

GLOSSARY

TECHNICAL METALS AND MINING TERMS

Bars

Long steel products that are rolled from billets. Merchant bar and reinforcing bar (rebar) are two common categories of bars. Merchant bar includes rounds, flat-bulbs, angles, squares and channels that are used by fabricators to manufacture a wide variety of products, such as furniture, stair railings and farm equipment. Rebar is used to strengthen concrete in highways, bridges and buildings.

Basic oxygen furnace (BOF)

A pear-shaped furnace, lined with refractory bricks, which refines molten iron from the blast furnace and scrap into steel due to the oxidising action of oxygen blown into the melt under a basic slag. The basic oxygen process is the most powerful and effective steel making method. About 67% of the crude steel in the world is made in BOFs.

Blast furnace (BF)

A towering cylinder lined with heat-resistant (refractory) bricks, used by integrated steel mills to smelt iron from ore. Its name comes from the 'blast' of hot air and gases forced up through the iron ore, coke and limestone that load the furnace. Under extreme heat, chemical reactions among the ingredients release liquid iron from the ore.

Coils

Hot, cold or coated flat-rolled products, supplied in regularly wound coils.

Coke

Coke is the solid product obtained from the dry distillation of coking coal in the absence of oxygen. Depending on property, coke is known as hard coke, soft coke and metallurgical coke.

Coking coal

Coking coal is those varieties of coal that, on heating in the absence of oxygen (a process known as carbonisation), undergo transformation into a plastic state, swell and then re-solidify to produce a cake. On quenching, the cake results in a strong and porous mass called coke. Coking coal needed to produce blast furnace coke (the right type of fuel/reductant needed for a blast furnace) is characterised by certain specific properties in terms of appropriate composition (low ash (up to 10%), volatile matter (17-26%) and low sulphur and phosphorous content, etc).

Cold rolling

Plastic deformation of a metal at room temperature that might result in substantial increases in strength and hardness. The usual end product is characterised by improved surface, greater uniformity in thickness and improved mechanical properties compared with hot-rolled steels. Cold-rolled products typically include sheets, coils, strips and rebars, among others.

Continuous casting

A method of casting steel into a billet, bloom or slab directly from its molten form. Continuous casting avoids the need for large, expensive mills for rolling ingots into semi-finished products. Continuous cast slabs and billets also solidify in a few minutes, compared with several hours for an ingot. As a result, the chemical composition and mechanical properties are more uniform. Steel from the BOF or electric furnace is poured into a tundish (a shallow vessel that looks like a bathtub) atop the continuous caster. As steel carefully flows from the tundish down into the water-cooled copper mould of the caster, it solidifies into a ribbon of red-hot steel to form slabs or blooms.

Continuous improvement (CI)

An aspect of lean manufacturing, CI encompasses various changes in business processes that aim to improve operational results by taking a systematic approach to analysing problems and finding solutions throughout an organisation.

Crude steel

Liquid steel used to make steel castings. The term is also internationally used to mean the steel produced in basic oxygen furnaces, electric arc furnaces and open-hearth furnaces.

Crusher and conveyor system

A transportation system used to move bulk materials from mine shafts and open pits to the surface for further processing.

Downstream

In manufacturing, this term refers to processes that happen later in a production sequence or production line.

Direct reduced iron (DRI)

Solid metallic iron product obtained upon direct reduction of high-grade iron ore in solid state itself without being converted into liquid form like that in a blast furnace. DRI is also known as sponge iron because of its spongy micro structure. Merchant DRI product is delivered mainly in the form of pellets or briquettes.

Environmental Impact Identification (ENVID)

A systematic approach designed to identify and reduce the risk of incidents that can damage the surrounding environment, and to limit the environmental impact throughout the production process.

Enterprise Resource Planning (ERP)

An integrated system of software applications used by companies to monitor all core aspects of their business, such as purchasing to manufacturing to sales, facilitating information sharing and allowing managers to make decisions informed by a global view of what is happening across the supply chain.

Fe content

The chemical symbol for iron, Fe, comes from the Latin word 'ferrum'. Fe content refers to the iron content of an ore.

Ferroalloy

Alloys consisting of certain elements (Mn, Si, Mo, V, Ni, B, Cr and so on) combined with iron and used in steelmaking to reach the necessary chemical composition and properties of steel products. In some cases, the ferroalloys may serve as deoxidisers.

Finished products

Products that emerge at the end of a manufacturing process. In metallurgy, these products are obtained from hot rolling, cold rolling, forging and other processing of semi-finished steel (blooms, billets and slabs). These cover two broad categories of products, namely long and flat.

Flat products

Finished steel flat products are produced from slabs or thin slabs in rolling mills using flat rolls. These are supplied in hot-rolled, cold-rolled or in coated condition, depending on the requirement. Flat products include plates, sheets and wide and narrow strips.

Galvanised steel

Steel coated with a thin layer of zinc to provide corrosion resistance. Flat steel normally must be cold-rolled before the galvanising stage.

Hard coking coal (HCC)

Hard coking coal is a type of coking coal with better coking properties, which is traditionally measured by the CSR (coke strength after reaction) of coke made from a specific kind of coal. Usually the CSR for HCC is assumed to be about 60%.

Hazard and Operability Study (HAZOP)

A structured and systematic examination of a planned or existing process or operation, aiming to identify and evaluate problems that may represent risks to personnel or equipment or prevent efficient operation.

Hazard Identification (HAZID)

A systematic approach designed to identify and reduce the risk of dangerous incidents, and to ensure safety throughout the production process.

Heavy plate

Thick flat finished product with a width from 500 millimetres to 5 metres and a thickness of at least 3 millimetres. Plates are normally produced and supplied in hot-rolled condition with or without specific heat treatment. Heavy plate is mainly used for construction, machinery, shipbuilding or large-diameter pipe fabrication.

Hot rolling

Rolling of steel at above the re-crystallisation temperature (normally above 1,000°C) to produce hot-rolled long and flat products from semis. Ingots are also hot-rolled to obtain semis.

Human resources (HR)

HR broadly refers to the people who make up the workforce of a company, while also frequently referring to the HR management function that is responsible for ensuring the recruitment and retention of qualified employees, managing goal setting and assessments, overseeing the process of training and further education to meet company requirements and employee potential, and other processes required to maintain an effective workforce.

Ingot

The primary solid product obtained upon solidification of liquid steel in conventional vertical cast iron moulds, which are intended for rolling into intermediate/semi-finished products after re-heating.

Integrated steelmaking plant

A producer that converts iron ore into semi-finished or finished steel products. Traditionally, this process required coke ovens, sintering machines, blast furnaces, steelmaking furnaces and rolling mills.

Iron ore

A naturally occurring mineral from which iron (Fe) is extracted in various forms, mainly for producing hot metal and direct-reduced iron.

Iron ore concentrate

Iron ore containing the valuable minerals of an ore from which most of the waste material has been removed.

Lean manufacturing

An approach to manufacturing processes that focuses on creating value for the end user and eliminating waste.

Lock out, tag out, try out (LOTOTO)

A standard that is used to isolate hazardous energy during repair and maintenance work.

Long products

Finished steel products produced normally by hot rolling or forging blooms, billets and pencil ingots into useable shapes and sizes (such as rounds, flat-bulbs, angles, squares, rebars, channels, etc). They are normally supplied in straight or cut length, except wire rods, which are supplied in irregularly wound coils. Long products are used in all industrial sectors, particularly in the construction and engineering industries.

Lost-time injury frequency rate (LTIFR)

An internationally recognised safety indicator, the LTIFR is the ratio of lost-time injuries per million hours worked. It is calculated using the total number of incidents leading to the loss of one day/shift or more from work.

Mineral

A natural inorganic substance that is definite in both chemical composition and physical characteristics, or any chemical element or compound occurring naturally as a product of inorganic processes.

Mineral resources

The known mineral concentration, estimated and interpreted from specific geological evidence and knowledge and with reasonable prospects for economic extraction.

Open-hearth furnace (OHF)

A furnace for melting metal, in which the bath is heated by the combustion of hot gases over the surface of the metal and by radiation from the roof. This furnace is used to derive steel from pig iron and scrap. The open-hearth process has been replaced by the basic oxygen process and electric arc method in most modern facilities.

Overburden

Used in mining to describe material that lies above the area of economic interest, e.g. the rock and soil that lies above the iron ore body. Overburden is removed during surface mining, but is typically not contaminated with toxic components and may be used to restore a mining site to a semblance of its appearance before mining began.

Pelletising

Pelletising is the process of compressing or moulding a product into the shape of a pellet. When doing so with iron ore concentrate, spheres of typically 8-18 millimetres (0.31-0.71 inches) in diameter are produced. The process combines agglomeration and thermal treatment to convert the raw ore into pellets with characteristics appropriate for use in a blast furnace and DRI processes.

Pelletising machine

Specific equipment designed for production of pellets (see Pelletising).

Pellets

An enriched form of iron ore shaped into small balls or pellets, that are used as raw material in the iron making process (see Pelletising).

Permit-to-work procedure

A process used to control work that is identified as possibly hazardous.

Pickling line

Specialised equipment for the chemical removal of surface oxides (scale) and other contaminants such as dirt from steel product by immersion in an aqueous acid solution. The most common pickling solutions are sulfuric and hydrochloric acids.

Pig iron

High-carbon (above 2.14%) iron alloy made by reducing iron ore in a blast furnace. A product in solid (lumpy) form obtained on solidification of hot metal in pig casting machine. It is called pig iron because of its typical humpy shape.

Pulverised coal injection (PCI)

Technologies whereby pulverised/granulated/dust coal is injected into the blast furnace through the tuyeres along with the blast to replace natural gas and a part of the coke requirement.

Public relations (PR)

Communications between an organisation and external stakeholders, in particular members of the general public, aimed at communicating both a positive impression of the organisation and its activities and identifying and addressing negative perceptions. PR uses mass and targeted media as well as public events and other outreach.

Reserves (proven, probable, recoverable)

Proven ore reserves are the part of measured resources that can be mined in an economically viable fashion. They include diluting materials and allowances for losses that occur when the material is mined. Proven ore reserves represent the highest confidence category of a reserve estimate.

Probable ore reserves are the part of indicated and, in some circumstances, measured mineral resources that can be mined in an economically viable fashion. They include diluting material and allowances for losses, which may occur when the material is mined. Probable ore reserves have a lower level of confidence than proven ones but are of sufficient quality to serve as the basis for a decision to develop a deposit.

Roasting machine

One of the types of equipment used to purify the metal component(s) at elevated temperatures. Such machines usually have variable temperatures so that they can process different types of ore.

GLOSSARY CONTINUED

Rolled products

Products obtained from hot rolling semi-finished steel (blooms, billets and slabs) or cold rolling hot-rolled steel.

Scrap

Steel waste that is not usable in its existing form and is re-melted to produce crude steel or sold.

Depending on its form and type, it is classified as heavy melting scrap, light melting scrap or turnings/borings, etc.

Sections

Hot-rolled long products obtained by rolling blooms or billets. They include angles, channels, girders, joists, I-beams, H-beams, rails and so on. Sections can also be produced by welding together pieces of flat products.

They can be used for a wide variety of purposes in the construction, machinery and transportation industries.

Semi-finished products

Intermediate solid steel products obtained by hot rolling or forging ingots or by continuous casting liquid steel. They are intended for further rolling or forging to produce finished steel products.

Sinter

An aggregate that is normally produced from relatively coarse fine iron ore, mixed with coke breeze, limestone dolomite fines and various metallurgical return wastes used as an input/raw material in blast furnaces. Sinter improves blast furnace operation and productivity and reduces coke consumption.

Slab

A semi-finished rectangular wide steel product used to make finished hot-rolled flat products such as plates, sheets and coils.

Square billet

A semi-finished steel product with a square cross section of up to 200 millimetres x 200 millimetres. This product is used as input material to make finished long steel products such as bars, rods and light sections.

Wire

A broad range of products produced by cold-reducing hot-rolled wire rod through a series of dies or through rolls to improve surface finish, dimensional accuracy and physical properties. Typical applications include nets, screws, rivets, upholstery springs, furniture wire, concrete wire, electrical conductors, rope wire and structural cables.

Wire rod

Hot-rolled coiled plain bar and rods of up to 18.5 millimetres in diameter. Wire rod is normally used to make steel wire, cold-rolled rebar and hardware.