

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 1213

VOCABULARY OF TERMS RELATING TO SOLID MINERAL FUELS

PART

TERMS RELATING TO COAL PREPARATION

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## BRIEF HISTORY

The ISO Recommendation R 1213, *Vocabulary of terms relating to solid mineral fuels - Part 1 : Terms relating to coal preparation*, was drawn up by Technical Committee ISO/TC 27, *Solid mineral fuels*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1057 which was circulated to all the ISO Member Bodies for enquiry in February 1967. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Greece	South Africa, Rep. of
Austria	India	Spain
Belgium	Iran	Switzerland
Bulgaria	Israel	Thailand
Canada	Japan	Turkey
Chile	Korea, Rep. of	U.A.R.
Czechoslovakia	Netherlands	United Kingdom
Denmark	New Zealand	U.S.A.
France	Poland	U.S.S.R.
Germany	Romania	Yugoslavia

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in June 1970, to accept it as an ISO RECOMMENDATION.

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## VOCABULARY OF TERMS RELATING TO SOLID MINERAL FUELS

### PART I

#### TERMS RELATING TO COAL PREPARATION

##### INTRODUCTION

Part I of this ISO Recommendation is a glossary consisting of a systematic list of terms commonly employed in coal preparation.

The arrangement of the glossary takes into account the distinction between *processes or operations* and the *methods or machines* for carrying them out.

Section 1 is devoted primarily to coal properties and the principal operations involved in coal preparation, and includes also general terms such as those relating to capacities and flowsheets.

Sections 2 to 5 cover the detailed terminology relating to sizing, cleaning, separation of solids from water or air, and size reduction.

Section 6 deals with the terms involved in interpreting or expressing the results of coal preparation operations.

Section 7 includes some miscellaneous terms.

Most of the sections are subdivided, and in each case the first subsection includes general terms and the remaining subsections cover groups of related terms. As far as possible this logical principle has been carried through into the arrangement of the terms themselves, which are also numbered for ease of reference. An alphabetical index is also provided, with a numerical cross-reference.

The use of the terms printed in italics is deprecated.

#### 1. GENERAL

##### 1.1 GENERAL COAL PREPARATION TERMS

###### 1.1-01 coal preparation

Collectively, physical and mechanical processes applied to coal to make it suitable for a particular use.

###### 1.1-02 raw feed coal

Coal supplied to a plant or machine, in which it undergoes some form of preparation.

###### 1.1-03 coal cleaning

The treatment of coal to lower the mineral matter (ash) content.

**1.1-04 middlings**

A product of the preparation of coal which, by reason of its ash content, is too poor in quality for ready sale, but contains too much combustible matter to be discarded. Middlings may be reprocessed.

**1.1-05 true middlings**

*bone coal*

Comparatively high ash material so nearly homogeneous that its quality cannot readily be improved by crushing and cleaning.

**1.1-06 refuse**

Waste material in the raw coal which it is the object of cleaning to remove.

**1.1-07 reject**

The material extracted from the feed during cleaning, for retreatment or discard.

**1.1-08 discard**

*dirt*

*stone*

The material extracted from the raw coal and finally discarded.

**1.1-09 'foreign' coal**

Coal received at a preparation plant from a colliery other than that to which the plant is attached.

**1.1-10 imported coal**

Coal coming from a foreign country.

**1.1-11 low grade coal**

Combustible material which has only limited uses owing to undesirable characteristics (e.g. ash content or size).

**1.1-12 segregation**

The involuntary separation of particles of different physical characteristics.

**1.1-13 inferior coal**

Usually middlings obtained by hand-cleaning which, though of high ash, may be converted by crushing and washing into clean coal and discard.

**1.1-14 float and sink analysis**

The division of a sample into specific gravity fractions with defined limits, the proportions of the fractions being expressed as percentages of the total sample, commonly with an indication of the ash percentage (and other characteristics, if required) of each fraction.

**1.1-15 size analysis**

The division of a sample into size fractions with defined limits, the proportions of the fractions being expressed as percentages of the total sample, commonly with an indication of the ash percentage (and other characteristics, if required) of each fraction.

**1.2 CLEANING CHARACTERISTICS**

**1.2-01 washability curve**

Any curve obtained from the results of a float and sink analysis permitting the theoretical yield of floats or sinks to be read off. There are four main types of washability curve :

- The characteristic ash curve
- The cumulative float curve
- The cumulative sink curve
- The densimetric (relative density) curve

**1.2-02 characteristic ash curve**

The curve obtained from the results of a float and sink analysis showing, for any yield of floats/sinks, the ash content of the highest/lowest density fraction passing into these floats/sinks, the yield being plotted on the ordinate and the ash content on the abscissa.

**1.2-03 cumulative curve**

Any curve expressing the results of combining successive specific gravity fractions or size fractions.

**1.2-04 cumulative float curve**

The curve obtained from the results of a float and sink analysis by plotting the cumulative yield of floats at each relative density against the mean ash of the total floats at that density.

**1.2-05 cumulative sink curve**

The curve obtained from the results of a float and sink analysis by plotting the cumulative yield of sinks at each relative density against the mean ash of the total sinks at that density.

**1.2-06 densimetric curve**

*relative density curve*

Any curve obtained from the results of a float and sink analysis by plotting the yield of floats or sinks against the relative density.

**1.2-07 performance curve**

Any curve used to show the relation between properties of coal and results of a specific treatment.

**1.2-08 actual performance curve**

A performance curve showing the results actually obtained from a coal preparation treatment.

**1.2-09 probable performance curve**

A performance curve showing the expected results of a coal preparation treatment.

**1.2-10 M curve**

*Mayer curve*

A cumulative curve used in the first instance to express the washability of a coal, plotted on a vectorial diagram in which the projection of the vector on the abscissa represents the percentage of the product (coal) and the direction of the vector represents the percentage of a particular constituent of the product.

**1.2-11 Ash/relative density curve**

The curve obtained from the float and sink analysis by plotting the ash contents of successive fractions against relative density.

**1.3 CAPACITY AND THROUGHPUT****1.3-01 nominal capacity**

A notional figure expressed in mass per hour used in the title of the flowsheet and in general descriptions of the plant, applying to the plant as a whole and to the specific project under consideration. It may be taken as representing the approximate mass of feed expected to be supplied to the plant during the hour of greatest load.

**1.3-02 operational capacities**

Figures given on the flowsheet to indicate quantities passing various points in the plant per unit time (see 1.3-03, 1.3-04, 1.3-05), taking account of fluctuations in the rate of supply and composition (as to size and content of impurity).

**1.3-03 design capacity**

The rate of feed, defined by limits expressing the extent and duration of load variations, at which specific items of plant subject to a performance guarantee must operate continuously and give the guaranteed results on a particular quality of feed.

**1.3-04 peak design capacity**

A rate of feed in excess of the design capacity which specific items of plant will accept for short periods without necessarily fulfilling the performance guarantees given in respect of them.

**1.3-05 mechanical maximum capacity**

The highest rate of feed at which specific items of equipment, not subject to performance guarantees, will function on the type and quality of feed for which they are supplied.

**1.3-06 feed**

Material for treatment supplied to an appliance or plant.

**1.3-07 basic flowsheet**

A diagram of the various stages in the treatment of the raw coal in a preparation plant, usually either a process flowsheet or an equipment flowsheet.

**1.3-08 process flowsheet**

A basic flowsheet indicating the main operational steps within the plant, the movement of the various materials between the steps and the final products obtained, and often also the quantities of material with which the plant must be capable of dealing at various points.

**1.3-09 equipment flowsheet**

A diagram indicating, preferably by symbols, the units of plant to be used in the various operational steps carried out within a coal preparation plant.

**1.3-10 materials flowsheet**

A flowsheet principally concerned with solid materials.

**1.3-11 liquids flowsheet**

A flowsheet to indicate the flow of liquids throughout a series of operations.

**1.3-12 weighted flowsheet  
capacity flowsheet**

A materials flowsheet including a statement of the capacity in mass per hour at principal points in the plant.

**2. SIZING****2.1 GENERAL****2.1-01 sizing**

Division of a material into products between nominal size limits.

**2.1-02 mean size**

The weighted average particle size of any sample, batch or consignment of particulate material.

**2.1-03 nominal size**

The limit or limits of particle size used to describe a product of a sizing operation.

**2.1-04 oversize**

Material in a product of size greater than the reference size; may be expressed as a percentage of the product.

**2.1-05 undersize**

Material in a product of size smaller than the reference size; may be expressed as a percentage of the product.

**2.1-06 dust**

Fine material removed dry from coal before its further treatment.

**2.1-07 screen**

A device for carrying out the operation of screening.

**2.1-08 screening**

The separation of solid materials of different sizes by causing one component to remain on a surface provided with apertures through which the other component passes.

**2.1-09 dry screening**

The screening of solid materials of different sizes without the aid of water.

**2.1-10 wet screening**

The screening of solid materials of different sizes with the aid of water, normally in the form of a spray.

**2.1-11 de-sliming**

The removal of slimes from coal or a mixture of coal and water, however accomplished.

**2.1-12 fines removal**

The removal of fine particles from a feed material, by either wet or dry methods, to facilitate treatment or utilization of the remainder.

**2.1-13 de-slurrying**

Fines removal by wet methods.

**2.1-14 de-dusting**

Fines removal by dry methods.

**2.2 SCREENING****2.2-01 overflow, screen**

That portion of the feed material discharged from the screen deck without having passed through the apertures.

**2.2-02 undersize**

In an overflow. Particles in a screen overflow which are smaller than the nominal dimensions of the screen apertures.

**2.2-03 underflow, screen**

That portion of the feed material which has passed through the apertures in a screen deck.

**2.2-04 oversize**

In an underflow. Particles in a screen underflow which are larger than the nominal dimension of the screen apertures.

**2.2-05 misplaced material**

Undersize contained in the overflow, or oversize contained in the underflow.

**2.2-06 near-mesh material**

Material approximating in size to the mesh aperture.

**2.2-07 mesh aperture**

The dimension or dimensions of the aperture in a screen deck, usually with a qualification as to the shape of aperture, e.g. "round-hole", "square-mesh", "long-slot".

**2.2-08 nominal screen size**

A notional size at which it is intended to divide a feed by a screening operation.

**2.2-09 nominal area**

Of a screen. The total area of the screen deck exposed to the flow of the material feed.

**2.2-10 useful area**

*working area*

Of a screen. The nominal area, less any area occupied by fixings or supports which obstruct the passage of material over or through the screen deck.

**2.2-11 effective screening area**

*open area*

Total area of the apertures expressed as a percentage of the useful area of a screen.

**2.3 PARTS OF SCREENS**

**2.3-01 sieve**

Generally. A screen of relatively small area.  
Particularly. A screen used in the laboratory for test purposes.

**2.3-02 screen deck**

A surface provided with apertures of specified size for carrying out the operation of screening.

**2.3-03 screen plate**

A plate provided with apertures of specified size for use as a screen deck.

**2.3-04 screen cloth**

A woven tissue suitable for use in a screen deck.

**2.3-05 wedge-wire deck**

*wedge-wire sieve*

A screen deck comprising wires of wedge-shaped cross-section spaced from each other at a fixed dimension; the underflow thus passes through an aperture of increasing cross-section.

**2.3-06 protection screen deck**

A screen plate with large apertures mounted over the screening deck in order to reduce the load and wear thereon.

**2.4 SCREENS ACCORDING TO PURPOSE**

**2.4-01 raw coal screen**

A screen used for dividing run-of-mine coal into two or more sizes for further treatment or disposal; usually employed to remove the largest pieces for crushing and re-addition to the run-of-mine coal.

**2.4-02 primary screen**

A screen used to divide coal (usually raw coal) into sizes more suitable for the subsequent cleaning of some or all of them.

**2.4-03 de-watering screen**

A screen used for the separation of water from solids.

**2.4-04 de-sliming screen**

A screen used for the removal of slimes from larger particles, usually with the aid of water sprays.

**2.4-05 slurry screen**

A screen to recover a granular product from circulating water in a washer, usually after a preliminary concentration of the solids and with or without the use of water sprays.

**2.4-06 spraying screen**

A screen used for the removal by spraying of fine solids present among or adhering to larger particles (see also 3.4-18 and 3.4-21).

**2.4-07 sizing screen(s)**

*grading screen(s)*  
*classifying screen(s)*

A screen or set of screens normally used for dividing a product (e.g. washed coal) into a range of sizes.

**2.4-08 oversize control screen**

*guard screen*  
*check screen*

A screen used to prevent the entry into a machine of coarse particles which might interfere with its operation.

**2.4-09 undersize control screen**

A screen used for the removal of undersize from a product.

**2.5 SCREENS ACCORDING TO PRINCIPLE OF CONSTRUCTION****2.5-01 single-deck screen**

A screen having one screening surface, not necessarily limited to one size or shape of aperture.

**2.5-02 multi-deck screen**

A screen with two or more superimposed screening surfaces mounted rigidly within a common frame.

**2.5-03 jiggling screen**

A screen or pair of screens to which a combined horizontal and vertical motion is imparted, normally by a crankshaft and connecting rod, the screen decks being horizontal or inclined at a small angle.

**2.5-04 resonance screen**

A jiggling screen, the period of an oscillation of which is at or very close to the natural period of oscillation of the resilient mounting.

**2.5-05 vibrating screen**

A screen oscillated either by mechanical or electrical means. The amplitude of movement of the vibrating screen is smaller than that of the jiggling screen and its speed of oscillation is higher.

**2.5-06 Trommel screen**

*revolving screen*

A screen in which the screening surface is formed into a cylinder or frustum of a cone, mounted upon a rotating shaft or on revolving rollers.

**2.5-07 roll screen**

A screen consisting of a number of horizontal rotating shafts, fitted with elements arranged to provide screening apertures.

**2.5-08 bar screen**

A stationary inclined screen, comprising longitudinal bars, spaced at intervals, on to which the material to be screened is fed at the upper end.

**2.5-09 grizzly**

A rugged screen for rough sizing at a comparatively large size (e.g. 150 mm); it can comprise fixed or moving bars, disks, or shaped tumblers or rollers.

**2.6 SIZING IN A CURRENT OF AIR OR WATER****2.6-01 air classification**

The process of sizing in a current of air.

**2.6-02 cyclone classifier**

A device for classification by centrifugal means of fine particles suspended in water, whereby the coarser grains collect at and are discharged from the apex of the vessel, while the finer particles are eliminated with the bulk of the water at the overflow orifice.

**2.6-03 sieve bend**

A device for classification of fine particles suspended in water by means of a stationary curved panel, commonly of wedge-wire, whereby the finer particles are eliminated with the bulk of the water in the underflow.

**3. CLEANING****3.1 GENERAL****3.1-01 upgrade**

To increase the commercial value of a coal by appropriate treatment.

**3.1-02 hand cleaning**

The removal by hand of impurities from coal, or vice versa.

**3.1-03 hand selection**

The selection by hand of pieces of coal with certain specific qualities according to surface appearance.

**3.1-04 dry cleaning**

The mechanical separation of impurities from coal by methods which avoid the use of a liquid.

**3.1-05 wet cleaning**

The mechanical separation of impurities from coal by methods involving the use of a liquid.

**3.1-06 washery**

A coal preparation plant in which a cleaning process is carried out by wet methods; the term is sometimes applied to a cleaning plant using dry methods.

**3.1-07 washer**

Apparatus for the wet cleaning of coal, together with its immediate ancillary equipment.

**3.1-08 primary washer**

The first of a series of washers, receiving raw feed, from which at least one product is re-treated.

**3.1-09 re-wash (to)**

To re-treat a product in the same or in another washer.

**3.1-10 re-wash**

The product from one washer to be re-treated in another.

**3.1-11 washery products**

The final products from a washery.

**3.1-12 reject elevator**

*refuse elevator*

An elevator for removing and draining the reject from a washing appliance.

**3.1-13 middlings elevator**

An elevator which removes material for further treatment or for disposal as an inferior product.

**3.1-14 head tank**

Any tank or vessel in the water circuit which is used to control the delivery pressure of the water to the washing units.

**3.1-15 launder**

A trough along which flow liquids or a mixture of liquids and solids.

**3.1-16 pump sump**

A tank into which the circulating water gravitates and from which it is recirculated by means of a pump.

**3.1-17 suspension**

A mixture of solid particles and water or air in which the solid particles are completely and individually supported, normally by means of an upwardly moving current and sometimes with the assistance of mechanical agitation.

**3.1-18 fluidized suspension**

A suspension of solids in an upward-moving current of water or air, whereby the support given to the particles reduces the internal friction between them to such an extent that the suspension acquires fluid or partially-fluid properties.

**3.1-19 teeter**

To make a fluidized suspension.

**3.1-20 full teeter (in)**

A condition of teeter in which the maximum degree of fluidization of the suspension is attained but without disruption of the bed.

**3.1-21 water circuit**

The complete system of pipelines, pumps, sumps, tanks, troughs and accessories used for the circulation of water in a washery, including the water treatment plant.

**3.1-22 closed circuit**

A water circuit designed so that the only water added is that necessary to replace the loss in the washery products and that due to atmospheric evaporation.

**3.1-23 circulating water**

The water in the water circuit.

**3.1-24 make-up water**

Water supplied to a washery to replace that lost from the circuit.

**3.1-25 rinsing water**

*spray water*

Water used to remove fine particles from larger sizes (3.4-21).

**3.1-26 waste water**

*surplus water*

*bleed water*

Excess water allowed to run to waste from the water circuit.

**3.1-27 pit water**

Water from the underground workings of a mine.

**3.1-28 slimes**

Undesirable extremely fine particles in suspension or present with larger particles.

**3.1-29 slurry**

Fine particles concentrated in a portion of the circulating water (usually by settling) and water-borne to treatment plant of any kind.

**3.1-30 froth flotation**

A process for cleaning fine coal in which the coal, with the aid of a reagent, becomes attached to air bubbles in a liquid medium and floats as a froth.

**3.1-31 Convertol process**

A process for flocculating the coal particles in a pulp by means of oil so that they are retained on a suitable screening surface and thereby separated from unflocculated material and the bulk of the water.

**3.1-32 phase inversion**

In the Convertol process. Replacement of the film of water covering a coal particle by a film of oil.

**3.2 DRY CLEANING**

**3.2-01 picking belt**

*picking table*

A continuous conveyor (e.g. in the form of a rubber belt or of a steel apron, steel plate or link construction) on which raw coal is spread so that selected ingredients may be removed manually.

**3.2-02 picking table, circular**

An apparatus used for the same purpose as a picking belt and consisting of a flat horizontal rotating annular plate.

**3.2-03 pneumatic cleaning**

Cleaning in an air current.

**3.2-04 dry cleaning table**

An apparatus in which dry-cleaning is achieved by the application of air currents and agitation to a layer of feed of controlled depth on the table surface.

**3.2-05 air jig**

A machine in which the feed is stratified by means of pulsating currents of air and from which the stratified products are separately removed.

**3.2-06 hand picker**

A person employed either for hand cleaning or for hand selection.

**3.3 JIGGING**

**3.3-01 jig**

*washbox*

A machine in which the feed is stratified in water by means of a pulsating motion and from which the stratified products are separately removed, the pulsating motion usually being obtained by alternate upward and downward currents of the water.

**3.3-02 primary washbox**

The first of a series of washboxes which receives the feed and from which one product at least is given further treatment.

**3.3-03 re-wash box**

A washbox to which the product (or a portion thereof) of a previous washing operation is fed for additional treatment.

**3.3-04 Baum type washbox**

*Baum box*

A washbox in which the pulsating motion is produced by the intermittent admission of compressed air to the surface of the water, following a principle introduced by Baum.

**3.3-05 feldspar type washbox**

A washbox to clean small coal, in which the pulsating water is made to pass through a layer of graded material, e.g. feldspar, situated on top of the screen plate.

**3.3-06 movable sieve type washbox**

A washbox in which the screen plate supporting the bed of material under treatment is moved up and down in water.

**3.3-07 plunger type washbox**

*piston type washbox*

A washbox in which the pulsating motion is produced by the reciprocating movement of a plunger or piston.

**3.3-08 diaphragm type washbox**

A washbox in which the pulsating motion is produced by the reciprocating movement of a diaphragm.

**3.3-09 Baum washer**

A washer which incorporates a Baum type washbox.

**3.3-10 washbox screenplate**

*grid plate*

*sieve plate*

*bedplate*

A perforated plate or grid which supports the bed of material being treated.

**3.3-11 jig bed**

The whole of the material on the washbox screenplate.

**3.3-12 washbox cell**

One of the individual portions into which the part of a washbox below the screenplate is divided by transverse division plates, each being capable of separate control.

**3.3-13 washbox compartments**

The sections into which a washbox is divided by transverse division plates which extend above the screenplate to form a weir; each compartment usually comprises two or more cells.

**3.3-14 hutch**

The part of a washbox situated below the screenplate in which the controlled pulsating movement of the water takes place.

**3.3-15 washbox feed sill**

That part of the washbox over which the feed passes when it enters the box. Usually the feed sill is a part of the feed-end refuse extraction chamber.

**3.3-16 washbox centre sill**

A sill fitted over a centre extraction chamber.

**3.3-17 washbox centre weir**

An adjustable plate situated between the feed end and the discharge end of a washbox and serving to regulate the forward movement of material through the box.

**3.3-18 washbox discharge sill**

That part of the washbox over which the washed coal passes out of the box. Usually the discharge sill is part of the discharge-end refuse extraction chamber.

**3.3-19 air valve**

The valve which controls the alternate admission and release of compressed air to each cell of a Baum type washbox.

**3.3-20 washbox slide valve**

*washbox piston valve*

A washbox air valve operated by means of a reciprocating motion.

**3.3-21 rotary air valve**

A washbox air valve which rotates on a central axis.

**3.3-22 washbox air cycle**

The valve-timing cycle determining the periods of air admission and exhaust.

**3.3-23 refuse extractor**

A device used in a washbox to remove the reject from the washing compartments, operated manually or automatically.

**3.3-24 float**

That part of an automatic refuse extractor which is suspended in a washbox to indicate variations in the layer of heavy material on the screenplate.

**3.3-25 refuse extraction chamber**

That part of the washbox into which the refuse extractor discharges.

**3.3-26 reject gate**

*discharge shutter*

The mechanism of the refuse extractor which may be manually or automatically operated to control the rate of removal of reject from the washbox.

**3.3-27 refuse rotor**

*star wheel extractor*

A reject gate in the form of a rotary (or star) valve.

**3.3-28 refuse worm**

A screw conveyor fitted at the bottom of some washboxes to collect the fine reject which has passed through the apertures in the screen plate.

**3.3-29 refuse discharge pipes**

Pipes used on some washboxes instead of a refuse worm.

**3.3-30 primary reject elevator**

A refuse elevator which extracts the first or heavier reject; usually situated at the feed end of the washbox.

**3.3-31 secondary reject elevator**

A refuse elevator which extracts the second or lighter reject; usually situated at the discharge end of the washbox.

**3.3-32 top water**

*transport water*

Water introduced with the raw coal feed to assist the transport of material through the washbox (see 3.3-33).

**3.3-33 flush water**

Water used to assist the flow of materials in chutes or launders.

**3.3-34 underscreen water**

*backwater*

Water which is fed into the cells of a washbox below the level of the screen plate.

**3.4 DENSE-MEDIUM CLEANING**

**3.4-01 dense liquid**

A homogeneous liquid or solution of density greater than that of water, which can be used in industry or in the laboratory to divide coal into two fractions of different relative densities.

**3.4-02 medium**

Any suspension of medium solids in water.

**3.4-03 dense medium**

A fluid formed by the artificial suspension in water of heavy particles (e.g. magnetite, barytes, shale), which can be used in industry or in the laboratory to divide coal into fractions of different relative densities.

**3.4-04 dense-medium process**

A process for the washing of coal, in which the desired separation is effected in a dense medium.

**3.4-05 medium solids**

The solid component of a dense medium.

**3.4-06 separating medium**

Dense medium of the density required to achieve a given separation.

**3.4-07 circulating medium**

Medium in circulation in or outside the separating bath, at or about the density of that in the separating bath.

**3.4-08 make-up medium**

*make-up medium solids*

Medium or medium solids added to the circuit to replace loss during the separation operation.

**3.4-09 dense-medium recovery**

*medium solids recovery*

The collection, for re-use, of medium solids from dilute medium, usually understood to include the removal, in whole or in part, of contaminating fine coal and clay.

**3.4-10 magnetic separator**

For medium solids recovery. A device in which medium solids are caused to adhere, by magnetic means, to a conveying belt or drum, while a current of water removes non-magnetic particles which contaminate the medium.

**3.4-11 medium solids recovery plant**

The equipment used to remove adherent medium solids from a product from a dense-medium bath (after drainage of surplus medium), usually by spraying, and to remove contaminating coal and clay from these medium solids.

**3.4-12 regenerated dense medium**

*recovered dense medium*

Medium obtained from the medium recovery system and purified (wholly or partly) from contaminating fine coal and clay.

**3.4-13 dilute medium**

Medium of density below that in the separating bath and usually occurring as a result of spraying the bath products for the removal of adhering medium solids.

**3.4-14 over-dense medium**

Medium of density above that in the separating bath, usually produced in the medium recovery system and used to maintain the desired density in the bath.

**3.4-15 dense-medium washer**

An apparatus for the large-scale operation of a dense-medium process including all the equipment associated with the recovery, regeneration and circulation of the medium.

**3.4-16 separating bath**

(a) A vessel containing dense medium in which the feed material is separated on a commercial scale into different fractions according to relative density.

(b) The liquid in a separating bath (a).

**3.4-17 density-control device**

An automatic device to control the density of the medium in or entering the separating bath in a dense-medium process.

**3.4-18 medium draining screen**

*depulping screen*

A screen for draining the separating medium from a dense-medium bath product.

**3.4-19 de-magnetize**

To promote dispersion, by means of a suitable magnetic field, of the solids in a dense medium which have been flocculated as a result of passage through a magnetic separator.

**3.4-20 suspended matter**

Particles from the feed of density equal or close to that of a separating medium, and which are therefore relatively difficult to remove from the bath.

**3.4-21 medium recovery screen**

A composite screen for draining and spraying the product from a dense medium bath to remove adherent medium solids.

**3.4-22 medium solids preparation**

Any purification or grinding of the raw dense medium solids to make them suitable for use.

**3.5 CLEANING EQUIPMENT****3.5-01 trough washer**

A washer applying the principle of alluviation in troughs.

**3.5-02 concentrating table**

A device consisting of a riffled deck, usually inclined in two directions to the horizontal, to which a differential reciprocating motion in a substantially horizontal direction is imparted; the material to be separated is fed in a stream of water, the heavy particles collect between the riffles and are there conveyed in the direction of the reciprocating motion while the lighter particles are borne by the current of water over the riffles to be discharged laterally from the table.

**3.5-03 riffle**

A raised portion of the deck of a concentrating table, which serves to trap the heaviest particles.

**3.5-04 upward current washer**

A washer in which separation takes place under the influence of an upward current of water or dense medium.

**3.5-05 plate cleaner**

A device for cleaning raw coal which uses the difference in the coefficient of resilience or friction between clean coal and an inclined plate, commonly of steel, and that between refuse and the plate to allow the clean coal to jump over a gap while the refuse falls through.

**3.5-06 barrel washer**

A washer comprising a cylinder rotating slowly about an axis which is slightly inclined to the horizontal and into which the raw coal, with a current of water or of a suspension, is fed near its upper end. The clean coal is carried by the water or suspension to the lower end of the cylinder over a scroll which conveys the reject to the upper end of the cylinder.

**3.5-07 cyclone washer**

A washer in which the principle of centrifugal force is applied in a cyclone to effect a separation in water or in a dense medium.

**3.5-08 classifier**

A device which separates particles, mainly according to their size and/or density, by physical means other than screening.

**3.6 FROTH FLOTATION****3.6-01 activating agent**

*activator*

A substance which when added to a mineral pulp promotes flotation in the presence of a collecting agent.

**3.6-02 collecting agent**

*collector*

A reagent added to a pulp to bring about adherence between solid particles and air bubbles.

**3.6-03 frothing agent**

*frother*

A reagent used to control the size and stability of the air bubbles in the flotation process.

**3.6-04 wetting agent**

A reagent to reduce the interfacial tension between a solid and a liquid and so to facilitate the spreading of the liquid over the solid surface.

**3.6-05 depressant**

A substance which when added to a pulp prevents a particular mineral or minerals from floating.

**3.6-06 pulp**

A suspension of finely divided particles in water.

**3.6-07 selective flotation**

A process for the preferential recovery of a particular ingredient of the coal, e.g. a petrological constituent, by froth flotation.

**3.6-08 aeration**

The introduction of air into the pulp in a flotation cell in order to form air bubbles.

**3.6-09 conditioning**

The preparatory stage in the flotation process in which the collecting agent is brought into intimate contact with the solids of the pulp.

**3.6-10 conditioner**

An apparatus in which conditioning takes place.

**3.6-11 reagent feeder**

An apparatus for the feeding and proportioning of one or more reagents.

**3.6-12 agitator**

A device used to bring about a continuous vigorous disturbance in a pulp, frequently used to assist bubble formation.

**3.6-13 flotation cell**

A vessel in which a pulp is subjected to froth flotation.

**3.6-14 primary cells**

A group of flotation cells in which the raw feed is given a preliminary treatment, either or both of the products being subsequently re-treated.

**3.6-15 rougher cells**

Primary cells from which the tailings are discarded.

**3.6-16 secondary cells**

A group of flotation cells in which a product from the primary cells is re-treated.

**3.6-17 cleaner cells**

*re-cleaner cells*

Secondary cells for the re-treatment of the concentrate from primary cells.

**3.6-18 scavenger cells**

Secondary cells for the re-treatment of tailings.

**3.6-19 flotation concentrate**

The clean product recovered in froth flotation.

**3.6-20 flotation tailings**

The reject from froth flotation cells.

**3.6-21 flotation middlings**

Flotation products which may be re-treated.

**3.6-22 contact angle**

The angle between the tangent to the interface and the tangent to the solid surface at any point along the line of contact of the interface between two fluids and a solid; usually measured inside the water phase where water is involved. Maximum and minimum values, measured under static conditions termed *advancing* and *receding* contact angles respectively, are usually qualified by stating the phase in which the angle is measured (e.g. oil-advancing contact angle).

**4. SEPARATION OF SOLIDS FROM WATER OR AIR**

**4.1 GENERAL**

**4.1-01 de-watering**

The removal of water from wet materials by means other than evaporation.

**4.1-02 drying**

The removal of moisture from coal, mainly by evaporation.

**4.1-03 draining**

The removal of water or medium from a product, mainly by gravity.

**4.1-04 filtration**

A process for separating solids from liquids by allowing the liquid to pass through a finely woven cloth or gauze which retains the solids, using vacuum or pressure to accelerate the separation.

**4.1-05 centrifuging**

De-watering with the aid of centrifugal force.

**4.1-06 flocculation**

The formation of aggregates from particles dispersed in a liquid.

**4.1-07 clarification**

The concentration and removal of solids from circulating water in order to reduce the suspended solids to a minimum.

**4.1-08 thickening**

The concentration of the solids in a suspension with a view to recovering one fraction with a higher concentration of solids than in the original suspension.

**4.1-09 effluent**

Water discharged from any item of equipment after fulfilment of its function or after having itself been treated (e.g. for clarification).

**4.1-10 washery effluent**

Surplus water discharged from a washery, usually to waste (after settlement of solids in suspension).

**4.1-11 slurry pond**

Any natural or artificial pond or lagoon for settling and draining the solids from washery slurry.

**4.1-12 dispersion**

- (a) A suspension of discrete particles in a fluid.
- (b) The creation of a dispersion (a) by deflocculation.

**4.2 DE-WATERING**

**4.2-01 dryer**

Equipment for the drying of coal with the aid of heat.

**4.2-02 fixed screen**

A stationary inclined or curved panel, commonly of wedge-wire, which is used to remove a large proportion of water and fines from a suspension of coal in water.

**4.2-03 basket centrifuge**

A device for de-watering in which wet coal is thrown by centrifugal force against a perforated containing-surface which permits the outward passage of water and retains the coal.

**4.2-04 bowl centrifuge**

A centrifugal device for de-watering, usually conical or bowl-shaped, in which the containing surface is imperforate. The greater density of the solid particles causes them to collect preferentially in contact with the inside of the containing surface whence they are discharged mechanically; the water usually overflows from a position nearer to the axis.

**4.2-05 filter feed trough**

A tank containing the pulp to be filtered, generally fitted with an agitator to maintain the solids in the pulp in suspension and in which the drum or disk of a rotary vacuum filter is partially immersed.

**4.2-06 filter cloth**

The fabric used as a medium for filtration, e.g. nylon cloth, blanket cloth, finely woven wire mesh, finely woven glass thread.

**4.2-07 filter cake**

The solid product from the filtration process.

**4.2-08 filtrate**

The liquid product from the filtration process.

**4.2-09 pressure filter**

A filter in which pressure is applied to increase the rate of filtration.

**4.2-10 filter press**

A form of pressure filter, non-continuous in operation, used in coal preparation for the removal of water from slurries, tailings and similar products.

**4.2-11 vacuum filter**

A filter in which a vacuum is applied to increase the rate of filtration.

**4.2-12 dredging conveyor**

A scraper partially immersed in a vessel containing liquid and used for removing any solids which may settle therein.

**4.2-13 dredging sump**

*drag tank*  
*smudge sump*

A tank, forming part of the water circuit, in which slurry or small coal settles and is removed continuously by means of a scraper chain or scraper buckets.

### 4.3 CLARIFICATION AND THICKENING

#### 4.3-01 flocculating agent

*flocculant*

A reagent added to a dispersion of solids in a liquid to bring together the fine particles to form flocs.

#### 4.3-02 flocs

Aggregates resulting from flocculation.

#### 4.3-03 settling cone

*conical settling tank*

A conical tank used to settle coarse solids from the circulating water.

#### 4.3-04 settling pond

A pond, natural or artificial, for recovering the solids from washery effluent.

#### 4.3-05 Spitzkasten

A surface-current classifier consisting of a series of tanks with conical or pyramidal bases.

#### 4.3-06 rake thickener

Equipment for thickening in which the concentrated suspension settles in a container of circular section and is delivered mechanically to one or more discharge points by a series of arms revolving slowly around a central shaft.

#### 4.3-07 cyclone thickener

A device for thickening by centrifugal means, in which the concentrated suspension is discharged from the apex of the vessel, while the bulk of the water is eliminated at the overflow orifice.

#### 4.3-08 headbox

A device for distributing a suspension of solids in water to a machine, or for retarding the rate of flow, as to a top-feed filter, or for eliminating by overflow some of the finest particles.

### 4.4 SEPARATION OF SOLIDS FROM AIR

#### 4.4-01 dust extraction

The removal of solid particles suspended in gas or ambient air.

#### 4.4-02 dust recovery

The accumulation in a convenient form for handling of solid particles suspended in air or gas.

#### 4.4-03 dust collector

An apparatus for separating solid particles from air or gas and accumulating them in a form convenient for handling.

#### 4.4-04 cyclone dust collector

An apparatus for the separation by centrifugal means of fine particles suspended in air or gas.

#### 4.4-05 bag filter

An apparatus for removing dust from dust-laden air, employing cylinders of closely woven material which permit passage of air but retain solid particles.

#### 4.4-06 electrostatic precipitator

An apparatus for removing dust from dust-laden air, employing the principle of electrostatic precipitation.

## 5. SIZE REDUCTION

### 5.1 GENERAL

#### 5.1-01 **breaking**

*cracking*

Size reduction of large particles.

#### 5.1-02 **crushing**

Size reduction into relatively coarse particles.

#### 5.1-03 **grinding**

**pulverizing**

Size reduction into relatively fine particles.

#### 5.1-04 **degree of size reduction**

Ratio of the surface areas of the broken or crushed material to those of the feed material.

#### 5.1-05 **ratio of size reduction**

Ratio of the upper particle size in the crushed material to the upper particle size of the feed material.

#### 5.1-06 **liberation of intergrown constituents**

Crushing of intergrown material to free the constituent materials.

#### 5.1-07 **breakage**

Voluntary or involuntary division of a solid.

#### 5.1-08 **smalls caused by breakage**

Small material produced by involuntary breakage during mechanical handling or processing.

#### 5.1-09 **degradation**

Involuntary breakage.

#### 5.1-10 **disintegration**

*dissociation*

The physical breakdown of material, usually shale, as a result of immersion in water or weathering.

#### 5.1-11 **crushability**

The relative ease of crushing a sample under standard conditions.

#### 5.1-12 **grindability**

The relative ease of grinding a sample under standard conditions.

#### 5.1-13 **selective crushing**

Crushing in such a manner as to cause one ingredient of the feed to be crushed preferentially to others.

#### 5.1-14 **selective grinding**

Grinding in such a manner as to cause one ingredient of the feed to be ground preferentially to others.

#### 5.1-15 **crushing cycle**

The sequence of operations in crushing a material, including, for example, the screening of the primary product and the re-circulation of the screen overflow.

#### 5.1-16 **grinding cycle**

The sequence of operations in grinding a material, including, for example, the screening of the primary product and the re-circulation of the screen overflow.

## 5.2 SIZE REDUCTION MACHINES

### 5.2-01 pick breaker

A machine for breaking coal by the splitting action of mechanically operated picks.

### 5.2-02 rotary breaker

*Bradford breaker*

A rotating steel drum perforated with holes through which material of the desired size falls. The over-size material is lifted by flights inside the drum and allowed to fall back so that the softer component, e.g. coal, may break by impact and fall through the holes. The stronger component, e.g. rock, may not break and so may pass through the drum along its axis.

### 5.2-03 jaw crusher

A machine for reducing the size of materials by impact or crushing between a fixed plate and an oscillating plate, or between two oscillating plates, forming a tapered jaw.

### 5.2-04 cone crusher

*gyratory crusher*

A machine for reducing the size of materials by means of a truncated cone revolving on its vertical axis within an outer chamber, the annular space between the outer chamber and cone being tapered.

### 5.2-05 roll crusher

*toothed roll crusher*

A machine in which size reduction is effected by causing the material to pass between a rotating roller, generally toothed, and a fixed or oscillating plate, or between two or more rollers.

### 5.2-06 rigid-hammer crusher

A machine in which size reduction is effected by elements rigidly fixed to a rotating horizontal shaft mounted in a surrounding casing.

### 5.2-07 swing-hammer crusher

*swing-hammer mill*

*swing-hammer pulverizer*

A machine in which size reduction is effected by elements loosely pivoted to disks fitted on a rotating horizontal shaft mounted in a surrounding casing.

### 5.2-08 ball mill

A cylinder, rotating on a horizontal axis, partly filled with balls (e.g. of steel) which, by their tumbling motion, reduce by impact a coarse material into a finely comminuted material. The diameter of the cylinder may be greater or less than its length.

### 5.2-09 tube mill

A ball mill in which the diameter of the cylinder is less than its length.

### 5.2-10 rod mill

A cylinder, rotating on a horizontal axis, partly filled with cylindrical bars (e.g. of steel) of relatively small diameter which reduce by impact a coarse material into a finely comminuted material.

## 6. EXPRESSION OF RESULTS

### 6.1 GENERAL

#### 6.1-01 efficiency performance

Any measure of the accuracy of a separation.

#### 6.1-02 statement of performance

A statement describing the scope and duty of a plant in terms, for example, of the tonnage of coal treated per hour, the processes used, the separations effected and sizes produced; sometimes also used to express the results of plant operation.

**6.1-03 yield**

*recovery*

The amount of a product obtained from any operation, expressed as a percentage of the feed material.

**6.1-04 reconstituted feed**

*calculated feed*

The composition (e.g. relating to size or density) of the feed to a preparation plant (or to a component part) calculated by combining the properties of the products obtained in the appropriate weight proportions, in contrast to the analysis of the actual feed.

**6.1-05 partition curve**

*distribution curve*

A curve indicating, for each density (or size) fraction, the percentage of it which is contained in one of the products of the separation (e.g. the reject).

**6.1-06 partition factor**

*distribution factor*

The percentage of a density (or size) fraction recovered in one of the products of the separation (e.g. the reject).

**6.1-07 cut-point**

The exact level (e.g. density or size) at which a separation into two fractions is desired or achieved.

**6.1-08 misplaced material**

*tramps*

Material wrongly included in the products of a sizing or density separation, i.e. material which has been included in the lower size or relative density product but which itself has a size or relative density above that of the cut-point, or vice versa. Its weight may be expressed as a percentage of the product or of the feed.

**6.1-09 total of misplaced material**

The sum of the weights of the misplaced material in the products of a sizing or density separation, expressed as a percentage of the weight of the feed. When three products are made in a single separator the total of misplaced material will be the sum of the weight of material wrongly placed in each of the three products, expressed as a percentage of the feed to the separator.

**6.1-10 correctly placed material**

Material correctly included in the products of a sizing or density separation.

**6.1-11 total of correctly placed material**

The sum of the weights of material correctly included in the products of a sizing or density separation, expressed as a percentage of the weight of the feed to the separator (and equal to 100 minus the total of misplaced material).

**6.2 SIZING OPERATIONS**

**6.2-01 designated size**

The particle size at which it is desired to separate a feed by a sizing operation.

**6.2-02 separation size**

A general term indicating the effective size at which separation has taken place, calculated from a size analysis of the product; commonly expressed as either partition size or equal errors size.

**6.2-03 partition size**

The separation size corresponding to 50 % recovery as read from a size partition curve.