Building a Ventilation on Demand system? 4 things you need to know

Jared Haube for Mining IQ

Ventilation on Demand (VOD) is a whole-of-mine ventilation system, which is enhanced by coordinating the ventilation equipment settings for the needs of the mine on a real-time basis.

Ahead of Hard Rock Mine Ventilation 2014, I caught up with **Allison Golsby, CEO of ConsultMine**, to discuss the impact of VOD systems and how they are offering new opportunities to reduce operational costs, improve efficiency and health & safety.

Implementing VOD needs thorough planning

It's easier to switch the communication systems and the PLC interfaces when the equipment is installed – and a lot more cost-effective. Most equipment these days are fitted with these interfaces. Any of the systems that are fitted at a mine site have a payback period between 12 months and three years.

However, when planning out a VOD implementation strategy, site teams need to have a systems-based approach. It's also important to determine what is actually needed by the mine site and what the sensitivities are, and conduct a risk assessment.

"A systems-based approach offers a methodical solution to increasing the energy efficiency. The starting point is the evaluation of the ventilation requirements, the control strategy and the performance characteristics of the currently installed equipment," Allison said.

Some examples are the addition of an adjustable speed drive to reduce fan output based on shift times, occupancy, the type of mining activity, as well as other factors.

Mines most suited to VOD have operations that are in distinct segments or areas that traditionally are flood-ventilated, such as block caves, development activities, stoping or for drill and blast activities. This compartmentalisation does not require the entire mine to be ventilated at any one time.

Software changes might be needed when implementing components into the ventilation system that are based on pre-requisites for automation and monitoring.

There's often a need for running communication cables or optical fibre to connect everything up to the system, which then needs to be read by the software.

There are commercial, off-the-shelf products that enable sites to read PLC outputs in order to understand through a graphic user interface (GUI). Engineers can analyse fan components and even have low level semi-controlled systems with alarms set into them.

There needs to be more coordination of short to long-term ventilation planning

Currently, when mines are designed at the initial stages, teams are focused on what's going to be the ore clearance systems for the mine.

“Although this is a fair call from a business perspective, they’re only analysing development costs and management processes. The finalised plans are given to the ventilation engineer to ventilate.

“However, if teams placed ventilation design early on in the planning process, they could design the intakes and extraction drives to reduce resistance. South African mine sites are using this strategy in the form of what they call a blueprint, through which the operational team manages the technical discipline, incorporating ventilation,” Allison remarked.

Ventilation engineers have the opportunity to work with the project designers to examine how set parameters such as the size of drives and equipment variants impact ventilation planning.

More importantly, engineers can expand some of the ventilation drives out or run some of the ventilation circuits in parallel as opposed to a series, to make the ventilation system more effective.

Instead of the air flowing through several ventilation areas, resistance is managed and the operational cost is reduced by at least 15 to 20% without significantly increasing the capital costs in any way.

Reducing loads on the ventilation system reduces maintenance costs. Having a vent system constantly at full power invites breakdowns. High pressures in the vent circuit can also be a safety hazard.

Mines are implementing VOD across large scale operations

Xstrata’s Nickel Rim Mine, northeast of the Sudbury Basin in Canada, has used VOD to enable distinct technological applications driven by the need to improve productivity and reliability.

Construction of a surface exhaust fan installation involved use of variable frequency drives (VFDs), multi-fan PLC and fan operation considerations.

Through a layered control application approach, the fan-controlled optimisation can respond in real time to ventilation changes in ventilation requirements.

These changes require many levels of monitoring to create a real time response system, including basic control loop standard, design and simulation, loop tuning of the entire control system and air monitoring stations (AMS) underground, and interaction testing between surface fans and AMS across multiple circumstances.

At one point the entire control system operated in automatic and cascade control mode at several-hour increments on four occasions. This method underpinned an initiative to have an integrated, governing strategy encoded within the PLCs to coordinate surface fans exhaust and supply fans.

“Mines cannot survive any longer solely by increasing the prices for which they sell the resource. They have to address costs. If VOD is implemented into the mine as it’s developed, smaller ventilation shafts, fan installations, supporting infrastructure and capital costs are lower than a comparable flood ventilation system,” Allison remarked.

The benefits of VOD go beyond cost reduction

Through a systems-based approach, site teams can collect data on a specific system and develop a load duty cycle to establish energy demand, operating hours, and annual energy consumption.

At one mine site to which Allison referred, the ventilation system’s fans were significantly oversized. As a solution, fifteen out of the eighteen system fans were fitted with variable frequency drives. The damper controls were no longer necessary and the fan control dampers were opened 100%.

“The total electrical power demand fell from 322 kW to 122 kW and the total annual energy consumption fell from 2,700,000 kWh to 1,100,000 kWh. Some benefit also resulted from reduced power factor penalty costs. The annual energy cost savings were $100,950 and the project implementation cost was $130,000,” she observed.

Ventilation costs can be a considerable proportion of the energy costs for a mine, and these savings can make a marked difference to the bottom line.

Other benefits from implementing VOD systems relate to more effective management of dust, fume, DPM, heat, detection of unplanned events and gas, and reduced pressure differentials. Therefore, lowered leakage and propensity for spontaneous combustion in coal mines and fans can be on standby and maintained without reducing production.

Ventilation on Demand represents a unique step towards operational cost reduction and improved efficiency. At Hard Rock Mine Ventilation 2014, Allison will run a workshop on reducing operational costs via Ventilation on Demand, and conduct an in-depth roundtable discussion on proactive ventilation design strategies to ensure operational cost savings, focusing on:

- Fundamental requirements of effective ventilation design;
- New ventilation techniques applicable to existing mine sites and;
- Real examples of operational cost savings.