Appin Colliery Explosion Revisited

by Duncan Chalmers, Senior Lecturer, UNSW School of Mining Engineering

The history of TestSafe Australia and the establishment and expansion of testing facilities at Londonderry is indelibly linked with the 1979 Appin Mine Disaster. Not only did the site investigate the causes of the explosion, but site facilities were established to implement recommendations of the subsequent Government Inquiry into the causes of the explosion and fire.

In this article Duncan Chalmers, a University of NSW mining engineering academic who has been closely involved with TestSafe, recounts his first-hand experiences at Appin at the time of the accident.

On 24th July 1979 at approximately 11:00pm an explosion occurred in a section of the mine known as K panel. As a result 14 people were killed. This loss of life was tragic, as expected an enquiry was held and the results of this are a matter of public record. All those that actually knew what was being undertaken at the time perished in the explosion and thus it required significant investigation to piece together the likely scenario that precipitated such an event.

Of the 14 that died that evening only Mr Alcorn was known to me, as I had spent several weeks during my graduate programme working at the mine. In the hours after the explosion the mutual assistance scheme was activated and the Southern Mines Rescue Service Brigades went into active service. On the afternoon of 25th July, the rescue team, that I was Captain, sat on the surface of the Colliery where we worked waiting to be called into action as the search and rescue effort proceeded. In many senses we were fortunate that the last body was found and the operation ceased before we were called in.

It is for these reasons that this event above others is important to me, and to gain understanding of this event and to learn from this is paramount to the ongoing safety within the mining industry.

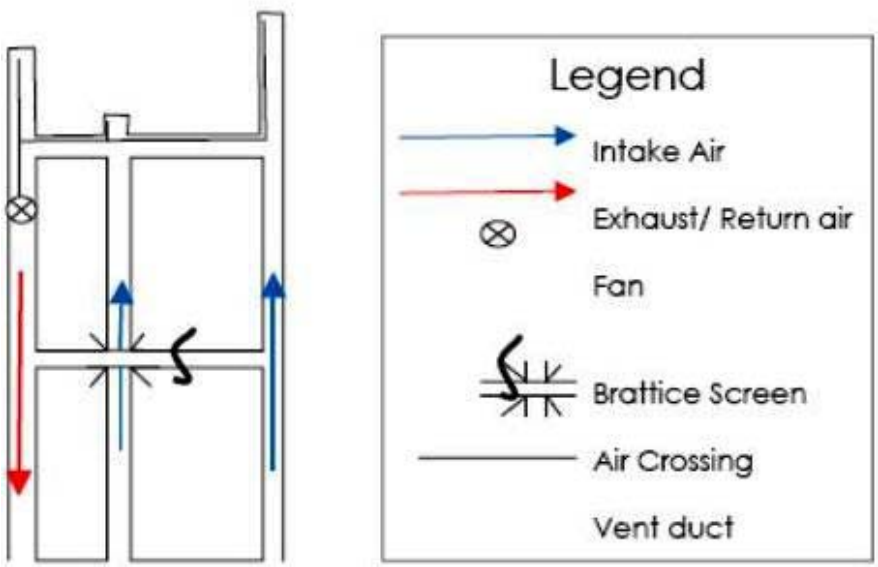

Figure 1 - K panel ventilation prior to change

Contributing factors

Ventilation Change

On the evening shift when this explosion happened there were two distinct operations happening in K- Panel. One was the routine mining of coal, and the second was effecting a ventilation

change to provide the capability to manage the methane gas make and improve productivity. These two activities led to the increased number of personnel in the section of the mine and thus the high death toll from this event.

Ventilation Plan before this change is shown in figure 1. The intake air is shown in blue and the exhaust shown in red. The three blind headings would have been ventilated by an exhausting auxiliary fan that is shown in the left hand heading and rigid ducting taken into the faces

Figure 2 shows the proposed change with a second fan installed in the right hand heading. It was this new fan that was removed and examined after the event. It had been delivered into the section and had been installed in the position shown in figure 2. Its purpose was to provide ventilation to the blind heading that had previously been ventilated by the existing fan in the left hand heading.

It is a relatively quick job to put the fan in place, extend the ducting to the heading and start the fan, provided the preparation for the job was done correctly. I.e. duct run out, cable in position fan site level and clear.

Fan starter

Mine fans are powered by three phase motors. The normal start up is for the motor windings to be configured in a star formation and when the fan reaches 70-80% of full speed the stater box switches to a delta formation to bring it up to full speed. Direction is controlled by the phase shift from each phase and reversing two, will reverse the direction. If the star connections and the delta connections are reversed then instead of accelerating to full speed the motor will try to rotate in the opposite direction and trip on overload.

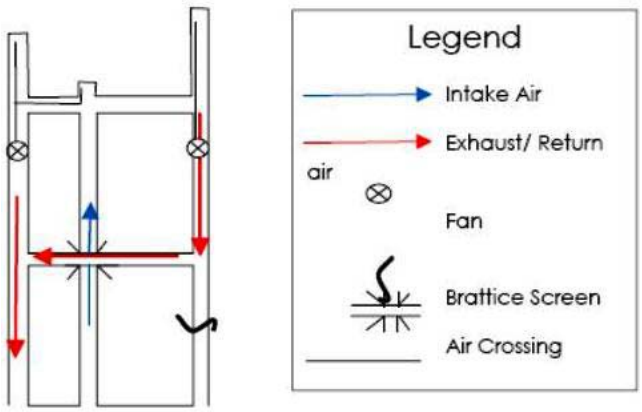

Figure 2 - Ventilation plan after vent change

If this was the case with this second fan then the electrician in the panel would need to open the control box and reverse two of the phases to the delta windings. If, instead he changed the incoming phases then the same overload would be exist except the fan would spin initially in the other direction. If he changed the star winding connections then the fan would start and spin in reverse.

Each change should entail the removal of all the bolts holding the flameproof enclosure cover, remove the cover, make the change and then the replacement of the cover and bolts to hold it in place. This is a time consuming exercise.

Gas accumulation

The Bulli seam at Appin Colliery has a moderately high methane content. Gas desorbs from the coal once the pore pressure within the coal is lowered to atmospheric pressure and the rate at which the gas comes out is very much dependent on the permeability of the coal itself. This means that if a place is left unventilated then the gas issuing from the coal will mix with the air in the heading and the percentage will slowly rise.

Face ventilation is therefore very important to dilute and render this gas harmless before it can accumulate. If an accumulation is present, then mixing air with this gas needs to be controlled so that the accumulation is diluted in situ as there will always be an explosive fringe formed between fresh air and the gas accumulation. Keeping this fringe away from ignition sources is paramount to safely control and dilute it.

Improvements to Mining

Sam Levenson suggests that "You must learn from the mistakes of others. You can't possibly live long enough to make them all yourself." Thus from this disaster there were improvements that arose.

Fans were required to have a mixing chamber to better control the clearing an accumulation of gas.

TestSafe's Bill Dunn with the electric powered fan which he found in his 1979 investigation to be the cause of ignition for the Appin Mine Explosion

Mines increased the research and development of methane drainage techniques so that the overall gas content of the coal could be lowered. Now some mines will spend almost as much on gas drainage as they do on production.

Conclusion

It would be easy with the wisdom of hindsight to criticise those that were involved, but this is not the point of this article. This tragedy is an opportunity to take stock of how we work, and take that moment to look at the broad environment when a problem arises, in order that we by omission in focusing on the problem at hand miss a greater problem that may be developing.

There are many scenarios that can be read into this particular event, however for an explosion to occur three things must be present, an ignition source, fuel and oxygen. If the fuel is controlled then an explosion cannot ensue.