Case study

Ventilation on Demand brings substantial energy and cost savings

Howden Simsmart was invited to design and implement a ventilation control system that would optimize the supply of fresh air to underground workers while reducing energy consumption and operating costs.

Howden Simsmart recently worked with a North American hard rock mine to introduce a Ventilation on Demand system using SmartEXEC™ technology bringing dramatic benefits in safety, energy costs and reduced carbon footprint.

The challenge

The mine was sunk to extract high-grade nickel ore from a deep deposit. It is designed to produce around one million tonnes of ore per year. From the start, environmental protection was a major factor in planning and operating the mine workings. In addition to the safety of personnel working underground, which is always the overriding factor, the operators were determined that the energy usage and carbon emissions from the project would be kept to the minimum required for personnel safety and comfort.

The largest operational cost driver in any mine is the ventilation system. Traditionally, mine ventilation fans have been run continuously. In the case of this mine, there is a total of approximately 18,000 HP of fans installed, 50% being underground auxiliary fans and 50% main surface fans. The task for Howden Simsmart was to introduce a management and control system that used these fans effectively to ensure safe ventilation levels throughout the mine while reducing the power consumption to the minimum.

The solution

A unique control strategy was implemented to minimize the overall resistance in the mine and optimize the speed of the main fans. This was reckoned to offer the best balance between energy savings and smooth control response. The speed of the main fans is governed by the actions of the main ventilation regulator, through a mechanism known as a 'speed optimizer'. The auxiliary fans are equipped with on/off starters. Different levels of control are used to control the auxiliary fans, 'scheduling' and 'dynamic control', used in parallel to optimize their use. In the 'scheduling' mode, the fans are started and stopped at the beginning and end of the shift in the relevant zone of the mine. The 'dynamic control' mode is enabled at the start of the shift and uses the data provided by the electronic vehicle and personnel tags. This leads into high energy savings for both the auxiliary and main fans.

The mine has around 110 auxiliary fans on the site, all were fitted with scheduling control, and about half of them also currently have dynamic control strategy. These fans are switched on when there are vehicle movements or personnel working in the area, and switched off after the area is once again empty of people.

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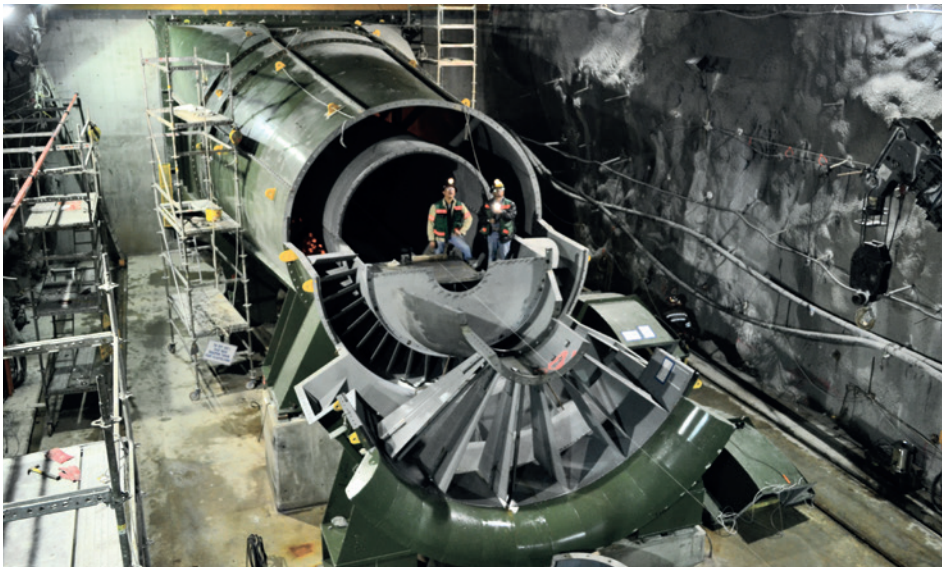
The outcome

In calculating the savings achieved by the introduction of SmartEXEC™ Ventilation on Demand, we investigated the way the ventilation system would otherwise have operated. In the case of the auxiliary fans, a base case was first established, to estimate how much power would be consumed by each fan if no VOD system was available. We looked at the records over a 96 day period and scaled the figures up to one year. This demonstrated a reduction, over the twelve month period, of 11,000 MWh, which at the prevailing energy costs brought a saving of $900,000.

Additional savings arose from running the main surface intake and exhaust fans in 'speed optimizer' mode, and decreasing the fan's speed for around 40 minutes at the end of each shift. Comparing electricity consumption with figures from a previous period showed that the annual energy saving in the exhaust fans was about 9,500 MWh. The cumulative cost saving was calculated to be around 700,000$. Savings in energy costs thus totalling $1,600,000.

Further benefits came from reducing the main fan speed and shutting down all underground auxiliary fans during energy cost premium time throughout the year. Such control would not have been possible without the use of the advanced control system of the SmartEXEC™. While this figure of $1,400,000 was specific to the local energy provider and brought the total saving to about $3,000,000, the wider value of the SmartEXEC™ VOD system, in reducing both costs and carbon footprint, is clear.



Component	Savings
	C$/year
Exhaust fans	660,000
Intake fans	79,000
Auxiliary fans	891,000
Peak hour savings	1,600,000
Total	**3,230,000**