

Science of Materials

Metals



KS3/4 Metals Info Sheet

Production of Aluminium – from rock to pop

1. Bauxite Mining – Norsk Hydro Paragominas Mine in Northern Brazil

Bauxite is the mineral rock ore containing aluminium, in the form of aluminium oxide. One of the largest open cast mines for bauxite in the world is found in Northern Brazil.



Extraction of Alumina – Norsk Hydro Alunorte Alumina Refinery

Alumina or aluminium oxide (Al_2O_3) is the key raw material for producing aluminium. It is a white powder extracted from bauxite through Bayer process.



Hydro Alunorte is the world's largest alumina refinery and is in Pará, Brazil, in the



industrial park of Barcarena.

The refinery produces 6.2 million tonnes of alumina (Al_2O_3) per year. From here it is shipped to smelting plants around the world.



2. Smelting via Electrolysis

The second largest aluminium smelting plant in the world is the Alba plant in Bahrain. It produces 1,365,005 tonnes of aluminium products (ingots, rolling slabs and billets) every year and covers 2,546,031 sq.m.

Electrolysis is used to extract aluminium from the alumina.

Carbon (graphite) cathodes and anodes are used to provide free electrons for the reaction.



The process uses a huge amount of energy as the solution must be heated to well over 750°C

so that the molten aluminium can be removed.



3. Rolling Aluminium Slabs into Aluminium sheets

Sheets are rolled from ingots within some processing plants. Arconic is the largest producer of aluminium sheets in the world, but there are smaller plants worldwide, including in Europe.



4. Can processing

Aluminium sheets are processed into cans in factories like the largest in Europe, in the UK near Leicester which makes 9 million cans a day.



Labels are printed onto empty cans then the cans are transported to factories for filling.



5. Can filling and distribution to shops and supermarkets



Cans can be filled with fizzy drink or alcoholic drinks like beer.



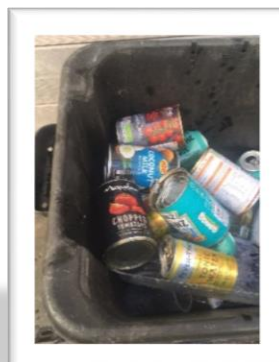
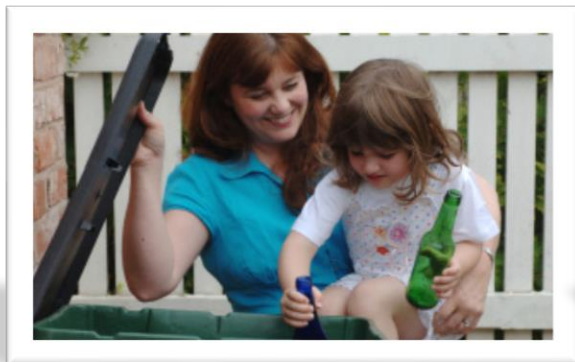
Supermarket distribution centres are usually situated near to major road networks for ease of transport to regional supermarkets. Consumers buy their preferred drinks in cans then taken them home to enjoy and recycle the cans.

Phew! What a trip!



Recycling of Aluminium – from can to can

1. Consumer recycles empty, clean can in kerbside household recycling bins in Devon.



2. Council picks up can from street in Devon



Waste collection or recycling trucks and teams of people will collect the recycling and take to the nearest depot for sorting and bulking up for transport. They are out in all weathers and start early in the morning to minimise disruption on roads.



3. Can separated from other recycled materials in Devon



Sorting recycling is done by District Councils in Devon. Huge conveyor belts propel recycling under large magnets to separate steel from aluminium and plastic. The aluminium foil and cans are separated from the plastic using eddy currents.



4. Taken to recycling plant in Wrexham

Aluminium cans are baled up and transported by truck to Wrexham which is the location of the largest can recycling plant in the world. Most of the cans in the country end up here. The aluminium is turned back into ingots or sheets, depending on what is needed.



5. Remade into a new can in Leicester



Cans are remade from sheet aluminium at places like the biggest can factory in the country. From here they are labelled and sent to the drink manufacturers.



6. Filled with drink and distributed to supermarkets

The journey from drinks manufacturer to consumer is the last stage of the process from can to can. Drinks are filled then sent to distributors to go to supermarkets and other shops, then are bought by consumers.



Phew! What a trip!



Production of Steel cans – from rock to beans

1. Iron ore mining

The largest iron ore mine in the world is the Carajás mine in northern Brazil. Vale's iron ore production for 2013 at Carajás was 104.88 million metric tonnes. The ore is transported to the coast by railway.



2. Concentration of iron ore into pellets

Pellets are small balls of iron ore used in the production of steel. They are made with technology that uses the powder that is generated during the ore extraction process, once considered waste. The picture shows a pelletisation plant in Northern Brazil.



3. Production of Steel from Iron ore pellets in a blast furnace

Blast furnaces are found around the world. Some of the largest ones in the world are in China where half the world's iron and steel is made. A few remain in the UK, including the Port Talbot plant run by Tata.



4. Steel processed into food packaging grade product

The largest factory that does this in the UK is in Llanelli and is called Trostre. Hot rolled steel is transported here and converted into food grade steel plate ready to be made into food packaging.



5. Can Processing Plant

Steel sheets are processed into cans at processing plants like the Crown Food Packaging factory in Wisbech in Cambridgeshire.



6. Can filling

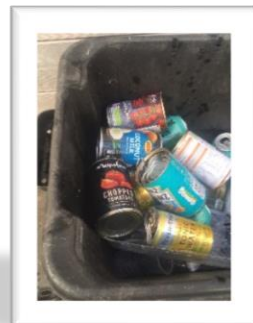
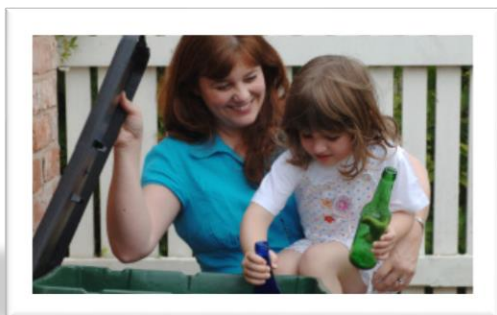
Cans are filled with cooked food at plants like the famous Heinz factory in Wigan. From here they are distributed to shops and supermarkets.

Phew! What a trip!



Recycling of Steel – from can to can

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2. Council picks up can from street in Devon



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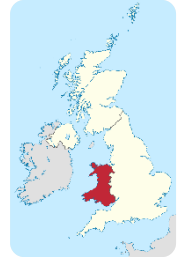
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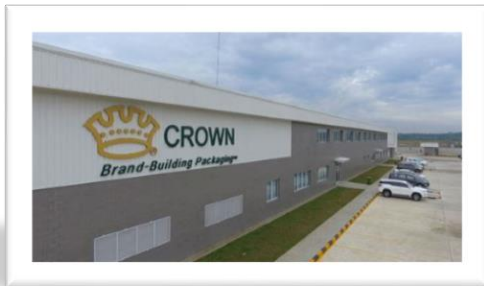
4. Taken to steel recycling plant in South Wales



After being baled up steel cans are taken to be melted back into steel for packaging or other steel items like car parts. This process uses less energy than making steel from iron ore pellets.



5. Remade into a new can in Wisbech, Cambs



Plants can then be remade new cans from old at plants like the biggest can producing plant in Wisbech. From here they can be taken to factories for filling with more delicious and long lasting food.



6. Filled with food and distributed to supermarkets



The recycled steel cans are filled with food, distributed to shops and supermarkets and then bought by us, the consumer to be taken home and stored until we need them.



Phew! What a trip!

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Aluminium Sheet and Can Production

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