

Autonomous Haulage System

Komatsu is the first manufacturer in the world to commercialize Autonomous Haulage Systems (AHS) in the mining industry. Each autonomous dump truck is equipped with vehicle controllers, a high precision GPS system, an obstacle detection system and a wireless network system. These features allow the dump truck to safely operate through a complex load, haul and dump cycle and to integrate with the dozers, loaders and shovels that are also part of the system.

Automation has been a long-time dream for the mining industry and AHS helps realize this dream. AHS allows unmanned operation of multiple super-large dump trucks at mining sites, enabling customers to manage their fleets with fewer drivers. This helps protect employees from hostile, remote working conditions and, at the same time, reduces operating costs. It also helps improve safety, by significantly reducing accidents caused by driver error. AHS also optimizes driving performance, which improves productivity and reduces fuel and tire costs.

A large portion of the digging costs come from the running and hauling performed by the dump truck fleet. Not only does AHS optimize this part of the operation, by coordinating the fleet with other manned vehicles, it optimizes the entire mining operation. The demand for mining companies to develop mineral resources is increasing each year. New mines must be developed, but up to now, developing new mines in remote and unfavorable locations was not economical, because of the harsh working conditions and the high cost of labor, transportation and suitable worker accommodations. Automation helps mining customers operate with a minimum number of workers, whose main duty is to monitor dump trucks from a fleet control center. This system not only reduces running costs; it also increases productivity and creates jobs in remote areas.

AHS also helps customers protect the environment, conserve energy and promote efficiency. With AHS, the dump trucks run at a specified speed with no unnecessary acceleration or deceleration, which leads to better fuel efficiency and lower CO2 emissions.

The 930E super-large dump trucks are used as the base model. AHS truck does not require an on-board operator, so complex or potentially hazardous tasks can be carried out without placing personnel at risk. The computer system that controls the autonomous truck can run continuously and consistently, regardless of time or weather. There are numerous advantages to using the Komatsu AHS: a continuous load transport process (every miner's dream), higher productivity, lower transportation costs, reduced accident risk and lower overhead – all of which result in less impact on the environment.

Corresponding to the growing demands for natural resources by emerging countries like China, mining sites are expanding in remote places with severe environmental conditions, and where the site owners typically encounter difficulty in hiring truck operators despite higher salaries being offered. AHS enables stable operation under grueling conditions such as at high altitudes or in sparsely populated, arid desert areas.

Komatsu's AHS utilizes GPS technology to locate the exact position of the unmanned trucks and control them on predetermined courses. The technology also enables extended operating time and contributes to efficiency by decreasing manpower. By ensuring stable speed control it helps reduce equipment wear and fuel consumption.

The dump trucks, which are equipped with vehicle controllers, a high-precision global positioning system (GPS), an obstacle detection system and a wireless network system jointly developed by Komatsu Ltd., Komatsu America Corp. and Modular Mining Systems, Inc., are operated and controlled via a supervisory computer. Information on target course and speed is sent wirelessly from the supervisory computer to the driverless dump trucks, while the GPS is used to ascertain their position. When loading, the dump trucks are automatically guided to the loading spot after computing the position of the bucket of the GPS-fitted hydraulic excavator or wheel loader. The supervisory computer also sends information on a specific course to the dumping spot.

The fleet control system prevents collisions at the mining site. If an obstacle detection system detects another vehicle or person within the hauling course under AHS operation, the vehicles will reduce speed or stop immediately.



AHS Contribution to Customer's Mining

Efficiency

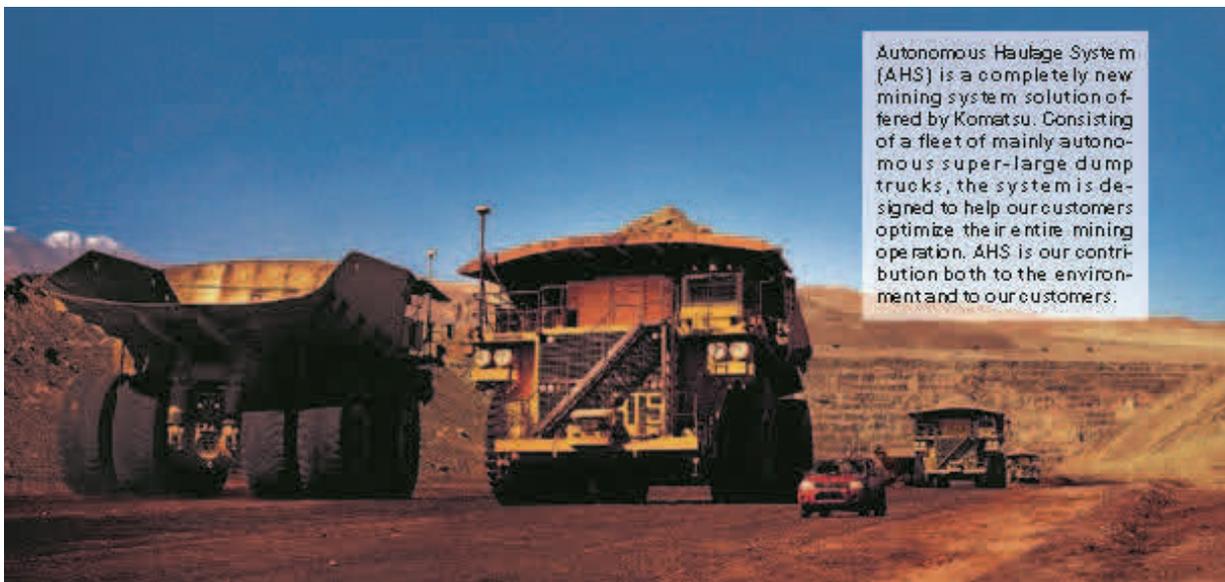
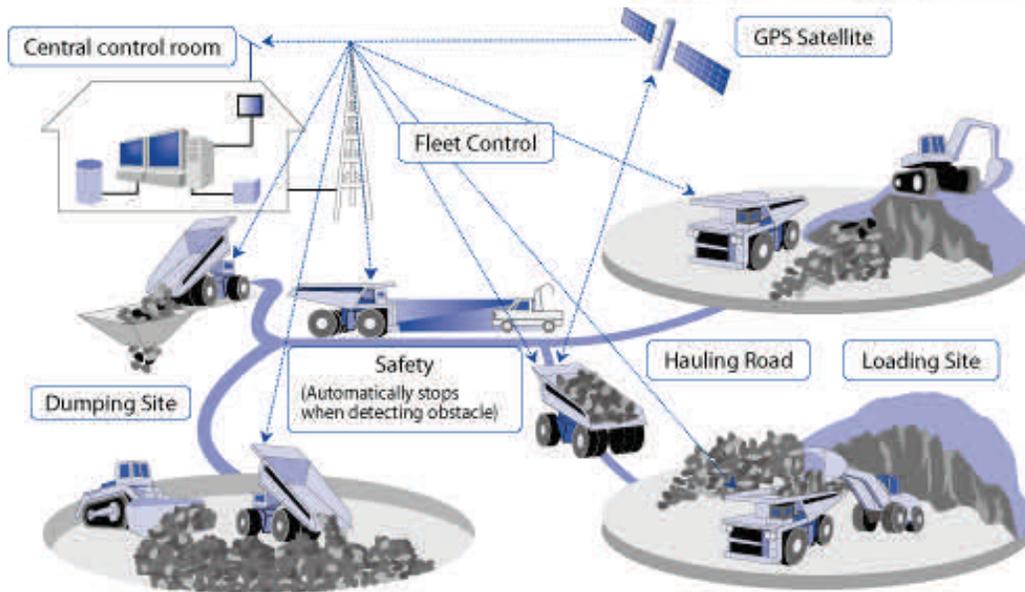
- Optimal operation through autonomous running
- Decrease in overall costs
- Facilitation of new mine development

Environment

- Lower CO₂ emissions (Greater fuel efficiency and longer tire life)

Safety

- Eliminates driving accidents caused by human error



Autonomous Haulage System (AHS) is a completely new mining system solution offered by Komatsu. Consisting of a fleet of mainly autonomous super-large dump trucks, the system is designed to help our customers optimize their entire mining operation. AHS is our contribution both to the environment and to our customers.