TBS/MMDC 9 (6484) P3 - Mineral Processing Terminology - Part 1 - Commination
0 Foreword

This draft Tanzania Standard is being prepared by the Mineral Processing and Equipment Technical Committee (MMDC 9), under the supervision of the Mining and Minerals Standards Divisional Committee (MMDC).

This document has been prepared in order to standardize and co-ordinate technical terms in current use in the mining industry and ensure expertise of other type of mining activities.

The need for this document arose from the widely varying interpretation of terms used within the industry and the prevalent use of more than one synonym.

This document consists of the following parts; -Part 1: Comminution

Part 2: Concentration

Part 3: Metal recovery processes

Part 4: Metallurgical accounting

Part 5: Mine effluent detoxifications

1 Scope

This document covers the terms and definitions used in mineral processing industry basically in crushing and grinding.

2 Normative references

This document does not contain normative references.

3 Terms and definitions

3.1 Crushing

3.1.1 Abrasion

wearing away by rubbing or friction

3.1.2 Abrasion hardness

hardness expressed in quantitative terms or numbers indicating the degree to which a substance resists being worn away by frictional contact with an abrasive material, such as silica or carborundum grits. Also called abrasion resistance; wear resistance

3.1.3 Abrasion index

the percentage of a specially prepared 3-in by 2-in (76-mm by 51-mm) sample of coke remaining on a 1/8-in (3.2-mm) mesh British Standards test sieve after the sample of coke has been subjected to a standardized abrasion procedure in a rotating drum

3.1.4 Abrasive

tending to abrade or wear away

3.1.5 Apron feeder/ Belt feeder
a feeder in which the material is carried on an apron conveyor and in which the rate of feed is adjusted either by varying the depth of material or the speed of the conveyor, or both.

3.1.6 Assay

to analyze the proportions of metals in an ore; to test an ore or mineral for composition, purity, weight, or other properties of commercial interest.

3.1.7 Automatic Mode

controller operating mode in which the controller changes the manipulated variable to effect control

3.1.8 Balance cylinder

cylinder in the crusher lubrication oil line that uses air pressure to force oil under the hydroset piston, raising it with the mainshaft, whenever the mainshaft jumps as a result of nipping some hard particle.

3.1.9 Belt feeder

short loop of conveyor belt, or articulated steel plate, used to draw ore at a regulated rate from under a bin or stockpile

3.1.10 Breaking

size reduction of large particles. Also called cracking.

3.1.11 Breaking point

in rock crushers, a deliberate weak link that yields if excessive strain is developed. May be a scarfed toggle, weak cap bolts on a pitman, a shear pin in drive, or a clutch designed to fail at a given load.

3.1.12 Blocking

the condition where a single rock is too big to enter the crushing chamber.

3.1.13 Bogey (stacker conveyor)

a wheel truck consisting of two wheels. The radial stacker has a total of six bogeys.

3.1.14 Boom (stacker conveyor)

a steel structure that supports the belt conveyor.

3.1.15 Bottom shell

the lower casting of the gyratory crusher body comprising the power transmission, eccentric, and hydroset system. The top and bottom shell castings meet at the crusher choke point.

3.1.16 Boulder

a detached rock mass larger than a cobble, having a diameter greater than 10 in (25.4 cm) or 8 phi units, or about the size of a volleyball, being somewhat rounded or otherwise distinctively shaped by abrasion in the course of transport; the largest rock fragment recognized by sedimentologists.

3.1.17 Bowl liner

part that protects the bowl, the outer part that forms the crusher cavity.

3.1.18 Breakage
size reduction by causing rock to fracture.

3.1.19 Breakage action
refers to the method of breakage, either by impact or by attrition

3.1.20 Breakage event
in comminution modeling the action of size reduction is considered to consist of two components, selection and breakage

3.1.21 Breakage pattern
the distribution of sizes of all particles produced from the breakage of a parent particle.

3.1.22 Breakage rate
the frequency (number per unit time) of breakage events

3.1.23 Bridging
when two or more rocks are individually small enough to enter the crusher but straddle the opening in such a way so as to prevent each other from falling in

3.1.24 Bushing
a fixed or removable cylindrical metal lining used to constrain, guide, or reduce friction

3.1.25 Chain tension
the actual force existing at any point in a conveyor chain.

3.1.26 Chain-type conveyor
a conveyor using a driven endless chain or chains, equipped with flights that operate in a trough and move material along the trough.

3.1.27 Center of gravity
point where the mass of an object is perfectly balanced in all directions.

3.1.28 Centrifugal force
the force that pushes a rotating object outward.

3.1.29 Choke feed
a feeding arrangement in which the potential rate of supplying material at the feed point/equipment exceeds the rate at which the conveyor will remove material.

3.1.30 Choke point/ Choke zone
that region between the mantle and concaves where the unit area, and therefore the unit volume, is at a minimum

3.1.31 Cobbing
the separation, generally with a handheld hammer, of worthless minerals from desired minerals in a mining operation; e.g., quartz from feldspar

3.1.32 Choking
when the downward flow of rock in the crusher is stopped for some reason(s)

3.1.33 Circuit
a link of all crushing or grinding stages

3.1.34 Circulating Load
the quantity of material recycled in a closed circuit

3.1.35 Comminution
the progressive size reduction until mineral of interest is liberated/ exposed

3.1.36 Comminution machine
any machine designed to reduce the size of particles. In mineral processing the two broad categories are crushers and grinding mills.

3.1.37 Competency
a term used to describe the structural integrity of a particular ore.

3.1.38 Conveyor
the device that moves bulk solids from one location to another on a belt/chain.

3.1.39 Conveyor belt weightometer
a device that measures the total mass that has been transferred by the conveyor, which is important for plant metallurgical accounting

3.1.40 Controlled Variable/ Measured Variable
variable that the controller tries to maintain at set point

3.1.41 Crusher
a comminution device that breaks particles by exerting mechanical force

3.1.42 Closed side setting (CSS)
the minimum distance between mantle and concaves at the choke zone

3.1.43 Crusher cavity
space inside the crusher where the ore is located.

3.1.44 Crushing
size reduction primarily by impact. Particles are broken down by forces applied perpendicular to their surface, compressing them.

3.1.45 Crushing work index
a measure of the quantity of electrical energy required to crush a given quantity of rock.

3.1.46 Current
the amount of electric charge flowing past a specified circuit point per unit time.

3.1.47 Dead Load

in a stockpile the rock particles not directly within the repose angle above a draw point will not flow unaided into the draw point. This region of the stockpile is called the dead load

3.1.48 Deadman switch

a safety mechanism that ensures stoppage of equipment if the operator is not proactively ordering its movement.

3.1.49 Degree of liberation

the percentage of that mineral or phase occurring as free particles in relation to the total of that mineral occurring in the free and locked forms

3.1.50 Degree of locking

the percentage occurring in locked particles in relation to the total occurring in the free and locked forms

3.1.51 Double-roll crusher

a machine for breaking down ore, rock, or coal and to discharge the crushed material below.

3.1.52 Double-roll press

a press in which pressure is applied by the mating of one or more pairs of indented rolls of equal diameter, revolving in opposite directions.

3.1.53 Drive pulley

pulley attached to a power source that when in use puts force on a belt/cable/chain

3.1.54 Dust enclosure

any means for confining air contaminated with particulates so that it can be withdrawn from the surrounding environment.

3.1.55 Dust suppression system

a system for capturing and removing particulates from contaminated air

3.1.56 Eccentric bushing

a bushing that fits inside the eccentric journal. The mainshaft assembly fits inside the bushing

3.1.57 Eccentric gear

attached to the eccentric, the eccentric gear meshes with the pinion. Motor power is transferred to the main shaft assembly through this gear and the eccentric

3.1.58 Eccentric Motion

a rotating motion which is not centered on the center of the apparatus

3.1.59 Effort

a force applied against inertia.
3.1.60 Energy efficiency (kWh/t)

power draw (kW) per throughput (tons/hr.)

3.1.61 Feeder

a device for introducing dry bulk materials to a conveyor at a controlled rate.

3.1.62 Gangue

worthless rock or other material in which valuable minerals are not found or non – valuable minerals.

3.1.63 Gape

the opening dimension of a gyratory crusher as measured from the top of the mantle to the top of the concaves

3.1.64 Hardness

usually thought of as a rock’s ability to withstand deformation under load

3.1.65 Head pulley

the head pulley is located at the discharge end of a conveyor and is the usual location for connection of the conveyor drive

3.1.66 High alarm

in a control system, an alarm that occurs whenever some measured quantity (ie: level, speed, weight, flow, etc) reaches a level considered to be well above normal

3.1.67 High-high alarm

in a control system, an alarm that occurs whenever a measured quantity has passed sufficiently beyond a high point (see High alarm) that some counter action must be taken

3.1.68 Impact

the breakage through the application of force to the rock surface in a short period of time

3.1.69 Impact idler

impact idlers cushion the shock at the loading point. They are grooved so that they can flex to absorb this shock, and are mounted very close together directly under a loading point

3.1.70 Liberated particle

a particle from the comminution process/machine that is composed mostly of a single mineral

3.1.71 Liberation

the fundamental step in mineral processing by which the valued minerals are freed from the gangue mineral

3.1.72 Locked particle

a particle from the comminution process/machine that is composed of several minerals

3.1.73 Low alarm
in a control system, an alarm that occurs whenever some measured quantity (ie: level, speed, weight, flow, etc) reaches a level considered to be well below normal

3.1.74 Low-low alarm

in a control system, an alarm that occurs whenever a measured quantity has passed a low point (see Low alarm) and is at a point where some counter action must be taken

3.1.75 Mainshaft

the moving part in a gyratory crusher covered by mantle

3.1.76 Manipulated Variable

the variable that the controller changes

3.1.77 Mantle

part that protects the cone, the inner part that forms the crusher cavity

3.1.78 Manual Mode

controller operating mode in which the manipulated variable is kept constant

3.1.79 Marcy Scale

an apparatus used to measure the density of a slurry

3.1.80 Metal detector

the device which measure the electrical conductivity of materials being conveyed

3.1.81 Middlings

particle of locked minerals and gangues

3.1.82 Ore

naturally occurring material from which a mineral or minerals of economic value can be extracted profitably

3.1.83 Open side setting

the maximum distance between mantle and concaves at the choke zone

3.1.84 Packing

condition of compaction within the crusher where the material stops flowing

3.1.85 Particle

single physical entity

3.1.86 PID Controller

common controller which compensates proportionally to the error (P – proportional), compensates for sustained errors (I – integral) and compensates for changes in error (D – derivative)
3.1.87 Plugging
when feed will no longer pass through the crusher. Due either to packing in the crushing chamber or an obstruction underneath the crusher

3.1.88 Primary
the first stage in a series of stages

3.1.89 Primary crushing
first stage of crushing in a comminution circuit

3.1.90 Primary gyratory crushing
first stage of crushing where a gyratory type crusher is used the stage is always described as primary crushing even if there is no additional crushing following

3.1.91 Radial stacker
type of conveyor that can pivot from one end and move in a horizontal arc

3.1.92 Radius of gyration
viewed from above, the base of the mantle in a gyratory crusher moves in a circle around the crusher centerline

3.1.93 Ratio
relationship in quantity, amount or size between two things

3.1.94 Ratio Control
control methodology where the controller output is calculated so that a ratio with a measured variable is maintained

3.1.95 Reclaim conveyor
conveyor that recovers material from storage

3.1.96 Reduction ratio
ratio of the largest size that can enter the crusher to the largest size that can leave it. Equivalent to: Gape/set

3.1.97 Regulated feed
where the flow of material to the crusher is throttled in some manner so that it is never completely filled

3.1.98 Regulatory Control
refers to the low-level control used to stabilize the process

3.1.99 Repose angle
slope at which a given material will come to rest under a given set of conditions

3.1.100 Representative sample
when inferring some characteristic of a population from a small sample, the problem always exists that
the sample is biased, that is, it does not represent the population with respect to that characteristic

3.1.101 Return idler
support the conveyor belt on its return run

3.1.102 Rock breaker
air powered impact hammer supported by a hydraulic boom

3.1.103 Rock hook
hook shaped especially for prying up rocks wedged in the crushing chamber

3.1.104 Rounded
shaped into the form of a circle or sphere

3.1.105 Run-of-mine (ROM)
ore entering the crusher from mine

3.1.106 Safety cord
cord that runs alongside a conveyor

3.1.107 Set
equivalent to the open side setting, the distance of furthest approach between the mantle and concaves at the choke point

3.1.108 Set Point
desired value that a controller attempts to maintain.

3.1.109 Sheave
wheel or disk with a grooved rim, especially one used as a pulley

3.1.110 Shorthead Crusher
cone crusher designed to handle relatively fine material

3.1.111 Side travel switch
electric switch that senses whether the conveyor belt is traveling off center (ie. misaligned)

3.1.112 Spider
massive arm that spans the top of the gyratory crusher

3.1.113 Stall
overload induced stoppage

3.1.114 Standard Crusher
cone crusher designed to handle relatively coarse material
3.1.115 **Step bearing**
circular disk that sits directly beneath the main shaft and supports it

3.1.116 **Stockpile**
storage pile of dry bulk solids

3.1.117 **Stone box**
receiving area for rock as it is dumped out of the haulage trucks, the stone box confines the rock so that it flows into the crusher

3.1.118 **Supervisory Control**
refers to the high-level control that does not directly manipulate the valves and motors in the plant

3.1.119 **Surge pocket**
storage compartment directly beneath the crusher that enables smooth feeding of crushed product onto a takeaway conveyor

3.1.120 **Surging**
large fluctuations such as in flow or current

3.1.121 **System Dynamics**
behavior of a system during a period of change

3.1.122 **Tail pulley**
tail pulley is located at the feed end of a conveyor and is used to adjust the belt tension

3.1.123 **Ton**
measurement unit for mass, there are 2,000 pounds in one ton

3.1.124 **Tonne**
measurement unit for mass, there are 1,000 kilograms in one tonne

3.1.125 **Top shell**
the upper casting of the gyratory crusher body to which are attached the Concaves, the top shell provides the mainshaft with a fulcrum point through the spider and comprises the feed opening of the crusher

3.1.126 **Training idler**
training idlers track a conveyor belt to prevent misalignment (ie: side travel)

3.1.127 **Troughing idler**
troughing idlers support the belt load, their profile causes the belt to trough thereby increasing its carrying capacity

3.1.128 **Throughput**
the total tons per hour passing through the plant
3.2.0 Grinding

3.2.1 ABC Circuit
two-stage grinding circuit composed of an autogenous mill, a ball mill and a crusher

3.2.2 AG/SAG
types of grinding mill which use the feedstock wholly or partly as the grinding media. In Autogenous Grinding (AG) large pieces of rock in the feed break other rock. In Semi-Autogenous Grinding (SAG) steel media such as balls are added to enhance the grinding action. Both types accept much coarser feed than do conventional (rod, ball) mills

3.2.3 Assay sampling
process of taking small amount bulk to represent the whole bulk.

3.2.4 Attrition
rubbing away or wearing down by friction

3.2.5 Attrition Grinding
grinding by wearing away through rubbing and chipping

3.2.6 Autogenous Mill (AG)
tumbling mill in which comminution is achieved by tumbling ore particles onto themselves.

3.2.7 Ball Mill
tumbling mill in which steel balls tumble onto ore particles to break them

3.2.8 Ball mill grindability test
crushed particles of a given size range are placed in a ball mill; the reduction in size of particles for a given number of revolutions of the mill is interpreted in terms of a grindability index

3.2.9 Batch grinding
grinding of a charge of mineral (dry or wet) in a closed ball mill

3.2.10 Batch mill
grinding mill, usually cylindrical, into which a charge of ore and water is placed and is ground to completion of the required comminution

3.2.11 Beater mill
used for impact crushing of easily broken minerals. An armature carrying swinging hammers, plates, or disks hits the falling stream of rock, dashing particles against one another and against the casing of the mill

3.2.12 Bull Gear/ ring gear
the gear that encircles the tumbling mill and transmits the motion of the pinion gear to the mill, the mill rotates as the pinion gear meshes with the bull gear

3.2.13 Calibrate

to determine, check, or adjust the scale of a thermometer, guage, or other measuring instrument, usually done by comparison with a standard instrument

3.2.14 Cascade Control

control methodology where a series of controllers in which the output of one controller is the set point of the next

3.2.15 Cascading

motion of the charge in a tumbling mill which occurs when the grinding media roll down from the top of the load to the toe of the load

3.2.16 Cataracting

motion of the charge in a tumbling mill which occurs when the grinding media are ejected from the top of the load onto the toe of the load

3.2.17 Circuit

a link of all grinding stages

3.2.18 Competent

rock that is structurally intact, that is, it is without significant fractures or flaws that would make it crumble easily

3.2.19 Conventional mills

fine grinding has traditionally been done for many years in cylindrical tumbling mills with a length to diameter ratio ranging from 2:1 to 3:2

3.2.20 Critical Size

size of the particles that build-up in the mill or in the circulating load due to a low rate of breakage

3.2.21 Critical Speed

minimum speed at which the grinding media are pinned to the mill liners because of the centrifugal force

3.2.22 Closed grinding circuit

a grinding circuit in which the underflow from the classifier at the mill discharge returns to the mill while the overflow leaves the circuit

3.2.23 Cumulative size distribution

standard method for representing size distribution analyses

3.2.24 Distributed Control System (DCS)

system that distributes the monitor and control duties among several devices

3.2.25 Density
mass of a material divided by its volume

3.2.27 Digging Shoes
pick up the grinding media and ore particles that settle at the bottom of the tower mill

3.2.27 Direct current
an electric current flowing in one direction only

3.2.28 Discharge Grate
grate inside the mill that retain coarse rocks

3.2.29 Drag
retarding force on a body resulting from the resistance to flow put up by the viscosity of the surrounding fluid

3.2.30 Drawhole
opening underneath a stockpile that allows the ore to reach the feeders

3.2.31 Gamma Gauge
device which uses a weak radioactive source to produce gamma rays to measure density (% solids)

3.2.32 Gland Seal
device which consists of packing compressed in a stuffing box for preventing slurry/steam/fluid leakage around the rotating shaft joint

3.2.33 Grade
percentage of a metal in a product

3.2.34 Grain
discrete chunk of pure mineral, may consist of one or many crystals

3.2.35 Grate Discharge Mill
type of mill in which the slurry flows through a grate to exit the mill, other common type of mill discharge is the trunnion overflow discharge

3.2.36 Grinding
size reduction primarily by attrition. Particles are broken down by forces applied tangential to their surface, abrading and chipping them

3.2.37 Grinding balls
media to aid the comminution of rock, consisting of forged or cast spherical iron balls

3.2.38 Grinding media charge
refer to media (balls, rods etc.) only (not the ore) in a grinding mill
3.2.39 Grinding mill

a rotating cylindrical steel vessel which contain a charge of loose crushing bodies - the grinding medium - which is free to move inside the mill, thus comminuting the ore particles.

3.2.40 Grinding Media

solid bodies which tumble onto ore particles to break them into smaller particles. The most common grinding media are steel balls, steel rods, and large ore particles.

3.2.41 Grindability index

measure of the grindability of a material under specified grinding conditions, expressed in terms of volume of material removed per unit volume of wheel wear

3.2.42 Grinding work index

energy that required to mill rock particles of specific size to a finer products of specific size

3.2.43 Grind Out

procedure in which the mill is run without any solids feed for a short period to time to get rid of slurry in the mill

3.2.44 Hammermill

crushing unit consisting of a rotor, fitted with movable hammers that is revolved rapidly in a vertical plane within a closely fitting steel casing

3.2.45 Head Pressure

energy supplied by the pump to the slurry, it is the difference between the pump discharge pressure and the pump suction pressure

3.2.46 Heterogeneous

consisting of dissimilar composition or parts

3.2.47 Homogeneous

uniform in structure or composition throughout

3.2.48 Hydraulic Gradient

slope or change of height required for flow

3.2.49 Hydrostatic Lift

trunnion bearing lube oil pressure, used in AG and SAG mills to monitor mill load

3.2.50 Impact grinding

shattering of particles by direct fall upon them of crushing bodies or the use of a device that vibrates a metal object such as a shutter box

3.2.51 Impact mill

a crushing unit in which a rapidly moving rotor projects the charged material against steel plates; impact mills find use in the size reduction of such materials as coal, feldspar, perlite, etc
3.2.52 Impede
to obstruct

3.2.53 Inching
slowly turning the mill to a new position, normally performed when relining the mill

3.2.54 Interlocks
control methodology where equipment can be permitted to start on shutdown based on certain

3.2.55 Inertia
tendency of a body at rest to remain at rest or of a body in motion to stay in motion in a straight line unless acted on by an outside force

3.2.56 Liners
pieces that protect the mill shell from wear

3.2.57 Manual Mode
controller operating mode in which the manipulated variable is kept constant, controller suspends control action

3.2.58 Mesh Size
the number of openings per linear inch in a screen.

3.2.59 Mesh
the screen number of the finest screen of a specified standard screen scale.

3.2.60 Mesh of grind
optimum particle size resulting from a specific grinding operation, stated in terms of percentage of material passing (or alternatively being retained on) a given size screen

3.2.61 Mill Load
the contents of the mill composed of grinding media and slurry, the total mill load also includes mill shell, liners, etc., that increase the weight at the trunnions

3.2.62 Moisture
weight of water in a product divided by the weight of product expressed as a percentage

3.2.63 MSDS
material safety data sheet outlines the hazards and first aid measures for each chemical

3.2.64 Open Circuit
a grinding circuit in which the particles go through the mill once. Or circuit without circulating load

3.2.65 Over current trip
motor protection feature, when a motor draws excess power in response to a load it rapidly heats up, risking damage
3.2.66 Overload
unstable condition where the amount of material in the mill or in the circulating load increases and is compounded by a reduction in grinding capacity

3.2.67 Pancake Mill
tumbling mill with a length over diameter ratio (L/D) much less than one, for example a ratio of 1/3

3.2.68 Particle diameter
length of a straight line through the center of a sedimentary particle considered as a sphere, a common expression of particle size

3.2.69 Particle size
general dimensions (such as average diameter or volume) of the particles in a sediment or rock, or of the grains of a particular mineral that make up a sediment or rock, based on the premise that the particles are spheres or that the measurements made can be expressed as diameters of equivalent spheres

3.2.70 Particle-size distribution
the percentage, usually by weight and sometimes by number or count, of particles in each size fraction into which a powdered sample of a soil, sediment, or rock has been classified—such as the percentage of sand retained on each sieve in a given size range

3.2.71 Particle disappearance rate
the time rate at which particles leave a comminution process. In a primary crusher, particles may exit the crusher when they are small enough to pass the gap at the bottom

3.2.72 Pebble Port
large grate openings used to remove critical size material

3.2.73 Pebble mill
horizontally mounted cylindrical mill, charged with flints or selected lumps of ore or rock. Usually long and high discharge

3.2.74 Peening
impact causing metal flow. In grates it reduces the opening size

3.2.75 Pendulum
a body suspended from a fixed support so that it swings freely back and forth under the influence of gravity

3.2.76 Percentage (%) Solids
the percentage by weight of solids in a slurry (often called pulp or slurry density)

3.2.77 Permeability
the ease with which a porous mass permits the passage of water

3.2.78 pH
a measure of hydrogen or hydroxonium ion activity i.e. acidity, alkalinity or neutral in solution

3.2.79 PID Controller

a common controller which compensates proportionally to the error (P – proportional), compensates for sustained errors (I – integral) and compensates for changes in error (D – derivative)

3.2.80 Pinion

the gear connected to the mill motor which causes the mill to rotate as its teeth mesh with the teeth of the bull gear

3.2.81 Powder

collection of very fine particles

3.2.82 Powder factor

the ratio of average power to the maximum average power obtained when the voltage and current are synchronized

3.2.83 Power

energy per unit of time.

3.2.84 Power Factor

ratio of average power to that when voltage and current are in synch.

3.2.85 Pressure

force applied to a unit area.

3.2.86 Primary Grinding Circuit

first grinding circuit in a series of grinding stages

3.2.87 Pulp Lifters

lifters that carry the slurry from the discharge grate to the exit of the mill

3.2.88 Residence/ Rentation Time

the length of time a slurry spends in a vessel

3.2.89 Rod Mill

a tumbling mill in which steel rods tumble onto ore particles to break them

3.2.90 Resistance thermal device (RTD)

a resistance thermal device is a way of measuring temperature; it varies resistance proportional to the temperature

3.2.91 SABC

a two-stage circuit composed of a semi-autogenous mill, a ball mill and a crusher

3.2.92 Secondary
second, a stage in a process that is second in a series

### 3.2.93 Secondary Grinding Circuit
second grinding circuit in a series of grinding stages

### 3.2.94 Semi-Autogenous Mill
a tumbling mill which uses a combination of ore and balls as grinding media

### 3.2.95 Single Stage Grinding
operation where a single grinding circuit is used to obtain a final product size

### 3.2.96 Slurry
a mixture of ore particles and water

### 3.2.97 Slurry Density
the percentage of solids by mass

### 3.2.98 Square Mill
a tumbling mill with a length over diameter ratio (L/D) of one

### 3.2.99 Sump
refer to a floor sump (a pit used to collect spilled water or slurry), or can refer to the pump box

### 3.2.100 Tertiary
stage in a process that is third in a series

### 3.2.101 Tertiary Grinding Circuit
third grinding circuit in a series of grinding stages

### 3.2.102 Torque
force times the distance to the point of rotation, it is the energy of rotation

### 3.2.103 Toughness
the natural resistance of a material to fail in tension

### 3.2.104 Tower Mill
a vertical cylinder with a special screw or stirrer designed to move the grinding media, grinding is achieved by the rubbing action of the media as it moves

### 3.2.105 Tramp Metal
unwanted piece of metal which can upset normal equipment operation

### 3.2.106 Trommel
the rotating cylindrical screen at the mill discharge which rejects coarse objects

### 3.2.107 Trunnion
the point of entry and discharge for the tumbling mill, the trunnion bearings support the mill at either end and ease rotation

3.2.108 Tube Mill
tumbling mill with a length over diameter ratio (L/D) much larger than one, for example a ratio of 3/1

3.2.109 Tumbling Mill
rotating horizontal cylinder partially filled with grinding media that tumble onto the ore to grind it

3.2.110 Velocity
Speed

3.2.111 Viscosity
the resistance of a fluid to flow

3.2.112 Voltage
electromotive force or potential difference

3.2.113 Work Index
measure of ore hardness which gives the energy required to grind one tonne of ore to a specific size

3.2.114 Recovery
mass valuables in final product per mass valuables in feed

3.2.115 Plant availability
explaining % of time is plant operating/ hours operating/24hrs

3.2.116 The discharge geometry
average size of openings or maximum size of openings or total Open Area

3.2.117 Mill Discharge
the charge in a specific size that exit the grate to go to the product stream

3.2.118 Discharge function
the fraction of the charge which reports to the discharge grate which then exits the mill

3.2.119 Mill Power Draw
power required to turn the mill shell or power required turning the lifters liners and grating discharge

3.2.120 Bond work index
energy that is required to mill rock particles of a specific size to a finer product of a specific size

3.2.121 Discharge Grates
the one which act as a separating barrier not allowing particles larger than the holes to escape

3.2.122 Pebble ports
pebble ports remove big rocks which are not breaking easily in order to prevent a build-up of this material

3.2.123 Slurry Pooling

the hold up of slurry inside the mill