

# CAST METALS



Australia's Cast Metals industry is a vital part of manufacturing in today's rapidly developing world. Metal casting and moulding techniques are used to make an almost limitless array of products, ranging from small precision components to large engine blocks and manifolds.

You could cast and mould engine parts, axles, machine beds and casings, marine and aeronautical components, tooling or even pump housings for anything from dishwashers to irrigation dams.

The industry needs Product Designers to design the precision moulds and Patternmakers, Fabricators and Moulders to bring their designs to reality. Metallurgists, Testers and Finishers ensure the final product is of the highest quality and finish.

Metal Casters fabricate mould patterns and construct sand moulds and cores for the production of cast metal products. They utilise ferrous and non-ferrous metals, such as nickel alloy, steel, iron and aluminium.

The skills you learn in working on Cast Metals could also see you moving across to work in related industries such as Light Fabrication, Aerospace, Marine and Automotive.



**Scott Lanham**

"The thing I like about what I do is seeing something that you drew, see it go through the numerous processes that are in the plant, and then see it come out the other end as a finished piece of equipment.

If you are a person who is a 'maker' and you love making things with your hands; if you are very conceptual and you love to think of ideas – perhaps then a trade can be a very fulfilling way to go..."

**Tooling Designer @ Toowoomba Metals**

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# CAST METALS PRODUCT DESIGN



From the smallest precision component to a propeller for a supertanker, every cast metal product needs to be designed to match a client's need.

As a Design Engineer you will undertake extensive research and consultation to identify the client's requirements for their new product or process. You will also develop specifications for new products, focusing on cost, method of production, new technology and business objectives.

Another challenging area is Tooling Design. The Tool Designer designs precision tools that not only create the desired shapes to high tolerances, but also ensure the proper flow of molten metal throughout the mould. Today's technology allows for 'rapid prototyping', a technique used to produce detailed simulations prior to manufacturing tooling or moulds.



1952: Merv Richardson builds the first Victa lawnmower in his garage in Sydney.  
1953: 6 staff in 1 shed producing 60 Victas a week.  
1966: The 1 millionth Victa rolls out.  
1983: 30 years, 4 million mowers.  
2000: Victas star in Opening Ceremony of Sydney Olympics.  
2002: 50 years, more than 6 million Victas.  
2004: Victa Razor mower wins Australian Design Award

Victa has also produced ride-on mowers, brushcutters, shredders...even an aeroplane, the Airtourer (which does not cut grass).

**CUTTING EDGE**

If you have good technical skills, enjoy the challenges of design and development and like working with computer aided design (CAD) software, this could be a great career for you.

Relevant qualifications that could lead to a job in this area are to be found in the Metal and Engineering Training Package ([see the Qualifications InfoSheet](#)).



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# METALLURGY



The quality of the metals used in components is as important as the process of manufacturing itself. Metallurgists understand the fundamental science of minerals and metals and work with engineers in the manufacture of metal products.

As a Metallurgist in a cast metals manufacturing plant you would be responsible for testing the quality and composition of the metals used at the various stages of manufacturing processes.

You will conduct studies of metals and alloys before and during processing to determine their properties, supervise sampling for laboratory analysis, and examine metal processing techniques to ensure that quality is maintained.

You could also investigate whether methods being used are the most cost effective, environmentally acceptable, and efficient. You would then work out adjustments in



Early alchemists were considered crackpots, pseudo-scientists, or charlatans who attempted to turn lead into gold. Most were serious, intelligent scholars, innovators investigating the nature of substances and processes, very like today's metallurgists.

And guess what? In 1980, American Nobel Prize winning chemist Glenn Seaborg finally transmuted lead into gold. However the amount of energy used and the microscopic amount of gold created negated any possible commercial application.

**NEVER SAY NEVER**

temperature, raw material mixtures and other processing variables in order to improve methods and processes.

The skills you learn in Metallurgy could also see you working in related areas such as corrosion control, non-destructive testing and heat treatment of metals.

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# NON-DESTRUCTIVE TESTING



Today's high-speed, hi-tech world demands stringent standards of quality assurance. Any manufactured good requires rigorous testing prior to use, as well as in-service. The field of Non-Destructive Testing (NDT) plays an important role in testing and quality control within manufacturing processes.

Working in Non-Destructive Testing (NDT), you will examine and test products and materials for quality standards by methods that do not affect their usefulness. You might perform tests for cast components that are used in engines and commercial products.

NDT and analysis provides data to evaluate ductility, strength, toughness, corrosion resistance and fatigue properties of metals. As an NDT technician you will use various techniques such as radiography, ultrasonics, liquid (dye) penetration, eddy



Non-Destructive Testing (NDT) is carried out on all sorts of things, for example airframes (the mechanical structure of an aircraft) and spaceframes, such as those interlocking truss frameworks that make possible unsupported roofs of sports stadiums.

It is also used to test bridges and other structures such as storage tanks and amusement park rides. NDT is used, in general, in applications where one needs to test something but cannot afford for it to be destroyed in the process.

TESTING TESTING TESTING

current and magnetic particle testing. You will also use your testing skills to ensure the correct operation of machinery within assembly processes.

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# CAST METALS CASTING & MOULDING



The craft of casting and moulding is almost as old as the discovery of metals themselves. From steam trains to modern airliners almost everything that has been manufactured contains some cast metal products.

Components of all shapes and sizes require skilled, precision construction of timber, metal patterns and sand moulds. As a Patternmaker you will use computer aided design (CAD) equipment and computer numerical controlled (CNC) machinery to design and make patterns using wood, polystyrene, metal, polymer and other materials. Skilled patternmakers can be highly paid because of the specialised nature of their trade.

As a Casting Fabricator or Moulder, you will fashion moulds and cast metal into shapes for a wide range of components such as engine blocks, automotive



Casting has been around for thousands of years, possibly since 5500 years BC. There is proof of systematic iron production in the Hittite Empire in 1400 BC, and possibly in India from 1800 BC.

Examples through the ages include:

- 1454: Johannes Gutenberg, inventor of the 'modern' printing press, uses sand moulds to cast his type.
- 1814: John Jethro Woods invents a plough with a replaceable cast-iron tip.

Casting and moulding still uses many traditional principals but with modern technology and hi-tech materials.

SHAPES

components, train bogeys, stove parts, pumps and wheels. You will use patterns and mix chemically bonded sand to form moulds, tend the furnace and operate automated moulding equipment. This can be physical and challenging work.

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# CAST METALS SURFACE FINISHING



Surface Finishing adds the final touches to cast metal products before they are delivered to a customer. It provides protection and hard wearing surfaces for metals that are prone to oxidation (for example rust in steel, which can deplete structural integrity and eventually destroy a metal product).

As a Surface Finisher in the cast metals industry you will coat the surfaces of cast metal parts and components using a variety of techniques, such as electrolytic (electric current) processes, organic coatings or galvanizing. You will pre-treat parts and components prior to coating, maintain treatment solutions, and be responsible for the flow of work through the treatment.

Working in Electroplating or Industrial Painting you will perform these processes by controlling automated machines and processes to ensure the highest quality of finish.



Laminar flow is when a fluid, or air, flows in parallel layers, with no disruption between the layers. Disruption to flow will create friction which creates drag, and drag slows things down.

A smooth, polished surface reduces friction, which keeps air or water flows laminar. This is why high-speed aircraft have smooth polished skins, and Formula One race cars are highly polished and aerodynamic in shape.

How to reduce friction? A clean, polished surface finish.

**SMOOTH**

If you like to see a job well done, and if you can set and maintain high standards working in a physical environment, then Surface Finishing could prove a highly rewarding career choice for you.

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