nobel fire®

ADVANCED BLAST DESIGN & OPTIMIZATION TOOLS THAT INTEGRATE WITH YOUR DIGITAL ECOSYSTEM

DYNO®
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Software Suite for Optimized Blasting

Nobel Fire is Dyno Nobel's digital platform that provides best-in-class software solutions for mining operations of all shapes and sizes. From field data collection to design and from blast reconciliation to compliance reporting, Nobel Fire has everything an operation needs to design, execute, report, and improve their blasting activities.

Design and Integrated Modeling

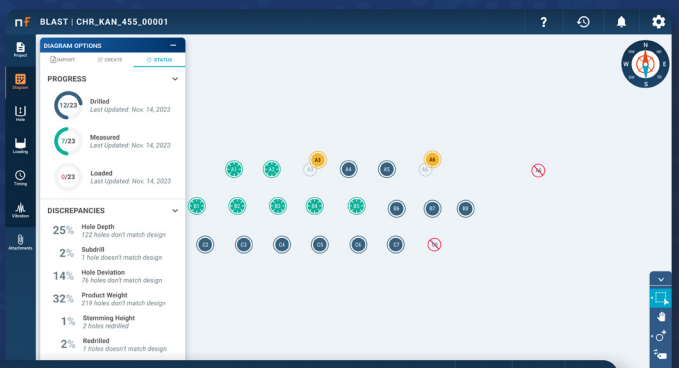
- Nobel Fire enhances simple blast designs with advanced tools such as Fracture Density Model (FDM) fragmentation prediction and vibration prediction for an efficient and controlled blasting process.

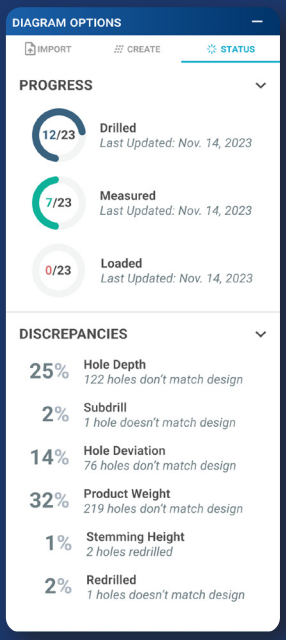
Data Collection

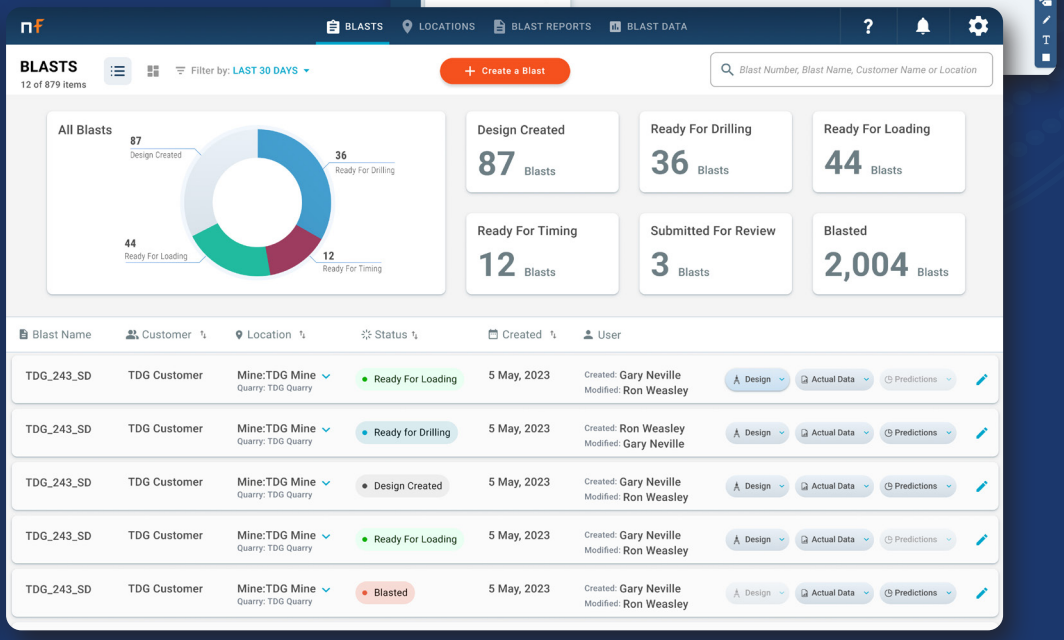
- The Nobel Fire mobile app allows users to log, drill, and load data and integrates with delivery systems including EC200, EC300, and Universal Control System (UCS).

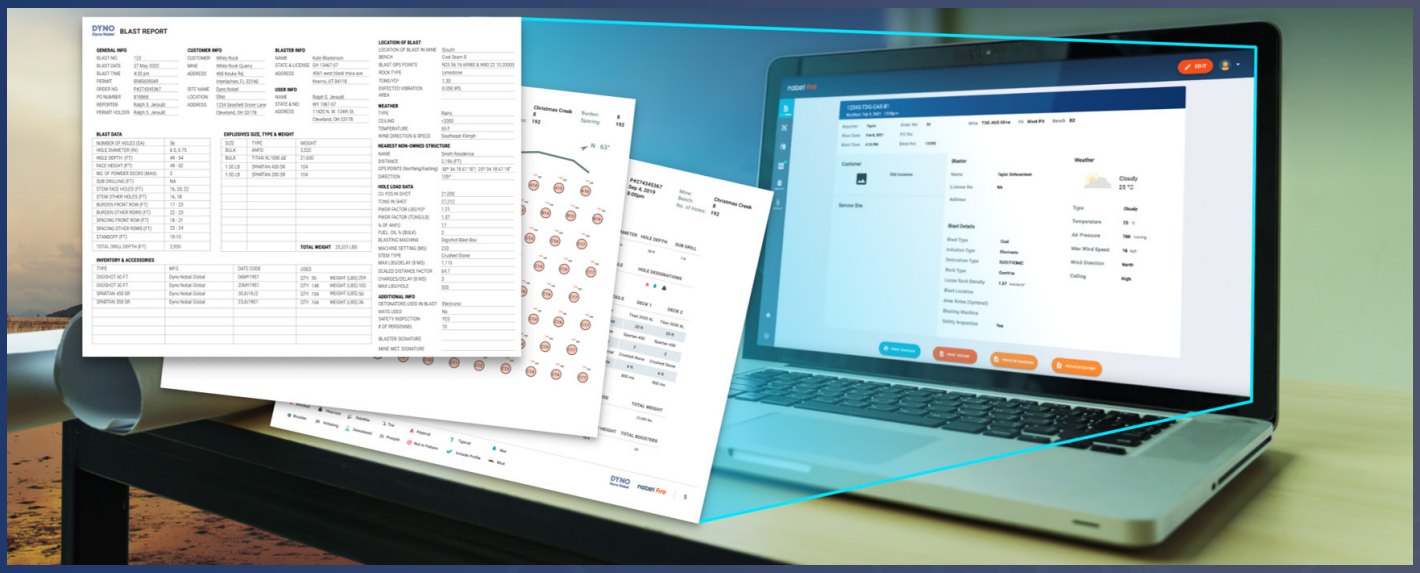
Design vs. Actual Blasts

- Users can compare the designed blast parameters with actual blast results for analysis and optimization.









Blast Reporting

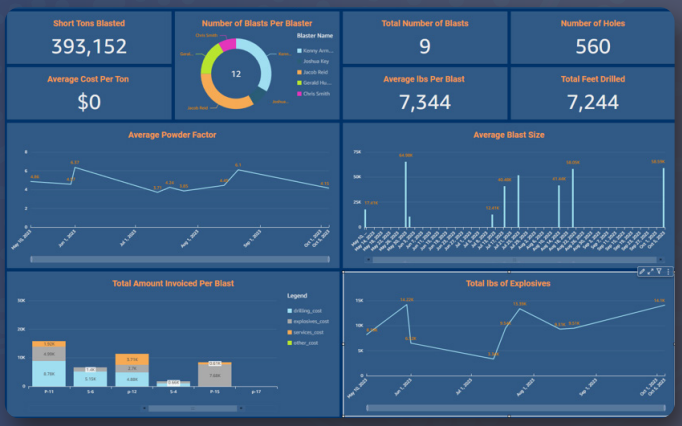
- The platform generates comprehensive blast reports that meet regulatory requirements and provide value summaries.

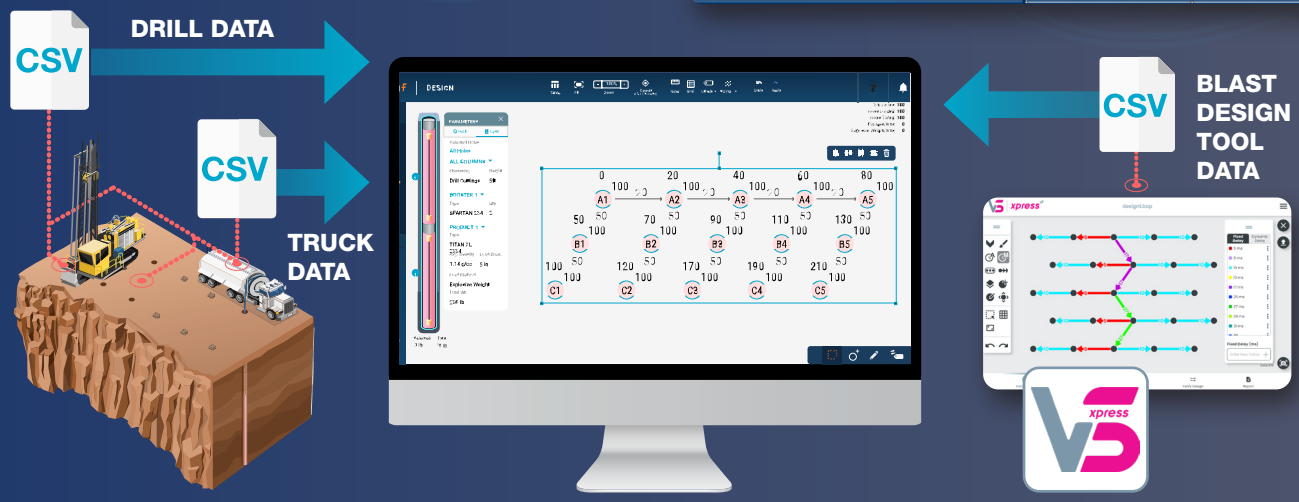
Cross Integrations & Data Output

- Nobel Fire is designed to operate as a central hub for blasting operations and seamlessly integrates with operations' existing digital ecosystems. Its versatility allows users to create and load blast patterns effortlessly through API connections or CSV file uploads for a straightforward experience for blasters and engineers.

Post-Blast Analysis and Dashboarding

- Nobel Fire offers post-blast analysis capabilities and provides dashboarding features for visualizing and analyzing aggregated blast data to assess trends in explosives usage and performance.



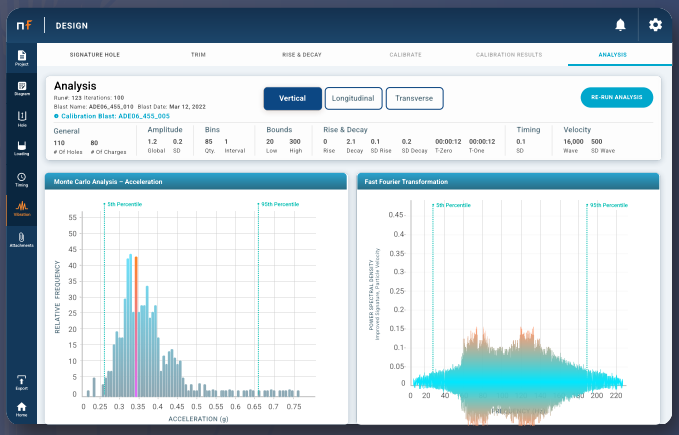


Advanced Vibration Prediction

Blasting Vibration Prediction Tool

Advanced Vibration Prediction is Dyno Nobel's vibration prediction tool designed to revolutionize the way the mining industry approaches vibration. While traditional models assume every blasthole will generate an identical wave, Advanced Vibration Prediction accounts for variability in blasting, including confinement, charge weight, bearing to structure, geological differences, and destructive and constructive interference, for the most accurate vibration prediction in the industry.

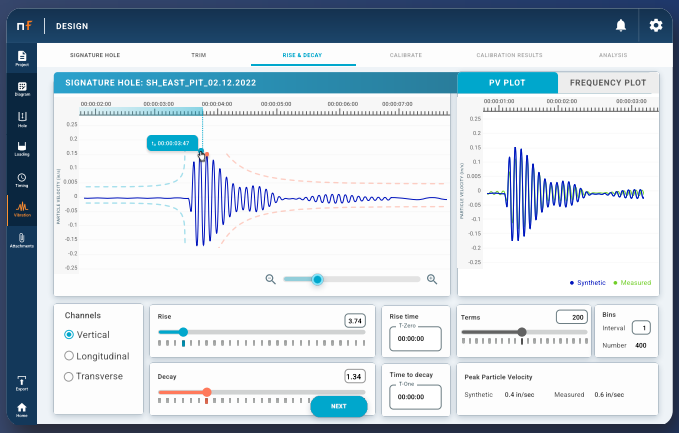
Through a proprietary waveform generation algorithm, Advanced Vibration Prediction uses a seed waveform as a starting point. It then generates thousands of synthetic waveforms to add variability to the synthetic convoluted blasting outcomes. These iterations of a single blast give a stochastic analysis that provides the likelihood of all potential outcomes so operations of all shapes and sizes can predict vibration outcomes with confidence.



▲ *Statistical analysis of outcome in AVP*

Benefits

- Industry-Leading Accuracy
- Calibrated From Measured Blasts
- Accounts for Intrinsic Variability in Blasting
- Stochastic Approach for Confidence in Prediction
- Simulates Hundreds of Blasts for Statistical Analysis



▲ *Shaping a waveform in AVP*

Vibration Timing Optimization

Optimal Timing for Vibration Mitigation

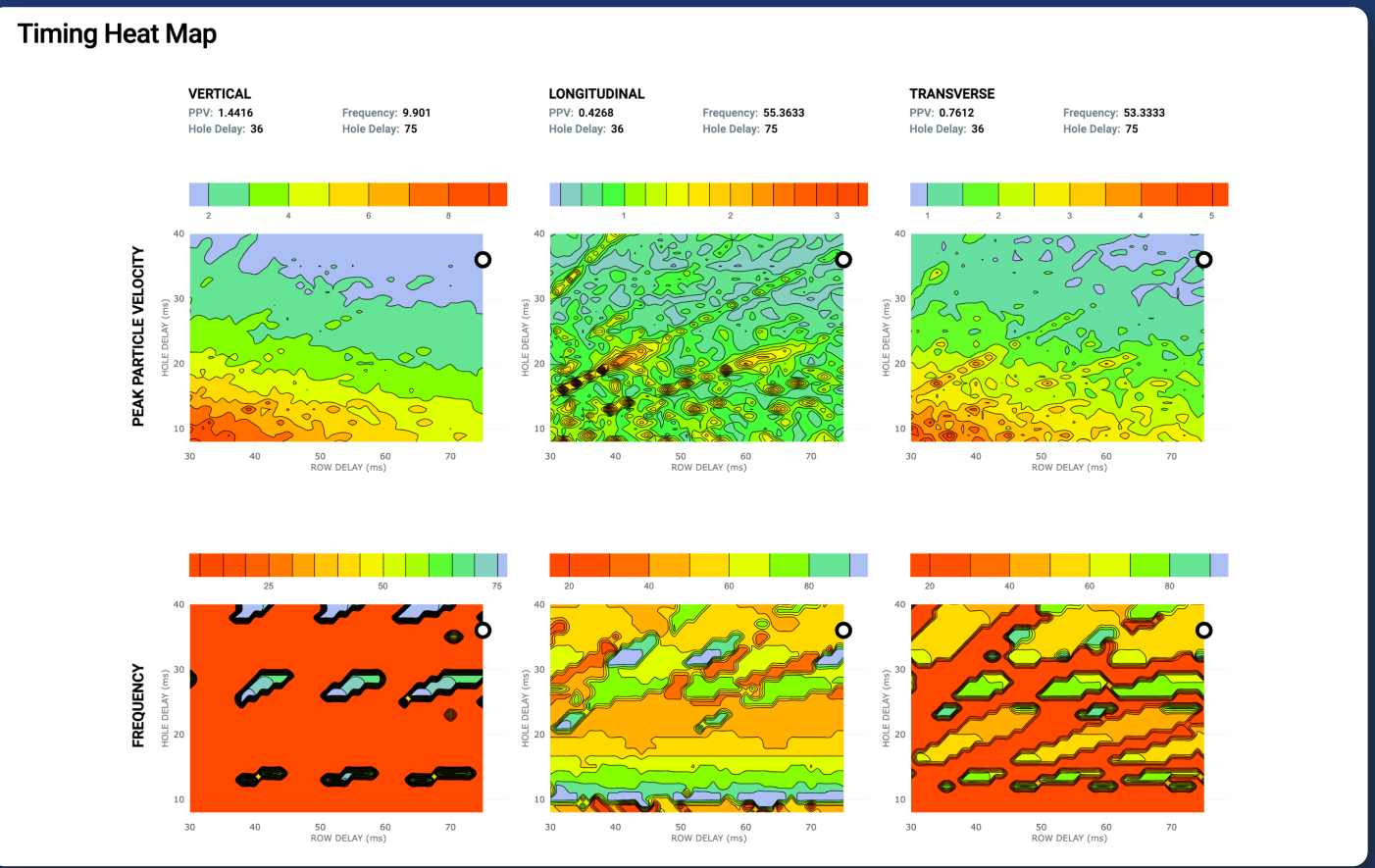
Dyno Nobel's Vibration Timing Optimization is a signature waveform convolution engine that quickly helps identify blast timing pairs that help reduce vibration at a structure. Using traditional or travel time-based signature wave analysis, Vibration Timing Optimization can run thousands of scenarios in seconds to find the optimal timing for vibration mitigation. This tool pairs seamlessly with the Advanced Vibration Prediction tool in Nobel Fire.

Benefits

- Simple, Fast, and Accurate
- Runs Thousands of Scenarios in Seconds
- Identifies Optimal Timing for Vibration Mitigation
- Pairs Seamlessly with Advanced Vibration Prediction

Use Cases

- Vibration Mitigation
- Timing Optimization
- Community Relations
- Safe Blasting Near Structures



▲ *Heatmap results in VTO*

Fracture Density Model

Physics-Based Fragmentation Modeling

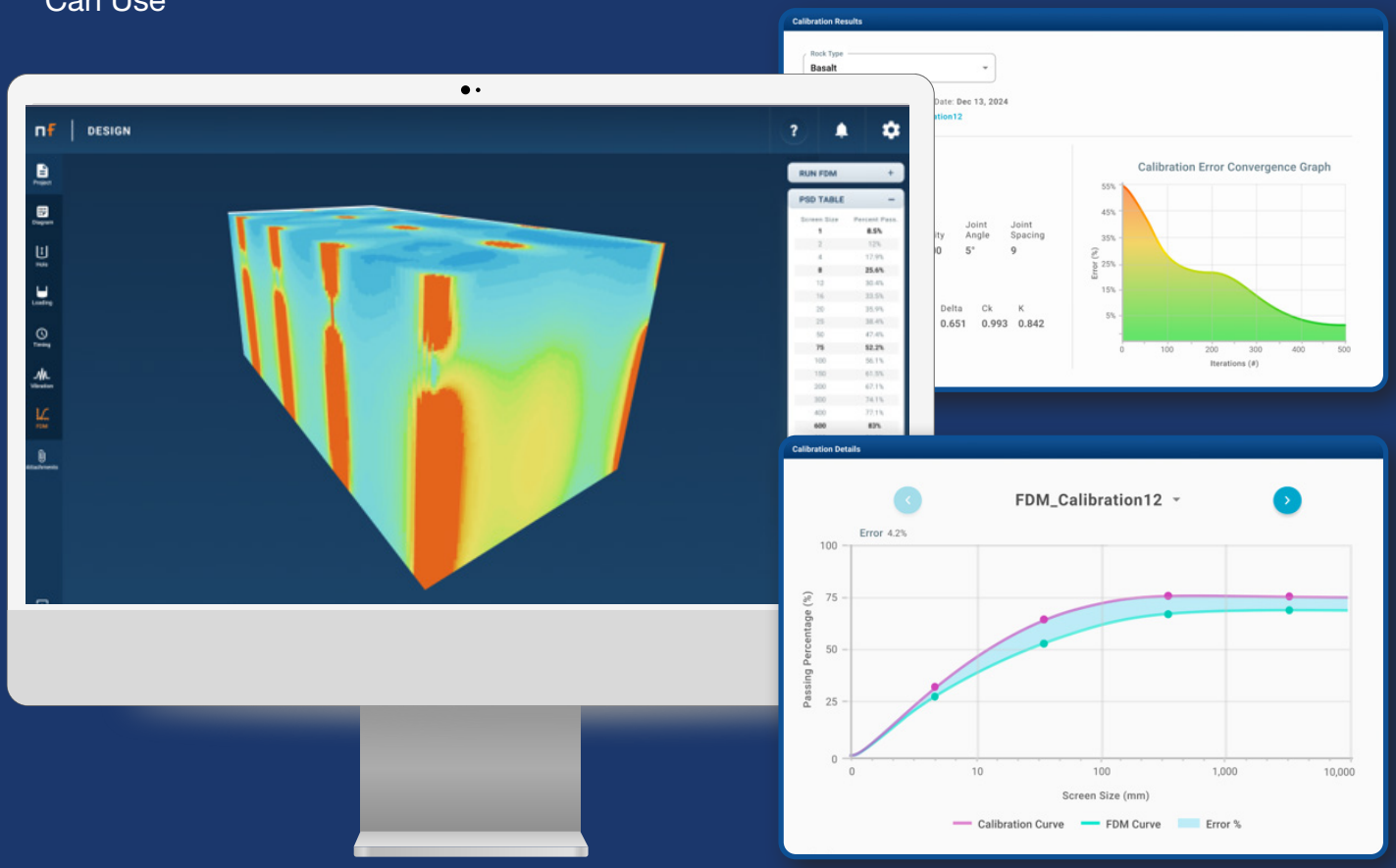
FDM is Dyno Nobel's physics-based fragmentation model. Built with the end-user in mind, it's an advanced modeling tool that anyone can use. Through an automated calibration process, the model can be calibrated using a single or series of blasts that have been measured, making the model extremely accurate for operations' specific geology. Modeling future outcomes significantly reduces the operational impact of continuous improvement projects, including cost reduction, fines reduction, oversize reduction, and pattern expansions.

Benefits

- Industry-Leading Accuracy
- Calibrated to Operations' Specific Geology
- Uses Any Source of Particle-Size Fragmentation Measurement
- Automatic Calibration Process
- Cloud-Based Architecture for Fast Results
- Powerful Physics-Based Tool That Anyone Can Use

Use Cases

- Cost Reduction
- Fines Reduction
- Oversize Reduction
- Pattern Expansion
- Particle Size Distribution Optimization
- Continuous Improvement



Geological Element Movement

Physics-Based Heave Modeling

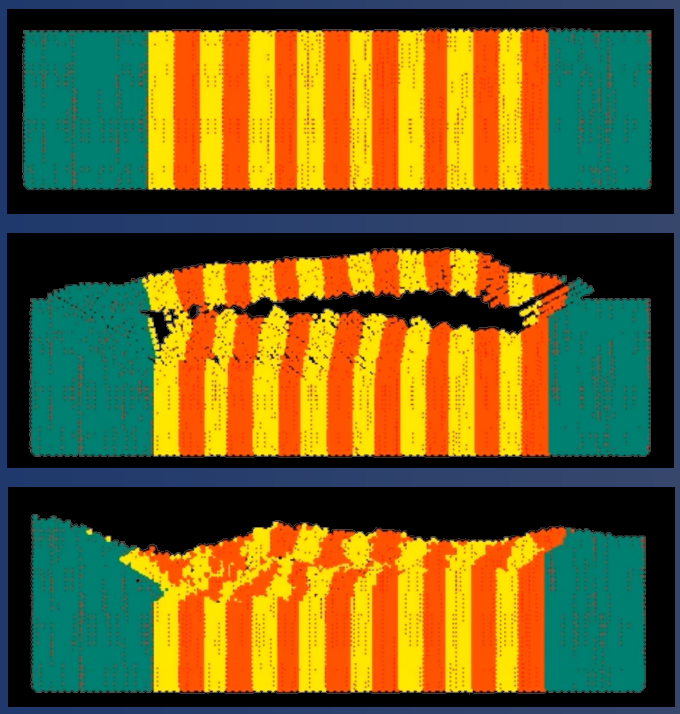
GEM is Dyno Nobel's industry-leading heave and blast movement modeling tool. By using shapes that can accurately represent rock fragments and code written to leverage modern hardware, GEM can help you predict cast-blasting results. GEM can also model ore and waste dilution to help manage your blasting outcomes. GEM is the industry's fastest and most accurate movement blast modeling tool.

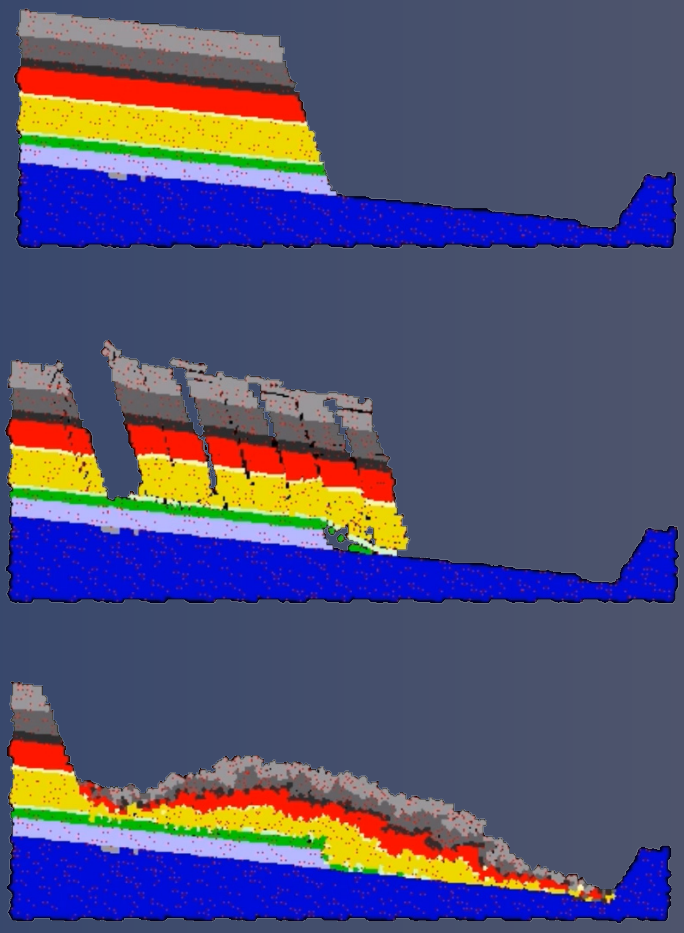
Benefits

- Industry-Leading Accuracy
- Physics-Based for Heave and Movement Modeling
- Predicts Cast-Blasting Results
- Helps Manage Blasting Outcomes
- Models Ore and Waste Dilution

Use Cases

- Blast Outcome Predictions
- Ore and Waste Dilution Modeling
- Cast-Blasting Result Prediction





▲ *GEM modeling a cast blast.*

◀ *GEM modeling an ore dilution blast.*

MOBILE APP

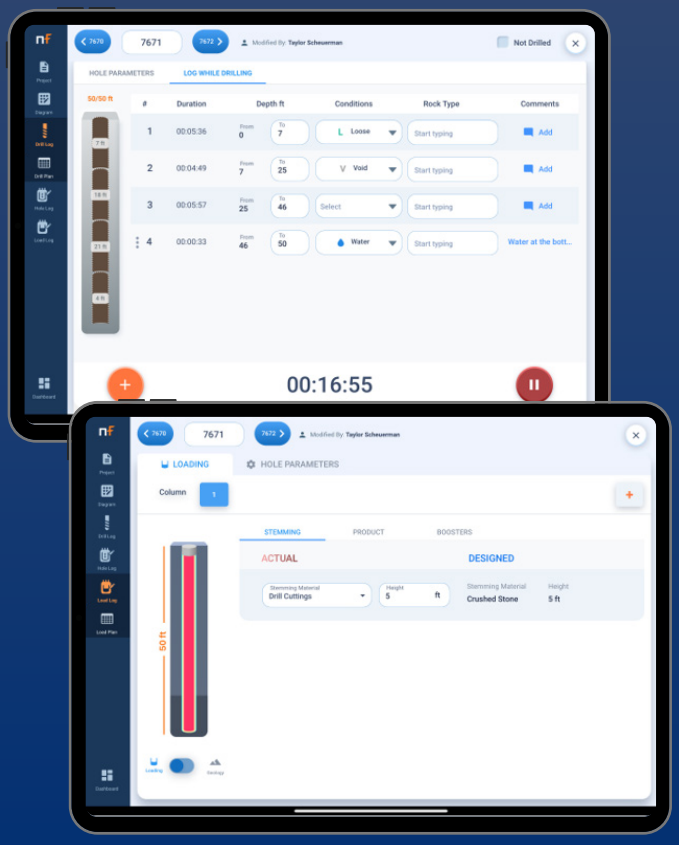
Bringing Nobel Fire to the Bench

Nobel Fire's mobile app streamlines blaster operations on the bench and makes it easy to accurately collect data in the field. Available on any modern iOS or Android tablet, the mobile app allows users to add real-time drill information and blast data during the layout and loading process. The collected data can then be combined with other data sources to analyze and monitor the blasting process.

The Nobel Fire mobile app integrates seamlessly with the web application. Mobile app users can create blast designs and capture drill, blasthole, and load data and see the information on the web application in real time. The mobile app can also be used offline and synced once connected to the internet.

Benefits

- Design Blasts on the Bench
- Capture Drill and Blast Information
- Analyze and Monitor Blasting Process
- Integrate with Nobel Fire Web Application



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@DynoNobel
dynonobel.com
@DynoNobel
Dyno Nobel
dna.marketing@am.dynonobel.com

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