Smart Fleets Improve Safety in MINING OPERATIONS

- Fully Rugged Vehicle-Mounted Terminal
- Fleet Management Terminal
- Rugged Tablet with Peripherals
Coping with Harsh Operating Environments

Heavy Industry Fleet Management is the Key

Heavy industrial work environments are different from roads in general, and the heavy industry vehicles face harsh working conditions. This is a huge challenge for the in-vehicle system vendors. By incorporating an intelligent fleet management system, work efficiency and safety for the heavy industry vehicles can be dramatically increased.

By Yu-Feng Chen
Interview with Van Lin, Director of Digital Logistics & Fleet Management Sector, Advantech

Heavy industry vehicles, such as mining vehicles, farming machines, and cranes, do not travel on general roads. These vehicles often have to operate in extremely harsh conditions such as dusty mines or bumpy terrain, and must withstand extremely severe vibrations when traveling and performing mine drilling operations. Furthermore, if the operation is underground salt mine excavation, vehicles must also be able to resist salt corrosion. Overall, the harsh working conditions faced by the heavy industry vehicles also pose great challenges for the in-vehicle system vendors.

Van, Director of Digital Logistics & Fleet Management Sector at Advantech, emphasized that, "Ruggedness and stability are critical for in-vehicle computers. They must be able to operate normally under dusty environments and during strong vibrations, and withstand rougher handling by the heavy industry vehicle drivers."

The degree of ruggedness for the in-vehicle devices in heavy industry vehicles not only must exceed that for the general industry, it is also 3 to 5 times higher than that required in military standards. Therefore, in addition to the whole machine being waterproof and dustproof, Advantech also provides impact and shatter resistance solutions for the most vulnerable part of the computer, namely the LCD panel. Van stated that, “During the tests, we dropped a 500 gram iron ball from 1.3 meters high onto the LCD panel, which emerged unscathed.”

Function Modules can Improve Safety for Dangerous Mine Environments

The work environments for heavy industry do not have general roads, and the vehicle fleet may face unpredictable conditions during operations. However, a vehicle fleet management system can help to monitor the relevant data.
and provide warnings on a variety of unusual conditions, in order to improve safety for the onsite operators and reduce the risk of property damage. For example, after a gold mine in South Africa implemented Advantech’s mine fleet real-time dispatching management system, the mine started to use the integrated functions of Advantech’s in-vehicle computers to add different management modules such as collision avoidance systems, oil level monitoring systems, weighing systems, and tire-pressure monitoring system. The relevant data would be transmitted through the in-vehicle computer to the backend management platform, where it would be displayed on a monitor in the truck, thus enabling onsite operators to obtain the latest information.

Van illustrated the importance of tire pressure detection and stated that, "If a tire chain on a mining vehicle breaks, the vehicle may be taken out of commission for one or two months. Because mines are mostly located in remote and desolate places, it would take a long time to deliver a tire."

Through this mine fleet real-time dispatching management system, instructions for the dispatching and scheduling of vehicles can instantly be transmitted and displayed on the in-vehicle computer screen for the drivers. Furthermore, the in-vehicle computer platform can also collect the login and logout times, engine initiation times, the number of mine carts pulled, the quality of the ores carried, and etc. In addition to being displayed on the monitor in the vehicle, the data would also be transmitted to the back-end management.

Moreover, if emergency situations such as road collapses are occured, the driver only needs to touch the in-vehicle computer screen to transmit the distress and location signals to the platform in order to request immediate assistance. This is a very useful function for the mining environment because drivers could only yell for help in the past, but their yells may be drowned out by other noises at the site. Speed monitoring is also a major issue. Drivers tend to accept the risks of driving faster in order to deliver more loads and get higher returns, but the monitoring function can now effectively manage and warn drivers of illegal operation behaviors.

**Self-propelled Farming Machines Emphasize Positional Accuracy**

In terms of farming machinery, the current fleet management system is primarily applied to the "self-propelled" farming machines. The demand for such equipment is huge, particularly in the vast farmlands of China. For the farming machine leasing industry, the integration of an intelligent fleet management solution can enable managers to have a full picture of the usage statistics in the few months that the machines are rented, the distance and area of farm cultivation, and whether the lessee has shortened the service lifetime of equipment due to incorrect usage.

For lessors and lessees, the biggest requirement for self-propelled agricultural machines is “accurate position.” High-accuracy GPS devices and local positioning systems can help to improve output efficiency. The range of error for the general consumer GPS devices are approximately 10 meters, which is very far from the error range of within 1.5 meter required by self-propelled agricultural machines.

To achieve higher accuracy, Advantech has adopted a differential GPS technology solution. Van explained that Advantech currently has two types of fleet management solutions that have error ranges of 0.7 meters to 1 meter and 0.3 meters to 0.5 meters, and stated that, “Indeed, the self-propelled farming machine positioning solutions provided by us and our partners have an error range that is definitely less than 1 meter.”

At present, the primary requirement for cranes, the other main type of heavy industry vehicle, is to enable the operator to receive partial or full images of the surroundings of the crane through the monitors in the operating cabin. This would mean that the operator would no longer need to rely on other personnel to provide directional guidance, which can further enhance efficiency.

By integrating the intelligent fleet management system into heavy industry vehicles, their operation efficiency and safety can both be improved dramatically. However, because of the special nature of such working environments, heavy vehicles have more stringent ruggedness, stability, and accuracy requirements compare to vehicles used in other fields. Relevant companies must choose their solution carefully, to prevent possible risks and achieve the desired results.
Smart Fleets Improve Safety in Mine Operations

Mine environments are different from regular roads, so fleets moving in a mine will encounter more hazardous situations. Fleet management systems can help us monitor all relevant data and warn us of abnormal conditions to increase the security of operators and decrease property losses.

By Sharlene Yu and Pictures from Advantech
Interview with Lu-Bin Zhang, Project Manager of Micromine

In an open-pit mine in Ghana in South Africa we can see dust and smoke floating over rough ground and machines and equipment everywhere. Roaring excavators dig out crushed ore, where the so-called “king of metal”- gold is hidden. On the ground, truck drivers keep their eyes on the weight of their loads to prevent exceeding the maximum load of 200 tons. The management personnel in the dispatching room also pays attention to the data, because heavy loads will result in failure of engines, heavy wear on tires and increased safety risks, alternatively light loads fail to conform to production efficiency.

At the mine site, a lot of mining trucks move in and out, rushing through the roads to transit ore to the treatment plant from 2-3 kilometers away. For each monster truck, worth tens of millions of dollars, is concerned, a collision means a serious accident or asset loss. But now, with their vehicle mounted intelligent management system’s Collision Avoidance System installed, truck drivers can carefully traverse routes to avoid collisions when receiving messages that other vehicles and machines are approaching, ensure workers’ safety and reducing maintenance costs.

This gold mine belongs to Gold Fields of South Africa Ltd. (GFSA). In fact, 50% of known global gold resources, totally 89000 tons, are in South Africa. The open-pit mine uses a mine fleet management system that Micromine and Advantech co-developed in 2012. The system has been installed on about 40 loaders and trucks totally. Micromine is a mining industry software developer, established in 1986 in Australia. The company’s Pitram mine production real-time control and report/decision system has been successfully applied to various kinds of mines in North America, Canada and Australia.

Real-time Monitoring for Instant Command

Micromine’s Pitram software system, Advantech’s TREK-743 vehicle mount computer and MESH Network’s wireless transmission constitute a complete mine fleet real-time dispatching management system. To the platform, Advantech will add different modules via the integration function of Advantech’s vehicle mount computer according to the requirements of customers, such as an anti-collision system, oil-level monitoring system, weighing system and tire management system. And all related data will be transmitted to the back end management platform via vehicle mount computers.
and displayed on the screens of the trucks to inform operators on the spot.

With the mine fleet management system, task dispatching and vehicle dispatching commands can be immediately transmitted to, and shown immediately on the screens of, Advantech’s vehicle mount computers for drivers to execute. The vehicle mount computer will also collect login and logout times of drivers, engine starting times, daily vehicle usage times, mine loading amounts etc, and display them on the screens of vehicles or for management at the back end.

For emergencies, such as road collapses, drivers can send distress and position messages directly to ask for immediate help. In the past, drivers could only ask for help by shouting loudly, but a drivers’ voice can easily be drowned out by noise. Speed monitoring is also necessary because drivers may exceed the speed limit so as to earn more money. Nevertheless, the system can effectively manage all these unforeseen events and warn these drivers against these.

Soft/Hardware Integration for Platform Stability

Lu-Bin Zhang, the project manager of Micromine, said that, “Over the past 20 years, we tried to introduce mine fleet management systems from various hardware suppliers without much success. However, we decided to completely use Advantech’s products finally because Advantech’s vehicle terminal has better price/performance ratio, stability and lower maintenance cost.”

If vehicle mount computers crashed frequently, maintenance teams need to move between different mine sites to repair them, which is extremely hazardous, and suspension of work will cause losses. Therefore, stability is Micromine’s top priority when selecting a vehicle terminal.

“With this mine fleet management system, we can increase mine production efficiency by about 10%. For example, we need 10 billion CNY to dig out a hundred thousand tons of gold ore; however, with the new system, we only need 9 billion CNY. In Nevada, United States, the director of a dispatching room having the same management system also stated that, “With the system, we can immediately acquire reports and avoid unnecessary cost because the management digitization and informatization are significantly enhanced.” Due to its high performance, another mine fleet, also belonging to GFSA in Ghana, will also introduce the mine fleet management system and Advantech’s TREK series products to their 40 truck fleets in 2014.

Considering the requirements of China’s mine fleets, Micromine has started to pro-actively run the business in China from 2012. Their fleet management solutions co-developed with Advantech have grabbed much attention from mine companies. It is anticipated that some further achievements will be made in 2014 to help China’s mining industry management be even more intelligent.”