Glossary

Many of the terms listed in the glossary are described in greater detail in Part 5: Overview of Foundry Processes.

Alloy	A substance having metallic properties and composed of two or more chemical elements of which at least one is metal. Usually possesses qualities different from those of the components.
Baghouse dust	Small solid particles created by the breaking up of larger particles by an process. Typically dusts are created in the foundry industry from metals, sand, and other refractories. These materials are often collected in baghouses (extraction and filtration systems).
Binders	Materials, both organic and inorganic, that are added to the mould materials to achieve sufficient mould hardness.
CAD / CAM	Computer-Aided Design / Computer-Aided Manufacture.
Captured foundry	Refers to a foundry operation that that is wholly incorporated into a larger manufacturing operation and produces castings exclusively for that operation.
Casting	The process of pouring molten metal into a cavety to form a solid metal shape.
Charge	The metal and alloy materials that comprise the melt.
Core	Part of the mould which forms the internal shapes or parts of a casting which cannot be shaped by the pattern.
Crucible furnace	A furnace fired with coke, oil, gas, or electricity in which metals are melted in a refractory crucible.
Cupola furnace	A traditional furnace that uses coke as the fuel source to melt the charge.
Dimensional accuracy	The specified allowable difference in limiting sizes from the initial design and the final casting. Precision casting processes typically achieve higher dimensional accuracy.
Direct-Arc Furnace	An electric arc furnace in which the metal being melted is one of the poles.
Ferrous metal	Refers to alloy in which the predominate metal is iron. This includes iron and steel.

Fettling and cleaning	The removal of gates, runners, risers and sand from the rough casting. Also involves any hand finishing such as grinding, blasting or polishing.
Flash	A thin section of metal formed at the mold, core, or die joint or parting in a casting due to the cope and drag not matching completely or where core and coreprint do not match.
Gating systems	Gating systems are designed to allow the metal to flow in to the mould and to aid appropriate solidification of the metal. Gating systems typically include the **sprue** where the metal is poured, **gates** which allow the metal to enter the running system; **runners** which carry the molten metal towards the casting cavity; **risers** which may have several functions including vents to allow gases to be released, reservoirs prior to the casting cavity to aid progressive solidification, and waste cavities to allow metal to rise from the casting cavity to ensure it is filled and to remove the first poured metal from the casting cavity, thus avoiding solidification problems
Green sand	A naturally bonded sand mould mixture which includes silica, bentonite clay, carbonaceous material and water. Green refers to the fact the material is wet.
Gross weight of cast	The weight of the casting as poured. This includes the actual product plus the metal in the gating system (see also **net weight**).
Impurity	An element unintentional allowed in a metal or alloy. Some impurities have little effect on properties; others will grossly damage the alloy.
Inclusion	Nonmetallic materials in a metal matrix. Sources include reoxidation, refractories, slag, and deoxidization products.
Indirect-Arc Furnace	An AC (Alternating Current) electric-arc furnace in which the metal is not one of the poles.
Induction Furnace	A AC melting furnace which utilizes the heat of electrical induction.
Investment casting	Casting produced in a mold obtained by investing an expendable pattern with a refractory to produce a shell. The expendable pattern may consist of wax, plastic, or other material and is removed prior to filling the mold with liquid metal.

Jobbing foundry	Refers to a foundry operation that produces a wide range of castings, typically in small batches, for various customers (see also **repetitive foundry**).
Ladle	Metal receptacle frequently lined with refractories used for transporting and pouring molten metal. Types include hand bull, crane, bottom-pour, holding, teapot, shank, lip-pour.
Lining	Inside refractory layer of firebrick, clay, sand, or other material in a furnace or ladle.
Lost Foam Process	Casting process in which a foam pattern is removed from the cavity by the molten metal being poured.
Metal yield	Comparison of weight of finished castings to total weight of metal melted.
Mould	The mould forms the cavity into which the metal is poured. The mould forms the -ve of the final cast shape and also includes the necessary gating systems. For traditional two part sand moulds the top of the mould is called the cope and the bottom is called the drag.
Net weight of cast	The weight of the actual casting once all excess metal from the gating system has been removed (see also **gross weight**).
Non-ferrous metal	Refers to alloy in which the predominate metal is not iron. Predominant metals include aluminum, bronze, copper, gunmetal etc.
Oxidation losses	Reduction in amount of metal or alloy through oxidation. Such losses usually are the largest factor in melting loss.
Oxidizing atmosphere	Furnace atmosphere which gives off oxygen under certain conditions or where there is an excess of oxygen in the product of combustion, or the products of combustion are oxidizing to the metal being heated.
Pattern	The pattern is a +ve replica of the final casting typically including the gating systems.
Pigging	The practice of pouring excess molten metal into refractory lined containers for solidification and return to the furnace.
Quenching	Rapid cooling of hardening; normally achieved by immersion of the object to be hardened in water, oil, or solutions of salt or organic compounds in water.

Rapid prototyping	Equipment used for computerized building of three-dimensional models and patterns. Enables the data representation of a CAD solid model to be directly converted into a plastic model of a casting.
Reducing atmosphere	Furnace atmosphere which absorbs oxygen under suitable conditions or in which there is insufficient air to completely burn the fuel, or the product of combustion is reducing to the metal being heated.
Repetitive foundry	Refers to a foundry operation that produced continuous production runs of a set number of castings (see also **jobbing foundry**).
Replicast process	A ceramic shell process similar to the investment casting process. Uses a pattern made from expanded polystyrene and is surrounded by a thin ceramic shell.
Sand Casting	Metal castings produced in sand molds.
Sand Reclamation	Processing of used foundry sand grains by thermal, attraction or hydraulic methods so that it may be used in place of new sand without substantially changing current foundry sand practice.
Scrap and reject	Scrap typically refers to all non-product metal including runners and risers and reject product. This is also referred to as foundry returns or " revert ".
Shaw Process	A precision casting technique in ceramic molds which do not require wax or plastic investment.
Shell moulding	A process for forming a mold from resin-bonded sand mixtures brought in contact with pre-heated metal patterns, resulting in a firm shell with a cavity corresponding to the outline of the pattern.
Shotblasting	Casting cleaning process employing a metal abrasive (grit or shot) propelled by centrifugal or air force.
TCLP	Toxic Characteristic Leaching Procedure. A specific test to measure the leaching potential of solid waste.
Vacuum Casting	A casting in which metal is melted and poured under very low atmospheric pressure; a form of permanent mold casting where the mold is inserted into liquid metal, vacuum is applied, and metal drawn up into the cavity.

An annotated Guide to Resources Available on the Internet

This section provides a list of many of the best Cleaner Production resources available on the web. All the links listed were accurate as at October 1999. If the sites change in the future, it may be possible to located the new address by doing a general internet search. In general, Excite and Alta Vista were found to be the most suitable for locating information on the foundry industry.

The Future of Metal Casting

The Cast Metal Coalition in the United Stated has developed a Metalcasting Industry Technology Roadmap. This document, accompanied by the report "Beyond 2000: A vision for the American Metalcasting Industry" provides a good strategic framework for developing R&D needs for the Australian foundry industry. These documents are fully down-loadable in PDF format.

http://www.oit.doe.gov/metalcast/roadmap.shtml

Cleaner Production Guides

USEPA Sector Notebook for the Metal Casting Industry

This is an authoritative guide to Pollution Prevention (Cleaner Production) in the casting industry. This provides valuable background information about the sector as well as practical improvement opportunities.

http://es.epa.gov/oeca/sector/

Environment Canada Technical Pollution Prevention Guide for Foundries

This is an excellent guide for practicing foundries offering detailed advice aimed at cost effective implementation of Cleaner Production programs in the sector.

http://yvrwww1.pyr.ec.gc.ca/ec/frap/frapdata/frap/pollu.html

Clean Technologies in U.S. Industries: Focus on Metal Fabrication

This site contains some additional information about clean technology in the foundry indusrty.

http://www.usaep.org/reports/metal.htm

Energy Efficiency Best Practice Programme

This site gives details of a the hardcopy publications that can be ordered from the site. These reports are free of charge to companies within the UK only. The reports contain valuable information.

http://www.etsu.com/eebpp/

Cleaner Production Case Studies

Cleaner Production Demonstration Project at Auscast

This site provides the full report of the Cleaner Production assessment undertaking by Dames and Moore Consultants for Auscast in 1994-1997. It provides detailed of a number of potential projects including sand reclamation, improved sand quality; trials of new resins and odour control; and improved recycling of solid waste materials.

http://www.environment.gov.au/epg/environet/eecp/case_studies/cs_aus1.html

Francis W. Birkett & Sons Limited

Article, Foundry casts net over sand waste. This site provides a brief summary of a sand reclamation project at a foundry.

http://www.waste-management.co.uk/studies/birkett.htm

Decatur Foundry, Inc.

Infrared Drying. This site describes an infrared drying project that helped the company overcome problems associated with the change from solvent- to water-based paints.

http://www.aceee.org/p2/p2cases.htm#decatur

KHD Humboldt Wedag.

This case study discusses how an internal reuse of foundry sand reduces sand waste by 75% and reduces stack emissions at the company.

http://www.unepie.org/icpic/castu/castu152.html

Wolverine Bronze Company

This case study discusses Low Energy Recycling of Foundry Sand.

http://es.epa.gov/techinfo/case/michigan/mich-cs4.html

Progress Casting Group, Inc.

This aluminum foundry replaced TCA with water-based coatings. The case discusses the Cleaner Production implications.

http://www1.umn.edu/mntap/P2/FOUND/cs93-e1.htm

Ashley Forge

Common sense approach to hard waste savings. This brief case discusses a number of opportunities developed at the foundry to reduce some general waste streams.

http://www.waste-management.co.uk/studies/ashley.htm

The Casting and Development Centre

This site has a number of case studies particularly for CAD/CAM technologies, casting simulation and other methoding techniques.

http://www.castingsdev.com/

Other Case Study Sites

This site provides a number of brief Cleaner Production case studies for the foundry industry.

http://www.wmrc.uiuc.edu/packets/primmetals/chapter3.htm

Beneficial Use

Beneficial Use Information Centre

This centre at the University of Wisconsin-Madison USA provides a wealth of information about potential beneficial use options for the foundry industry. The site is designed to 1) collect and disseminate published and non-published information sources, 2) undertake detailed technical reviews of the beneficial use options, and 3) identify topics in need of research.

http://geoserver.cee.wisc.edu/buic/

CWC Technology Brief, Beneficial Reuse of Spent Foundry Sand

This brief fact sheet provides some information about a range of potential beneficial reuse projects.

http://www.cwc.org/briefs/industrial.html

Process Information

TIA Process Information

This site provides a brief description and some technical specifications for many of the common casting techniques.

http://www.metalbot.com/cast.html

Wynn Danzur Group

The Wynn Danzur Group presents a summary of many of the major molding processes.

http://www.wynndanzur.com/toppage1.htm

The Engineering Zone

Other process information is available at this site. As well as a wide range of casting techniques, this site offers detailed information on rapid prototyping, rapid tooling and other metal working processes such as forging, machining, and surface finishing.

http://www.flinthills.com/~ramsdale/EngZone/casting.htm

The Castings Development Centre

The Centre specializes in the Replicast process which, along with conventional lost foam processes, are explained in some detail at this site.

http://www.castingsdev.com/

Foundry Online

This is a good site for general process information. The site includes information on the histroy of metal casting, the major processes and new developments including Rapid Prototyping.

http://www.implog.com/foundry/foundrp.htm

The Hitchener Process

The Hitchener Homepage provides some technical information about the innovating casting process.

http://www.hitchiner.com/home.html

Casting Source Directory

This directory contains a number of technical articles that discuss the advantages and disadvantages of a number of casting processes.

http://www.castingsource.com/

Primary Metals

This site contains good process descriptions particularly with reference to sand reclamation techniques. Several short case studies and diagrams are included.

http://www.wmrc.uiuc.edu/packets/primmetals/chapter3.htm

Rapid Prototyping

This site provides a detailed technical report on the emerging technologies of Rapid Prototyping. Good information on conventional mould casting, investment casting, casting simulation technology and other foundry processes is also available here.

http://itri.loyola.edu/rp/toc.htm

Another site that provides useful information on this topic can be found at:

http://www.biba.uni-bremen.de/groups/rp/rp_sites.html

See also:

http://www.biba.uni-bremen.de/groups/rp/rp_page.html

http://www.cs.hut.fi/~ado/rp/rp.html

Casting Simulation Systems

The National Centre for Excellence in Metalworking Technology provides a number of technical bulletins on advanced forming processes and casting simulation techniques.

http://www.ncemt.ctc.com/thrustAreas/bulletin/castone.html

A good overview of simulation techniques can be found at:

http://www.castech.fi/ARTICLES/ADI/index.html

See also:

http://mama.minmet.uq.edu.au/cast/service.html

http://www.magmasoft.com

Other Links

Metalcasting Industry Hotlinks

This site has a wide range of links to foundry industry sites on the web.

http://www.oit.doe.gov/metalcast/hotlinks.shtml

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