Blasting Performance Analysis Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Blasting Performance Analysis Training Course delivers actionable, deep-tech competencies in high-fidelity fragmentation evaluation, precision spatial blast modeling, and advanced digital diagnostics. By systematically bridging the gap between historical rock blasting fundamentals and industry-standard predictive technologies, this program equips technical teams with the tools to significantly reduce downstream processing costs, secure high excavation velocity, and eliminate volatile structural risks.

Rooted in competitive modern-day engineering practices, the course directly addresses the dual challenges of **operational efficiency** and **environmental compliance**. Participants will dive into multi-modal workflows featuring digital twin modeling, unmanned aerial vehicle (UAV) photogrammetry, high-speed videography, and intelligent electronic-detonator delay configuration. By emphasizing real-time field data processing over archaic powder-factor formulas, this training empowers enterprises to transition from reactive troubleshooting to highly accurate, proactive energy-matching frameworks. Ultimately, this course changes how mining operations exploit explosive energy, changing raw detonation force into a precise, highly managed, and economically optimized industrial asset.

Programme Curriculum

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Course Objectives

1. Maximize Mine-to-Mill Synergy.
2. Execute High-Precision Fragmentation Modeling.
3. Minimize Dilution and Ore Loss.
4. Optimize Advanced Digital Design Software
5. Mitigate Ground Vibration and Air Overpressure
6. Implement High-Speed Diagnostic Analysis
7. Control Wall Stability and Face Profiling.
8. Manage Smart Electronic Initiation Protocols
9. Formulate Adaptive Geology Blasting Profiles.
10. Verify Structural Explosive Integrity.
11. Enforce Comprehensive Safety Risk Assessments.
12. Calculate Precise Blast-Induced Capital KPIs.
13. Lead Continuous Drill and Blast Continuous Improvement.

Target Audience

- Drill and Blast Engineers.
- Mine Planning and Design Engineers.
- Mining Operations Supervisors & Superintendents.
- Geotechnical and Geological Engineers.
- Technical Quarry Managers.
- Explosives Technical Service Engineers
- Environmental Compliance and Safety Officers.
- Civil Infrastructure Project Managers.

Course Modules

Module 1: Rock Mass Characterization and Blastability Indexing

- Geomechanical data collection workflows targeting Joint Volumetric Count, RQD, and structural orientation.
- Quantification of dynamic rock tensile and compressive strength metrics via laboratory ultrasonic testing.
- Application of Lilly’s Blastability Index to calibrate local site explosive energy factors.
- Structural mapping methodologies utilizing automated drone photogrammetry and LiDAR point clouds.
- Mitigating macro-geological vulnerabilities including faults, shear zones, mud seams, and water-bearing strata.

- **Case Study**: *Exploiting Structural Discontinuities in a Complex Copper-Gold Porphyry Pit to Overcome Severe Oversize and Hard-Toe Blockages.*

Module 2: Modern Explosives Technology and Energy Partitioning

- Thermochemical properties and performance characteristics of ANFO, heavy blends, and straight matrix emulsions.
- Physics of the Velocity of Detonation and its critical relationship with borehole detonation pressure.
- Mechanics of shock versus gas energy partitioning during the sub-millisecond rock breaking cycle.
- Selection protocols for cast boosters, continuous profiling, and variable-density bulk explosive formulations.
- Storage, bulk handling, and delivery chemistry controls to maintain product shelf life and prevent premature breakdown.
- **Case Study**: *Transitioning to Variable-Density Emulsions at an Iron Ore Operation to Reduce Overall Powder Factor by 14% While Preserving Fragment Sizing.*

Module 3: Advanced Drill Pattern Geometry and Precision Execution

- Mathematical derivation of critical spatial boundaries: Burden, Spacing, Stemming Depth, and Sub-drill.
- Design principles for specialized spatial layouts, including equilateral staggered, square, and specialized multi-row configurations.
- Evaluation of the economic and operational impacts of drill hole deviation on local burden confinement.
- Deployment of 3D laser face profiling systems to calculate true burden metrics and eliminate dangerous flyrock risks.
- Integration of real-time Measure-While-Drilling telemetry to dynamically adapt hole load sheets.
- **Case Study**: *Deploying High-Resolution Face Profiling at an Urban Limestone Quarry to Safeguard Neighboring Infrastructure and Stop High-Velocity Flyrock.*

Module 4: Initiation Systems and Micro-Second Delay Sequencing

- Comparative evaluation of non-electric shock tubes versus high-precision programmable electronic detonators.
- Mechanics of shockwave collision, destructive interference, and stress-field modification using precise micro-second delays.
- Design methodologies for complex firing sequences, including V-cut, echelon, and specialized trunkline delay configurations.
- Timing principles to maximize face relief, establish stable muckpile profiles, and ensure optimal casting characteristics.
- Programming diagnostic protocols, leak checks, and remote electronic initiation line safety workflows.
- **Case Study**: *Optimizing an Electronics Sequence Delay at a High-Throughput Gold Operation to Improve Excavator Digging Rates by 18%.*

Module 5: High-Fidelity Fragmentation Analysis and Comminution Optimization

- Digital image processing workflows using automated sizing software for rapid muckpile fragmentation tracking.
- Correlating dynamic particle size distribution curves back to active Kuz-Ram model assumptions.
- Quantitative assessment of the presence of internal micro-fractures within ore fragments to optimize grinding efficiency.
- Strategies to minimize the generation of ultra-fines in high-value, friable mineral deposits.

- Establishing interconnected KPIs tracking the direct relationship between fragmentation sizing and crushing circuit power draw.
- **Case Study**: *Implementing an End-to-End Mine-to-Mill Campaign to Safely Lift Primary Crusher Throughput by 22% via Fragment Sizing Adjustments.*

Module 6: Environmental Diagnostics: Vibration, Acoustic Shock, and Fumes

- Wave propagation physics governing blast-induced ground vibrations and the calculation of peak particle velocity.
- Establishing site-specific Scaled Distance regression curves using dedicated multi-station seismograph networks.
- Application of Signature Hole Analysis and advanced wave superposition modeling to calculate precise delay sequences.
- Root-cause management of low-frequency air overpressure, acoustic shock waves, and atmospheric venting events.
- Chemical remediation strategies to eliminate hazardous post-blast nitrogen oxide orange fume clouds.
- **Case Study**: *Deploying Signature Hole Superposition Analysis to Keep Blast Vibrations Safely Below Strict Regulatory Limits Adjacent to a High-Pressure Gas Pipeline.*

Module 7: Wall Control Engineering and Geotechnical Protection

- Physics of perimeter control methods: Pre-splitting, smooth-wall blasting, post-shearing, and cushion blasting techniques.
- Operational design parameters for pre-split charges, including decoupled column spacing and uncharged decking calculations.
- Evaluating wall damage and structural backbreak using high-resolution down-hole borescopes and acoustic telemetry.
- Catch-bench design criteria and structural slope stabilization strategies within high-stress underground mass-mining operations.
- Assessing long-term highwall safety margins through radar displacement metrics and structural rock mass mapping.
- **Case Study**: *Applying Precision Pre-Split Designs to Achieve Near-Perfect Half-Cast Factors on a 30-Meter Open-Pit Catch Bench.*

Module 8: Digital Twins, Advanced Analytics, and Field Diagnostic Auditing

- Building operational Blast Digital Twins by merging MWD, laser profiling, and spatial 3D block models.
- Real-time field application of continuous down-hole VOD measurement cables to verify explosive reaction rates.
- Application of high-speed videography analysis to accurately identify initial rock movement times and stemming ejection failures.
- Deploying spatial Blast Movement Monitors to track real-time 3D vector displacement of high-grade ore bands.
- Designing automated KPI dashboards for executive leadership highlighting cost-per-ton and environmental variance tracking.
- **Case Study**: *Leveraging 3D Blast Movement Monitors within a High-Grade, Complex Gold Vein Operation to Reduce Total Dilution Losses by $1.2M Over 6 Months.*

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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