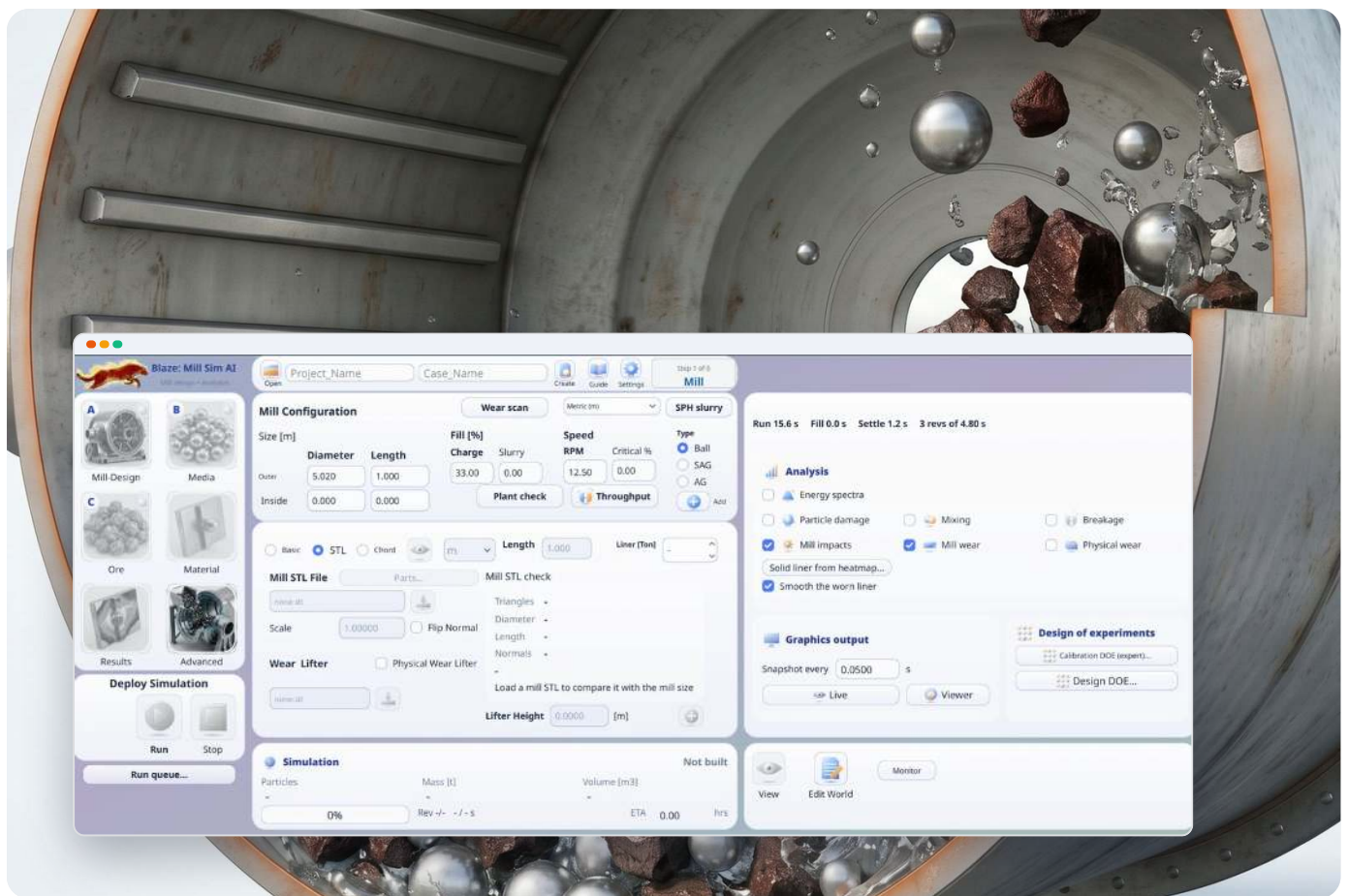




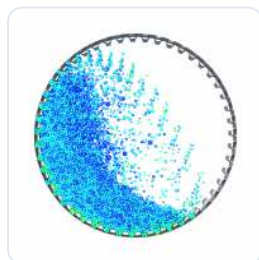
AI + PHYSICS

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.



Five questions, one simulation run



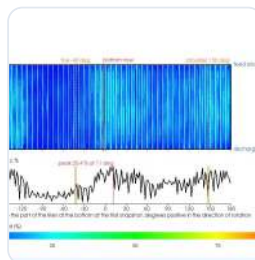
Mill power

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



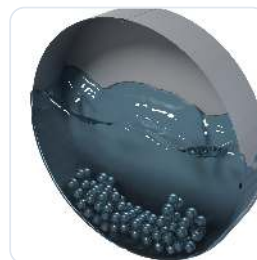
Throughput and P80

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.

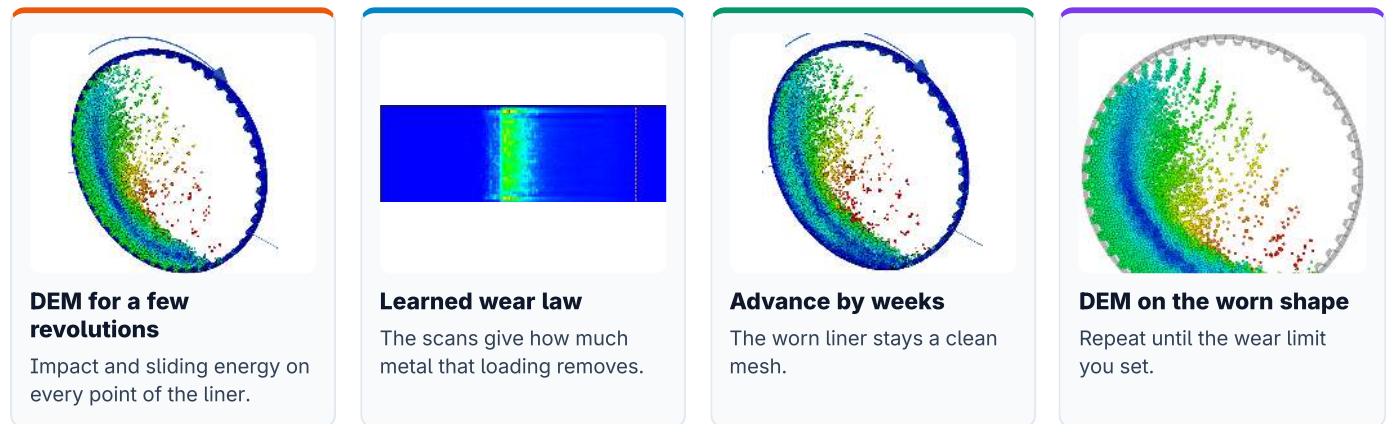


Best liner design

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.



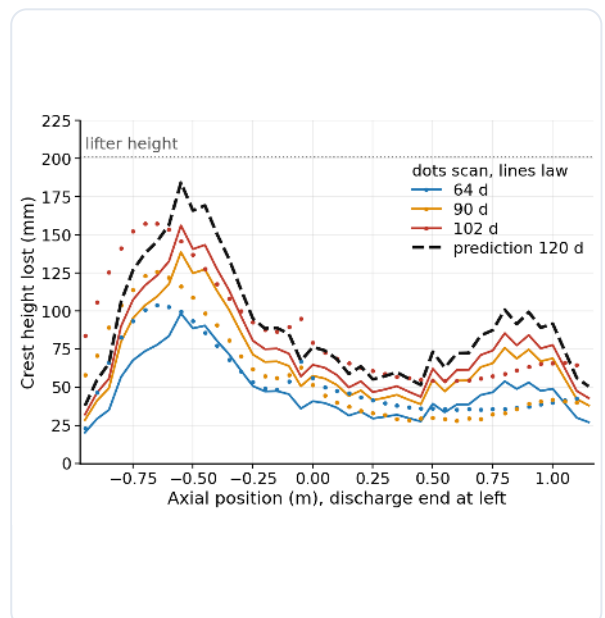
One button: Predict liner life

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

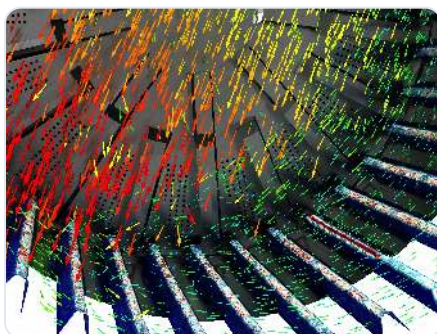
Ore abrasiveness (abrasion index, JK ta), liner hardness, slurry solids, pulp pH, corrosive water, ball size and throughput enter the law. Known directions are priors: a harder liner wears slower, a more abrasive ore and a corrosive pulp wear faster; unknown inputs stay neutral. A law learned at one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

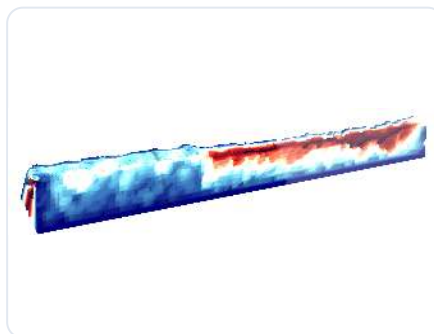


Lifter crest height lost along the mill: laser scans at 64, 90 and 102 days after relining (dots), the wear law learned from them (lines) and its forecast at 120 days (dashed).

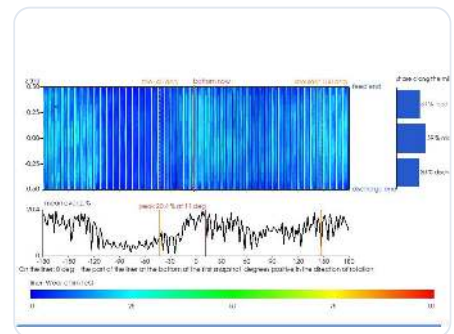
Physical wear and solid lifters



Solid element lifters are removed as they wear, so the charge meets the real, changing shape.



Real Vickers hardness of steel or rubber liners; a wear speed-up shows days of wear in a few revolutions.



Wear scan: a laser scan of the worn liner is fitted to the mill and becomes a measured wear rate.

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: the scan fitted to the mill, with the loss of liner along the mill.

Ore breakage and throughput

Ore properties and plant survey for the throughput and power estimate, and the DEM breakage parameters. Hover any field for its meaning and typical values.

Ore:

☐ Throughput analysis

Ore breakage (JK drop weight or SMC test)

A [N]:
b [t/kWh]:
A x b:
t10 family alpha:

Slurry

Pulp density [% solids w/w]:
Slurry pool fill [-]:
Slurry filling U [-]:

Plant survey (to compare and calibrate)

Measured mill power [kW]:
Fresh feed rate [t/h]:
☐ Gearless (ring motor) drive

Plant size distribution...

Product and grate discharge

Product size [mm]:
Grate aperture [mm]:
Grate open area [m²]:
Grate blinding [%]:
SPH discharge file...

Ball mill feed and grind

Bond work index BWI [kWh/t]:
Feed F80 [mm]:
Feed spread n [-]:
Feed size distribution...

Target product P80 [mm]:
Discharge type:
Trunnion diameter [m]:
Ore hold up [t]:

Scale up and calibration

Size length factor [-]:
Throughput calibration factor [-]:

Ore breakage and throughput: ore properties, plant survey and the breakage parameters.

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, rolling resistance 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.

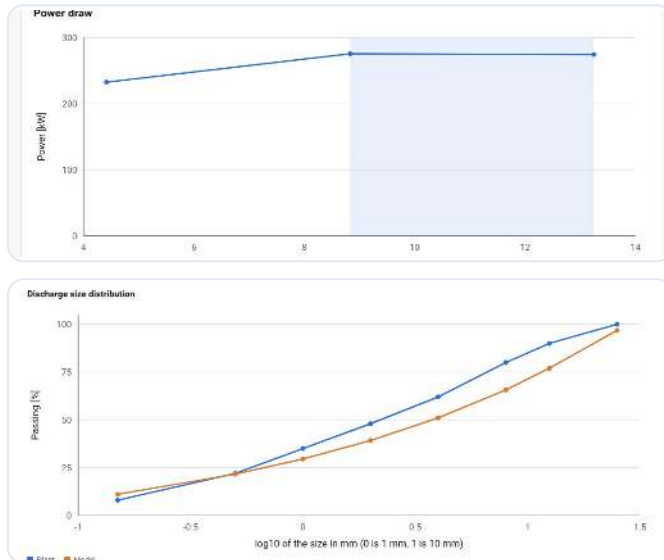


Design DOE: generated lifter profiles run as cases and ranked by a figure of merit against the current design.

Report, viewer and the Blaze solver

Report and compare

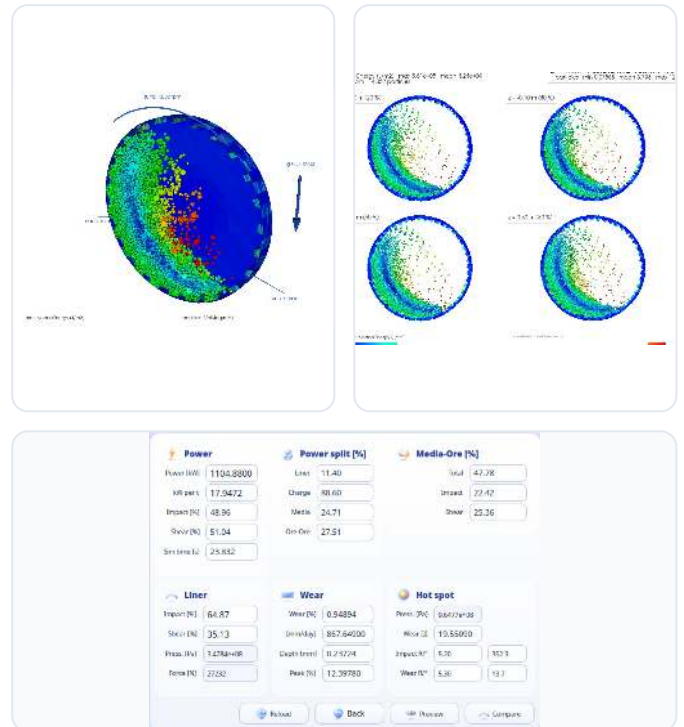
One HTML file per run, no internet needed: case summary, mill and ore, key findings, power history, torque arm power, power split, snapshots, toe and shoulder angles, liner wear and pressure, liner parts and mixing. Compare runs puts liner designs or operating conditions side by side.



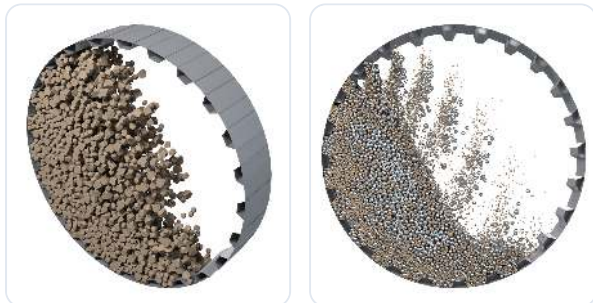
Power draw history and the size distribution of the discharge in the report.

Mill viewer

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



3D cut and multi-slice views, and the results listed when a run ends.



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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