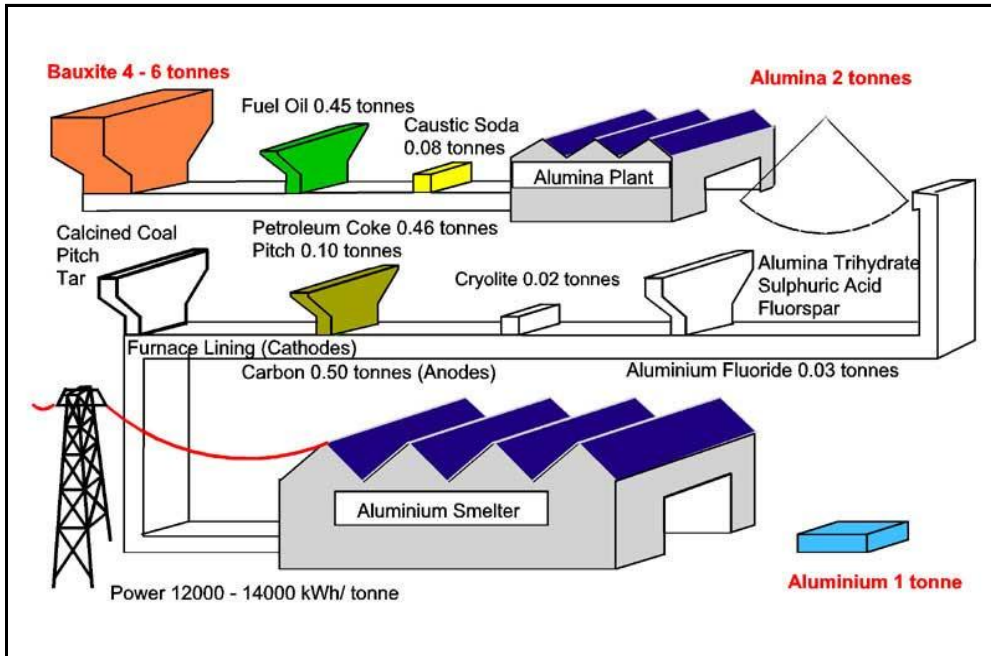


Materials – What to find in this section

Aluminium is a **global commodity**. The economic advantage of hydropower has shifted production sites to countries **rich in hydroenergy resources**.



Aluminium's natural resources are abundant

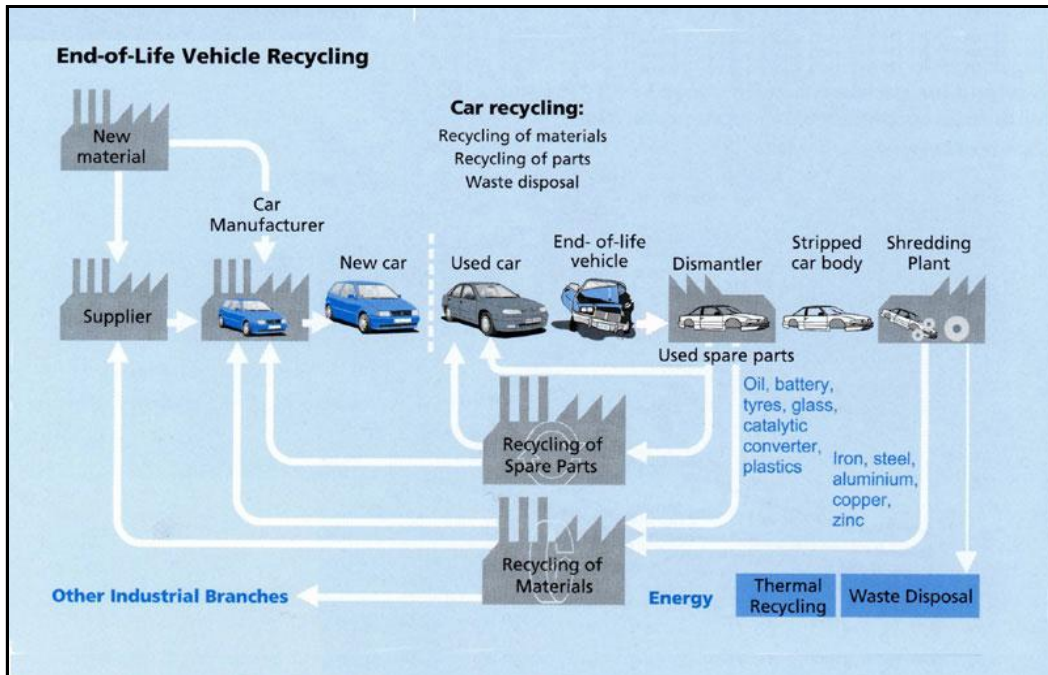
Stability of **supply** and **price** is a dominating criteria for use of materials in product models built over a long period of time. What is the situation for aluminium in the foreseeable future?



Another growing resource is scrap collected from spent products

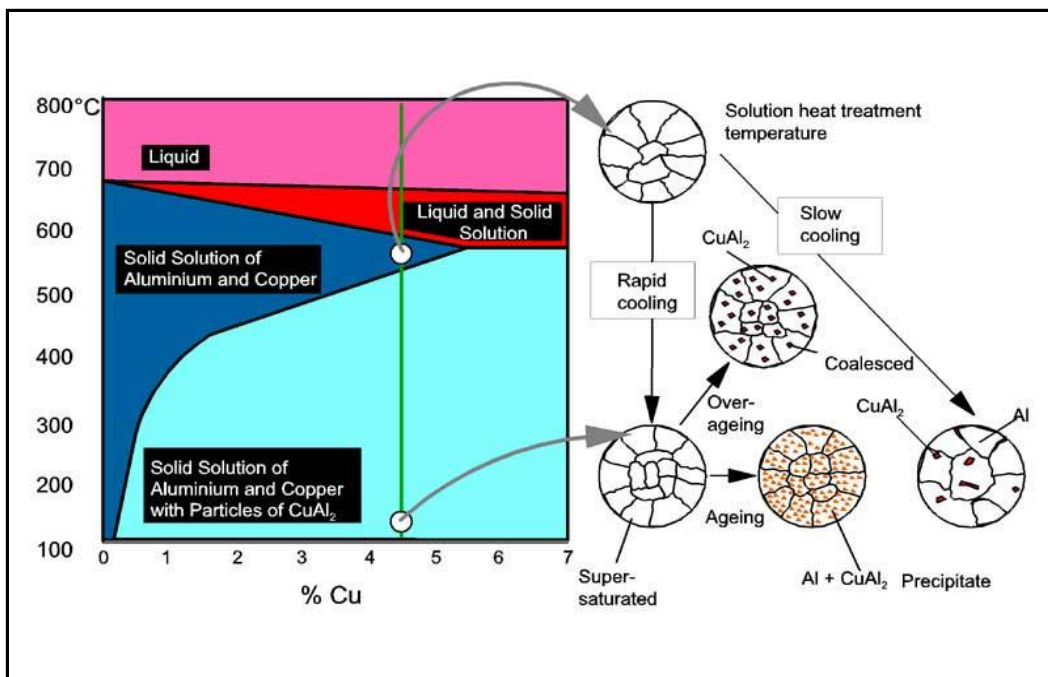
THE Aluminium Automotive MANUAL

Recycled aluminium alloys are presently being used predominantly for production of castings. Sorting by alloys is needed for wrought products.



95% of the aluminium content of existing cars is reclaimed and fed into the recycling system

The **constitution of wrought and cast alloys** is the basis for understanding the **strengthening mechanisms** and the principles of **heat treatment**.



Heat treatment during production or fabrication needs very close control over process parameters for optimum quality

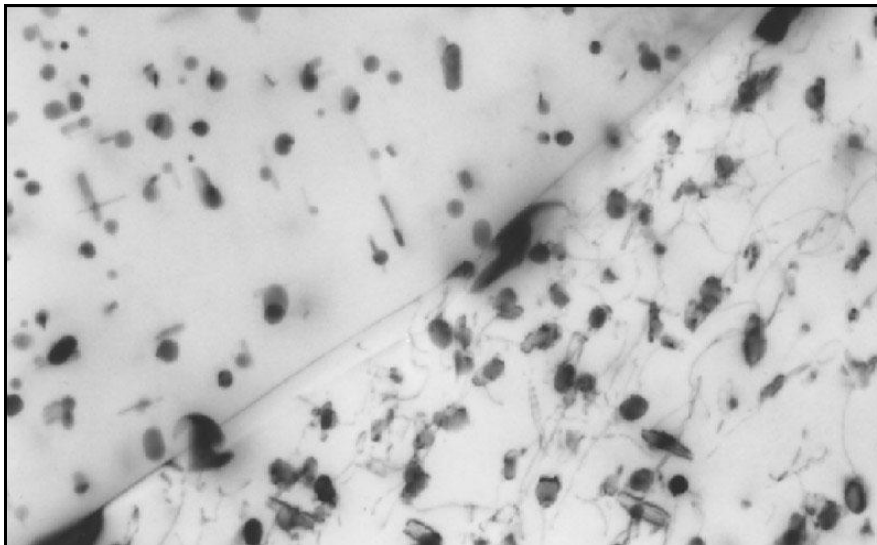
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The international (AA, EN, ISO) aluminium **alloy designation systems** are the basis for global communication among materials engineers, designers, suppliers and fabricators.

Aluminium Alloy Designation System (CEN)						
		Major alloying element	Atoms in solution	Work hardening	Precipitation hardening	
Wrought Alloys*) EN AW-	1XXX	None (min. 99.00% Al)		X		Non-heat treatable alloys
	3XXX	Mn	X	X		
	4XXX	Si	X	X		
	5XXX	Mg	X	X		
	2XXX	Cu	X	(X)	X	
	6XXX	Mg + Si	X	(X)	X	Heat treatable alloys
	7XXX	Zn	X	(X)	X	
	8XXX	Other	X	(X)	X	
	Casting Alloys*) EN AB- EN AC- EN AM-	1XXX0	None (min. 99.00% Al)			
2XXX0		Cu				
4XXX0		Si				
5XXX0		Mg				
7XXX0		Zn				
8XXX0		Sn				
9XXX0	Master Alloys					

Each aluminium alloy is defined by a unique designation system

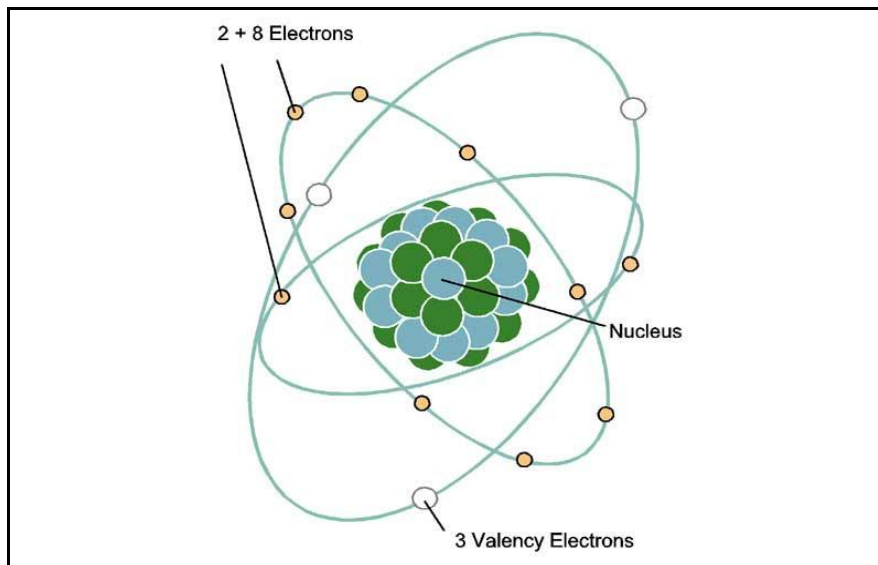
Thermo-mechanical effects during processing - from melt to final product - determine the behaviour of products: **microstructure is the key.**



Microstructure governs the properties

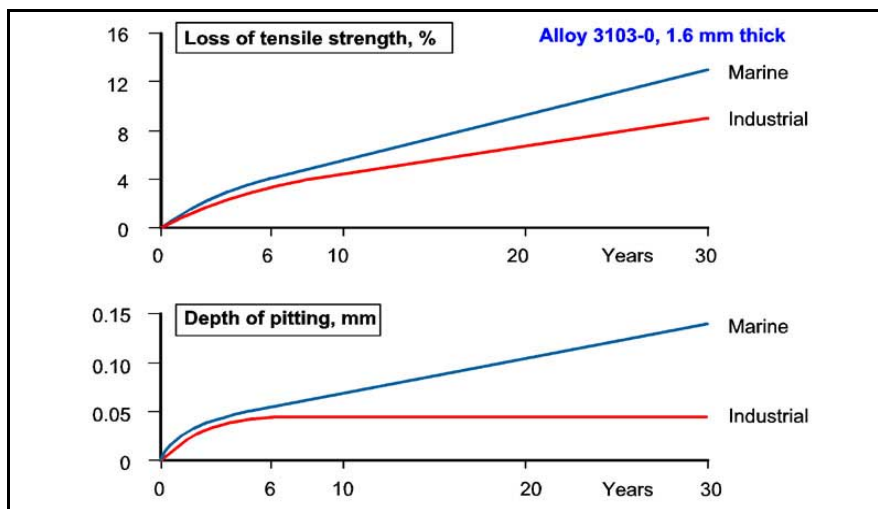
THE Aluminium Automotive MANUAL

Apart from its low density aluminium has many other useful **physical properties**, which are different from other materials and make it unique for applications.



Knowledge of the physical properties is essential to exploit aluminium's potential

To assess the danger of corrosion is not only the task of materials engineers, but also a task for the designer. Material selection, part design and assembly are **factors to avoid corrosion failures**.



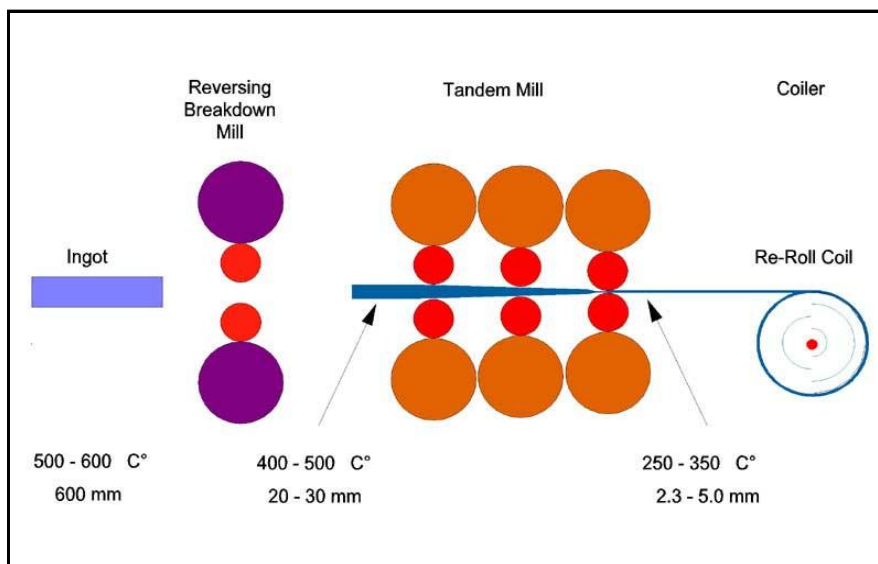
Corrosion behaviour is governed by alloy composition, processing and environment, it also depends on design

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The mechanical behaviour of aluminium parts under static and dynamic loading make it an **excellent material for safety parts**.



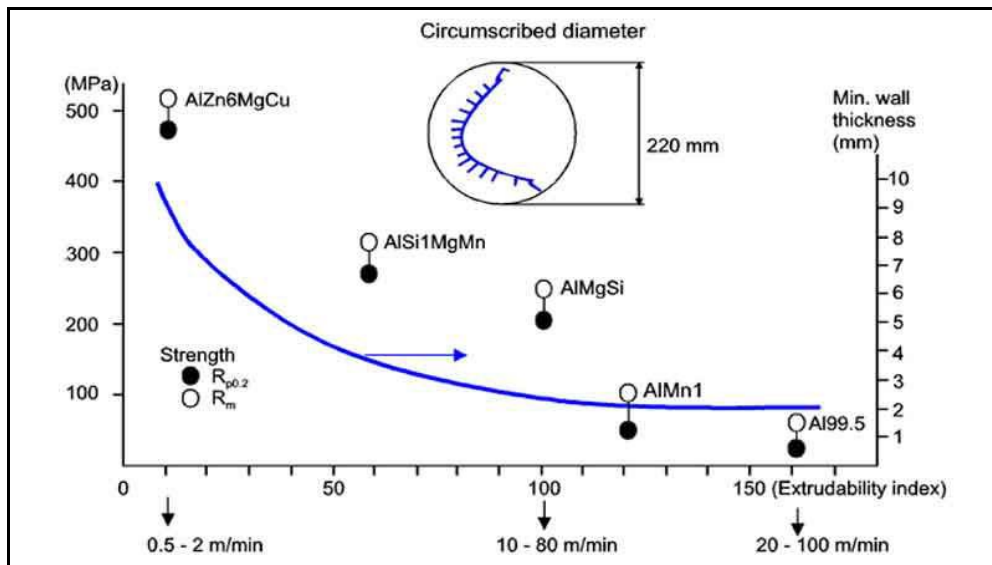
The **main processing steps** in manufacturing rolled, extruded, forged or drawn wrought products are described to understand properties and design.



The DC-cast structure and thermo-mechanical rolling schedule determines the properties of sheet

THE Aluminium Automotive MANUAL

Designing for optimum economy and service properties is often a complex task taking into account all the parameters that govern the metal flow in dies.



Form, size, alloy strength, minimum wall thickness, extrudability and extrusion speed are interdependent

Surface treatments can often be provided by the material manufacturer through efficient coil coating and finishing operations.

