The Australian Mine Ventilation Conference 2017

Paper Number: 07

Auxiliary ventilation design - why mines waste so much power on inferior systems

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ABSTRACT

There has been a strong trend over the past decade in hardrock mines towards the use of very high powered twin-stage auxiliary fans pushing air into a single "trunk" duct that in turn splits into multiple branches with multiple outlets feeding multiple workplaces. This often produces a poor result in terms of face flows due to both high resistance and high leakage, as well as high fan capital and operating (power) costs, which in turns also result in a higher cost for underground power reticulation systems. This paper explores the reasons why this trend exists and what ventilation practitioners can do to utilise less expensive systems that simultaneously deliver better workplace conditions. It includes a case study.

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Paper Number: 08

Fan tender adjudication for ventilation engineers

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ABSTRACT

The correct specification and then selection of primary or major fans for an underground mine is a critical decision not only in terms of fan capital and operating cost, but also safety and reliability which further impact on mine production. In addition, fan manufacturers may spend tens of thousands of dollars preparing proposals for a purchase enquiry for primary fans. There are therefore many good reasons to thoroughly and fairly adjudicate fan tenders. This paper describes the process to achieve this starting with the initial fan specification through to the final award. It includes a case study.

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Paper Number: 39

Pros and cons of primary ventilation systems and the need for critical spares

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ABSTRACT

Various suppliers of Primary ventilation systems supply products into the market today and it is sometimes hard to distinguish between what system would best fit my operation. There is no wrong system, just a wrong application of a system and with that the question is laid before you which system offers what to an operation and how will the operation benefit?

I intend to explore the difference between Axial, Centrifugal and mixed flow fans and the benefits it offers an operation but also the hidden aspects many times not explored. Some of the points that will be touched on will be fall over redundancy through design, fan efficiencies, electrical input power, maintenance requirements and the need for critical spares. I tend to show what the result of poor maintenance of a primary fan installation may lead to and what the impact on business potentially could be should no critical spares be available.

Too often ventilation controls are picked for the wrong reason and forgotten about until the day a major fan failure occurs, and no contingency plan has been put in place. It is important, even more so for a small operator, to protect the business against un planned stoppages which may result in major loss to production and revenue.

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Paper Number: 68

Operation of DMLZ mixed flow fans after the first fan upgrade – a parallel fans case study

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ABSTRACT

Part of the PT Freeport Indonesia mine production is in the process of transitioning from Deep Ore Zone (DOZ) Mine to the Deep Mill Level Zone (DMLZ) Mine, which is the next lift in the caving series and lies 500m below the current DOZ footprint. The DOZ Mine production has declined from 80 ktpd to 35 ktpd currently, and will ramp-up to 60 ktpd in 2017 and sustain this rate for several years until the mine is completed in 2021. Over the next six years, the DMLZ Mine will ramp-up to 80ktpd.

In order to reduce the need for an additional ventilation system for the DMLZ Mine, it was decided to upgrade the performance of the three existing DOZ mixed flow ventilation fans in situ and establish connections from DMLZ to these fans.

The upgrade process involved replacement of motors, fan shafts and bearings. The existing 1600kW DOZ mixed flow fans are 3500mm diameter and operate at a speed of 595 RPM and were originally designed to deliver 390m^3/s at 3.3 kPa. The upgraded DMLZ fans are required to deliver 425m^3/s at 3.7 kPa and it was necessary to increase the motor size and speed to 2200kW at 710 RPM.

This paper will discuss the fan upgrade project and method of integration of this unusual system that operates multiple large fans in a semi parallel installation.

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Paper Number: 35

A comparison of predicted operational performance of auxiliary ventilation ducting systems

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ABSTRACT

The objective of this paper is to examine some modern forms of auxiliary ventilation fabric ducting with streamline design fittings and the efficiency of construction practices. The most dynamic form of auxiliary ventilation is a moveable fan and ducting which is easy to install and uses light weight fabric. The porous nature of some ducting construction results in leakage and loss of efficiency. Flexible fabric ducting is primarily associated with metalliferous mining and industrial material quarrying. Some applications are found in coal in stone/rock development and with use of dust scrubbers.

Forcing auxiliary ventilation systems employing circular fabric ducting have been examined. Leakage of air from ducting is affected by ducting material and construction methodology (such as welded or sewn), quality of installation, number of joints, total length, pressure differences between the inside and outside and diameter. The best ducting system with welded construction can have up to four times less leakage as compared with some systems with sewn construction. It is also evident that the sewn type ducting will deliver less air to working faces and require more fan power, hence higher operating costs to run when connected to the same fan.

A case study has also been undertaken to compare predicted operating costs of auxiliary ventilation systems connecting various types of ventilation duct fittings. The study also assesses the technical importance of streamline design with low aerodynamic resistance to reduce the shock losses of the duct fittings. It was found that the system connected with streamline designed fittings is able to provide some power cost savings and deliver more air compared with the system fitted with conventional fitting pieces.

Using a ventilation ducting system with a lower leakage coefficient and low resistance represents a sound solution to new challenges faced by the industry for increasing demand for better quantities and quality of air delivered to working faces due to higher production schedules and stricter mine health and safety regulations within the Australian mining industry.