



MINING INDUSTRY
OCCUPATIONAL
SAFETY & HEALTH



MINERALS COUNCIL
SOUTH AFRICA

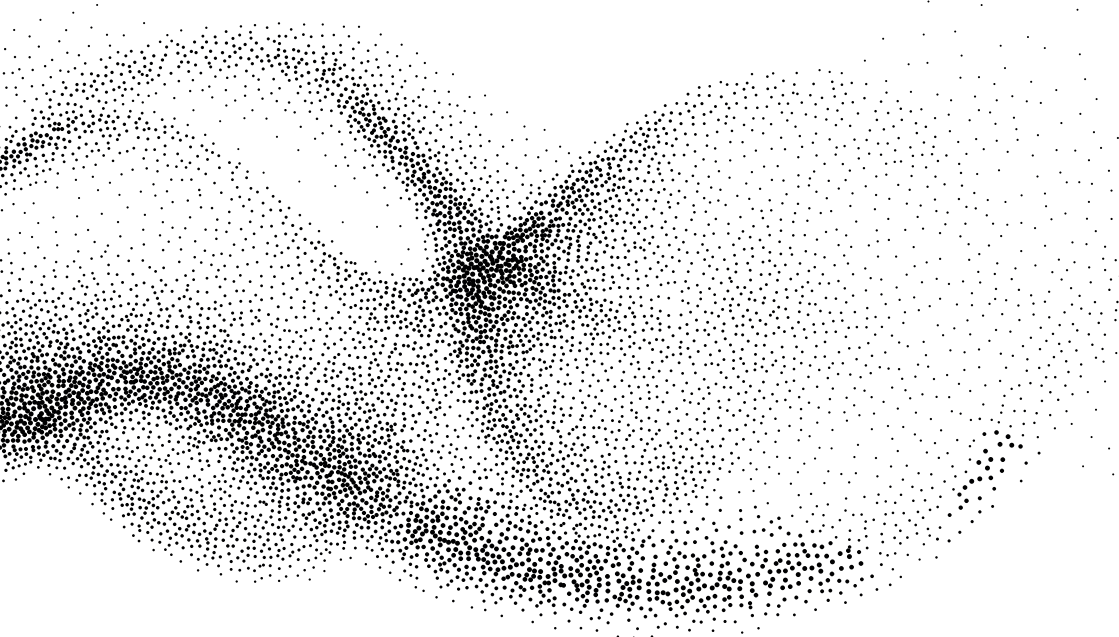
SIMPLE LEADING PRACTICE ADOPTION BRIEF

CONVEYOR BELT

AUTOMATED TRANSFER POINT

FOGGING DUST

SUPPRESSION SYSTEM





The Conveyor Belt Automated Transfer Point Fogging Dust Suppression System has been recognised as a primary engineering dust control system at ore transfer points.

The Conveyor Belt Automated Transfer Point Fogging Dust Suppression System ensures that airborne dust particles are captured and trapped by increasing the surface area of one droplet of water to create mist vapour capable of capturing respirable dust particles. The coagulation and absorption of dust particles by water is further enhanced by adding low dose of surfactants that descale, sterilise (treat the water for fungal and bacterial agents) and bind.

SOURCE MINE - EXXARO MATLA 3



Background:

The MOSH Leading Practice Adoption System was established by industry in 2007 to assist in achieving the tripartite agreed 2003 occupational health and safety (OHS) milestones. In 2005, the CEOs of major mining companies committed their companies to achieving these milestones.

System: The system is based on the simple concept of identifying, documenting and then facilitating widespread adoption of leading practices that have enabled superior OHS performance at existing mines. Although conceptually simple, the barriers to successful technology-transfer make it notoriously difficult to consistently achieve in practice. The MOSH system therefore includes special behaviour management techniques to address these barriers.

Behaviour management plans: The behaviour management techniques of the MOSH adoption process need to be implemented as part of the leading practice. They are derived from mental models research conducted specifically to identify the various barriers that prevent successful adoption.

Simple Leading Practice (SLP): Conceptually, a leading occupational health or safety practice may be categorised as an SLP when both the practice and its adoption do not depend on securing a change in the behaviour of many people. The practice and its adoption should then involve few steps, few people, little or no training and have no material negative impact on any person or a group of people. An independent review panel is established in each case to formally make this assessment. If the practice is confirmed as an SLP, behavioural communication and leadership behaviour plans that are generically applicable may be customised and used. Such plans are provided in this adoption brief.

Adoption process: Importantly, sustainable adoption of a leading practice, including a simple leading practice, must include adoption of not only the technical leg, but also its behavioural communication and leadership behaviour legs. In concept, a leading practice, including an SLP, must therefore be considered to comprise of the three legs depicted below:

MOSH Leading Practice

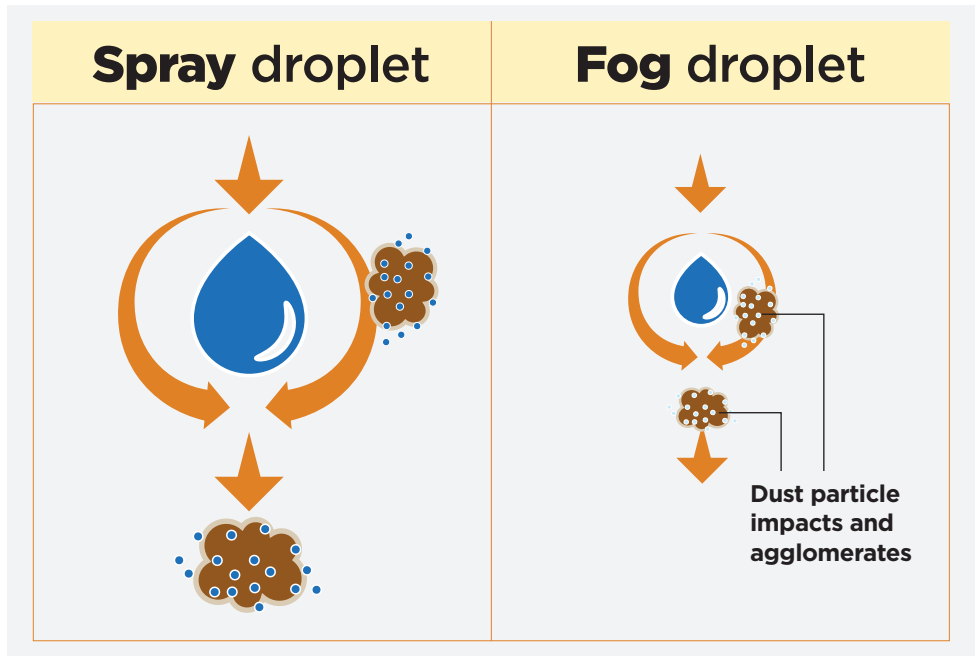




SCHEMATIC OF THE PRINCIPLE OF OPERATION

HOW DROPLET SIZE CAN AFFECT AGGLOMERATION

If a droplet diameter is much greater than the dust particle, the dust particle simply follows the air stream lines around the droplet and little or no contact occurs.



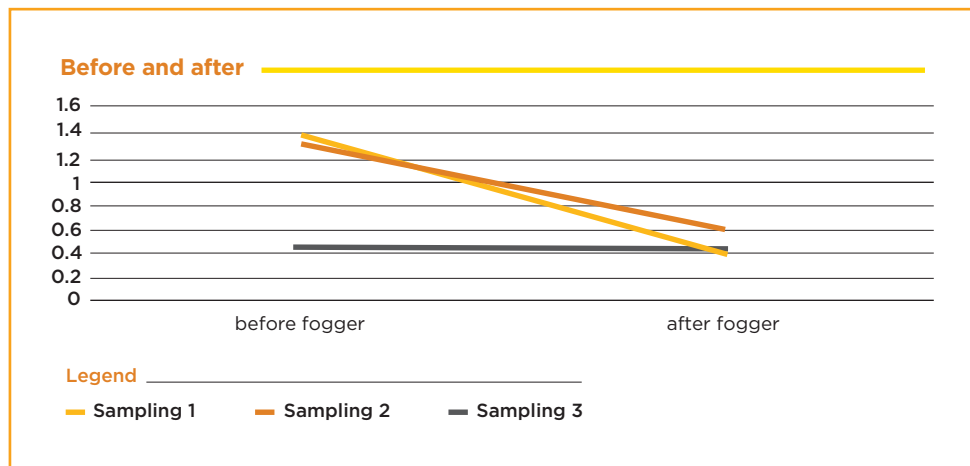
If the water droplet is the same size or smaller compared to that of the dust particle, contact occurs as the dust particle tries to follow the air stream lines. The probability of impaction increases as the size of the water droplets decreases.

The coagulation and absorption rate of the mist/vapour is further enhanced by the addition of specific blends of wetting/surfactant agents.

Up to 98% removal rate of specific airborne pollutants were possible this way.

Following the installation of the underground Conveyor Belt Automated Transfer Point Fogging Dust Suppression System at the Exxaro Matla 3 source mine, airborne total dust liberation has been reduced between 0.397mg/m³ and 0.433mg/m³ time weighted average (TWA) from a range of between 1.352mg/m³ and 0.461mg/m³ TWA in the immediate vicinity of the transfer point.

DUST RESULTS BEFORE FOGGER SYSTEM – TWA	DUST RESULTS WITH FOGGER SYSTEM OPERATIONAL
Sampling point 1: 1.352 mg/m ³	Sampling point 1: 0.397 mg/m ³
Sampling point 2: 1.297 mg/m ³	Sampling point 2: 0.599 mg/m ³
Sampling point 3: 0.461 mg/m ³	Sampling point 3: 0.433 mg/m ³





SUMMARY OF THE GENERIC VALUE CASE

The value case for adopting the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP is outlined in the table below.

Value case

An important point about a value case is that it contains more than a conventional business case. Much of the value from an intervention to improve health or safety performance cannot be readily assessed in hard financial terms. The value derived from many health and safety interventions is of strategic or long-term benefit, and therefore needs to be recognised in those terms.

ISSUE		DETAILS
1	Initial cost	Unit cost for underground is estimated at R334 203 NB: The price is for the Exxaro Matla 3 source mine and is dependant on the situational analysis to design fit-for-purpose and will vary from operation to operation and is site specific
2	Operational costs	Materials and other consumables are estimated at R120 000 per unit per annum. Maintenance cost is dependent on the option selected by the user which includes either developing inhouse skills or outsourcing. The Exxaro Matla 3 source mine found that inhouse skilling was not sustainable in the long-term due to continuous staff turn-over and unforeseen misplaced priorities, or the SLA contract which is negotiated upfront with the original equipment manufacturer (OEM) and the assignment of the engineering or VOHE departments as custodian
3	OHS benefit	The risk of coal workers' pneumoconiosis (CWP) to underground employees will be significantly reduced. This is of real value to management, workers and their families
4	Progress towards zero harm	Debilitating lung disease and mortality from CWP and fibrosis caused by excessive exposure to coal dust is of concern. Reducing this risk to underground employees (who are most at risk), will constitute a significant step towards achieving the goal of zero harm as well as going beyond compliance
5	Improved working relationships	Implementation of the behavioural communication and leadership behaviour plans is key to significantly improve the operational working relationship between supervisors and their staff
6	Buy-in and support	The mine-wide dust suppression interventions in the interests of protecting the health of those most at risk, will help engender buy-in and support by all stakeholders



SUMMARY OF THE GENERIC VALUE CASE

continued



MINING INDUSTRY
OCCUPATIONAL
SAFETY & HEALTH

ISSUE	DETAILS
7 Legal compliance	The installation of the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP will assist in meeting regulated maximum dust exposure levels. It will also be a good case of management doing what is reasonably practicable to provide and maintain a working environment that is safe and without risk to the health of all underground employees
8 Reduced compensation	In the longer term, the mining industry, including the mine, will benefit from a reduction in compensation and other costs associated with CWP
9 Other added benefit	• Removal of soluble gas particles in the air • Increased dilution of explosive gases • Oxygen reduction at the possible source of fire/heat • Immediate drop in temperature of surrounding air • Huge absorption of energy from fires and friction areas • Reduced friction heat on conveyor belt pulleys



Extract from Mine Health and Safety Act: Section 5 (1)

As far as is reasonably practicable, every employer must provide and maintain a working environment that is safe and without risk to the health of employees.

Behavioural communication: The elements of the behavioural communication plan set out below identify beliefs and issues that are generally present at mines and which act as barriers to adoption of new technologies and practices. The provision and presentation of convincing information is necessary to address the misperceptions or knowledge gaps associated with these beliefs and issues.

Generic belief/issue		Essence of required communication
1	No personal benefit	The direct health benefits at ore transfer points of airborne total dust liberation was a reduction of between 0.397mg/m ³ to 0.433mg/m ³ TWA from a range of between 0.461mg/m ³ to 1.352mg/m ³ TWA in the immediate vicinity of the transfer points from the 3 sites piloted. The indirect benefits derived from adopting the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP must be identified and explained to the relevant supervisors and engineering maintenance staff
2	Will have a negative impact on production	Experience illustrating that adoption of the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP has no impact on production, must be explained to all supervisors and underground employees
3	Will involve extra work effort	The extra maintenance work required of the engineering maintenance staff must be made part of their defined work
4	Short cuts are taken to meet production targets	The reasons for a safe mine being a productive mine must be explained to the underground employees, engineering staff and their supervisors. The harm of ill-advised short cuts to health, safety and production should be brought out
5	Trust and buy-in are needed for adoption	The importance of regular dialogue with staff to identify and address any and all concerns about the SLP to be explained to all relevant supervisory levels
6	Leaders must lead by example	Leaders responsible for ensuring operation or maintenance of the equipment must regularly check and ensure that the equipment is in proper working order
7	Workers have a disregard for health and safety	Managers and supervisors must communicate their high regard for health and safety through their actions, particularly by ensuring that workers do not sacrifice health and safety considerations in the interests of production

Generic belief/issue		Essence of required communication
8	Workers fail to implement training provided	Explain to supervisors that they will get what they allow. Persons who do not do what they have been trained to do must be constructively coached or sent for re-training if necessary

Communication materials

It is the responsibility of the mine to develop the required communication material to effectively and convincingly convey the substance of the key messages set out in this generic behavioural communication plan, which has been customised for the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP.

It will also be important to identify and brief those responsible for delivering the various messages.

Leadership behaviour: The elements of the customised leadership behaviour plan that must be implemented in adopting the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP are set out below. The provision of appropriate briefing and training will be necessary to achieve the leadership behaviours identified in this plan.

ANTECEDENTS	BEHAVIOURS	CONSEQUENCES
(to enable the behaviour for successful adoption)	(by the relevant person for successful adoption of the SLP)	(by next level supervisor in response to observed behaviour)

OPERATIONAL ADOPTERS (ENGINEERING MAINTENANCE CREW)

Maintenance crew training on operation and required regular maintenance

Maintenance crew to maintain Conveyor Belt Automated Transfer Point Fogging Dust Suppression System to specification as trained for the following:

- i. chemicals dosing
- ii. multistage filter replacement

- Immediate positive feedback from the section engineer supervisor on observing desired behaviour
- Constructive coaching to address any observed problems (no abuse)
- Special recognition for exceptional performance
- Prompt action on any reported problems



GENERIC SLP BEHAVIOURAL PLANS

continued

ANTECEDENTS (to enable the behaviour for successful adoption)	BEHAVIOURS (by the relevant person for successful adoption of the SLP)	CONSEQUENCES (by next level supervisor in response to observed behaviour)
OPERATIONAL ADOPTERS (ENGINEERING MAINTENANCE CREW)		
Occupational hygienists training on SLP	Occupational hygienist to measure the efficiency of system: i. during routine inspections and using area sampling and or ii. during continuous real-time monitoring at control room	• Immediate positive feedback from the managing ventilation engineer or the immediate supervisor on observing the desired behaviour
Dust mitigating strategy performance briefing before implementation must be discussed	No short cuts	
Regular performance enquiries by supervisors	• Report any problems with SLP • Request explanations to ensure full understanding	• Constructive coaching to address any observed problems (no abuse) • Special recognition for exceptional performance • Prompt action on any reported problems

FIRST LEVEL SUPERVISORS (ENGINEERING MANAGER OR VENTILATION ENGINEER DEPENDING ON MINE SET-UP)

- Briefing of engineering team on the situational analysis and installation operation and required regular maintenance prior to implementation
- No short cuts allowed or taken
- Ensure that maintenance crew receive necessary training and instruction
- Enquire about Conveyor Belt Automated Transfer Point Fogging Dust Suppression System performance or problems at regular meetings with supervisors
- Provide immediate positive feedback on observing desired behaviour
- Provide constructive coaching on observing sub-standard behaviour
- Immediate positive feedback from next level supervisor on observing desired behaviour
- Constructive coaching to address observed problems (no abuse)
- Special recognition for exceptional performance



Training

It is the responsibility of the mine to develop the training and briefing material required for implementation of the generic leadership behaviour plan that has been customised for the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP.

Guidance on implementation of the leadership behaviour and behavioural communication plans is provided later.

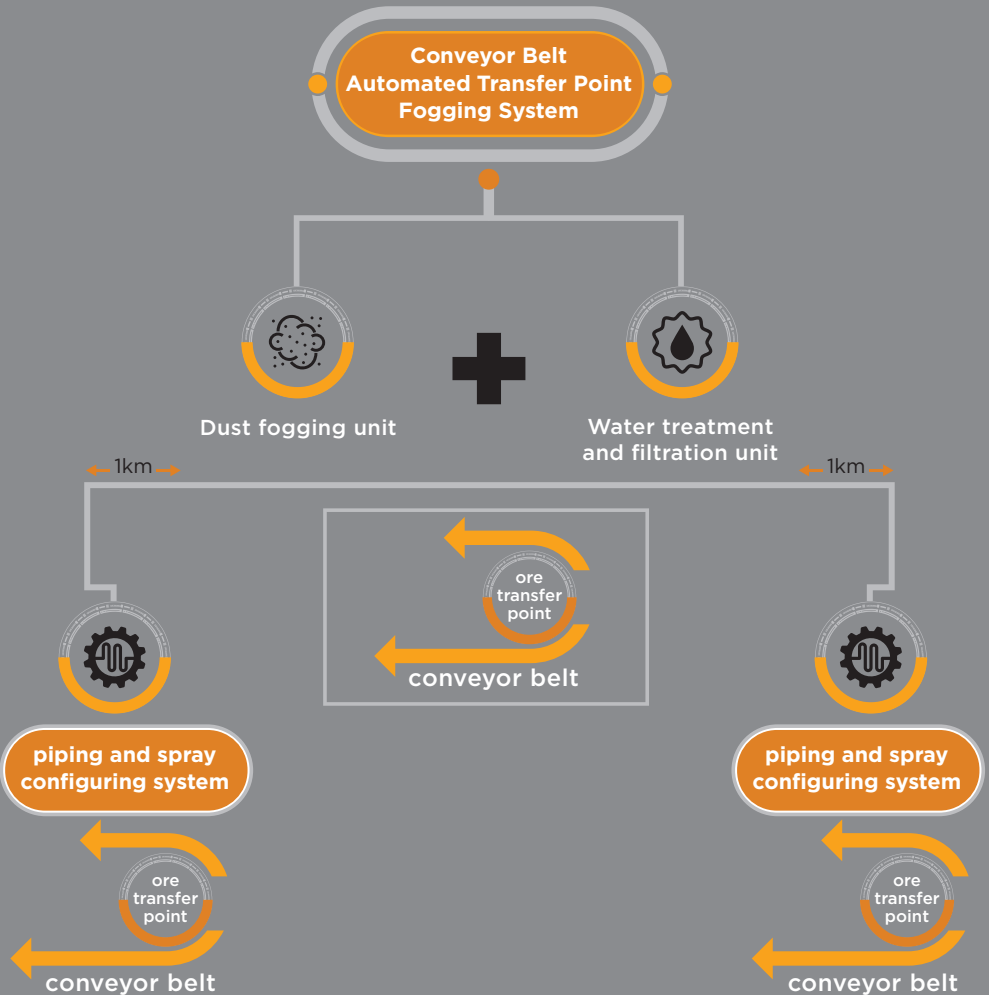


Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP relevant technical aspects are listed below:

1	Conducting situational analysis upfront ensures the right design of the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System and the correct site installation
2	The water pressure should be maintained at correct pressure level, and the nozzle small enough to create a vapour curtain in order to increase the water-dust particle agglomeration. The Exxaro Matla 3 source mine was able to achieve the results using pressure of 70 bar sprayed through a 0.2mm fogging nozzle
3	The multistage water filters' size specification and sizes must be of 25 micron, 5 micron and 1 micron to yield similar results attained by Exxaro Matla source mine
4	In order to avoid potential negative impacts, please note the following: a. The dosage of each of the chemicals to treat, descale and bind must be clearly stated b. Risk assessment of the surfactant/chemical additive to the fogging dust suppression (people), should be done upfront, treatment of spillages and emergency management in case of human exposure be clearly marked on appropriate/clear signage c. Risk assessment of the surfactant/chemical additive to the Fogging Dust Suppression (environment) and management thereof should, be clearly noted on appropriate signage d. Risk assessment of the fogging system with regards to noise emission levels should not exceed sound levels of 107 dB(A)
5	It is important that a person is appointed to conduct daily visual inspections of the system and report findings. In the case of the Exxaro Matla 3 source mine, an SLA with the OEM stipulating that the OEM's technician should conduct these daily inspections and report to the mining engineer to be signed upfront
6	Roles and responsibilities to be clearly defined upfront, for an example – who is responsible for the capital and working cost budget, for ordering the filter bags, for maintenance, for continuous awareness and feedback. Ultimately, a multi-disciplinary approach is key
7	Housing the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System in a safe cage with the correct signage is an added advantage to reduce spillage and untoward tempering



SCHEMATIC DRAWING OF UNDERGROUND ORE TRANSFER POINT ARRANGEMENT



Notwithstanding the simple nature of the practice, the systematic 10-step process outlined below should be used with adjustment where necessary, to manage adoption of the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP at the mine.

STEPS FOR MINE-WIDE ADOPTION

Step no.	Activity	Guidance notes/comment
1	Facilitate adoption decision Obtain top management decision to adopt	- Environmental specialist to develop and present a mine-specific value case for mine-wide adoption - Top management buy-in and support is essential for successful adoption
2	Secure widespread support for adoption - Issue mine wide briefing note about adoption - Brief mine health and safety representatives	- Advise all mine staff of the adoption decision, point out its benefit to all underground staff - Brief health and safety representatives through dialogue

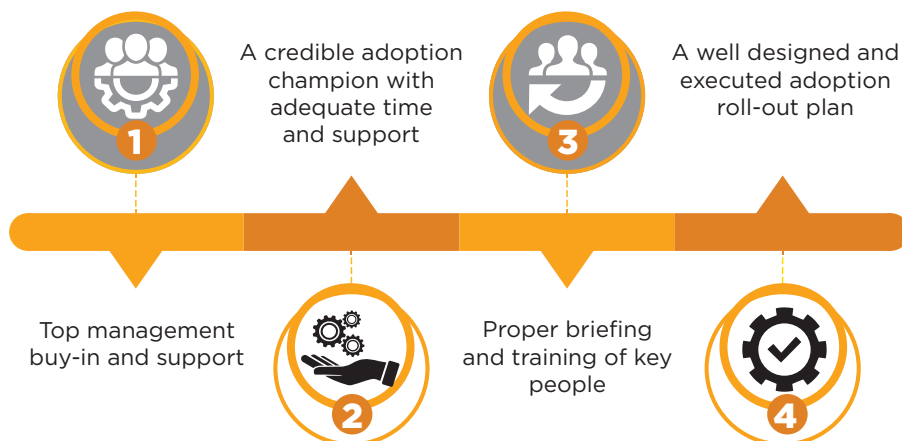
STEPS FOR MINE-WIDE ADOPTION

Step no.	Activity	Guidance notes/comment
3	Establish an effective adoption team - Identify a person to lead or champion the adoption process - Ensure/enable provision of any needed support	- Manager to ensure that the selected person has the stature and time needed to lead and champion the process - Manager to hold a meeting with relevant persons to brief and instruct about the needed support
4	Develop mine-wide adoption plan - Identify appropriate piloting arrangements - Develop mine-wide roll-out plan	- Identify a suitable piloting section to enable checking and troubleshooting before mine-wide roll-out - Develop a mine-wide Conveyor Belt Automated Transfer Point Fogging Dust Suppression System installation and maintenance programme
5	Implement a monitoring programme - Identify measurements to show impact of practice - Design monitoring plan and initiate data collection	- This should include appropriate dust measurements, as well as relevant measurements to show any impacts per site - The monitoring plan must include analysis and reporting arrangements for the duration of the plan
6	Harmonise practice with mine standards - Review SLP against mine circumstances - Adjust non-core aspects of the practice as necessary	- Engineering department to draw up specifications for the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System to suit the mine's operating conditions - Adoption leaders to ensure retention of core elements of the practice

STEPS FOR MINE-WIDE ADOPTION

Step no.	Activity	Guidance notes/comment
7	Develop training and communication materials - Identify persons who need to be trained or briefed - Develop required training and briefing materials	- All persons involved in operating or overseeing the adoption and successful operation and maintenance of Conveyor Belt Automated Transfer Point Fogging Dust Suppression System should be identified for briefing and training - The mine to develop the necessary materials to implement the behavioural communication and leadership behaviour plans provided in this brief - Materials will be required for use with maintenance crew
8	Brief and train mine persons Plan and implement briefing and training programme	- Existing communication systems on the mine should be used such as management briefs, posters, waiting place discussions, virtual learning - Responsibility for conducting the briefing sessions and providing the necessary training for successful adoption must be clearly identified - Appropriate elements of the behavioural communication material should be used to address the entire workforce and in awareness training during induction of new employees and employees returning from leave
9	Pilot adoption of the practice - Conduct pilot scale adoption of the practice - Monitor, identify and test any required improvements	The piloting arrangements should include one or two sites and be long enough to allow operational difficulties to emerge and be addressed
10	Finalise and implement mine-wide roll out plans - Review and finalise mine-wide roll out plans - Implement mine-wide roll-out plans	The roll out process should be carefully monitored by the mine's adoption champion until its completion

CRITICAL SUCCESS FACTORS



TRAINING AND COMMUNICATION MATERIALS

Relatively simple training and communication materials are envisaged for the Conveyor Belt Automated Transfer Point Fogging Dust Suppression System SLP.

Some of the identified behavioural communication messages may warrant being communicated to all employees. The development of more substantial material and presentation arrangements may thus be justified in those cases. This is a matter that should be seriously considered and decided by management.

END NOTES

Any queries in relation to the practice or adoption procedures outlined in this adoption brief should be raised with the MOSH Dust Adoption Team Managers, or Principal Adoption Specialist.



011 498 7100

[illegible]

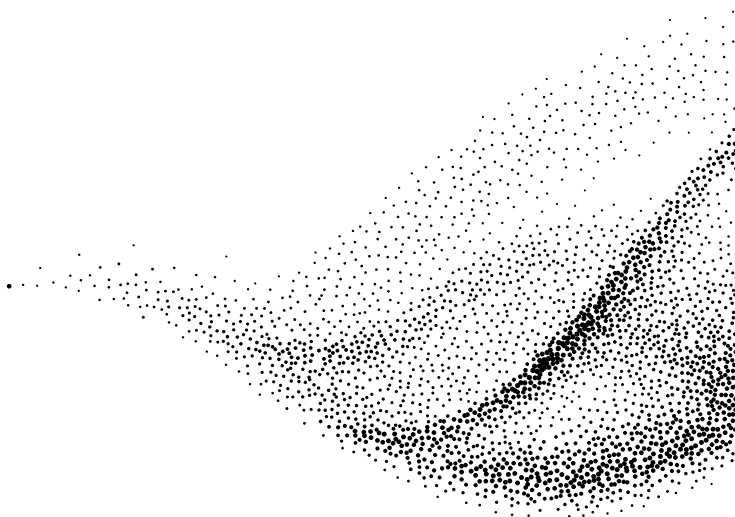
[illegible]



**MINING INDUSTRY
OCCUPATIONAL
SAFETY & HEALTH**



**MINERALS COUNCIL
SOUTH AFRICA**



www.mineralscouncil.org.za
www.mosh.co.za