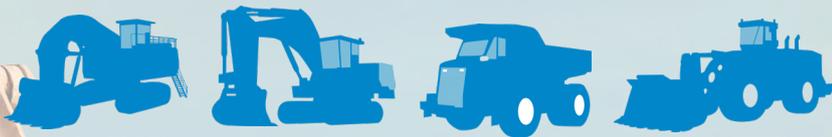


# MINESIM AVR

CRAWLER EXCAVATOR SIMULATOR,  
DUMPER TRUCK AND LOADER SHOVEL



 **simumak**  
simulation as a service

[www.simumak.com](http://www.simumak.com)

*Simumak is a Spanish company with an international presence belonging to **everis Aerospace and Defense**, which, in turn, is part of the **NTT DATA** group. Simumak has a long experience developing didactic simulation solutions for the Automotive, Construction, Mining, Logistics and Defense sectors.*

*Simumak develops 100% of its solutions in an affordable way, focusing on the specific needs of customers, combining the use of new technologies with the real needs of its customers.*

## How to operate it?



**Simumak Immersive Simulators** is the division from which we develop the software and hardware of cockpit simulators specifically designed for students to learn how to operate vehicles or machines. Boost the performance of your operators or qualify more prepared students thanks to our training plans on board Simumak simulators.

## How does it work?



From the **Simumak VR Training** division, we design training plans adapted to the needs of the client, with the aim that the students are able to assimilate theoretical-practical knowledge, functions, or processes, using, as hardware, high quality and very low cost commercial products (Oculus Go). Optimize the assimilation of your processes or improve the understanding of your students through our immersive training tools.

# MINESIM AVR



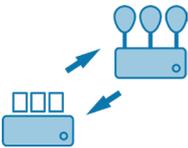
# MINESIM AVR SIMULATOR

*Our goal is to maximize your profit by increasing the safety and productivity of your equipment.*

After **more than 15 years of designing virtual trainings tools**, we have developed a product adapted to your needs with which you will be able to achieve real, measurable results that will optimize the operation of your company.



Fewer accidents, higher productivity in the warehouse, more profitable work cycles, recruiting, creating and retaining talented operators through specific training programmes are just some of the examples where we can help you through our **virtual training tools**.



Simumak has developed **MINESIM AVR, a multi-machine simulator** specially designed to meet the needs of companies in the mining sector.

MINESIM AVR can easily be configured as a **crawler excavator (front or backhoe), loader shovel or dumper truck** from the same hardware. This will allow training to be given to different groups of professionals from a single simulation station, thus facilitating the rapid amortization of the investment made.



MINESIM AVR incorporates a revolutionary **AVR (Augmented Virtual Reality) vision system** that immerses the operator in a completely virtual environment, in which he has absolute freedom to modify his perspective, also allowing him to see his own hands and the controls of the cabin that surround him and with which he has to interact. Never before has a machine simulator come so close to reality.



MINESIM AVR can operate stand-alone, but it can also be integrated with the **INSTRUCTOR STATION**, the student and exercise management platform (**SOCRATES**) and the exercises generator (**Training Manager**), which will allow you to create training plans very quickly and at a very low cost.

We know that there are many different needs, even within the same company, so we have developed a product range with different models to suit different scenarios. From the MINESIM AVR PORTABLE, designed to be easily transported and deployed on the student's own table, to the MINESIM AVR GOLD, which with its set of real controls and its 3DOF motion platform has been designed to meet the most demanding immersion needs.

## SIMUMAK SIMULATION ECOSYSTEM



### **SOCRATES**

- Students and instructors management
- Exercises settings
- Sessions scheduling
- Results displaying



### **TRAINING MANAGER**

- Exercises creation and edition
- Generation of specific situations
- Guided learning plan



### **SIMFLEET MANAGER**

- Simulators management
- HW and SW updates
- Maintenance
- Remote issues management



### **OBSERVER STATION**

- It may be located in another room.
- Learning extension
- It allows the students to observe the development of the practice carried out in the simulator

### **INSTRUCTOR STATION**

- Formed by three screens, a computer and a printer
- Telemetry application
- Visualization and communication with the student
- Modification of simulation conditions in real time (events, breakdowns, modification of weather conditions...)
- Interaction in real time with another vehicle thanks to the cooperative driving mode

### **SIMULATION STATION**

- High immersion: realistic HW and SW
- Customizable learning program
- 3DOF movement platform to guarantee a complete immersive feeling
- Several machines in one simulator

## AVAILABLE VERSIONS

This simulator is highly configurable, and able to be adjusted to client's needs. This simulator offers three kinds of versions.



### MINESIM OYD

The option **OYD (On Your Desktop)** consists on one notebook, VR headset and controls (joysticks, steering wheel and pedals). It offers an immersive solution, creative and economic, designed to be easily portable.

The installation is very simple and takes up very little space, allowing its use in conventional training classroom that in a few minutes become advanced simulation centers where all students can practice on board a simulator.

When the VR headset is put on, the students sit on a machine thanks to the AVR system.



### MINESIM AVR SILVER

**MINESIM AVR Silver** offers a very realistic immersion thanks to the machine control system, which imitates the real controls. This system allows the configuration as a crawler excavator, dumper truck and loader shovel, by mean of a simple change of controls that can be carried out by the instructor himself.

Under the seat it is possible to install a 2DOF motion platform that will move the operator slightly, giving him a sensation of immersion and almost absolute realism.



### MINESIM AVR GOLD

The main difference between the MINESIM AVR Silver and the **MINESIM AVR Gold** is that the latter mounts under its cockpit (not just under the seat) a 3DOF platform(3 degrees of freedom: heave / roll / pitch) that represents with great fidelity the inertial experience on board the machine.

In a few seconds the operator will forget that he is on a simulator and will focus on carrying out the work or exercise that has been entrusted to him. The immersion is very complete and this allows students to spend a lot of time on board the simulator without feeling fatigue or discomfort.

# MINESIM AVR

## PEDALS

Accelerator pedal, brake and retarder for the dumper and the shovel and pedals with levers for the management of the system of the excavator chains.

## STEERING WHEEL COLUMN

Steering column for the steering handling on shovel and dumper.

## DASHBOARD

Biometric identification system, navigation through the simulator menus, and emergency stop device.

## RIGHT CONTROL THRONE

To manage the dumper.

## RIGHT CONTROL THRONE

Includes servo control for shovel and crawler excavator handling (front and backhoe).

## REAR SPEAKERS

Optional surround sound system.

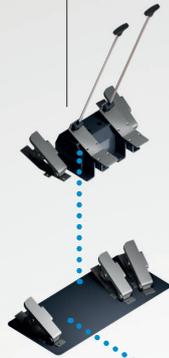
## AVR HEADSET

System of visualization of augmented virtual reality with positioning system 6DOF.



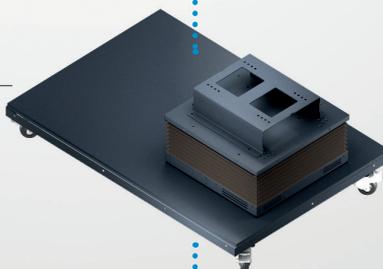
## CONTROL TOWER AND CONTROL SYSTEM SCREEN DISPLAY AND SOUND

This module contains the simulator computer as well as the main electronics. It also serves as a support system for the 50" main screen and the 2.1 sound system.



## LEFT CONTROL THRONE

Includes servo control for the operation of the crawler excavator.

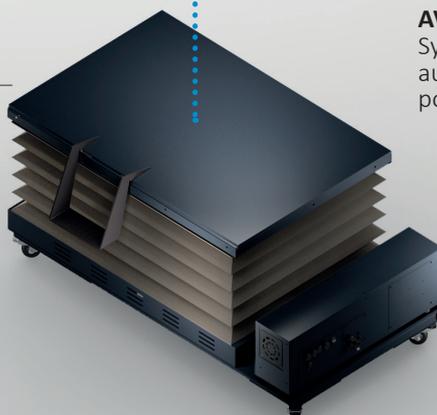


## 2DOF MOTION PLATFORM

(TWO DEGREE OF FREEDOM)

Optional 2DOF platform under the seat.

Reinforces the immersion and realism of the simulation by recreating the accelerations and inclinations suffered on board the machine.



## 3DOF MOTION PLATFORM

(THREE DEGREES OF FREEDOM)

3DOF platform under the cockpit. Reinforces immersion and realism of the simulation by recreating the accelerations and inclinations suffered on board the machine. Thanks to its high-frequency movement system, it is capable of reproducing engine vibrations or terrain imperfections.



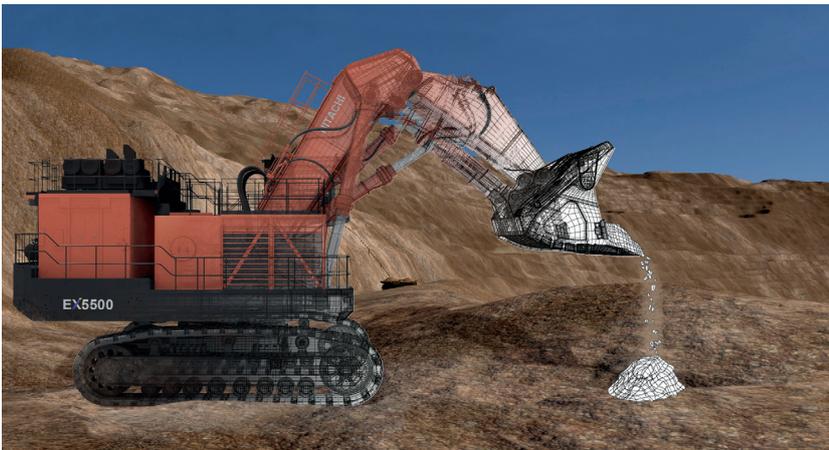
## TECHNOLOGY AT YOUR SERVICE

MINESIM AVR is equipped with the most advanced technologies that turn this simulation experience into a realistic and useful learning one, making this product an essential tool for training.



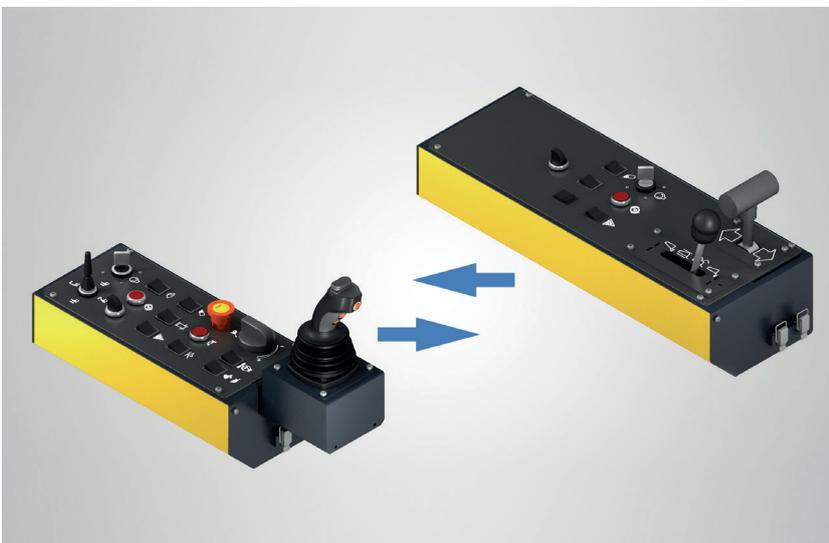
### HIGH IMMERSION AVR

No more seeing reality through a screen. Thank to **Augmented Virtual Reality (AVR)**, looking in any direction, changing the perspective and being able to interact with the cockpit that surrounds us is possible. The sensation of immersion cannot be greater.



### EARTH PHYSICS SYSTEM EAPS

Thanks to the “**Earth Advanced Physics System**” and its multithreaded technology, the feel of digging and the behaviour of the earth become fluid and absolutely realistic. Evaluate the dexterity of your operators thanks to exercises in which EAPS allows you to work with a high level of precision.



### MODULAR HARDWARE

The simulator's modular architecture allows the equipment to be quickly configured in **shovel, excavator (front or rear) or dumper mode**.

This multi-machine function makes the simulator a versatile tool that can be adapted to several types of simultaneous training on the same hardware, thanks to which space can be saved and the amortization of the simulation equipment maximized.

## HARDWARE FEATURES

MINESIM AVR has **interchangeable modules** that make it customizable and adaptable to the configuration needs of each customer to suit the driving of **excavator, dumper and shovel loader**.



### CRAWLER EXCAVATOR

It can be configured in **front excavator or backhoe mode**.

In both modes, the hall effect electronic **servo-controls** on the right and the left allow the control of the cab rotation, the height of the arm, the up and down movement of the gable and the movement of the bucket. The chains are controlled with two **pedals** that can be operated with the feet or connected to two **levers** that would allow the movement of the machine with the hands.

The crawler excavator also consists on two **control thrones** formed by buttons and controls important for the operation of the machine.



### DUMPER TRUCK

In dumper mode the truck is driven with the **accelerator and brake pedals**. It also has an electric brake or **retarder**, which is more advisable for this vehicle than the traditional brake due to its weights and the loads it carries.

It has a steering column with steering wheel for driving and a **right throne** where the **lever** that controls the tipper is located. This lever allows this part of the vehicle to be lifted and the entire load to be unloaded in the area selected for this purpose.



### LOADER SHOVEL

The loader is moved with **accelerator and brake**. It has a **servo-control** on the right side that controls the movement of the arm and the shovel.

For the configuration of this machine, there is a control throne on the right side that contains the most important buttons and commands for its proper functioning.

## SOFTWARE FEATURES

MINESIM AVR allows four machines to be driven: **crawler excavator (front and backhoe modes), loader and dumper truck**. Each machine has a tailor-made training plan, which enables the student to gradually assimilate the knowledge.



The training plan developed for the **crawler excavator** allows your students to practice doing a multitude of exercises:

- Unload to belt
- Unload in dumper
- Unload into well
- Circuit navigation. Slalom
- Adjusting the power of the machine to the job to be done.
- Excavation of slopes of different widths, in a straight line and in a zigzag.
- Excavation of slopes in dangerous areas, with risk of falls.
- Operation at night and in low visibility environments (excess dust, fog, rain).
- Etc.



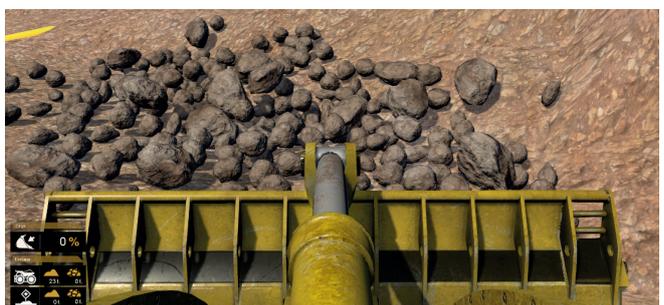
The training plan developed for the **dumper truck** allows its students to practice with different types of activities:

- Using automatic retarder
- Use of cruise control
- Material unloading operation
- Emergency stop
- Evasive maneuver
- Mine traffic management
- Gauge control
- Recognition of tipper controls and dashboard reading.
- Practical positioning maneuvers for backhoe loaders and front loaders.
- Unloading of material into bathtub-type landfill.
- Traffic through open pit mine. Includes dangerous crossings and descents with retarder use.
- Operation at night and in low visibility environment (excess dust, fog, rain)
- Etc.



The training plan developed for the **loader shovel** allows students to practice different aspects:

- Using the floating shovel function
- Using the kick down function
- Proper gear management
- Traction control in complex environments
- Working with boluses
- Unloading by truck
- Discharge into well
- Working with traffic situations
- Recognition of machine controls and instrument panel reading
- Loading and unloading operations in dumper and hoppers at different heights
- Working with different typers of material, with different densities
- Traffic through open pit mine. Includes crossing
- Operation in risky situations, such as obstacles or low visibility environments
- Etc.



## INSTRUCTOR STATION AND SOCRATES

While the student is doing the practice, the instructor can observe him from different cameras, check the telemetry or interfere with it through the command sending system of the **instructor station**.

- Triggering malfunctions
- Modification of time of day / weather conditions
- Inclusion of risk situations or special conditions (traffic/pedestrians)
- Co-operative driving



**CARGADORA FRONTAL - MINA** PI

**ENTORNO**

**TRAFICO**

- Ninguno
- Leano
- Mediano
- Pesado

**EVENTOS**

**AVERIAS**

- Sobrecalentamiento
- Combustible
- Retrorvisor izq.
- Retrorvisor derech.
- Frenadas
- Motor
- Subcarga de barro

**VEHICULO INSTRUCTOR**

**PUNTO PARTIDA INSTRUCTOR**

**VEHICULO ALUMNO**

**PUNTO PARTIDA ALUMNO**

**NIVEL DE CARGA**

0% 25% 50% 75% 100%

**CONDICIONES**

- Activar
- Desactivar

**CÁMARAS**

**CÁM. PUESTO INSTRUCTOR**

- Siguierte cam. alumno
- Siguierte cam. instructor
- Cámara de conducción
- Activar cámara libre
- Sincronizar vista en PD
- Ver mapa

**CÁM. PUESTO OBSERVADOR**

- Siguierte cam. alumno
- Siguierte cam. instructor
- Cámara de conducción
- Activar cámara libre

**Telemetría / Cám. Alumno**

**COMANDOS DEL VEHICULO**

Grados de Giro: 38.39°

RPM: 1812.71

Velocidad (Km/h): 56.97

**TELEMETRÍA DEL VEHICULO**

Información de los pedales

Información de consumo / contaminantes

**COMANDO**

**INFORMACION DEL ALUMNO**

**ALUMNO**

Usuario no registrado

DNI: INSTRUCTOR

**Simulador**

SMVTOOL: TOR: 001: 14-00031

SMV España

SMV Pruebas España

Sala 1

**Ejercicio**

Ejercicio Libre

Descargar telemetría

Descargar repetición

Estado de la sesión: Finalizada

**General** **Producción alumno** **Mapa** **Estadísticas**

Gráfico de telemetría con ejes de tiempo y valores.

**Calificación del alumno**

100%

The simulator recognizes the student through a biometric identification system and stores its result in **SOCRATES**, generating a report of each practice carried out for later analysis.

At all times, the simulator supervises the student's practice, monitoring the correct handling of the machine and sending messages when it detects that incorrect maneuvers are being carried out. This automatic supervision system can be used to compute the note of the exercise, indicating in the design of the exercise which infraction or errors will subtract points from the student's grade.



**EVALUACION**

PUNTOS INICIALES: 10 (total de puntos con los que parte el alumno)

TIPO DE INFRACCION: Colisión con línea eléctrica (5 puntos)

INFRACCION	PUNTOS	MODIFICAR	QUITAR
Distancia a operario no respetada	1	✓	✗
Descarga incorrecta	2	✓	✗
No respetar prioridad	2	✓	✗
Conducción con la caja subida	3	✓	✗
Colisión	5	✓	✗

**Información del alumno**

**ALUMNO**

Usuario no registrado

DNI: INSTRUCTOR

**Simulador**

SMVTOOL: TOR: 001: 14-00031

SMV España

SMV Pruebas España

Sala 1

**Ejercicio**

Ejercicio Libre

Descargar telemetría

Descargar repetición

Estado de la sesión: Finalizada

**General** **Producción alumno** **Mapa** **Estadísticas**

Gráfico de telemetría con ejes de tiempo y valores.

**Calificación del alumno**

100%

## SIMULATED MACHINES



### CRAWLER EXCAVATOR

The MINESIM AVR excavator makes it possible to excavate low-level ground around an open-cast mine with the option of a front or backhoe excavator. The operator will be able to practice tasks such as filling a dumper-type truck or counter-rotating excavation, in different weather conditions and at different times of the day.

HARDWARE FEATURES	
LEFT SERVO CONTROL	arm extension / retraction and turning of the machine
RIGHT SERVO CONTROL	elevation / lowering of the gable
	extension / retraction of the bucket
PEDALS	bucket opening pedal, bucket closing pedal
	right crawler control pedal
	left crawler control pedal
RIGHT THRONE	engine accelerator
	tick over system
	selection of propulsion mode
	pilot cut off
	horn, work lights, windscreen wipers
	ignition key
LEFT THRONE	heavy load system
	engine power mode, gable mode
	rotation priority mode / gable
CONTROL PANEL	display, indicators and clocks
	navigation arrows, emergency stop button
	biometric identification system

DYNAMIC FEATURES	GENERIC	model	HITACHI EX 5500-6
		fuel	diesel
		operating weight	522t
		bucket configuration	frontal / retro
		bucket capacity	29 m <sup>3</sup>
	DIMENSIONS	total width	10080 mm
		cabin height	8600 mm
		running gear length	9350 mm
		running gear width	7400 mm
		shoe chains width	1400 mm
		pressure on floor	232 kPa
	PERFORMANCE	maximum speed	2,3 km/h
		speed of turning	3,3 rpm
		maximum slope	30°
		maximum pull strenght	18000 N
		maximum ramp	23%
		engine power	2088 kw



### DUMPER TRUCK

The MINESIM AVR dumper is a specific mining truck that allows large quantities of sand and rocks to be transported between different points of an open pit mine. The operator will be able to practice tasks of this machine such as the dumping of material, traffic circulation or the use of retarder on downhill slopes.

HARDWARE FEATURES	
STEERING WHEEL	steering wheel with 1100° rotation
	turning indicators, lights and windshield wipers lever
PEDALS	gas pedal
	retarder brake pedal
	service brake pedal
RIGHT THRONE	FNR gearshift lever
	box operating lever
	ignition key
	parking brake
	warning
	working lights
CONTROL PANEL	screen
	indicators
	warning light
	clocks
	navigation arrows
	emergency stop button
	biometric identification system

DYNAMIC FEATURES	GENERIC	model	HITACHI EH 5000 AC
		supply of energy	diesel- electric
		operating weight	500 t
		payload	296 t
	DIMENSIONS	total width	8160mm
		total height	7520mm
		total length	15490mm
		maximum height box folded out	14500mm
	PERFORMANCE	maximum speed	56 km/h
		turning diameter	30 m
motor power		2125 kW	



## LOADER SHOVEL

The MINESIM AVR loader shovel allows you to work with different types of sand and rocks in the environment of an open pit mine. It has an exercise plan designed to increase operator productivity in real-life situations, such as unloading material into a hopper or a dumper truck.

HARDWARE FEATURES	
RIGHT SERVO CONTROL	raising / lowering the arm bucket opening / closing
PEDALS	accelerator pedal service brake pedal
RIGHT THRONE	engine accelerator tick over system selection of propulsion mode pilot cut off horn work lights windshield wipers ignition key
CONTROL PANEL	display, indicators warning light clocks navigation arrows emergency stop button biometric identification system

DYNAMIC FEATURES	GENERIC	model	KOMATSU WA900
		fuel	diesel
		operating weight	107t
		ladle capacity	13m <sup>3</sup>
	DIMENSIONS	total width	4585mm
		total height	5275mm
		total length	14000mm
		turning radius	9200mm
		maximum height box folded out	9350mm
	PERFORMANCE	maximum speed	28 km/h
		lifting time	11,2 s
		maximum torque / rpm	4089 Nm / 1300 rpm
		motor power	672 kW

**+ 5000**

simulators  
manufactured

**+ 15**

countries with  
installed base

**+ 20.000.000**

performed  
sessions



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