Energy saving and production security in quarries

Most quarries contain a proliferation of electric motors which power fans, pumps, conveyors, crushers, hoists etc. These vary from large machines that are critical to site operations to smaller examples that enable basic plant processes such as dust suppression and surface water control. Each one draws electricity and unless it is already part of a smart control solution, it could be contributing more towards energy and general cost saving.

The most basic guide is that if a motor has more than fractional kilowatt power rating and has an active duty cycle, then fitting a variable speed inverter drive (VSD) can save money by reducing energy consumption, and will have a payback period that makes it worth investing in.

If you can also take advantage of onboard intelligence such as the built-in PLC functionality featured on Mitsubishi Electric's FR-A800 series drives, plus compatible Smart Condition Monitoring devices, then the savings start to ramp-up considerably.

Since continuity of production and security of supply dominates commercial concerns due to high operating costs and penalty clauses for delays in supply, smart monitoring alongside the base-line energy saving, can have a huge impact.

We have seen several instances of key processes that have failed due to the harsh operating conditions which could have been avoided by using a smart condition monitoring device. The total overhead cost of the unplanned downtime completely dwarfs the cost of the solution.

A Smart Condition Monitoring solution from us can be easy to install by either fitting up to two sensors to a drive via Ethernet or connecting multiple sensors to a monitoring box.

Having installed the condition monitoring device and connecting to a VSD we can report on the health of the machine and also feed-back energy usage data. From that point we can start to monitor and record electrical efficiency and then calculate other key metrics such as OEE. This is where the benefits of a 'connected' site from an automation point of view really start to stack up.

If we can use smart devices like modern VSDs and condition monitoring equipment to connect processes together, then we can compound the savings. There is no point leaving a dust suppression pump working flat out when the plant isn't active. Sounds like a small point, but over a year the costs, and conversely the savings, can be significant.

There are still lots of mechanical damping assemblies in use on pumps and fan motors that are very inefficient. For example, we recently fitted a VSD solution to a pumping system with a header tank and basic on/off feedback loop control that paid for itself within six months of operation.

There was a mechanical rotary valve installed to control the flow, however, since it was manually operated, the operations team had been forced to wind it back until it was nearly shut because there simply wasn't the time or manpower available to keep going back and adjusting it as the demand changed. We fitted an inverter drive with a smart operating parameter set already optimised for pump control and managed to save 78% of its energy usage.

If many pieces of equipment are provided with smart, energy efficient drives, condition monitoring and then networked, feeding information into a SCADA system or other MES / ERP style management software layer then you start to develop an intelligent system. Energy savings can be optimised, based on efficient running and intelligent, demand-based operation is made possible. Combine that with live machine health and maintenance-on-demand reducing downtime to a bare minimum and the savings are potentially huge.