

How satellite messaging can aid automation in mining

Anu Sood demonstrates how automated machine-to-machine technology delivers actionable real-time intelligence for improved mining operations

Automatic, real-time notification of dust concentrations prompt dust-suppression vehicles to focus their efforts in specific locations

With mine operations stretching across the world's most remote regions, automated data transmission is essential in order to achieve optimal value from mines to their markets. While cellular and radio transmission works in some scenarios, these technologies cannot be relied on to monitor, track, control and communicate with remote workers, fleets and fixed equipment.

A satellite communications system is often the ideal solution for mining companies where optimised operations and safety are of concern. However, satellite technology with high data throughput can be cost-prohibitive. For many monitoring and control applications, the ability to send regularly scheduled messages and one-off transmissions is all that is needed. Satellite messaging terminals send and receive the equivalent of text messages, which come at a much more reasonable cost.

Satellite messaging terminals provide a fiscally responsible way to automate machine-to-machine (M2M) communications for tracking, monitoring and messaging. The technology meets the increasing demand for richer information in mobile and fixed remote monitoring applications, and allows mining companies to share data across diverse operations without the added cost associated with continuous connectivity.

Proven practices that include communication, rapid measurement, interpretation and decision support show that satellite technology can conquer the cost barriers of automation and improve the bottom line.

FLEET MANAGEMENT

From trucks, excavators and loaders to dozers and graders, mine sites operate a variety of mobile equipment. Beyond position reporting, satellite messaging terminals can be used to monitor the health of each asset. This allows equipment supervisors to be more proactive with maintenance planning and operator training.

For instance, sensors can be used to



track the performance of the entire mining fleet so that maintenance staff can analyse usage and receive early warnings of developing problems before a catastrophic failure occurs. On-board diagnostics monitor the performance of the engine's major components, checking malfunctions and emissions. This data helps to reduce maintenance and repair costs.

Automated collection of diagnostic fault codes, fuel consumption, idle time, temperature and pressure data also helps to ensure that vehicles are operating at peak efficiency. This reduces repair costs because problems can be resolved before the issue gets worse, and more expensive to repair. If the issue is due to repeated misuse, training can be proactively scheduled.

Automated monitoring of tyre pressure is another application that can result in substantial savings for mining companies. A tyre will wear out 12% faster when only 10% underinflated, and fuel consumption is increased by 1% for every 69kPa that a truck's tyre is underinflated. By continuously monitoring the inflation of heavy equipment tyres, the life of a tyre can be extended and fuel consumption can be lowered.

Satellite messaging terminals can also be used for alert notifications for tracking unauthorised use. Text messages or

emails can be set up to warn when a vehicle violates a curfew or travels outside of a specific geographical boundary (geofence). Alerts can also be created to notify when the battery on a vehicle is low or being tampered with.

The benefits of mining companies using satellite messaging for fleet maintenance includes:

- lower operating costs;
- reduced fuel consumption;
- minimised total cost of ownership of equipment; and
- maximised return on investment by making the best use of equipment warranties.

DUST SUPPRESSION

Open-pit mines and mines in arid areas are plagued by very high levels of dust. The impact on heavy equipment moving parts includes compromised functionality and performance, and, ultimately, expensive repairs and downtime.

Satellite messaging terminals prove very useful in automating dust-suppression activities. By integrating automatic and real-time notification of dust concentrations into fleet management systems, the data can prompt dust-suppression vehicles to focus their efforts in specific locations.

This type of remote management application reduces dust suppression

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vehicle usage, fuel costs and the consumption of water and other materials that are used to keep airborne dust down. The latter is particularly important for regions where water shortages are a common concern. Satellite messaging terminals can also be used on dust-suppression vehicles to accurately meter the flow of water or dust-suppression material for accurate billing and record keeping.

Satellite-based remote monitoring of airborne dust concentrations has many benefits to mine operators, including:

- proper gauge of dust levels on all roads regardless of location and availability of terrestrial-based communication systems;
- optimal fleet utilisation to ensure dust treatment is managed appropriately; and
- lower damage costs resulting from less dust on heavy equipment and other motorised equipment.

WATER MONITORING

Water ingress is an issue that affects all types of mines. Underground mines experience water ingress via rainfall down shafts and adits, as well as cracks in geological structures and pressurised aquifers.

Open-pit mines are affected by water from precipitation as well as overland or storm water flows. For these reasons, dewatering or the removal of excess water is a function that needs to be closely monitored and controlled to maintain functional mining operations.

Satellite messaging terminals connected to sensors can be used to automate the monitoring of water levels and remotely turn on and off dewatering

equipment located in areas where other wireless communications services are not yet available, are unreliable, or do not have the required reach.

The same terminals can also be used to regularly share data about the health and operation of equipment via performance indicators such as engine performance, engine run hours, utilisation reports and other engine data. This alleviates the risk of excessive wear and damage to unsupervised pumps. Early warnings of developing problems before a catastrophic failure occurs reduce downtime and loss of revenue.

Automated monitoring of water via satellite messaging terminals provides mining operators with:

- increased uptime because issues can be diagnosed early;
- greater energy savings through managed operations;
- reduced operating and maintenance costs with data to analyse trends and proactively schedule maintenance; and
- improved emergency response time with machine-to-machine satellite management of pumps.

WEATHER MONITORING

To evaluate environmental conditions, mining companies may set up weather stations to collect data to generate forecasts and help determine which locations will result in the greatest production output during any given time. For the utmost accuracy, total visibility is essential.

In many instances, the only viable transmission method for sharing data between meteorologists and remote locations is satellite communication. However, some satellite solutions are



unstable in these environments. Also, the formidable cost of data retrieval limits the number of transmissions to once a day in some cases. This compromises the accuracy of total visibility.

Fortunately, some satellite technology has advanced to a point where environmental conditions and financial responsibility are no longer deterrents to regular, automated collection of weather data. Analysts now have both real-time and historical data including temperature and humidity, rain measurement, solar radiation levels, snow height and wind speed. Using satellite messaging terminals for climate monitoring provides weather data more frequently (several times an hour, instead of once every few days) – all at low cost.

The alarm capabilities of satellite systems also ensure that information is sent instantly if a dangerous threshold is reached. The power requirements of satellite installations are very low, which minimises the number of solar panels required, thereby reducing the overall cost of the system. The satellite terminals are also highly portable, permitting stations to be moved as required.

Satellite weather monitoring provides multiple benefits to mining companies, including: reliable forecast conditions of all-weather road and slope stability; improved risk management strategies associated with inclement weather; and reduced costs associated with people and vehicles driving to remote weather stations to gather weather data.

CONCLUSION

Remote monitoring and operations management requires technology that delivers a consistent, reliable communication service. When satellite messaging technology is integrated into automation processes, mining companies have the tools and information to increase productivity and reduce costs across the enterprise. ♥

Satellite communications systems can monitor, track, control and communicate with remote workers, fleets and fixed equipment

“Remote monitoring requires technology that delivers a consistent, reliable communication service”

Sensors connected to satellite messaging terminals enable monitoring and operation of dewatering equipment

