figures for aluminium and steel are not available.

### *American Samoa*

In American Samoa, a scrap metal yard managed by the American Samoa Power Authority (ASPA) is operated where metal can be left for no charge. A baler is located on-site where equipment can be prepared for shipping. T&T Recycle and Salvage Company collect metals for recycling.

Impress in American Samoa, collect and bale offcuts from their tuna can manufacturing process for return shipment for recycling in the United States.

### *Fiji*

Scrap Metals (Fiji) collect steel, copper, brass, aluminium, radiators, condensers, aluminium cans and batteries and have been in operation since 1994. The company provides a pick-up service six days a week. The majority of the metal is collected from businesses and a much smaller proportion from households. Over 60 containers per year are shipped by Scrap Metals (Fiji) for recycling. Waste Recyclers in Fiji collect a range of scrap metal products and send to Australia or New Zealand for recycling. International Recycling operates in Fiji as well as smaller facilities in Kiribati and New Caledonia, for the collection of scrap metals.

### *Kiribati*

Moel Trading in Kiribati collects brass, copper and lead.

### *Samoa*

West End Company in Samoa, recycles all non-ferrous metals (copper, aluminium, brass) and has recycled batteries in the past. The company has been in operation for 16 years and ships 3-4 containers per year, although 50 containers of steel per year was a past quantity. The company offers up to 60 sene/kilogram and mostly send to Sims Pacific Metals.

### *Vanuatu*

Since 1980, Vanuatu Recyclers have been collecting non-ferrous metals including aluminium cans, telephone cables, radiators etc. The business is sending about 4 containers per year to Australia in bags of about 50kg amounts.

### *Solomon Islands*

BJA Agencies in the Solomon Islands collect scrap metal for recycling.

### *Tonga*

Atenisi University in Tonga is also carrying out a small amount of metal recycling, mainly aluminium cans and scrap, copper, zinc and batteries. Moana Recycling in Tonga collect aluminium cans, copper and brass. About two containers per year are sent to Australia for recycling.

## **Safe Handling**

Scrap metals should generally be handled with protective gloves, particularly if cutting is required and sharp edges are exposed. Gloves can be obtained from specialist suppliers (refer to contact listing for suggested suppliers).

## **Management Options**

Scrap metal needs to be cut into pieces that can be easily managed for both transportation purposes and infeed into the recycling facility. There are three different ways that scrap metals can be shipped:

- ?? In large pieces,
- ?? Cut into pieces or swarf (very small pieces),
- ?? Or crushed and then pressed into bales.

There is a variety of equipment that can be used to prepare metals for shipping. These are outlined in Table 1 below. The equipment required to adequately reduce the volume of scrap metals can be bought from specialized suppliers (refer to contact listing for suggested suppliers), from Australia, New Zealand and the USA.

The equipment that is best suited for a particular recycling operation is dependent on:

- the volume expected to be processed,
- how the end-recyclers would like the product (or what will provide the most returns for the capital cost of the equipment ie. copper swarf is more valuable than large pieces of copper, but the equipment to refine the metal is very expensive and may never be repayed)
- the properties of the metal (type, size etc).

Some approximate prices of equipment are included in Table 1 below.

**Table 1: Details of equipment for scrap metal preparation.**

<b>Equipment</b>	<b>Description</b>	<b>Capacity</b>	<b>Indicative Price</b>
Shears	1.5kw, single phase, 8" blade, 28 tonne shear force, weight 150kg	Cuts ms round 20mm diameter	NZD6,250 (USD3,360)
	11kw, 3 phase, 85 tonne shear force, weight 1900kg	Cuts 45mm mild steel round	NZD26,500 (USD14,248)
Shredding Machine	8.2kw, weight 800kg	800kg/hr	AUD 25,600 (USD 14,907)
Bailers	1.5kw, single phase, bale size 350 x 350 weight 350kg	26 tonne of compactive force	NZD10,250 (USD5,510)

\* The prices have been sourced from suppliers in New Zealand and Australia and are detailed in the Contacts List.

Compactors should last about 10 years with a proper maintenance schedule.

One major consumable item is the gases required for steel cutting if using gas torches. The cost of refilling a standard G size bottle with oxygen and acetylene, is SAT112.50 (USD ?) and SAT365 (USD ?), respectively. Those islands where the bottles cannot be refilled locally, will incur much higher costs as the bottles will have to be shipped over. Acquisition of a gas plant may need to be considered in those islands where local gas production plants are not available and a supply of gas is necessary.

### *1. Ferrous Metal*

Ferrous metal or steel, is the most abundantly used metal today and is commonly found in PIC's in motor vehicles, construction equipment and whitegoods. These sources are detailed further below.

#### *Abandoned Car Bodies*

The composition of a typical car has changed substantially in recent years. For example, ferrous metal content has declined significantly, as lighter, more fuel-efficient materials are incorporated into vehicle design. The overall metal content of cars has declined rapidly during the past 20 years, which has been accompanied by an increase in the proportion of non-ferrous metals, such as aluminium and magnesium. Almost 10% of the weight of an average car is now accounted for by plastic components.

Shredding or compacting is the only effective procedure for recycling the light steel in motor cars and light trucks. Tyres, oil, battery, radiator and engine must be removed and the petrol tank holed. The car body must be crushed to about quarter height. (This could be done with a bulldozer.) There is a company, Gamma Compaction, that offers a service of compaction and

collection of car bodies in New Zealand. Gamma Compaction owns suitable compactors which can be shipped to PICs and is able to offer this service as long as details of quantity can be provided. The cost of this service will be dependent on factors such as the distance from New Zealand, the quantity and quality of steel. Costs may be recovered if a number of countries organise a regional collection.

### *Heavy Steel*

Heavy steel consists of abandoned and derelict construction equipment (bulldozers, draglines, cranes etc) shipwrecks and stranded barges, old structural steel, engine blocks and parts. This thick steel needs to be cut or broken down into manageable size pieces for shipment to the recycler. The steel needs to be sound.

Normally, the purchaser of such scrap, operating on a commercial basis, would use open hold vessels, equipped with magnetic lifting gear. Without a crane equipped with a magnet, the handling of the scrap steel, both in and out of the vessel is very laborious and consequently costly. The type of ship which specializes in this type of cargo is large and would normally pick up a load of 5,000 tonnes or more. It is possible, however, that a load as little as 500 tonnes could be taken under favourable circumstances. This situation might arise if a scrap carrier were travelling through the Pacific and could be diverted minimally from its direct route to collect a load from one of the islands. The value of the scrap on delivery to the recycler would have to be at least equal to the shipper's costs for this to happen, even if no payment for the scrap was made at the point of loading (Scrap Metals in Micronesia, 1993).

Heavy duty cutting equipment is required to manage this category of metal

Metal that is rusting or is contaminated with rust, oil, dirt and fungus should be avoided, unless it can be cleaned. Cleaning can be a time consuming exercise so preservation of the metal once collected will reduce these efforts. It should be remembered that a higher price will be paid for quality metal.

### *Whitegoods*

All whitegoods are produced overseas and imported into PICs. By weight, whitegoods are mostly ferrous metals, however light-weighting and technology changes in whitegoods mean they are now complex scraps. Average whitegoods are made of ferrous metals (53%), non-ferrous metals (6%), glass (2%), plastics (19%), and other materials (20%). Therefore, as the amount of metal reduces in whitegoods, the feasibility of recycling whitegoods will reduce as dismantling costs will increase. Stoves, refrigerators and ovens are the main items imported into PICs and the rate of import has increased as access to electricity has widened.

This type of metal is termed 'light gauge'.

## *2. Non-Ferrous Metals*

Non-ferrous metals attract much higher prices than ferrous metals and include copper, brass, aluminium and lead. Refer to the guideline on Aluminium Cans for more information on recycling of this metal.

### *Copper*

Copper is sourced from telephone cables, once the outside plastic casing is removed, the copper found underneath fetches a high price and is termed bright and shiny copper. Other sources of copper include water pipes and fittings, building wire, door knobs, locksets, wall clocks, car radiators, air conditioners, and small amounts in other major appliances such as refrigerators and clothes washers.

### *Brass*

Brass is sourced from brass house fittings such as door knobs and handles, water pipes and fittings and car radiators. Car radiators need to be emptied of the contained coolant before they are sent for recycling. To dispose of appropriately, coolant should be released onto an absorbent medium before being landfilled.

### *Lead*

Some scrap metal recyclers melt down the lead found in batteries to form ingots. This practice should not be conducted as the poisonous fumes formed during the melting process can easily be inhaled by workers and coat the area downwind, causing lead contamination to the surrounding environment.

## **Recyclers**

There are many companies that will buy scrap metal in Australia and New Zealand. The most widely known and used is Sims Pacific Metals in New Zealand. Others include

### Australia

- Sims Metals
- Tall Ingots
- Comalco
- International Recyclers
- Queensland Metals

### New Zealand

- Auckland Metal Recycling
- Cableco Metal Industries Ltd
- Cableco Corporation (is the same?)
- Dominion Trading
- Hamilton Recycling Centre
- Macaulay Metals
- Metal Man Recyclers
- Metal Smelters (Auckland)
- MetalCorp NZ
- Scrap Steel Recyclers
- Paper Reclaim



- Resource Recycling Technologies NZ Ltd

A company dealing in scrap metal transport, particularly abandoned car bodies across New Zealand is Gamma Compaction. This company is able to provide a service to Pacific Island Countries if there is sufficient scrap to warrant shipping one of their 4 mobile crushers over.

### Export and Import Permits

There are no particularly permits required.

### Economics

It is common practice for scrap metal recyclers in the region to offer a small amount for bringing in metals to a collection centre. For instance in Vanuatu 20 vatu/kg is paid for non-ferrous metals and in Fiji, \$0.5/kg for aluminium, \$0.80/kg for brass, \$1.6/kg for copper. Samoa offers up to 60 sene/kg for non-ferrous metals and Tonga offers Pa'anga\$0.20/kg.

Average weights of containers for non-ferrous scrap metals, depending on the metals included in the container, range between 11 to 16 tonne generally, average 12.6tonne. Average weights of containers containing ferrous scrap metals are on average heavier ranging between 21 to 24 tonne. These weights were taken from a recycler in the region.

Some recyclers report that fumigation is required in Australia and New Zealand. The price of fumigation in Brisbane, Australia is approximately AUD110 (USD64).

### Case Study of fees

The cost of transporting a 20 foot container of scrap metal, from American Samoa to New Zealand is outlined in the following table, Table 1. This economic analysis does not take into account collection costs which can form a large component of resources and time, nor capital costs.

**Table 1:** Costings of a shipment of scrap metal, sent from American Samoa to New Zealand in 2002.

Fee	\$ Value	Unit charge	Total
AMG fee	15	%	-USD2,399
Port Service charge in American Samoa	USD50	Each	-USD50
Ocean freight and Pago dock storage	USD604.50	Lump sum	-USD605
Inland freight – 1 container	USD19	Lump sum	-USD19
Income from Product			
Copper conductor (5.062t)	USD1,320	tonne	+USD6,682

Copper (1.874t)	domestic	USD1,090	tonne	+USD2,043
PVC cable (8.6t)		845	tonne	+USD7,267

Income – Cost = +USD12,919

It can be deduced from the above analysis that the cost of shipping high return scrap metals from American Samoa to New Zealand, excluding collection costs and capital cost paybacks, can provide very good returns.

### Collectors

Scrap metal could be shipped to either New Zealand or Australia or maybe direct to China or Japan. (The difficulty with the latter two is getting shipping companies to release containers for that trade. This option could be investigated once recycling is occurring on a wider scale.)

The requirements of the biggest metal buyer, Sims Metals, are detailed. Sims Metals will accept:

- car bodies, whitegoods, sheet metal, railbar, plate, wire
- Industrial metal offcuts such as punchings and trimmings, castings and bushelling, electrodes and lead acid batteries
- Cans, tins, electrical wire, cable, extrusions and structural steel
- Demolition scrap metal
- Metallic materials

Sims Metals will not accept:

- pressure vessels, gas cylinders, flammable products, drums or containers with chemical residues, poisons, corrosives

Some buyers will have their own requirements. For instance, Resource Recycling Technologies in New Zealand request a clearance from countries Ministry's on some sort of written form before shipping any type of scrap metal. This is due to a container of scrap metal (mainly copper, car radiators and copper cables) previously imported from Nauru to New Zealand which needed to be steam cleaned by New Zealand's Ministry of Agriculture.

### Case Study

American Samoa only has a few years left in the landfill in Tutuila, 10 years optimistically, so efforts are being taken to divert as much as possible from the landfill. Residents pay for a landfill service through their power bill ensuring that everyone on the island contributes towards the costs.

ASPA has a metal recovery yard that residents of Tutuila can leave recyclable metals at no cost. If not closely monitored, a lot of rubbish also gets put in the yard.

The scrap metal yard has a densifier for cans and a big baler, called an Al-John, for larger scrap metals, Refer Figure 5. The latter piece of machinery was purchased second hand from the United States. Figure 6 shows the large bales that are produced by the baler. Cutting torches with oxygen and acetylene is used to cut heavy equipment up into manageable pieces.



Figure 5: The Al-John Baler.

ASPA sends several shipments of scrap metals to Sims Pacific Metals in New Zealand each year. They have sent 12-15 containers in the last year and a half. Another company metals are sent to is Cableco Metal Industries in New Zealand.

Some of the recyclables that ASPA ship for recycling include copper conductor, Cu domestic, PVC cable and steel cable.

They operate through a broker, called AMG Resources Corporation. This company is from the US mainland and organise everything for ASPA regarding shipping the containers off-island. AMG have a 15% of sale price fee for their services.

The economics of a shipment containing copper and PVC cable to New Zealand by ASPA have been detailed in the section – Case Study of Fees. In 2002, ASPA were also receiving USD1,350 for radiators and baled aluminium cans in New Zealand.



Figure 6: The Al-John crushes metal into large bales.