

Fine Coal Processing

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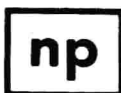
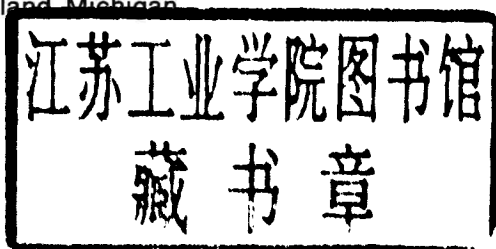
FINE COAL PROCESSING

Edited by

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FINE COAL PROCESSING

Preface

The availability of relatively cheap energy has been a cornerstone behind the rapid growth, during the twentieth century, in the world's gross global product. Indeed, as individuals, our standards of living are directly related to the cost and availability of energy. Numerous events of the last two decades have shown the vulnerability of the continued assumptions of low-cost and readily available energy. The major sources of energy such as crude oil, natural gas, nuclear reaction, and coal are all being faced with increasing economic, political and environmental pressures.

The world reserve of crude oil resource is expected to be seriously depleted some time in the next century. Consequently, there will be an increasing motivation in upcoming years to move away from the use of crude oil as the major source of energy. Coal is by far the world's largest and most uniformly distributed fossil fuel resource, but economic deposits, by today's standards, may be exhausted sooner than necessary if they are not properly exploited, processed and utilized. The specifications required for different coal uses are becoming increasingly complex. Such specifications can only be met through efficient processing. Factors such as ash content, volatile matter, particle size, coking properties, sulfur content, etc., have controlling influences on the ultimate uses of coal. These factors are a direct consequence of efficient methods of gangue liberation and its removal by appropriate processing techniques. Careful process design and process optimization are keys to meet the various market requirements.

With the drive towards reducing the overall mining economics, the modern trend of intensive mechanization and non-selective mining have increased the production of fines (<500 micrometers). Depending on various geological and operational factors the fines content in the run of mine coal can vary between 10 to 35 weight percent. These fines not only form a significant proportion

of processing plant feed, they also contain economic amounts of the desirable carbonaceous component required in specific coal markets. Their elimination can also adversely influence the chance of meeting selected market specifications. Consequently for such marginal coal, the optimization of fine coal processing plays a critical economic role.

Fine coal processing has been considered a major problem for some time. Compared to coarse fractions it is more expensive to treat fines. Various processes have been developed based on the physical and the physico-chemical properties of coal and the associated gangue minerals. Some of them have achieved significant commercial success. There have also been attempts to integrate the technologies of mineral, ore and coal processing, as the former has achieved relatively more sophistication. With the increasing economic significance of coal, coal processing is also attracting increasing research and development resources.

Processes based on the relative density differential between coal and associated gangue minerals, such as tables, spirals, sluices and water washing cyclones are frequently used for treating fine coal. However, froth flotation remains the most effective method of fine coal processing, though other surface chemical processes such as selective flocculation and agglomeration have received attention in recent years. The problems associated with fine coal flotation have presented many challenges to process engineers. Factors such as surface oxidation, clay slime content, fine particle size, and sulfur content are considered to be major problems in various parts of the world. Development of suitably designed flotation reagents, proper instrumentation and process control are leading towards the improved recovery of coal. The circuit yield is further improved through efficient dewatering of the froth concentrate.

To our knowledge, there is no book which is exclusively devoted to the subject of fine coal processing. The subject is complex and it is difficult to justify full and detailed coverage of every subject in a volume of this size. Our objective is to provide a self-contained introduction to current technology. It is expected that this book would be useful to students, practicing process engineers, chemical and equipment suppliers and researchers working in the field of coal process engineering. We have been fortunate in being able to secure the collaboration of a team of authors who have been major contributors in the field of fine coal processing for many years.

January 1987

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Contents

1. FINE COAL PREPARATION—ITS PRESENT STATUS AND FUTURE . . .	1
<i>Frank F. Aplan</i>	
Introduction.	1
Present Status of Coal Preparation	2
Inadequacies in the Present System.	4
Economy of Scale	4
Operating Time.	6
Coarse Coal Cleaning	7
Misplaced Particles.	7
Middlings Particles.	9
Intermediate Coal Cleaning	11
Fine Coal Cleaning.	12
Quality Control.	14
Human Resources	14
Cost Control.	14
Projections for the Future.	15
Energy and Environmental Considerations	15
Predicted Preparation Plant Process Changes.	16
References	17
2. FINE COAL GRINDING	19
<i>Richard R. Klimpel</i>	
Introduction.	19
Fundamental Approach to Coal Fracture	19
Empirical Coal Grindability Tests	21
Descriptions of Coal Composition.	23
Coal Rank	23
Coal Petrography and Mineral Content	26
Liberation Characteristics of Coals and Types of Mills	28

Mechanistic Approach to Describing Coal Grinding	37
Breakage Functions	37
Concepts of Mass Balances	43
Special Problems Involved with the Fine Grinding of Dense	
Coal/Water Slurries	47
Viscosity Influence on Net Production Rates	47
Coal Property Influence on Net Production Rates	52
Conclusions	53
References	54
Appendix—Fine Coal Grinding.	56
Quantitative Models for Describing Size Distributions.	56
 3. PROCESS DEVELOPMENT AND SELECTION FOR FINE COAL	
TREATMENT	59
<i>Colin R. Ward and Russell G. Burdon</i>	
Introduction.	59
Coal Geology and Deposit Evaluation	60
Megascopic Coal Characteristics	61
Coal Exploration Programs	62
Coal Seam Sampling and Drill Core Analysis.	62
Particle Size Distribution	64
Simulation of Particle Size Distribution from Drill Cores.	64
Fine Coal Characteristics.	65
Coal Petrography.	65
Mineral Matter	68
Dispersive Clays	70
Oxidation	70
Utilization of Fine Coal	71
Combustion	71
Coke Manufacture	73
Separation	74
Summary.	75
References	76
 4. CHEMISTRY OF FINE COAL FLOTATION	78
<i>Richard R. Klimpel and Robert D. Hansen</i>	
Introduction.	78
Chemistry of Major Reagent Components	81
Collectors	81
Frothers	82
Depressants	85
Coal Composition and Floatability	86
The Flotation System.	90
Measurement Techniques	90
Time Effects in Flotation	91
Mathematical Models of Time-Recovery Profiles	93
Major Component Influences in Cell Performance	94
Operating and Cell Design Components	94

Collector Influences.	96
Frother Influences.	98
Conclusions	102
Bibliography	106
5. IMPROVED RECOVERY OF FINE COAL BY FLOTATION PROCESS	110
<i>Surendra K. Mishra</i>	
Introduction	110
Surface Chemistry in Coal Flotation	111
Hydrophobicity of Coal	111
Electrokinetic Properties of Coal and Gangue Minerals	111
Surface Chemistry of Hydrocarbon Oil	114
Flotation Behavior of Coal and Circuit Design	121
Flotation Circuits	122
Flotation of Difficult to Float Coals	126
Conclusions	132
References	132
6. MECHANICAL FLOTATION MACHINES FOR THE TREATMENT OF FINE COAL	136
<i>Richard R. Klimpel</i>	
Introduction	136
Description of Mechanical Flotation Machines	138
General Discussion.	138
Some Industrial Mechanical Flotation Machines	140
Flotation Circuit Design	147
Flotation Machine Scale-Up.	147
Flotation Kinetics Scale-Up.	150
Final Circuit Design	152
Conclusions	157
Bibliography	157
7. SELECTIVE FLOCCULATION OF FINE COAL	160
<i>Santhana V. Krishnan</i>	
Introduction	160
Fundamentals	161
Dispersion	162
Flocculation.	164
Conditioning	166
Separation	169
Applications	170
Conclusion	176
References	177
8. OIL AGGLOMERATION PROCESS FOR THE TREATMENT OF FINE COAL	179
<i>William G. Steedman and Santhana V. Krishnan</i>	
Introduction	179

Process Description	180
Principles of Operation	180
Process Description	180
Effect of Operating Parameters	182
Oil Concentration	182
Oil Type and Characteristics	183
Level and Duration of Mixing	186
Other Factors	187
Selection of Appropriate Values for Variables	188
Commercial Applications	191
Trent Process	191
Converto Process	192
Spherical Agglomeration Process	193
Shell Pelletizing Separator Process	194
Olifloc Process	195
CFRI Process	196
Broken Hill Proprietary Process	197
Other Processes	197
Process Economics	198
Conclusions	200
References	201

9. ALTERNATIVES TO SURFACE CHEMICAL METHODS FOR FINE COAL PROCESSING 205

Peter T. Luckie

Gravity Concentration of Fine Coal	205
Jigs	206
Partition Curves	206
Water-Only-Cyclones	208
Multistage Separation	210
Flowing Film Concentrators	212
Tables	212
Spirals	214
Cones	215
Dense Medium Cyclones	215
Dry Separation	219
Non Gravity Separation of Fine Coal	219
Magnetic Separators	221
Electrostatic Separators	221
References	223

10. DEWATERING OF FINE COAL 225

Surendra K. Mishra

Introduction	225
Moisture Retention Properties of Coal	225
Moisture in Porous Bed	226
Filtration Theory	229
Fluid Flow Through Porous Media	229

Development of Filtration Theory	230
Centrifuge Filtration	234
Moisture Content of Filter Cake	234
Selection Criteria for Filtration Equipment	235
Vacuum Filters	236
Pressure Filters	240
Centrifuge Filters	241
Selection of Filter Medium	241
Factors Influencing Dewatering of Fine Coal	243
Polymer Applications for Dewatering Fine Coal	249
Application of Surfactants in Dewatering Fine Coal	253
Use of Thermal Energy in Dewatering Fine Coal	254
Alternative Methods of Dewatering Fine Coal	255
Thermal Drying	255
Application of Direct Electric Current	261
Acoustic Drying	263
Conclusions	264
References	265
 11. COAL PREPARATION WASTEWATER AND FINE REFUSE TREATMENT	 269
<i>Richard Hogg</i>	
Introduction	269
Flocculation Processes	270
Stability of Fine Particle Suspensions	270
Particle Aggregation	272
Floc Breakage	274
Floc Structure	276
Flocculants	276
Inorganic Flocculants	276
Organic Flocculants	277
Performance of Flocculation Processes	279
Settling Rate	279
Supernatant Turbidity	280
Sediment Density	280
Filtration Characteristics	282
Application of Flocculation in Coal Preparation Wastewater Treatment	282
Reagent Selection	282
Testing Procedure	283
Reagent Preparation	288
Process Design	288
Thickening Processes	289
Sedimentation of Suspended Solids	289
Thickener Design	289
Thickener Operation	291
References	291

12. INSTRUMENTATION AND CONTROL FOR FINE COAL PROCESSING	294
<i>S. Komar Kawatra</i>	
Introduction.	294
On-Line Sensors	294
On-Line Measurement of Ash Content of Slurries	295
Ash Analyzers Based Upon the Backscattering of X-Rays and γ -Rays	295
Ash Analyzers Based Upon the Absorption of Gamma Rays	300
On-Line Measurement of Ash Content of Bulk Solids	301
On-Line Determination of Ash Content of Coal on Conveyor Belts	302
Gamma Ray Absorption	302
Pair Production	302
Moisture Content	302
Capacitance Method	303
Microwave Methods	304
Factors Affecting the Performance of Attenuation Type Microwave Moisture Meters	305
Microwave Frequency	305
Temperature and Bulk Density of Coal	305
Coal Rank	305
Particle Size	305
Microwave Moisture Meters Based on the Principle of Attenuation and Phase Shift	306
Neutron Moisture Gauges	306
Nuclear Magnetic Resonance Gauges	306
Calorific Value of Fine Coal	306
On-Line Sulphur Analyzers	306
Slurry Density Measurement	307
Particle Size Analyzers	307
Level Gauges	308
Slurry Level Measurement	308
Capacitance Level Gauges	308
Ultrasonic Level Gauges	309
Differential Pressure (DP) Gauges	309
Froth Level Measurement	309
Solids Level Measurement	310
Flowmeters	310
Pressure Transducers	311
Control of Fine Coal Cleaning Processes	311
Basic Characteristics of Automatic Control	312
Empirical Models	313
Phenomenological Models	313
Artificial Intelligence/Expert Systems	313
A Control System for Automatic Blending	313
Flotation	313
Thickeners	318

Filtration Devices	320
Heavy Media Cyclones	320
Baum Jigs	322
Conclusions	322
Acknowledgments	322
References	324
 13. STORAGE AND HANDLING OF FINE COAL	 329
<i>John W. Carson</i>	
Introduction	329
Definitions	329
Bin	329
Bulk Solid	330
Typical Flow Problems	330
No Flow	330
Flooding	330
Limited Capacity	330
Segregation	330
Degradation	330
Level Control	330
Flow Patterns	331
Funnel Flow	331
Mass Flow	331
Measurement of Flow Properties	333
Wall Friction Coefficient, μ	333
Flow Function	336
Effective Angle of Internal Friction, δ	337
Angle of Internal Friction, ϕ	337
Bulk Density	337
Permeability	337
Bin Design Methods	339
Wall Angle for Mass Flow	339
Outlet Size	340
Arching	340
Flow Rate	341
Gas Permeation System	341
Means to Control Discharge	343
Feeders	343
Screw Feeders	343
Rotary Valves	345
Gates	345
Standpipes	345
Other Considerations	347
Flow Aids	347
Air Blasters	347
External Vibrators	350
Free-Flowing Additives	350
Inserts	350