

Metal Casting

Terms and Definitions

Metal Technologies

Table of Contents

A..... 2
B..... 2
C..... 2
D..... 4
E..... 5
F..... 5
G..... 5
H..... 6
I..... 6
J..... 7
L..... 7
M..... 7
N..... 8
O..... 8
P..... 9
R..... 9
S..... 10
T..... 11
U..... 11
V..... 12
W..... 12

A

Anchor: Appliance used to hold cores in molds.

Annealing: The process of heating a metal and slowly cooling it; reducing the brittleness and increasing the strength of the metal.

Arbor: A device to reinforce or lift a mass of sand.

[\[back to top\]](#)

B

Bedding in: Sinking a pattern in to the sand by excavating a "bed" in which the pattern is placed for ramming up. Binders: Materials used to hold molding sand together.

Blackheart: American type of malleable iron. The normal fracture has a medium gray outer rim and a very black interior.

Blister: A surface bubble caused by gas expansion (usually from heating) which was trapped within the die casting or beneath the plating.

Blow Hole: Hole in the casting caused by trapped air or gases.

Bottom Board: The board on which a mold rests.

[\[back to top\]](#)

C

Casting: (v.) The process of pouring molten metal into a mold to create metal parts in shapes determined by the mold.

Casting: (n.) The metal shape, exclusive of gates and risers, that is obtained as a result of pouring metal into a mold.

Cast Iron: Iron shaped using any number of casting processes. Gray Iron is by far the oldest and most common form of cast iron. As a result, it is assumed by many to be the only form of cast iron and the terms "cast iron" and "gray iron" are used interchangeably.

Cavity: The recess or impressions in a die in which the casting is formed.

Centrifugal Casting: Process of filling molds by pouring metal into a mold which is spinning or revolving about an axis. Cast iron pipe can be created using this method.

Chaplet: A metal support used to hold a core in place in a mold. Not used when a core print will serve.

Cheek: The portion of a flask placed between the cope and drag when a mold has more than two sections.

Checking: Fine cracks on the surface of a die which produce corresponding raised veins on die castings caused by repeated heating of the die surface by injected molten alloys.

Chill: A metal object placed in the wall of a mold, causing the metal to solidify more rapidly at such a point.

Choke or Primary Choke: The part of the gating system that most restricts or regulates the flow of metal into the mold cavity.

Close Over: The operation of lowering a part of the mold over some projecting portion such as a core.

Coke: Coal derivative resulting from the distillation of bituminous coal in the absence of air. The distillation process removes all of the volatile material from the coal so it can be used as a very intense source of fuel in cupola melting.

Cold Box Process: A rapid coremaking process which does not require application of heat to cure the cores. Hardening of the cores is accomplished by chemical reaction rather than by conventional baking. A phenolic resin is added to the sand used to make the core. This resin reacts chemically when exposed to an accelerator (typically an active organic gas) and hardens very quickly, forming an organic bond in the core sand. This reaction occurs at room temperature and does not require special coreboxes or equipment. Additionally, since the bond is organic, the sand collapses readily during shakeout and can be recovered easily from the casting.

Cold chamber machine: A type of casting machine in which the metal injection mechanism is not submerged in molten metal.

Cold Shut: The imperfect junction where two streams of metal meet but do not fuse.

Compacted Graphite Iron: An iron with elongated graphite particles with rounded edges and roughened surfaces. It possesses characteristics of both gray and ductile iron.

Contraction: Decrease in size due to cooling of the metal after it is poured. Shrinkage is the term applied to the decrease in volume of a metal from liquid to solid stage. Contraction immediately follows shrinkage.

Cope: The upper or topmost section of a flask.

Cores: A separated part of the mold, made of sand and generally baked, which is used to create openings and various shaped cavities in the casting.

Core Box: A mold in which a core is formed.

Core Dryer: A metal form in which the core is baked.

Core Rod: Irons or bars imbedded in a core to strengthen it.

Creep: Plastic deformation of metals held for long periods at stresses lower than yield strength.

Crucible: A ceramic pot with refractory properties typically made of clay in which metal is melted for casting.

Crushing: The pushing out of shape of core or mold when two parts of the mold do not fit properly.

Cupola: Vertically oriented, tube shaped melting furnace in which the metal is melted in direct contact with the fuel.

[\[back to top\]](#)

D

Die lubricant: Liquid formulations applied to the die to facilitate casting release and prevent soldering.

Dimensional stability: Ability of a component to retain its shape and size over a long period in service.

Dowel: A pin used between the sections of parted patterns or core boxes to locate and hold them in position.

Draft: Slight taper given to a pattern to allow drawing from the sand.

Drag: The bottom part of a flask or mold.

Drawback: A part of the mold, made of green sand, which may be drawn back to clear overhanging portions of the pattern. It is rammed up on a plate or arbor so that it can be lifted away.

Drawing: Removing the pattern from the sand.

Drop or Drop Out: The falling away of a body of sand when the mold is jarred or lifted.

Ductile Iron: A type of iron in which the graphite content takes spherical rather than flake form. Ductile iron is produced by adding magnesium. The spherical form of the graphite provides greater tensile strengths and flexibility than other types of iron.

[\[back to top\]](#)

E

Electric Arc Furnace: A crucible furnace that uses an electric arc (similar to an electric arc welding operation) to melt metal.

Ejector marks: Marks left on castings by ejector pins.

Ejector plate: A plate to which ejector pins are attached and which actuates them.

[\[back to top\]](#)

F

Feeding: Supplying additional molten metal to a casting to make up for volume shrinkage during solidification.

Fillet: Curved junction of two surfaces, e.g., walls which would meet at a sharp angle.

Flask: A metal or wood frame, without a fixed top or bottom, in which the mold is formed.

Flask Pins: Pins to fit corresponding sockets on the joint of a flask to permit separation.

Feed Head: A reservoir of molten metal from which the casting feeds as it solidifies. Also called a riser.

Fin: A thin projection on a casting due to an imperfect joint in the mold.

Fillet: A concave corner piece used at the intersection of two surfaces to round out a sharp corner.

Follow Board: A board shaped to the parting line of the mold.

[\[back to top\]](#)

G

Gaggers: Metal supports shaped like the letter "L" that are used to reinforce the sand in the mold.

Gate: A channel through which the molten metal enters the casting cavity.

Gating System: The complete arrangement of gates, runners, and sprues through which molten metal flows into the cavity of the mold.

Gooseneck: Spout connecting a metal pot or chamber with a nozzle or sprue hole in the die and containing a passage through which molten metal is forced on its way to the die. It is the metal injection mechanism in a hot chamber type of die casting machine.

Gray Iron: Iron in which a large percentage of the carbon content is in the form of graphite flakes. The graphite flakes cause it to have low shock resistance, but high damping ability. It has a gray fracture. Gray Iron is by far the oldest and most common form of cast iron. As a result, it is assumed by many to be the only form of cast iron and the terms "cast iron" and "gray iron" are used interchangeably.

Green Sand: Natural sands combined with water and organic additives (such as clay) to proper consistency for creating molds.

Green-sand Core: A core that is made of molding sand but not baked.

[\[back to top\]](#)

H

Head: The pressure exerted by a column of fluid, such as molten metal, water, etc.

Hot Box Process: Method of making and curing cores within a heated corebox. To form and cure the core, the corebox is heated to approximately 500 degrees F. The sand used in this process contains a catalyst which hardens the binders in the core upon contact with the hot corebox. Complete curing while the core is still in the box results from the residual heat in the core, eliminating the need for conventional dryers or ovens. Frequently, cores created with the Hot Box process are shell cores.

Hot chamber machines: Die casting machines which have the plunger, gooseneck (metal pressure chamber) immersed in molten metal in the holding furnace.

Hot short: Term used to describe an alloy which is brittle or lacks strength at elevated temperatures.

Hot Spots: Areas of extra mass usually found at the junction of sections.

Hot Tears: Cracks in metal castings formed at elevated temperatures by contraction stresses.

[\[back to top\]](#)

I

Impact strength: Ability to resist shock, as measured by a suitable testing machine.

Impression: Cavity in a die. Also, the mark or recess left by a ball, or penetrator of a hardness tester.

Ingot: Metal or alloy cast in a convenient shape for storage, shipping and remelting.

Injection: The process of forcing molten metal into a die.

Insert: A piece of material, usually metal, which is placed in a die before each shot. When molten metal is cast around it, it becomes an integral part of the die casting.

Intergranular corrosion: A type of corrosion which preferentially attacks grain boundaries of metals or alloys, resulting in deep penetration.

Investment Casting: Method of casting using an expendable pattern of wax, plastic, or other material which is "invested" or surrounded by a molding medium in slurry or liquid form. After the molding medium has solidified, the pattern is removed by subjecting the mold to heat, leaving a cavity for reception of molten metal. Also called lost-wax molding.

Isocure: Trade name of a binder system developed for use in the cold box process of core construction.

[\[back to top\]](#)

J

Jarring Machine: A molding machine that packs the sand by jarring.

Jig: A device arranged to expedite a hand or machine operation.

[\[back to top\]](#)

L

Loam Mold: A mold built up of brick, covered with a loam mud, and then baked before being poured.

Loose Piece: Part of a pattern that remains in the mold and is taken out after the body of the pattern is removed.

[\[back to top\]](#)

M

Machine Finish: Allowance of stock on the surface of the pattern to permit the machining of the casting to the required dimensions.

Malleable Iron: Iron that may be altered in shape by hammering or by the pressure of rollers without exhibiting fracture or brittleness. The majority of the carbon content is in the form of graphite nodules rather than flakes.

Master Pattern: An original pattern made to produce castings which are then used as metal patterns.

Match Plate: A plate to which the pattern is attached at a parting line.

Metal saver: Core used primarily to reduce amount of metal in a casting and to avoid sections of excessive thickness.

Mold: A body of molding sand or other heat-resisting material containing a cavity which forms a casting when filled with molten metal.

Molding Sand: A sand which binds strongly without losing its permeability to air or gases.

Multiple cavity die: A die having more than one duplicate impression.

[\[back to top\]](#)

N

Nowel: The lower section of the flask; commonly called the drag.

Nozzle: Outlet end of a gooseneck or the tubular fitting which joins the gooseneck to the sprue hole.

[\[back to top\]](#)

O

Overflow-well: A recess in a die connected to a die cavity by a gate to assist in proper venting.

Overhang: The extension on the vertical surface of a core print, providing clearance for closing the mold over the core, also known as "shingle."

[\[back to top\]](#)

P

Parting: Joint where mold separates to permit removal of the pattern.

Parting line: A mark left on a die casting where the die halves meet; also, the mating surface of the cover and ejector portions of the die.

Parting Sand: A bondless sand dusted on the parting to prevent the parts of the mold from adhering to each other.

Plunger: Ram or piston which forces molten metal into a die.

Port: Opening through which molten metal enters the injection cylinder.

Porosity: Voids or pores resulting from trapped gas, or shrinkage during solidification.

Pouring: Filling the mold with molten metal.

Process control: Where parameters of a process are studied and correctly applied in the manufacturing process to produce high quality parts.

[\[back to top\]](#)

R

Ramming Up: The process of packing the sand in the mold or core box with a rod or rammer.

Rapping: Loosening the pattern from the mold by jarring or knocking.

Rechucking: Reversing a pattern upon a face plate to permit turning the opposite face to the required shape.

Rheocasting: Also called flow casting. A metal forming process in which a semi-solid metal is used to make the casting. The solid metal is heated to a partly liquid, softened state and then pressed into the final form. The finished part has closer tolerances, better surface finish, higher strength, and lighter weight than a similar part made with traditional casting techniques.

Riser: A column of metal placed in the mold to feed the casting as it shrinks and solidifies. Also known as a "feed head."

Rolling Over: Operation of turning flask over to reverse its position.

Runner: The channel through which the molten metal is carried from the sprue to the gate.

[\[back to top\]](#)

S

Sand Molding: Process in which moist sand is compressed into a hollow form. Molten metal is then poured into the form to fill the cavity. When the metal has solidified, the sand is broken away by vibration leaving the metal casting.

Shakeout: The stage in the casting process where the sand from the mold is cleaned off of the newly formed castings through vigorous vibration.

Shell Process: Process in which clay-free silica sand coated with a thermosetting resin or mixed with resin is placed on a heated metal pattern for a short period of time to form a partially hardened shell. The bulk of the sand mixture inside the resulting shell is removed for further use. The pattern and shell are then heated further to harden or polymerize the resin-sand mix, and the shell is removed from the pattern. Frequently, shell cores are made using the Hot Box process.

Shrinkage: The decrease in volume when molten metal solidifies.

Shrink Hole: A cavity in a casting due to insufficient feed metal.

Shot: That segment of the casting cycle in which molten metal is forced into the die.

Sizing: A primary coating of glue applied to the end grain of wood to seal the pores.

Skeleton Pattern: A framework representing both the exterior and interior of the shape of the casting.

Slab Core: A plain flat core.

Slag: The nonmetallic covering on molten metal resulting from the combination of impurities in the initial charge like ash from fuel, and any silica and clay eroded from the refractory lining. It is skimmed off prior to pouring the metal.

Slide: The portion of the die arranged to move parallel to die parting. The inner end forms a part of the die cavity wall that involves one or more undercuts and sometimes includes a core or cores.

Slurry: Thin watery mixture such as the gypsum mixture for plaster molding, the molding medium used for investment casting, core dips, and mold washes.

Snap Flask: A flask that has hinges and latches so that it may be removed from the mold prior to the pouring.

Soldering: Adherence of molten metal to portions of the die.

Soldiers: Wooden pegs used to reinforce a body of sand.

Spectrography: Process for determining the concentration of metallic constituents in a metal or alloy by the intensity of specific wavelengths generated when the metal or alloy is thermally or electrically excited.

Split Pattern: A pattern that is parted for convenience in molding.

Sprue: The opening into which the metal is first poured.

Sprue pin: A tapered pin with rounded end projecting into a sprue hole and acting as a core which deflects metal and aids in the removal of the sprue.

Strike or Strickle: A template or straightedge used for removing excess sand from a mold or core box.

Stock Cores: Standard cores of common diameters which are kept "in stock" for general use.

Stopping Off: Closing off a part of the mold that is not wanted.

Stripping Plate: A plate, formed to the contour of the pattern, which holds the sand in place while the pattern is drawn through the plate.

Sweep or Skree: A board shaped to a required profile. It is used to remove excess material from a mold or core.

Sweep Work: Forming molds or cores by the use of jigs or templates instead of patterns.

[\[back to top\]](#)

T

Toggle: Linkage employed to mechanically multiply pressure when locking the dies of a casting machine.

Trim die: A die for shearing or shaving flash from a die casting.

Tucking: Pressing the sand in place with the hands.

Tuyere: Opening in the cupola where the air blast enters.

[\[back to top\]](#)

U

Unit die: A die interchangeable with others in a common holder.

Undercut: Recess in the side wall or cored hole of a casting disposed so that a slide or special form of core (such as a knockout) is required to permit ejection of the casting from the die.

[\[back to top\]](#)

V

Vent: Small opening in the mold to facilitate escape of air and gases.

Vibrator: A mechanical device used to loosen a pattern from a mold.

Void: A large pore or hole within the wall of a casting usually caused by entrapped gas. A blow hole.

[\[back to top\]](#)

W

Warm Box Process: Coremaking method in which the corebox is warm when the core sand is introduced. The warmth of the corebox initiates curing but does not complete it. Cores finish curing outside the corebox (sometimes in a separate dryer), allowing for faster core production cycles than with the Hot Box process. Cores created using this process must be solid- they cannot be shell cores.

Waterline: A tube or passage through which water is circulated to cool a casting die.

[\[back to top\]](#)