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5 Hollard Street
Johannesburg 2001
P O Box 61809
Marshalltown 2107

Telephone: (011) 498-7100
Telefax: (011) 834-1884
Chamber home page: http:/www.bullion.org.za

Dust Control Strategy

Compendium of Practices

11/29/2011

Revision 5

MOSH Dust Adoption Team
Prepared by: Mr Gerrie Pienaar
Reviewed by: Mr Henry Moorcroft and Dr Audrey Banyini Mulaudzi

This document is intended to assist industry in the elimination of silicosis to meet the Mine Health and Safety Council Milestones.

BEST PRACTICE IN SILICOSIS PREVENTION

Objective:

This document is intended to assist industry in the elimination of silicosis to meet the Mine Health and Safety Council Milestones.

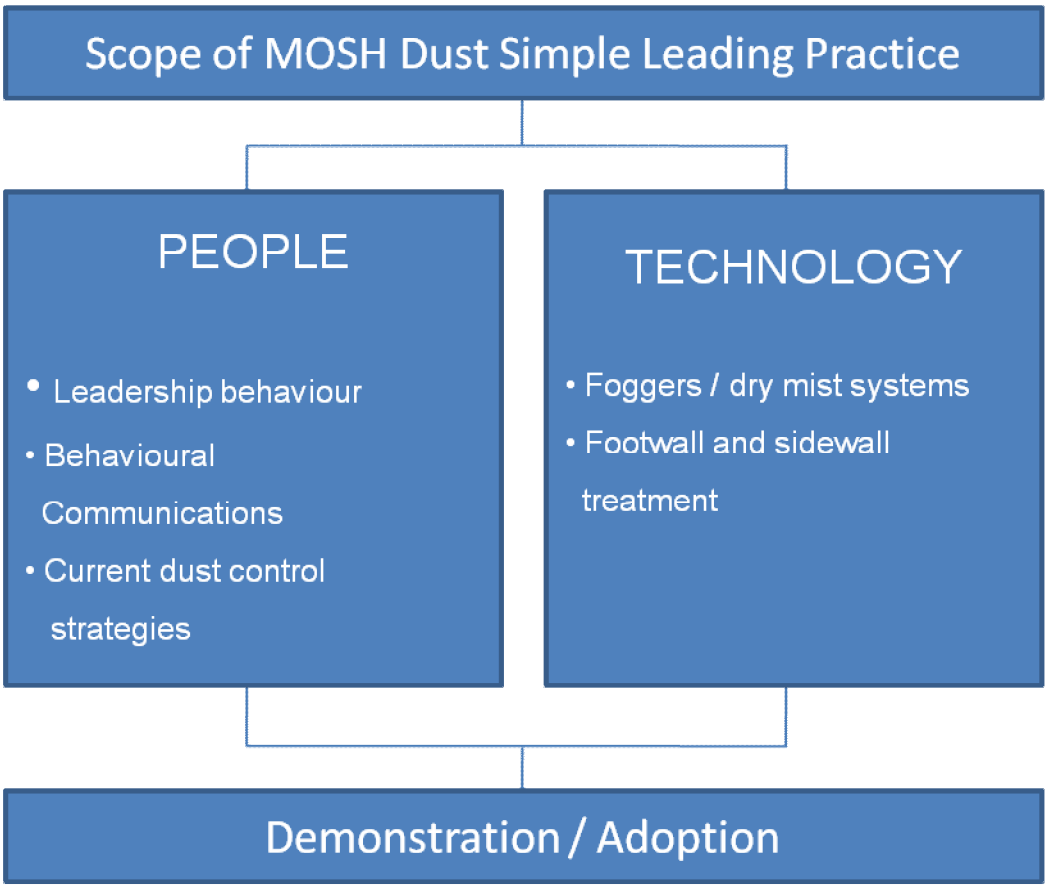
Introduction

In order to implement a leading practice in silicosis prevention a process including Leadership and Behaviour processes needs to be in place. The historic and significant challenge of dust control in general is well documented in Kissels' handbook for dust control in mining: "*If controlling dust were a simple matter, dust problems in tunnels and mines would have been eradicated years ago. Unfortunately, most underground dust control methods yield only 25 % to 50 % reductions in respirable-sized dust. Often, 25 % to 50 % reductions are not enough to achieve compliance with dust standards. Thus, mine operators must use several methods simultaneously, usually without knowing for sure how well any individual method is working. In fact, given a 25 % error in dust sampling and day-to-day variations in dust generation of 50 % or more, certainty about which control methods are most effective can be wanting. Nevertheless, over the years, some consensus has emerged on the best dust control practices*."

The MOSH Dust Adoption Team acknowledges this historic legacy and is committed that, through the Adoption System, it will assist industry to make a difference to the working environment by managing respirable crystalline silica (RCS) dust exposure and its impact on workers more effectively.

The MOSH system focuses on the three elements illustrated in diagram 1 below. At this point the dust team has identified Foggers / dry mist systems and Footwall / sidewall treatment.

Diagram 1: (Elements of the MOSH System)



REQUIREMENTS FOR THE MOSH SYSTEM TO BE EFFECTIVE WITH SPECIFIC REFERENCE TO AIRBORNE DUST

1. Company commitment to a Silicosis Prevention Programme

In order to have an effective programme the following needs to be in place:

- Executive designated with Programme Oversight
- Designated person(s) to coordinate programme implementation
- Company silicosis prevention task team/committee
- Appropriate resources made available to facilitate the implementation of company strategy to deal with silicosis
- Reporting mechanism to indicate progress on silicosis prevention. To include key indicators from occupational hygiene and occupational medicine
- Management performance assessment to include a health and safety component which includes silicosis prevention

- Key employer/company documents e.g. annual reports to safety bulletins to include information on silicosis prevention
- Employer programme to include progress monitoring of appropriate process.

2. Identification of dust sources and employee dust exposures during the active phases of all mining operations

Silicosis prevention is linked to the control of dust generation and liberation into the working environment. Levels of airborne respirable dust in the workplace are therefore an indicator of risk and the possibility of the development of silicosis.

- The risk assessment process should identify the sources of airborne dust and employees at risk from silicosis.
- Prepare a mandatory code of practice and ensure compliance with the requirements of the DME Guidelines for the compilation of a mandatory code of practice for an occupational health programme on personal exposure to airborne pollutants. This cop should include:
- Utilisation of appropriate and correct air sampling equipment and procedures
    - Prompt utilisation of the respirable dust measurements as an indicator for the need for dust control
    - Use of approved /reputable laboratories for quartz analysis
    - Ensuring correct statistical analysis and interpretation of Homogeneous Exposure Group data

3. Control of dust sources to eliminate or minimise dust exposures during the active phases of all mining operations

3.1 Ventilation Systems

Main and auxiliary ventilation air reduces dust by dilution and by displacement.

The basic principle behind dilution ventilation is to provide more air and thus diluting the dust concentration. Most of the time, the dust concentration is reduced roughly in proportion to the increase in airflow.

The basic principle behind displacement ventilation is to use the airflow in a way that confines the dust source and keeps it downwind of the employees.

During the design and operation of any ventilation system the following issues must be addressed (as a minimum):

- Ensure adequate main ventilation system performance e.g. appropriate dilution ventilation for airborne dust and correct haulage transport velocities to prevent re-entrainment of dust
- Ensure adequate auxiliary ventilation where required to control dust
- Ensure proper maintenance of ventilation systems

3.2 Dust Control

The major control methods for dust in mining operations continue to be dust suppression with water, airborne dust dilution and capture at source with dust extraction systems.

The basic rules to be followed if the control of dust exposure is to be effective include:

- Keep the dust generation to a minimum
- Prevent it from contaminating the atmosphere by controlling it at source.
- Reduce the amount of dust present in the air.
- Remove the worker from the dust laden air.
- Place a barrier between the worker and the dust laden air.
- Ensure that the installed systems for dust control are working at maximum efficiency for the maximum period of time.

Dust control to be effective requires regular maintenance of the service equipment.

4. Maintenance, examination and testing of the dust control systems.

Irrespective of the type of dust control systems used, the maintenance of the equipment in good working order is necessary to achieve low dust levels. Maintenance of dust equipment should not be the responsibility of management alone, but of everyone involved in the mine (including suppliers).

- Any dust control measures provided should be maintained in an efficient state, efficient working order and in good repair.
- There must be a thorough examination and testing of all engineering controls and suitable records must be kept.

5. Employee involvement in the Silicosis Prevention Programme

The involvement and commitment of employees in the silicosis prevention programme is critical.

- Employees should be encouraged to participate actively and in a positive manner in all pollutant control activities.
- The results of any dust survey should be made available to all employees.
- The results and recommendations from such surveys should be discussed at the relevant health and safety meetings.

6. Employee education and training

It is a legal requirement for the employer to provide health and safety training under the Mine Health and Safety Act (No. 29 of 1996). No worker can be expected to assist in making a control programme effective if he/she does not know the reasons for it in the first instance. It is important that employees know about silicosis, silica-dust hazards, and how to control their exposure. Their training and education should cover the following:

- The health effects of exposure to crystalline silica and or coal dust.
- The importance of effective controls, safe work practices, and personal hygiene.
- The importance of air monitoring and how to interpret the results.
- The importance of medical surveillance.
- How to use and care for personal respiratory protective equipment.
- Information on the health effects of smoking in exacerbating lung damage
- The early symptoms and signs of active tuberculosis (TB), which is a potential complication of silicosis.
- Refresher training and additional training as appropriate for health and safety personnel involved with silicosis prevention.

7. Administrative controls and work practices including the correct use of appropriate respiratory protection to minimise dust exposures

Work practices are procedures prepared by employers and must be followed by employers and employees to control hazards in the workplace.

7.1 Written Procedures for Dust Control.

These need to be sufficiently detailed to provide the information required by those people and their supervisors who install, operate, monitor and maintain the dust control measures. It needs to allow the design intention, as identified in the risk assessment, to be applied in a practical way.

The written procedures for dust control must specify the control measures. It will need to include the following:

- An outline description of the plant or processes identified in the risk assessment as sources of airborne dust.
- Details of the equipment provided in connection with each of these sources to prevent or minimise dust being produced or becoming airborne.
- Details of any equipment provided to remove dust from the air before it reaches a workplace.
- The design and minimum operating criteria for such equipment, including as appropriate, quality of water, water flow rates and pressures, pick sharpness etc.
- The design and minimum required ventilation flow rates.
- The systems of work to be adopted to eliminate or reduce the need for workers to go into hazardous areas close to or downstream of dust sources.
- Arrangements for supervision and maintenance of control measures
- The respiratory protective equipment (RPE) to be provided (such as disposable dust masks) and rules about when it needs to be used to best effect, while taking account of risks to their health and safety from other hazards which may be made worse by the use of RPE

7.2 Removal of Personnel

This is an important method of reducing employee exposure to airborne dust. Where blasting is conducted, re-entry periods are specified to prevent employees from being exposed to dust generated by blasting operations both during and after the blasting has taken place.

- Procedures must be put in place to ensure that no employee will be directly exposed to blasting fumes and associated dust.

7.3 Respiratory Protection

The protection of individual workers by respiratory protection should be the last resort, but such measures may be implemented as a temporary measure. It is important that employees are involved in the selection of the type of respirator to be utilized. It is no good having state of the art respirators available if the employees do not utilize them correctly.

Where Respiratory Protective Equipment (RPE) is utilized as a means of exposure control, cognizance must be taken of the following (as a minimum):

- RPE must comply with national standards (SANS 0338).
- RPE must be appropriate for the task being performed and the environment where the task will be performed.
- RPE must be comfortable to wear and accepted by the employees required to utilize RPE.
- Appropriate training, awareness, maintenance and issuing facilities and procedures must be implemented.
- Special preventive measures such as the provision of airline supplied respirators may be required for high-risk areas e.g. abrasive blasting and long-wall mining.

8. Periodic medical surveillance of employees exposed to airborne crystalline silica dust

A medical surveillance program includes medical and work history tracking, regular physical examinations, chest x-rays and lung function tests. Participating in a medical surveillance program can help in the early detection of silicosis and other associated diseases.

- The medical surveillance required is stipulated in the regulations for silica dust exposure and for coal dust exposure under the Mine Health and Safety Act (Act No. 29 of 1996).
- The employer must establish and maintain a system of medical surveillance for all employees who perform work in any working place where exposure to crystalline silica occurs in excess of 10% of the OEL for crystalline silica.

9. Auditing of the Silicosis Prevention Programme

The purpose of an audit is to examine occupational health programmes to verify their effectiveness for preventing occupational disease and ensure compliance with company and government standards and regulations. In addition, an audit must verify that the programme documentation will withstand third-party scrutiny.

- Conduct an initial audit to define the current status of the silicosis prevention programme, to outline problem areas, to check documentation and to provide a baseline to document progress.
- Rectify problem areas that may arise.
- Ensure the provision of proper documentation.
- Conduct periodic audits of the silicosis prevention programme.

10. Planning in the case of new or expanding mining operations to eliminate or minimize dust exposures

Lessons learnt from existing mines with regard to silicosis and CWP prevention should be incorporated into the planning for new or expanding mining operations. Companies should:

- Consider each possible dust generating source and proactively plan control measures to prevent or reduce dust generation from these sources.
- Select equipment with design features aimed at minimising dust generation.
- Adopt methods of work and layouts which minimise the need for workers to be downwind of major dust sources.

The following chapters are specific procedure/practices aimed at achieving the objectives set above:

Chapter Number	Last revision date	Description	Leading Practice (LP) or Simple Leading Practice (SLP)	
			LP	**SLP**
1	23-09-11	Footwall / sidewall treatment	-	✓
2	-	t.b.a.	-	-
3	-	t.b.a.	-	-
4	-	t.b.a.	-	-

Chapter 1:

Procedure for Footwall and Sidewall Treatment

The most common method of preventing dust from becoming airborne from the footwall is by wetting with water or a combination of water and surfactants or other agents which could include hygroscopic salts, soil cement, bitumen etc. The method most commonly applied in underground gold mines is by using a spray car pulled by a locomotive which sprays which sprays the solution onto the foot and side wall this is primarily to consolidate the dust and to prevent it from becoming airborne. Generally it is only conducted on intake airways where people travel but it is recommended to extend this practice to all areas of the mine where tracks are installed including return airways in which people travel and work on an ongoing basis. It has been proven that dust is also generated and liberated in other areas which have the potential for exposing other mine workers conducting tasks not included in the general production cycle eg installing support, lacing and meshing, drain cleaning etc.

Results from tests conducted by Driefontein Gold Mine:

Sidepack	Volume m^3/s	Velocity m/s	Readings before		Readings after	
			Max	TWA	Max	TWA
No 1	100.0	9.8	3.765	0.09	7.090	0.054
No 2	80.0	7.8	3.933	0.146	7.202	0.052
No 3	80.0	7.8	10.606	0.074	0.132	0.016
No 4	60.0	6.4	1.126	0.065	0.112	0.001

Special Considerations:

1. Maintenance programme must be established, implemented and monitored on a structured continued basis as there is a perception in industry that with the use of specific surfactants that the dust control is not that effective.
2. Full cognizance must be taken as to the type of pump used as with the Siemens pump currently in use, the application of hand spraying become problematic.
3. The frequency of application is based on dust load and the effectiveness of the product in use and need to be monitored to determine the optimum application frequency.
4. The height of application on the sidewalls will be site specific and the spray car design must take cognizance of this requirement.

Appendices

APPENDIX 1	-	Risk Assessment of the process and spray car
APPENDIX 2	-	Tau Tona Report

KLOOF / DRIEFONTEIN CONSOLIDATED

ISSUE BASED RISK ASSESSMENT:

TREATMENT OF FOOTWALL AND SIDEWALLS

KLOOF / DRIEFONTEIN CONSOLIDATED
ATTENDANCE REGISTER

GOLD FIELDS

Subject : Treatment of Footwall and Sidewalls

Date : 21 December 2010

Chairperson : M. de Koker. Facilitator: W. Birkenstock.

I attended the standard / risk assessment review or drafting of new standard / risk assessment and agree with the content there off. I was briefed on the above mentioned subject and the review / risk assessment process:

NAME	DESIGNATION	INDUSTRY NUMBER	YEARS EXPERIENCE	WORKPLACE	REMARKS	ON BEHALF OF	SIGNATURE
T. SIKO	SNR. SHE OFFICER	P7007092	32	ANGLOGOLD ASHANTI G.N. MINE			
MIKE DE KOKER	MOSH MNGR	2583196	31	COM			
J HOLTZHAUSEN		F2335946	35	—			
L.R. SAUER	OCC. HYGIENIST	P3195499	30	HARMONY			
H. WILKEN	SNR OCC. ENV. OFF	P3941163	30	ANGLOGOLDASH			
C DuPLESSIS	OCC HYGIENIST	P3124170	27	HARMONY			
C. O'Reilly	Administrator	Z1986607	7	KDC/Libanon			

SCOPE – This risk assessment involved the review of the current OEM and operational risk assessments regarding the treatment of footwall and sidewalls in the underground environment with dust suppressant agents. The risk assessment concerns the operator and persons likely to be affected, as well as maintenance requirements for this type of machinery. (Specific procedural safeguards will be identified and dealt with in the mine's training lesson plan.)

The process followed entailed the identification of associated risks and controls, as well as the evaluation of their current effectiveness. Furthermore, risk mitigation measures were sought to ensure that the remaining risk is as low as reasonably practicable.

RISK MATRIX FOR OPERATIONAL RISK ASSESSMENTS						
		Consequence (Where an event has more than one 'Impact', choose the 'Consequence' with the highest rating)				
Impact / Category		**1 Insignificant**	**2 Minor**	**3 Moderate**	**4 Major**	**5 Catastrophic**
(H&S) Injury or harm to people		First aid case / exposure to minor health risk	Lost time injury or health effects / Reversable impact on health	Serious / Reportable injury. Potential irreversable impact on health	Single fatality or loss of quality of life / Irreversable impact on health	Multiple fatalities / Impact on health ultimately fatal
(E) Environmental Impact		Minimal environmental harm - L1 incident	Material environmental harm - L2 incident remediable short term	Serious environmental harm - L2 incident remediable within LOM	Major environmental harm - L2 incident remediable post LOM	Extreme environmental harm - L3 incident irreversable
(D) Damage / Loss- business interuption		No Disruption to Operation / <R75k	Brief disruption to operation / R75k - R1m	Partial Shutdown / R1m - R10m	Partial loss of operation / R10m - R500m	Substantial or total loss of operation / <R500m
(R) Reputation - Community / Gov / Media		Slight impact - public awareness may exist but no public concern	Limited impact - local public concern	Considerable impact - regional public concern	National impact - national public concern	International impact - international public attention
Likelihood	**Examples** (Consider near-misses as well as actual events)	**Risk Rating**				
5 Almost Certain	The unwanted event has occurred frequently; occurs in order of one or more times per year & is likely to reoccur within 1 year	**11 (M)**	**16 (M)**	**20 (H)**	**24 (H)**	**25 (H)**
4 Likely	The unwanted event has occurred infrequently; occurs in order of less than once per year & is likely to re-occur within 5 years	**7 (L)**	**12 (M)**	**17 (M)**	**22 (H)**	**23 (H)**
3 Possible	The unwanted event could well have occurred in the business at some point within 10 years	**4 (L)**	**8 (M)**	**13 (M)**	**18 (M)**	**21 (H)**
2 Unlikely	The unwanted event has happened in the business at some time; or could happen within 20 years	**2 (L)**	**5 (L)**	**9 (M)**	**14 (M)**	**19 (H)**
1 Rare	The unwanted event has never been known to occur in the business; or is highly unlikely that it could ever occur beyond 20 years	**1 (L)**	**3 (L)**	**6 (L)**	**10 (M)**	**15 (M)**
Risk Rating	**Risk Level**	**Guidelines for Risk Matrix**				
19 to 25	(H) – High	Escalate to a higher level and implement specific action plans				
8 to 18	(M) – Medium	Proactively manage via appropriate management system				
1 to 7	(L) – Low	Monitor & manage as appropriate via management system				

CONTROL EFFECTIVENESS

Description	Control Effectiveness	Description	Control Effectiveness
Just getting started / A lot of work still to be done	1 - 30%	Most things in place and working but some still more to be done	61 - 89%
Some things in place – Monitoring effectiveness	31 - 60%	Nothing more to be done except review and monitor existing controls	> 90%

Abbreviations: Impact Category – See Matrix ; CE = Control Effectiveness ; C = Consequence ; L = Likelihood ; RR = Risk Rating

RISK IDENTIFICATION AND ANALYSIS						RISK EVALUATION			RISK TREATMENT & TRACKING			
No	**Risk Description**	**Impact / Category**	**Current controls in place**	**CE %**	**Responsible**	**C**	**L**	**RR**	**Further Controls Recommended**	**Responsible**	**Due Date**	**Status**
	Buffers size and height not same as mine	H & S	Standard buffers used	61-89	Engineer	4	3	18M	Adhere to Railbound COP	Appointed Engineer		**On going**
	Wheels and wheel base not same as mine	H & S	Standard 610mm wheels used	61-89	Engineer	4	3	18M	Adhere to Railbound COP	Appointed Engineer		**On going**
	Couplings and pins not same as for mine	H & S	Standard mine supplied couplings and pins used.	61-89	Engineer	4	4	22H	Adhere to Railbound COP	Appointed Engineer		**On going**
	No maintenance program in place	H & S, D	RBE Maintenance standards, Competent appointed personnel, Maintained by mine artisans, Mine specific maintenance system	61-89	Engineer	4	4	22H	Ensure car is on the Plan Maintenance system	Appointed Engineer		**On going**
	Mine parking including storage standard not adhered to	H & S, D, E	Mine Standard, Competent appointed personnel Supervision PTO	61-89	Responsible Person	4	5	24H	Adhere to Railbound COP, Demarcated area	Appointed Engineer and Responsible Person		**On going**
	No pre-use inspection list available	H & S	Safety System	31-60	Responsible Person	2	5	16M	Adhere to movable equipment requirements	Appointed Engineer and Responsible Person		**On going**
	All moving parts not covered	H & S, D	Safety System	61-89	Appointed Engineer	3	3	13M	Pre-use checklist	Responsible Person		On going

RISK IDENTIFICATION AND ANALYSIS						RISK EVALUATION			RISK TREATMENT & TRACKING			
No	**Risk Description**	**Impact / Category**	**Current controls in place**	**CE %**	**Responsible**	**C**	**L**	**RR**	**Further Controls Recommended**	**Responsible**	**Due Date**	**Status**
	Untrained persons using spray car	H & S, E, D	RBE COP	>90	Responsible Person	4	3	18M	Lock out system to be implemented on loco	Responsible Person		
	Untrained persons operating spray car	H & S, E, D	RBE COP,	>90	Responsible Person	3	3	13M	SOP, Proper job instruction, PTO	Responsible Person		
	Lock in bracket on tank damaged	H & S, E	Tank lock in brackets in place	1-30	Responsible Person	2	3	8M	Ensure included in car design, Pre-use checklist			
	No loco light bracket if car is pushed (No guard car)	H & S	RBE COP	31-60	Appointed Engineer	2	3	8M	Ensure included in car design, Pre-use checklist	Appointed Engineer		
	No operating procedures in place	H & S	RBE COP	1-30	Responsible Person, Engineer, Training Manager	3	4	17M	SOP, Proper job instruction, PTO			
	No maintenance procedures in place	H & S, E, D	RBE COP	1-30	Appointed Engineer	4	4	22H	Including maintenance system			
	Chemical not mixed to specification	H & S, E	As per suppliers specification, MSDS	61-89	Section 12 appointee	2	4	12M	Analyze the product specified in the MSDS, PTO and coaching, control chemical as per planning	Section 12 appointee		
	Inhalation of chemical	H & S	Safety Management system MSDS, PPE System	1-30	Section 12 Appointee	4	3	18M	Including training and determination of the health effects of the chemical	Section 12 Appointee & Training Manager		

RISK IDENTIFICATION AND ANALYSIS						RISK EVALUATION			RISK TREATMENT & TRACKING			
No	**Risk Description**	**Impact / Category**	**Current controls in place**	**CE %**	**Responsible**	**C**	**L**	**RR**	**Further Controls Recommended**	**Responsible**	**Due Date**	**Status**
	Skin absorption of chemical	H & S	Safety Management system MSDS, PPE System	1-30	Section 12 Appointee	4	3	18M	Including training and determination of the health effects of the chemical	Section 12 Appointee & Training Manager		
	Ingestion of chemicals	H & S	Safety Management system MSDS, PPE System	1-30	Section 12 Appointee	4	3	18M	Including training and determination of the health effects of the chemical	Section 12 Appointee & Training Manager		
	Chemical composition of the product resulting into a fire	H & S	MSDS, Handling of chemical procedure	61-89	Section 12 Appointee	4	3	18M	Ensure chemical is included in procedure,	Section 12 Appointee		
	Chemical composition of the product resulting into an explosion	H & S	MSDS, Handling of chemical procedure	61-89	Section 12 Appointee	4	3	18M	Ensure chemical is included in procedure,	Section 12 Appointee		
	Chemical spills	H & S, E	MSDS, Emergency procedures	61-89	Section 12 Appointee and Environmental Manager	3	4	17M	Ensure chemical is included in procedure,	Section 12 Appointee and Environmental Manager		
	Chemical storage	H & S, E	MSDS, Emergency procedures	61-89	Section 12 Appointee and Environmental Manager	3	4	17M	Ensure chemical is included in procedure,	Section 12 Appointee and Environmental Manager		
	Chemical decanting	H & S, E	MSDS, Emergency procedures	61-89	Section 12 Appointee and Environmental Manager	3	4	17M	Ensure chemical is included in procedure,	Section 12 Appointee and Environmental Manager		
	Storage / disposal of empty Chemical Containers	H & S, E	MSDS, Emergency procedures	61-89	Section 12 Appointee and Environmental Manager	3	4	17M	Ensure chemical is included in procedure,	Section 12 Appointee and Environmental Manager		
	Labelling of chemical container	H & S, E	MSDS, Emergency procedures	61-89	Section 12 Appointee and Environmental Manager	3	4	17M	Ensure chemical is included in procedure,	Section 12 Appointee and Environmental Manager		

ANGLOGOLD ASHANTI

TAUTONA

M E M O R A N D U M

TO : H.Moorcroft

FROM : Hennie Wilken
Snr. Occupational Environment Officer

DATE : 12 January 2011

SUBJECT : **Footwall Treatment**

M E S S A G E

Footwall treatment has been done on Tau-Tona for quite some time, and is being done on all major intake tramming haulages. All intake levels are sprayed on a monthly basis. Each level has its own spray car and the person in charge of the tramming is also responsible for the footwall treatment.

The product used was DS 3285 Dust Suppressant but problems have been experienced with the product, the nozzles gets blocked and if the car is not cleaned properly, the valves and pump get stuck resulting in damaged equipment. This resulted in that the footwall treatment was not done or if it was done, it was done ineffectively.

To solve the problem, another supplier was sourced that could supply a product that complies with our requirements. These requirements are that the product must have good dust suppression qualities and that it does not block the nozzles.

The supplier recommended a trial with their patented *DusTreat® DC9112A* chemical program for haulage road and footwall dust control. DusTreat DC9112A contains a binder that has humectant properties. This formulation is a cost-effective treatment to control fugitive dust on heavily travelled roads and in haulages. This product is biodegradable and does not contain corrosive compounds or waste oils.

DusTreat DC9112A acts as a binder on the haulage roads and footwalls to prevent fugitive dust emissions that are caused by vehicle (loco's and railcars) and people traffic. Water trucks are typically used to apply the treatment to the haulage roads and footwalls. DC9112A should be diluted in water for application to the dust surfaces

Tau-Tona Mine has specially designed underground spray trucks, pulled behind a locomotive, that will ideally suit the application of DusTreat DC9112A. The product is in a liquid form and is water soluble, which allows for easy mixing and effective and even distribution of the chemical.

Initially, (40 - 45) % DC9112A solution should be applied at a rate of (1.5–2.2) liters/m^2 to stabilize the surface material.
Thereafter, maintenance treatments with 15-25% solution should be applied to the surface periodically as required at 1.5 liters/m^2.

The cost of DusTreat® DC9112A supplied in 23kg pails (Drums) is R 12.01/kg. The Tautona Mine spray tankers is designed to contain 2000lt of water volume, which will then make use of 900kg's of DusTreat DC9112A to prepare a 45% solution strength.

The usage of 900kg's of DusTreat DC9112A to make up an initial 45% solution per spray truck volume, will amount to a chemical cost of R 10,0772.97 per spray tanker volume.
The touch up sprays will require 400kg of DusTreat DC9112A at a cost of R 4,695.91 per spray tanker volume

The suppliers went with us underground on our first visit to assess the situation and to assist with the correct mixing of the product. As footwall treatment was done previously, the suppliers recommended that we use a 20% solution and later 10-15% solution. The production supervisor and crew were present and were shown how to mix the product. Our first attempt was unsuccessful in that the nozzles installed on the spray car were too big, resulting in poor spray pattern. Three sets of nozzles were tested and after the 3rd attempt, the pattern and spray configuration was acceptable. A combination of V-jet nozzles and Hollow cone nozzles are used to create effective spray patterns.

Some results are tabulated below:

	After New Product Introduced				Before New Product Introduced			
Workplace	TWA	SILICA %	SILICA CONC.	Workplace Average	TWA	SILICA %	SILICA CONC.	Workplace Average
109/TT//CLR/TRAM	0.069	10.483	0.007	0.007	0.112	14.811	0.017	0.017
112/TT/CLR/TRAM	0.063	13.566	0.009	0.025	0.379	15.942	0.06	0.06
116/TT/CLR/TRAM	0.267	13.785	0.037	0.037	0.457	15.942	0.073	0.073
120/TT/CLR/TRAM	0.095	11.895	0.011	0.011	0.377	14.810	0.056	0.052

Benefits of DusTreat DC9112A

- **The chemicals are totally soluble in water and mixing is excellent**
- **Easy mixing, liquid form which prevents nozzles from clogging.**
- **Environmentally friendly & bio-degradable.**
- **Respirable dust levels are significantly reduced allowing Health & Safety industry milestones to be met.**

Chemical requirements

Because footwall treatment was done previously, the suppliers recommended a 20% solution strength, which means that on a spray car with a capacity of:
2500 liters – 20 drums of DusTreat are required
2000 liters – 17 drums of DusTreat are required
1000 liters - 9 drums of DusTreat are required

Below are product's fact sheet and Safety Data Sheet:

DusTreat* DC9112A
Dust Control Binding Agent

Provides excellent control of fugitive emissions
• Effective on coal, ores and other bulk solid materials
• Controls dust in active storage piles and roads
• Reduces inventory losses

Description and Use

DusTreat* DC9112A is a binder specifically formulated to control fugitive dust haul roads. This product is biodegradable and does not contain corrosive chloride compounds or waste
oils. DusTreat DC9112A solutions are effective in reducing respirable dust. Fugitive dust emissions can be a safety hazard, an environmental nuisance. Fugitive emissions can be significantly reduced by applying DusTreat DC9112A as a water solution to water spray systems at a material transfer point or from tank trucks equipped with sprays. DusTreat DC9112A solutions provide residual control so that treatment needs only to be applied at a minimal number of locations. This reduces the cost of heating value losses associated with moisture addition to coal.

Treatment and Feeding Requirements

Proper treatment levels for DusTreat DC9112A depend on many factors, such as severity of the problem, environmental influences and operating characteristics of the system. Therefore, this product should be used in accordance with the control parameters that GE Water & Process Technologies establishes for the application.

Packaging Information

DusTreat DC9112A is a liquid blend available in a wide variety of customized containers and delivery methods. DusTreat DC9112A should be stored at temperatures above freezing. To ensure maximum activity, use this product within six months.

Safety Precautions

A Material Safety Data Sheet containing detailed information about this product is available upon
request.

SAFETY DATA SHEET
DUSTREAT DC9112A

1 IDENTIFICATION OF PREPARATION

1.1 Identification of the substance or preparation
Product: DUSTREAT DC9112A

1.2 Use of substance/preparation - Binder for dust control

2 COMPOSITION / INFORMATION ON INGREDIENTS

Chemical description: Sulphonate in aqueous solution

Hazardous component(s): None.

3 HAZARDS IDENTIFICATION

Important hazards
- Health/physical hazard - Not considered hazardous to health.

- Environmental hazards - The product is not classified as dangerous for the environment.

4 FIRST AID MEASURES

Eye contact	Flush immediately with plenty of running water.
Inhalation	Remove to fresh air.
Ingestion	Rinse mouth with water.
Skin contact	Wash with water.

5 FIRE-FIGHTING MEASURES

Extinguishing Media - Suitable Carbon dioxide, dry chemicals, foam, water spray (fog).

Special protective equipment for fire fighters	Self contained breathing apparatus. (SANS50137) Protective clothing (SANS434) Protective gloves (SANS1228) Helmet (SANS397)
Special exposure hazards	Oxides of carbon and sulphur evolved in fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions	Protective clothing (Please refer also to section no. 8 'Exposure controls' for further information.)
Environmental precautions	Prevent from entering sewers or the immediate environment. Accidental release of large quantities into the aquatic environment may harm aquatic organisms.
Methods for Cleaning Up	on soil Absorb onto inert material and dispose of according to Controlled Waste Regulations.

7 HANDLING AND STORAGE

7.1 Handling	Normal chemical handling. Ensure good ventilation.
7.2 Storage	Store in dry, cool, well ventilated area.
7.3 Specific use(s)	Only for professional and industrial users

Maximum storage stability (days) 270

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure controls

- Recommended engineering controls:	Ensure good ventilation.
- Respiratory protection:	Not required.
- Hand protection:	Protective gloves (Plastic, impervious) (Protection against unintentional short-term contact) SANS1228
- Eye protection:	Safety goggles.SANS1404
- Skin protection:	Protective clothing if splashing or repeated contact with product is likely. SANS 434
- Environmental exposure controls:	Prevent from entering in public sewers or the immediate environment.

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1 General information

Appearance Liquid: Colour Brown

9.2 Important health, safety and environmental info

PH in aqueous solution 5,4 (10%)
Flash point (Pensky/Martens) (°C) > 100
Density at 20°C (kg/m3) 1290
Solubility in water (% weight) completely soluble
Relative vapour density (air=1) < 1
Evaporation rate (ether=1) < 1

9.3 Other information

Melting point, (°C) 0
Pour point, (°C) -3

10 STABILITY AND REACTIVITY

10.1 Conditions to avoid	Protect from freezing.
10.2 Materials to avoid	Avoid contact with strong oxidisers.
10.3 Hazardous decomposition products	Oxides of carbon and sulphur evolved in fire.

11 TOXICOLOGICAL INFORMATION

Mammalian Test Data	Oral LD50, rat (mg/kg) No information available.
Exposure hazard	Inhalation Prolonged or repeated exposure may cause transient irritation. Skin contact Prolonged or repeated contact may cause transient irritation. Eye contact Prolonged or repeated contact may cause transient irritation. Ingestion May cause slight gastrointestinal irritation.

12 ECOLOGICAL INFORMATION

Ecotoxicity	No data available
Persistence and degradability	No data available

Summary: The product is not classified as dangerous for the environment.
The evaluation of environmental hazards is based on the concentration limits as set out in Directive 1999/45/EC.

13 DISPOSAL CONSIDERATIONS

Disposal of product	Via an authorized waste disposal contractor to an approved waste disposal site, observing all local and national regulations.
Disposal of packaging	Via an authorized waste disposal contractor to an approved waste disposal site, observing all local and national regulations

14 TRANSPORT INFORMATION

Substance id.no. (SIN) (UN No.)	Not applicable.
Correct shipping name	Not applicable.
Land transport	RID/ADR classification, not classified under this legislation.
Maritime transport	IMO-IMDG class, not classified under this legislation

15 REGULATORY INFORMATION

EEC labelling information

- Symbol(s)	None.
- R Phrase(s)	No Risk phrases assigned.
- S Phrase(s)	No Safety phrases assigned.

- EINECS number — All ingredients of this product are listed in EINECS or ELINCS, unless specifically exempted under the EEC Directive 67/548/EEC.

16 OTHER INFORMATION

SDS issued on 02/10/2009

Nature of revision Initial issue

Based on 1999/45/EC
2001/58/EC
2001/118/EC
(EC) No 1907/2006 (REACH)
South African Standard : SABS ISO 11014-1:1994