

Project Summary : COL 310

Project Title:	Dust Capture Effectiveness of Scrubber Systems on mechanical miners operating in larger roadways 190p.		
Author(s):	BJ Hole and FH von Glehn	Agency:	Bluhm Burton Engineering/IMCL
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Category:	Coal	Machinery	Engineering

Summary

The effectiveness of scrubber dust capture is dependent upon a number of factors relating to the entire mining operation. These factors include the method of mining, the mining sequence, auxiliary ventilation arrangement, the general layout of the scrubber and the inlet position/s, and the operating parameters of on-board ventilation and dust control systems.

The present project was directed towards bord and pillar workings using mechanised miners operating in larger section roadways, where the problem of scrubber capture tends to be greatest owing to the limited size of the zone of influence around exhaust ventilation inlets. The study also concentrated on the use of jet fans for auxiliary ventilation, these representing the most common system in use in South African coal mining.

The project considered the influence of all the above factors using a variety of techniques including literature reviews of previous work both in South Africa and other countries, analysis of working methods from a number of underground visits and previous experience, and surface gallery trials studying the effect of the various components on scrubber capture, both individually and in combination.

The evaluation of each of the systems was carried out having regard to the primary function of any coal mine ventilation system - the effective ventilation of the working area to ensure the efficient removal of methane. An aspect of the working environment which was included in the work was a brief study into the problem of noise from scrubber systems.

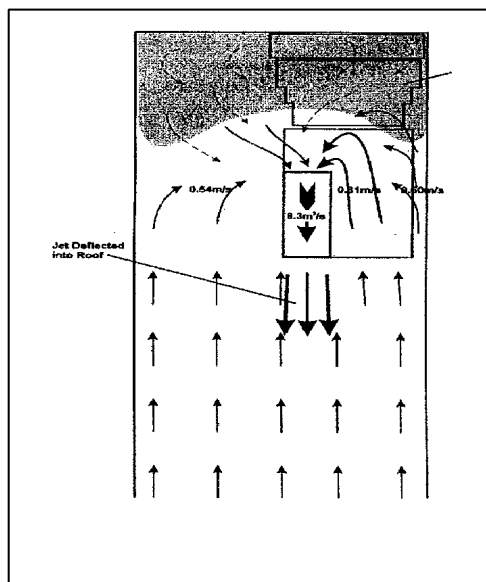


Figure 1. General Airflow Patterns around the Machine, Standard Scrubber Only Operating, Fitted with Outlet Deflectors

Conclusions

- X The mining sequence of a bord and pillar section has a great influence on both ventilation and dust control around the working face.
- X To ensure optimum dust capture by the scrubber system, the air flow capacity of the scrubber must be maximised with respect to the force ventilation quantities, while having regard to the limitations for recirculation within the DME Ventilation Guidelines.
- X The scrubber inlet should be sited as near to the face as practically possible.
- X The cutting sequence for partial and full cuts should be such as to maintain the scrubber close to the sidewall for both cuts.
- X The use of effective on-board force ventilation systems is vital to ensure a good standard of face ventilation during the first 12 m of cutting (when no force auxiliary ventilation is required).
- X The use of excessive pressures on water spray systems or excessive air quantity on air curtain systems can cause dust roll-back, with consequent reductions in scrubber dust capture efficiency.
- X The optimal arrangement for the scrubber system is for the treated discharge air to be ducted out of the heading, the scrubber unit either being mounted on-board the machine or off-board, in the LTR.
- X All scrubber units should be fitted with deflectors to prevent entrainment.
- X Improvements in dust capture efficiency can be gained by siting the inlet as near to the face as practical.
- X The optimum arrangement for a continuous miner is considered to be a US-style scrubber arrangement with a duct sited across the width of the machine jib giving three inlets beneath the jib: one on each side of the jib and one above the throat of the machine conveyor.
- X The design of the system is best carried out by machine manufacturers so that the various components can be an integral part of the machine structure.
- X Consideration should be given to incorporating a silencer into any inlet ductwork. For full effect, silencers need to be fitted to both the inlet and outlet of the scrubber, which should result in more significant reductions of the order of 5-10 dB (A).