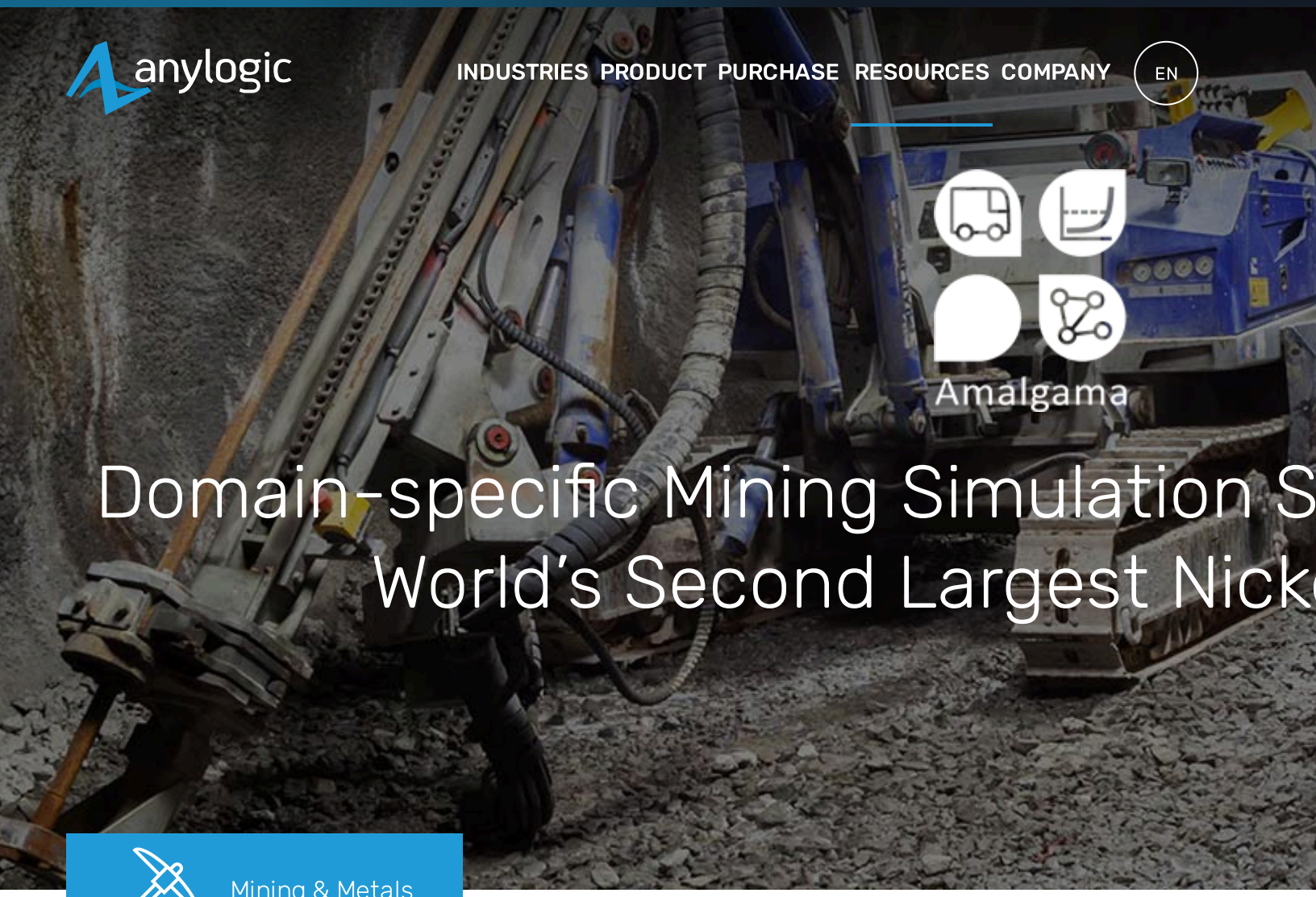


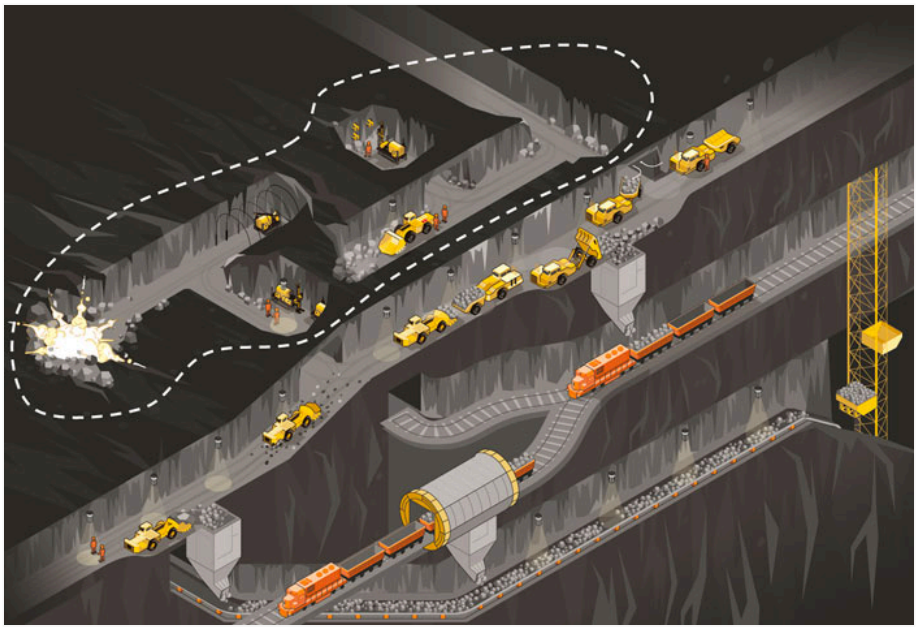
Domain-specific Mining Simulation S
World's Second Largest Nick

Mining & Metals

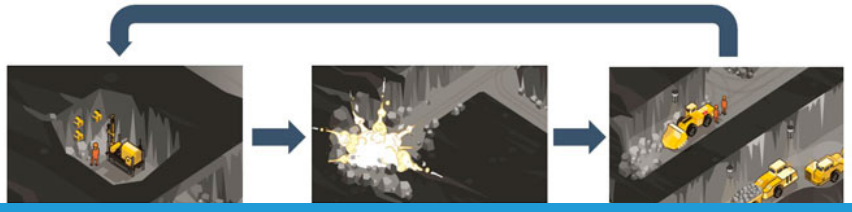
Problem

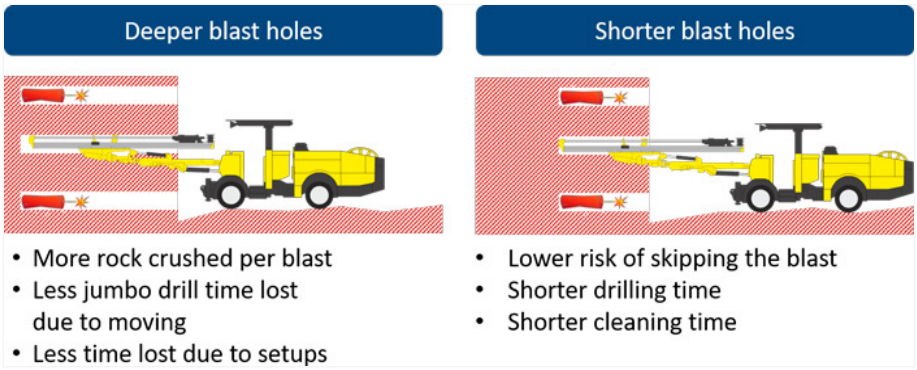
Mid-term and operational planning in mining is an area where simulation has become a de-facto standard. Simulation copes well with the planning of mining operations: with its hundreds of interacting machines, overlapping maintenance activities, complex layouts of mine fields, and limited capacity of bunkers and conveyors.

apply simulation in routine operations. That is why the world's leading mining companies frequently ask for integrated simulation-based tools, with user-friendly interfaces, to support their mid-term and day-to-day operations planning. This was the way the world's 2nd largest nickel producer followed.



The process inside stope works is cyclic: drilling, then blasting, then finally cleaning, then drilling again. The main constraint here is that all the blasts are done at the same time throughout the mine, two times a day. This is because making a blast requires the evacuation of the whole mine for evident safety reasons. If the drilling and cleaning teams have not completed, the blast is skipped until the next day and production capacity is lost.



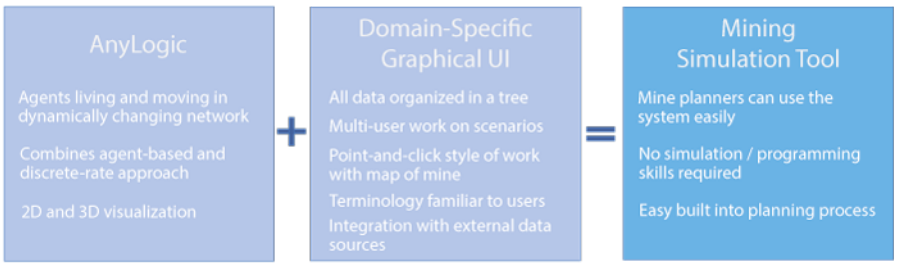


The trade-off between deeper and shorter blast holes has no global solution, since:

- Cycle times can vary.
- One drill rig can be shared between several stopes.
- Cleaning speed depends on haul length and position of ore passes.
- Drilling performance can differ from stope to stope due to geological reasons.

Simulation experiments needs to be run for at least every week of the mining process, including for drill and blast. That is why a domain-specific tool that simplifies the simulation experiment is required.

Solution



Amalgama developed a domain-specific mining simulation solution to be regularly used by mine planners. The tool is an application, featuring the

- Interactive dynamic simulation.
- Reports for viewing simulation results in charts and tables.
- Export of modeling results to external IT systems.

Technically, the tool creates, among other things, a drill and blast simulation model using AnyLogic software and a UI that supports a mine manager's needs. Commercially, such usage typical of an OEM application, where the AnyLogic engine is used within another vertical application.

The dashboard of the mining support software shows how the production capacity depends on the blast depth for each mine stope in each situation.

Blast hole length optimization is obviously not the only challenge that the mining simulation tool is used for. The tool is also used to support weekly planning and to find bottlenecks in the underground transportation system. The simulation demonstrates that the rescheduling of activities and the rerouting of underground transport helps increase the throughput of the mine and ensure the stable flow of ore to the processing plant.

well with the complexity. The AnyLogic model replicates interactions between movable equipment units, as well as the operation of conveyors with continuous flows of ore.

Mining models require a lot of input data that is hard to maintain by mine planners. To simplify the usage of simulation on a regular basis, the new software tool was created. The tool consists of a domain-specific graphical user interface for mine planners and mining simulation model created in AnyLogic software.

This tool opens the way to efficient simulation usage in mine operations to support a wide range of decisions, from daily operations scheduling to the return on investments calculation.

Project presentation by Andrey Malykhanov, Amalgama

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