Training Courses based on the Grinding Software

Presentations available

2015 - Presented by Marc Piccinin
Grinding Software list of calculators

Section 1: Ball Charges Kit
1. Ball charges Composition Calculator for Monochamber Mills
2. Ball charges Composition Calculator for 2 Chambers Mills
3. Ball charges Composition Calculator for 3 Chambers Mills
4. Modification of the Ball Charge after Sampling Analysis Calculator
5. Calculation of the Top Size Grinding Media
6. Ball Charges analysis calculator - Weight and Surface of the Grinding Charges
7. Ball Charge Make-up Calculator
8. Ball Mill Simulation
9. Grinding Media Wear Rate Monochamber Mill
10. Grinding Media Wear Rate 2 chambers Mill
11. Marked Ball Test Calculator

Section 2: Volume Load & Power Kit
12. Volume Load Calculator for 1 chamber mill
13. Volume Load Calculator for 2 chambers mill
14. Volume Load Calculator for 3 chambers mill
15. Bond Power Formula Calculator
16. Hogg and Fuerstenau Power Formula Calculator
17. Monochamber Mill Power Calculator
18. Drying + Grinding Chamber Mill Power Calculator
19. 2 Chambers Mill Power Calculator
20. Central Discharge (Birotator) Mill Power Calculator
Grinding Software list of calculators (suite)

Section 2: Volume Load & Power Kit (suite)
21. 3 Chambers Mill Power Calculator
23. Material Quantity in Monochamber Mill
24. Material Quantity in 2 chambers Mill

Section 3: Heat Balance & drying Kit
25. Heat Balance (Find Water) Calculator
26. Heat Balance (Find Temperature) Calculator
27. Drying Capacities with Weber Calculator
29. Cement Cooling in the Separator Calculator
30. Coal Drying Weber
31. Coal Drying Balance
32. Open Circuit Mass Balance Calculator
33. Closed Circuit 1 Mass Balance Calculator
34. Closed Circuit 2 Mass Balance Calculator
35. Closed Circuit 3 Mass Balance Calculator
36. Closed Circuit 4 Mass Balance Calculator
37. Closed Circuit 5 Mass Balance Calculator
38. Closed Circuit 6 Mass Balance Calculator

Section 4: Sizing Kit
39. Monochamber Mill Sizing Calculator
40. 2 Chambers Mill Sizing Calculator
41. Monochamber Mill Sizing for Wet Process Calculator
Grinding Software list of calculators (suite)

Section 4: Sizing Kit (suite)
42. Separator of Third Generation Sizing Calculator
43. Ventilation of the Mill an Fan Sizing calculator
44. Cyclones Sizing Calculator
45. Roller Press
46. Hydrocyclones Sizing Calculator
47. Bag Filter (Reverse) Calculator
48. Bag Filter (Pulse) Calculator
49. ESP Filter Calculator
50. Production vs Blaine and residue Calculator
51. Mill Modification ROI and Payback Calculator
52. Mill Circuit Modification IRR and Payback Calculator
53. Energy Optimization Calculator

Section 5: Tromp RRSB Kit
54. Tromp Curve calculator
55. Lagrange Correction calculator
56. RRSB (0,1 - 1000 microns) calculator
57. RRSB (1 - 10000 microns) calculator
58. RRSB (10 - 100000 microns) calculator
59. Blaine Calculator
60. Tromp simulation
List of presentations available

1 Comminution and Laws of Comminution

Introduction
Definition of the comminution
Comminution in the cement industry
Forces applied in comminution
Classification and designation of the stages of comminution
The three laws of comminution
Efficiency of the different crushing grinding devices
2 Types of Tube Mills

Introduction
Rod mills
AG and SAG mills
Pebbles mills
Slurry mills
Monochamber mills
2 Compartments compound mills
3 Compartments compound mills
Central discharge double rotator mills
Airswept mills
3 Power Formulas

Introduction
Bond Formula
Hogg and Fuerstenau Formula
Other power formulas
Power Calculators
Exercises
4 Volume Load Measurement Explanation

Introduction
Measurement of \( H \)
Counting of the number of visible plates
Measurement of the central part
Volume Load Calculators
Exercises
5 Ball Charges Composition

Introduction
Cement mill with 2 compartments
Cement mill with 3 compartments
Cement mill with only 1 compartment
Raw mills
Ball Charges Calculators
Exercises
Ball Mill Simulation
6 Cement Mill Heat Balance

Introduction
Principle
The three basic parameters
Definitions of the parameters
Equations of the heat balance
Hypothesis
Animated explanation
Heat Balance Calculators
Exercises
7 Drying capacities calculation

Introduction
Kinds of drying methods
Drying capacities calculation
Conclusion
Drying capacities Calculators
Exercises
8 Mill's Internals

Introduction
Head Liners
Linings
Lifting plates for drying chambers
Lifting linings for first or grinding (crushing) compartment
Linings of semi-finishing and finishing compartments
Retaining rings
Rubber linings
Diaphragms
Transfer diaphragms
Intermediate diaphragms
Single diaphragm
Double diaphragm
Flow control diaphragm
Flow control diaphragm for slurry mills
Comments on the slots
Central discharge diaphragms
Outlet diaphragms
Life time of diaphragms
Grinding media
Introduction
Ball charges quality
Wear rate
Wear rate calculation
Cylpebs
Wear rate Calculator
Exercise
9 Ball Charge Sampling

Introduction
Method used in the mining industry
Method to be used in the cement mill
Analysis of the samples
Conclusion
10 Marked Ball Test

Introduction
Goals of the MBT
Marked balls
Controls procedure
Data to take during the test
Results of the marked ball test
Example
MBT calculator
Exercise
11 Cement Ball Mill Sizing Explanation

Introduction
Bond equation and correction factors
Define fresh feed characteristics
Define target fineness
Define production target
Define efficiency factors
Define the estimated mill specific energy
Define the absorbed power required
Sizing of the ball mill
Other power correction factors
Ball mill final dimensions
Drying chamber (for raw mill)
Required installed power
Cement Ball Mill Sizing Calculators
Exercises
12 Mill Ventilation Measurement

Location of the measurement point(s)
Pitot Tube
Method of measurement
Mill Ventilation Calculator
Exercise
13 Material inside the mill and retention time

Introduction
Quantity of material inside the ball mill
Calculation with example
Residence time inside the mill
Material and retention time Calculator
Exercise
14 Ball Mill Inspection Procedure

Introduction
First chamber
Second chamber
15 Granulometry along the ball mill

Introduction
The Sampling Campaign
The Sieving in the laboratory
The results analysis with the curve and its interpretation
16 Mill Circuit Sampling Points and Procedure

Introduction
Example
Summary sheet of the work to do
17 Grindability and Hardness Tests

Introduction
Grindability definition
Hardness definition
Grindability tests
Hardness tests
18 Blaine Specific Surface Area

Introduction
Cement densities
Blaine and Air Permeability Method
Principle of the Blaine method
Determination of the amount of the cement sample
Calibration of the Blaine apparatus
Result
Example
Online Blaine Analyser
Blaine Calculator
Exercise
19 Production vs Blaine or Residue

Introduction
First Formula
Second formula
Third formula
Bond Formula
Production vs Blaine or Residue Calculator
Exercise
20 Cyclones

Introduction
Advantages
Disadvantages
Principle of operation
Forces affecting the particles
Flow Characteristics
Mechanical parts
Cyclones families
Design of the cyclones
Cyclones scale-up
Cyclone's efficiency
Cyclone's pressure drop
Design modifications and consequences
Methodology for sizing cyclones
Example of calculation
Cyclones sizing Calculator
Exercise
21 Static Separators

Introduction
Advantages
Disadvantages
Principle of operation
Mechanical parts
Operating characteristics
Diameter calculation
V-Separators
Introduction
Principle of operation
Mechanical parts
Operating characteristics
Dimensioning parameters
22 Dynamic Separators (Part 1)

Introduction
Dynamic Separators
Dynamic Separators: 1° generation
Introduction
Advantages
Disadvantages
Principle of operation
Possibilities of adjustments
Parameter of dimensioning
Suppliers
First generation separators data sheet
Dynamic Separators: 2° generation
Types of circuits
Advantages
Disadvantages
Principle of operation
Possibilities of adjustments
Parameter of dimensioning
Suppliers
Second generation separators data sheet
22 Dynamic Separators (Part 2)

Dynamic Separators: 3° generation
Introduction
Advantages
Disadvantages
General principle of operation
Suppliers principles of operation
Possibilities of adjustments
Possible causes of malfunction
Parameter of dimensioning
Suppliers
Types of circuits
Special designs for raw mill circuits
Example of dimensioning
Third generation separators data sheet
Separator Sizing calculator
Exercise
23 Cement cooling in the separator

Introduction
Separator as cooler
Heat balance of the separator
Cement cooling Calculator
Exercise
24 Particle Size Distribution

Introduction
Linear distribution
Linear distribution with x-log scale axis
Log - Normal distribution
Gaudin - Schuhmann distribution
Rosin-Rammler-Bennett distribution
Linear regression and correlation
Particle Size Distribution Calculator
Exercise
25 Tromp Curve Explanation

Introduction
Background of the theory
Circulation factor calculation
Separator's efficiency
Tromp curve
Tromp curve parameters
Practicle Example
Tromp Curve animated
Tromp Curve Calculator
Exercise
Lagrange calculator
Tromp Curve Simulation
26 Limestone Technology with Ball Mills

The limestone
Different applications of the limestone powder
Different types of grinding
Different types of mills and circuits
Mill's internals
Ball charge of the raw mills
Problems of drying
27 Coal Grinding Technology

Introduction
Types of coals
Coal properties
Petcoke
Reasons for grinding coal
Ball mills
Vertical Roller mills (VRM)
Comparison Ball mills vs Vertical mills
Drying problems
Fineness of the dust coal
Safety considerations
Dust collectors
Calculators
Exercises
28 Mill Circuit Modification ROI, IRR and Payback

Introduction
Definition
Payback Period
Discounted Payback Period
ROI (Return on Investment)
IRR (Internal rate of return)
Depreciation
Straight-Line Depreciation Example
Declining-Balance Depreciation Example
Calculators
Exercises
29 Mass Balance of grinding circuits

Introduction
Necessary data
Equations used
Sieves used in the calculation
Calculators
Exercises
30 Filters

Introduction
Electrofilters
Bag filters
Comparison between electrostatic precipitators and bag filters
Calculators
Exercises
31 Vertical shaft impactor

Introduction
Operating principle
Conventional circuit
Advantages of the VSI
Disadvantages of the VSI
Conclusion
32 Roller Press

Introduction
Operating principle
Explanation of the grinding action
General representation
Methods of use and types of circuits
Problem of the feed
Problem of the roller pressure
Operating parameters
Wear problems of the rollers
Particle size results of the press
Elements of sizing considerations
Main dimensions of the roller press
Determine the increase of production
Comparison of the situations before / after modification
Modification of the ball mill
Advantages of the roller press
Disadvantages of the roller press
Conclusion
33 Mills controls systems

Introduction
Concept of open loop (OL) and closed loop (CL)
Notions of transfer functions - Laplace Transform
Types of control systems
ON-OFF controllers
PID controllers (P, PI, PD and PID)
Fuzzy logic
Expert systems
Control possibilities of the grinding plants
Conclusion
34 Different ways to get an efficient grinding plant

Introduction
Increase the filling degree
Right lifting lining in chamber 1
Flow control intermediate diaphragm
Classifying lining in second chamber
Right ball charge gradation
From open to closed circuit
High Efficiency separator
Pre-crushing system
Pre-grinding system
Automated control
Predictive maintenance
Grinding aids
35 Grinding Software presentation
The Cement Grinding Office

END