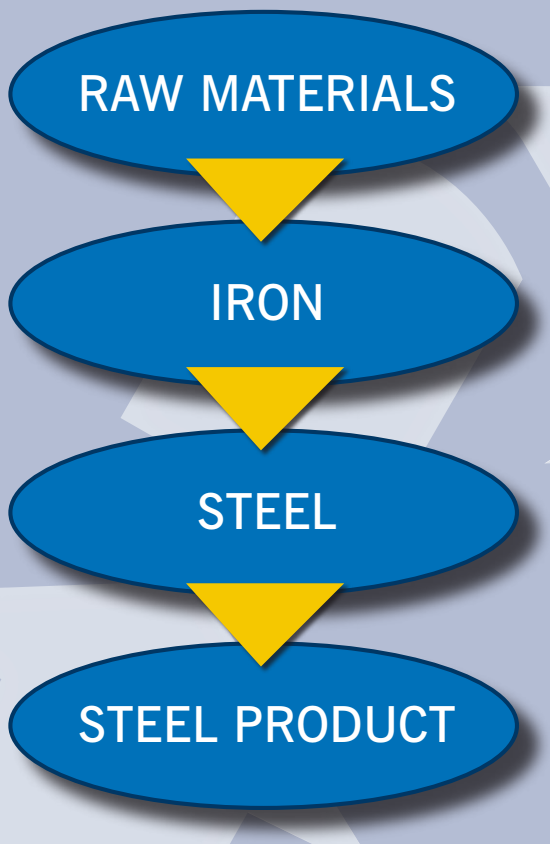
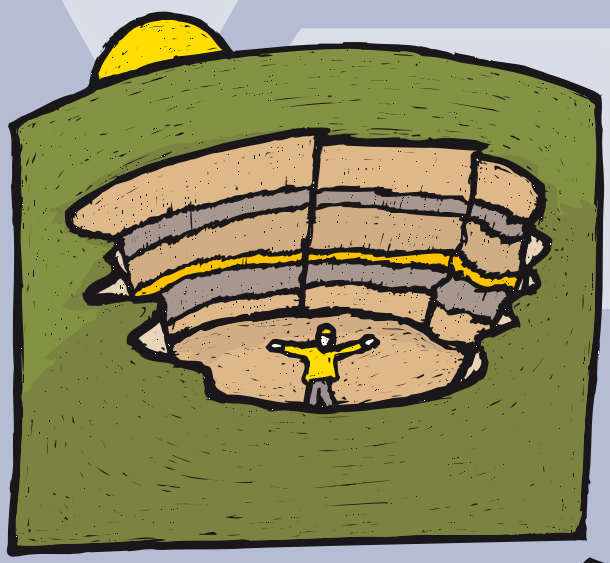
Steel

How is steel made?



- The iron ore is ground into fines and transported to a foundry
- The fines are mixed with coke and heated to produce a coarse material called sinter
- The sinter is put in a blast furnace with limestone and more coke
- Blast furnaces are lined with special bricks that can withstand temperatures up to 2000°C. Air is preheated to about 1000°C and is blasted into the furnace through holes near the base [1]
- Coke is used in this process rather than coal because it is a more pure form of carbon. It burns to very high temperatures and produces carbon monoxide gas which converts the ore into iron [1]
- The hot carbon monoxide gas is recycled. It is cleaned and used as a fuel to heat the blast furnace
- At 1000°C the iron turns to a molten liquid
- Any of the rock still attached to the iron is attracted to the limestone and floats on top of the molten iron because it is lighter
- The molten iron is then drained out of the bottom of the furnace
- The furnace can run constantly for 10 years, being fed at the top while being drained at the bottom. After 10 years the bricks that line the furnace need to be replaced

Making Iron



- Iron ore is taken out of the ground at open cast mines. Iron is found in rocks and requires blasting with explosives to break them up

Making Steel

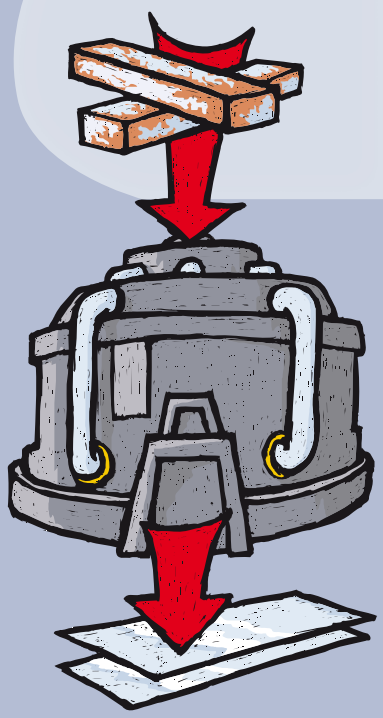
- There are two methods of making steel:
  1. Basic Oxygen Steelmaking
  2. Electric Arc Furnace Steelmaking

1. Basic Oxygen Steelmaking

- Scrap steel is melted in the furnace
- About 3 to 4 times as much iron is then added (up to 300 tonnes) [1]
- Oxygen is blown into the furnace through a lance (like a thin pipe) to help remove impurities
- Lime is added and mixes with the contaminants; silicon, manganese and phosphorus float on top of the metal forming a 'slag'
- Carbon in the metal forms carbon monoxide gas
- The metal is sampled to ensure the quality meets the required standard. The steel is then ready to be poured for casting, the slag remains in the furnace
- The slag is cooled and can be recycled as a cement for use as aggregate (broken stones) in building roads [1]

2. Electric Arc Furnace Steelmaking

- Scrap steel and lime (a white powder made from heating limestone) are put in the furnace
- The metal is melted using electricity from electrodes
- The molten metal is blown with oxygen, which produces carbon monoxide gas
- Any contamination mixes with the lime to make a slag



- The slag is poured off leaving just the molten metal which is ready for casting

Casting

- Casting is normally continuous
- The casts are poured from the ladle into moulds

  There are three basic shapes
- slabs, long wide and not very thick
- bloom, long, not very wide and thicker than slabs
- billet which are long and if viewed end on they are square

Steel recycling

- Steel cans are collected in many kerbside recycling schemes
- Can banks are found throughout the County and normally accept both aluminium and steel food and drinks cans. For information on recycling banks and collections in your local area check the www.recyclenow.org.uk website
- Steel cans in Leicestershire are taken to a can recycling plant where:
- Cans are passed through a double drum magnetic separator which removes any other materials such as aluminium which may have got caught up with the steel
- The steel is then mixed with iron to make new steel
- Over recent years the amount of packaging used has decreased by reducing the thickness of the containers. This has been achieved due to the strength of steel enabling it to be rolled very thin
- The magnetic properties of steel make it very easy to recover from household rubbish

- Recycling 1 tonne of steel has a significant environmental impact, saving 1.5 tonnes of iron ore and 0.5 tonnes of coal. It reduces the amount of water required in the production process and saves 75% of the energy needed to make steel from virgin materials as well as substantially reducing air emissions and water pollution [2]

Steel facts

- Each household uses approximately 600 cans per year [3]
- In 1980 a steel can weighed 31.2g, in 2004 they weighed only 21.4g [3]
- Around 8.5 billion drinks cans are manufactured in the UK each year [4]
- Over 2.5 billion cans (125,000 tonnes) are recycled in the UK each year. Stretched end to end these recycled cans could stretch ¾ of the way around the earth [3]
- The thinnest part of the can wall is 0.07mm thick, which is thinner than a human hair [3]
- All steel cans can be recycled
- All steel cans contain around 25% recycled steel [3]
- The shell of the Millenium stadium in Cardiff is made from 12,000 tonnes of steel [1]

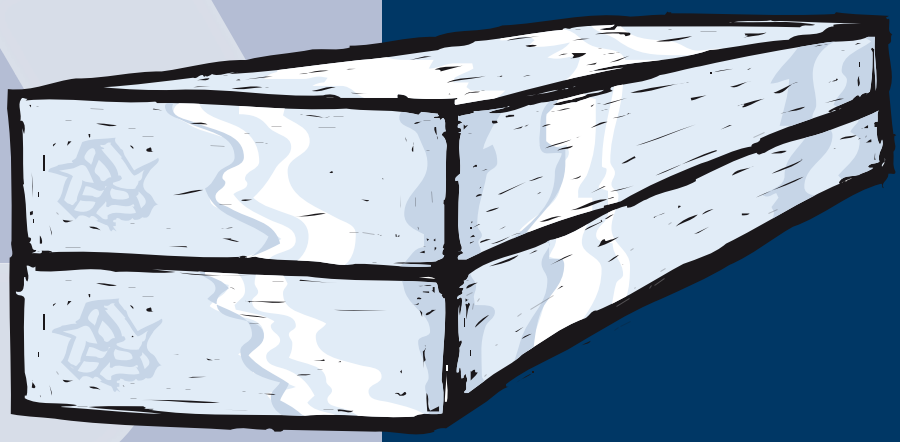
Weblinks

- www.corusgroup.com
  - Steel production information
- www.schoolscience.co.uk
  - Steel structure & properties
  - Steel making process
- http://www.wasteonline.org.uk/resources/InformationSheets/metals.htm
  - Steel packaging recycling information sheet
- www.canmakers.co.uk
  - Information on can construction methods

References

[1] www.schoolscience.co.uk

[2] www.corusgroup.com

[3] www.recycle-more.co.uk

[4] www.canmakers.co.uk