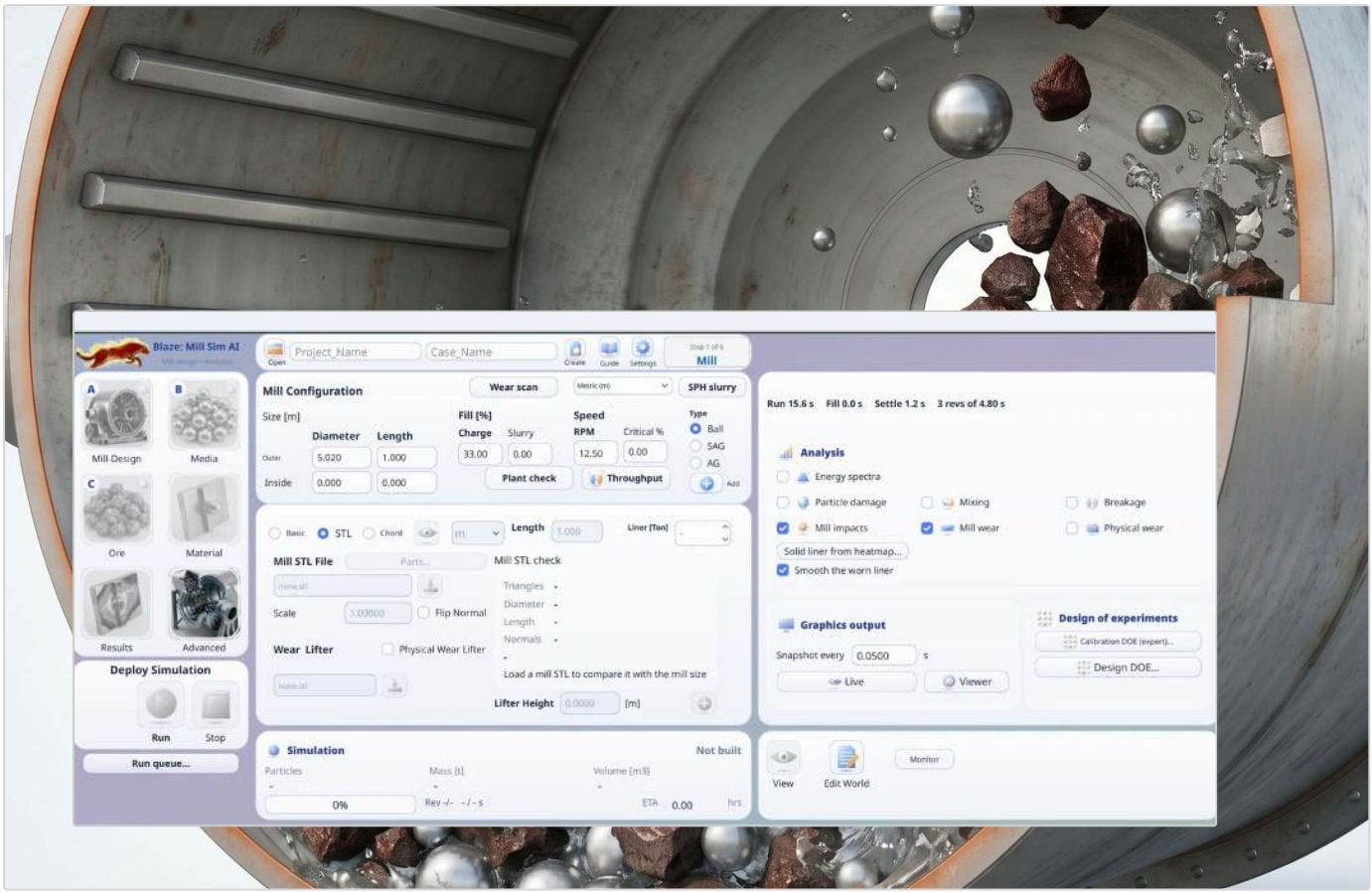
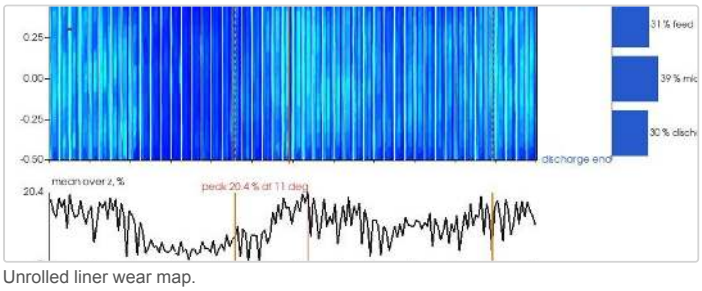
AI + Physics: Learns your mill, so you don't need to guess.

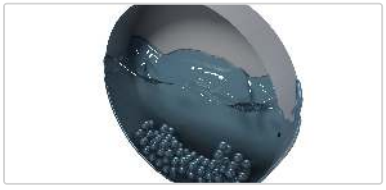
Multiphysics on the GPU: balls and ore as DEM and the slurry as SPH in one simulation. Mill Sim AI learns how your liners wear from your own laser scans, then gives power, throughput, P80 and liner life for SAG, AG and ball mills in one desktop program for Linux and Windows.



Power, throughput, liner life and slurry from one run



Unrolled liner wear map.


Coupled SPH slurry drum.


Polyhedral ore in an AG mill.



Mill power
Gross kW, torque arm and contact power from the simulation run.

Throughput and P80
Vogel-Peukert breakage scaled to plant t/h.

Liner life
Learned from your scans: the relining date.

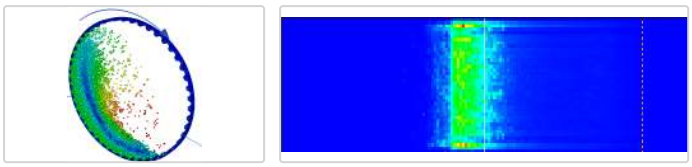
Effect of slurry
Two way SPH or a learned slurry estimate.



Best liner design
Design DOE ranks candidate liners.

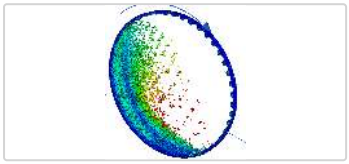
Liner wear learned from your scans

The DEM supplies where and how hard the charge loads every point of the liner; the plant's laser scans supply how much metal that loading removes. The law is small and smooth, so it trains from a few scans, not thousands.

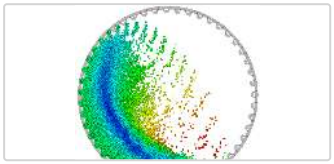


1. DEM for a few revolutions

2. Learned wear law



3. Advance by weeks



4. DEM on the worn shape

Step	Role in the loop
1. DEM	Impact and sliding energy on every point of the liner.
2. Learned law	The scans give how much metal that loading removes.
3. Advance	The worn liner stays a clean mesh.
4. Repeat DEM	Repeat until the wear limit you set.

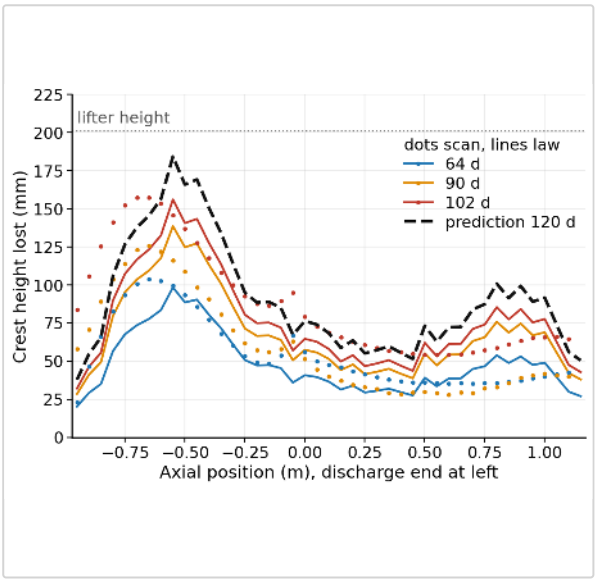
One button: Predict liner life

Load the plant's laser scans, run the mill on them once and press *Predict liner life*. The program learns the wear law and runs the loop by itself until the liner reaches your wear limit (millimetres of lifter left, or a percentage of the lifter height). The result is the relining date and a chart of lifter crest height against liner age for each section along the mill.

Site inputs with physics built in

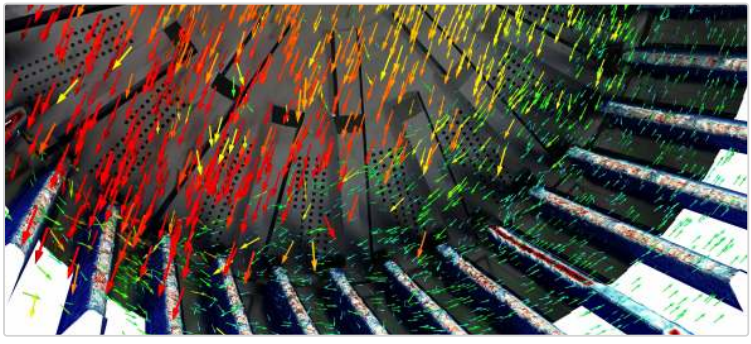
Ore abrasiveness (abrasion index, JK ta), liner hardness, slurry solids, pulp pH, corrosive water, ball size and throughput enter the law. Known directions are priors: a harder liner wears slower, a more abrasive ore and a corrosive pulp wear faster; unknown inputs stay neutral. A law learned at one site carries to another site and to a new mill.

- Wear only goes into the liner, grows with the loading and stops at the liner backing.
- The liner mesh wears without folds, flips or spikes.
- The same law can be the liner material's wear model inside a normal run.

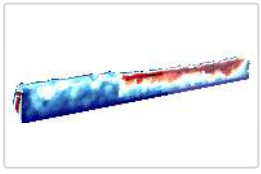


Lifter crest wear: plant scans, learned law and forecast.

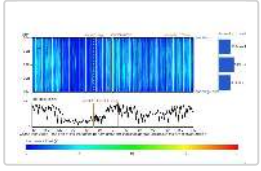
Physical wear and solid lifters



Worn solid element lifters inside a full mill.



Worn lifter bar modelled from liner Vickers hardness.



Unrolled liner wear measured from a laser scan.

One program, from plant survey to liner design

The Blaze solver, the viewer and the analysis tools ship inside it as compiled programs; only an NVIDIA GPU driver is needed for runs.

1. Plant check
Survey against published power models

2. Mill and liner
STL, simple or chord lifter builder

3. Media and ore
Uniform or axially graded

4. Checks
Rayleigh time step, GPU memory

5. GPU run
Blaze DEM and SPH

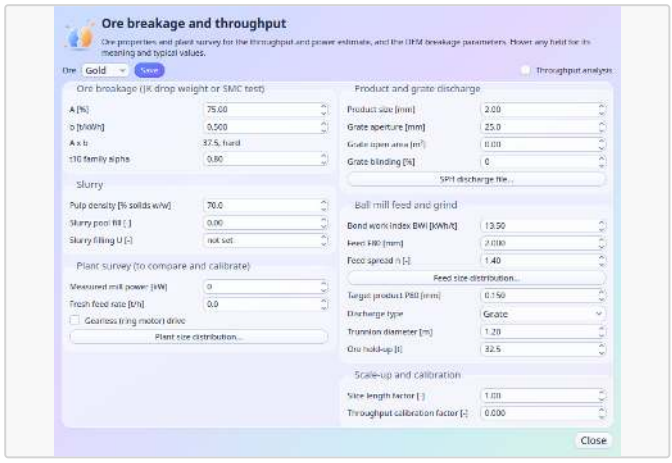
6. Results
Power, split and wear

7. Report
One HTML file, compare runs

8. Design DOE
Liner search and ranking



Wear scan alignment window.



Ore breakage and throughput window.

Model	Capabilities
Breakage and throughput	Each impact breaks an ore sphere with the Vogel-Peukert probability; fragments grow to the parent volume. **Calibrate** fits the breakage to the plant throughput. The throughput window gives gross power, t/h and product size, and the slice length factor scales a slice to the full mill.
Slurry	Two way coupled SPH slurry with the ore and media, discharging through the grate; power, discharge and backflow go into the report. **Learned Slurry** gives a fast dry run the slurry factors for power, liner impact and shear power, peak force and wear, with their range.
Design and calibration	**Calibration DOE** (expert) searches friction and wear rate to match the measured power and its split. **Design DOE** proposes lifter height, face angle and number of rows within published limits and ranks them. A run queue runs saved cases overnight.

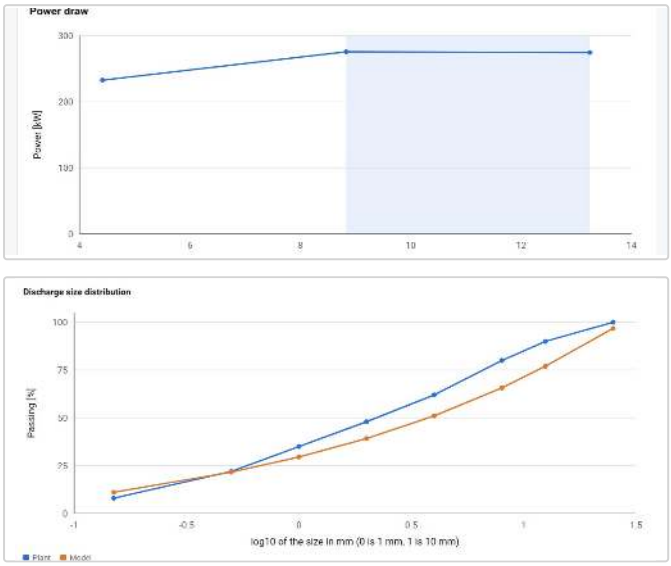


Design DOE liner ranking window.

Report, viewer and the Blaze solver

Report and compare

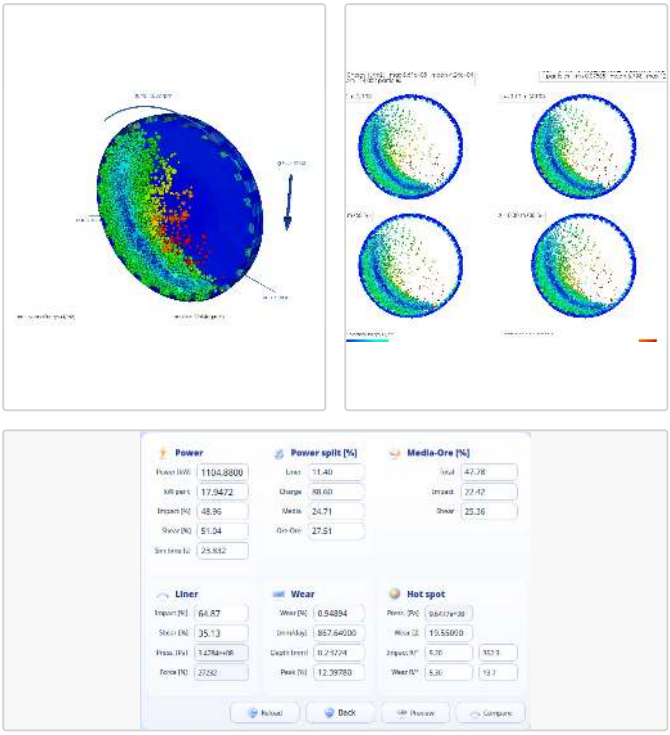
One HTML file per run, no internet needed: case summary, mill and ore, key findings, power history, torque arm power, power split, snapshots, toe and shoulder angles, liner wear and pressure, liner parts and mixing. Compare runs puts liner designs or operating conditions side by side.



Report power draw and discharge size plots.

Mill viewer

3D cut view coloured by the liner value, unrolled liner, slices, velocity vectors, trajectories and wear views.



Mill viewer 3D views and run results.



What the Blaze solver brings

The ore is true convex polyhedra, not sphere clusters, with Vogel-Peukert breakage, SPH slurry, liner wear and solid element liners on the GPU. The Blaze engine underneath also has rigid and flexible clumps and deformable Element meshes with crack propagation breakage.

Mill Sim AI 2026 V11

One desktop program for Linux and Windows that sets up, runs and reports a grinding mill simulation for SAG, AG and ball mills. Evaluation and academic licences are available.

Linux and Windows · SAG, AG and ball mills · Learned Slurry · SPH slurry

NVIDIA CUDA Research Center since 2013 (Blaze-DEM, University of Johannesburg); NVIDIA Applied Research Accelerator Program; NVIDIA Inception Program member

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