

Management of Silica Dust.

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What is respirable crystalline silica?

Crystalline silica is a common mineral (SiO_2) found in most types of rock/stone, sands, shale, clays and gravel. It mainly occurs in the form of quartz.

Sandstone – > 70% quartz.
Granite - up to 30% quartz.
Clays - 6-30% quartz.



“Respirable” : airborne particles small enough to reach the deep lung (less than 10 microns diameter).

Crystalline silica

- Why a priority
- The risk
- How well is the risk being managed
- The way forward

Occupational Exposure to Respirable Crystalline Silica



Health effects

Silicosis

Lung cancer

Chronic obstructive pulmonary disease
(COPD)

Silicosis

- High exposures over just a few months can result in “acute silicosis” – often a fatal condition.
- Chronic silicosis is a slow progressive, irreversible disease that usually takes many years to develop.
- *Silicosis may further develop even when exposure to silica has ceased.*



What are the symptoms of silicosis?

Early stages

Without medical exam may go unnoticed

Continued exposure

Shortness of breath upon exercising

Possible fever

Bluish skin at ear lobes or lips

Susceptibility to infectious lung diseases such as tuberculosis.



Progression of the disease

Fatigue

Extreme shortness of breath

Loss of appetite

Pain in the chest

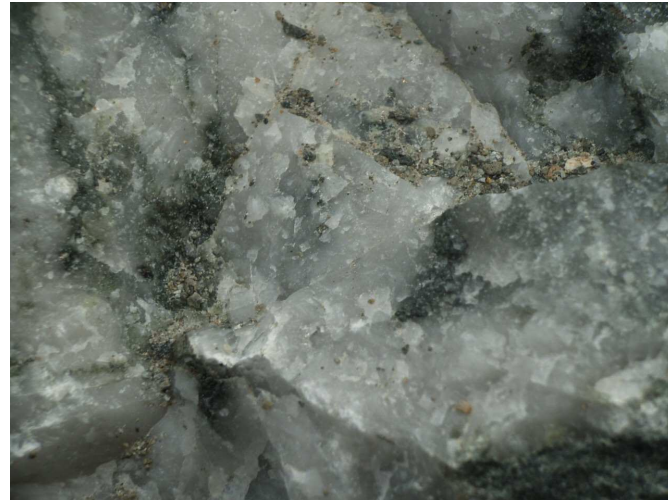
Respiratory failure

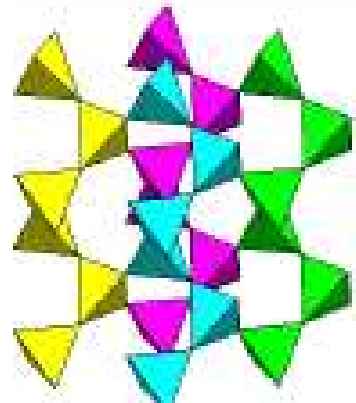
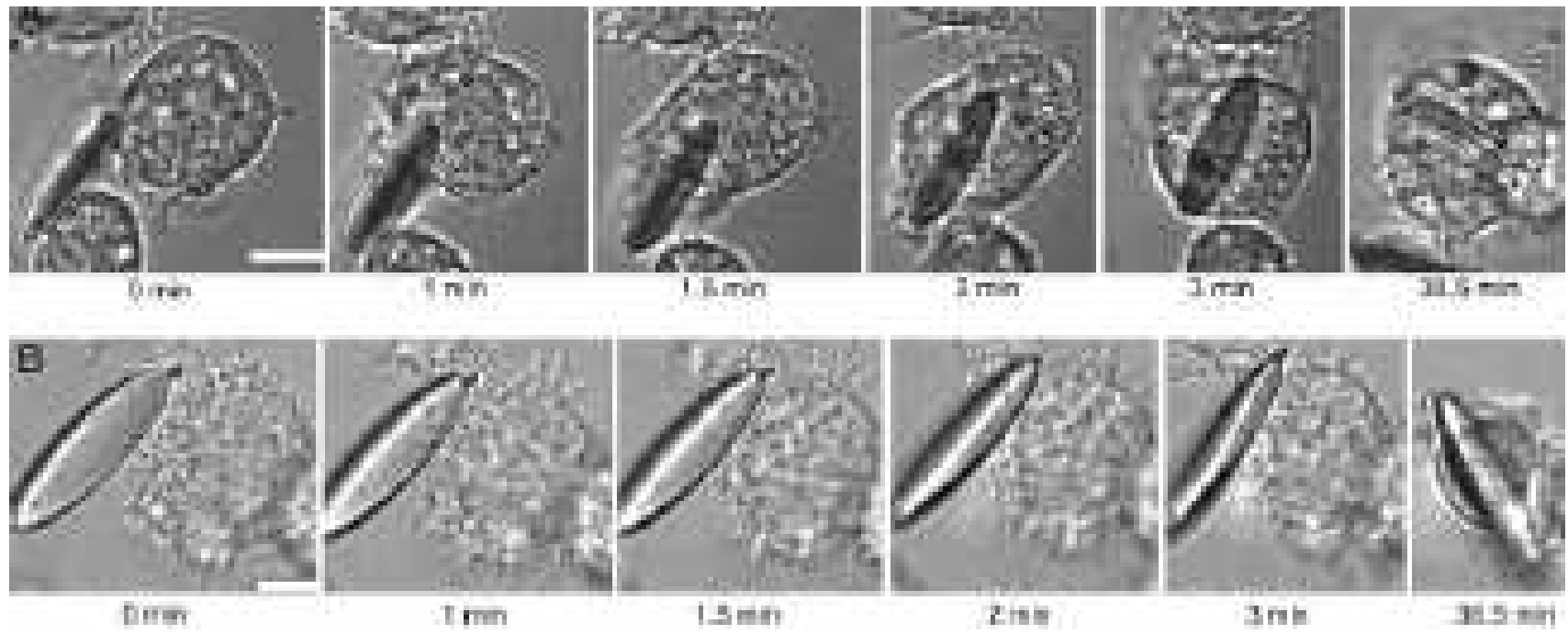
Suffering prior to death may occur for many years.



The Hazard

- Significant risk from dust containing silica, in:
 - Rock
 - Sands
 - Clays
 - Shale
 - Gravel





Intensity of exposure.

Freshly cut crystalline silica has a higher degree of potency to crystalline silica that has aged.

This may mean that if you breath in a relatively high concentration for a short duration of time this may be more hazardous than breathing in a lower concentration over a longer period of time.

Even though the average exposure over a day is the same.

Potency matrix

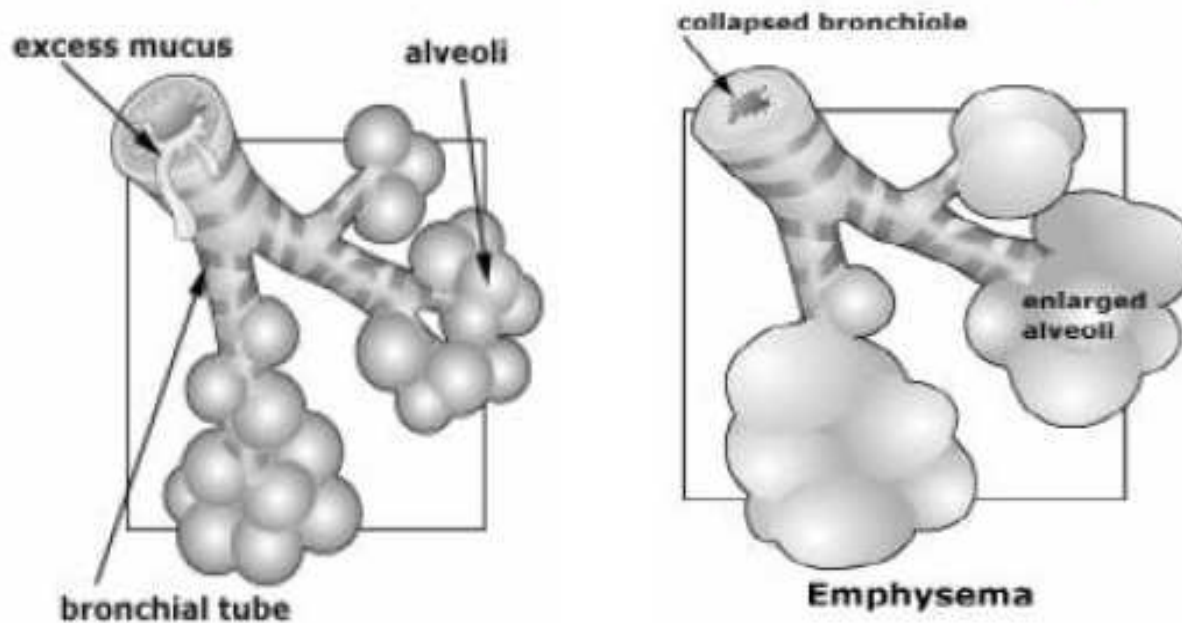
Factors	Comment	Situations
Particle size	Enhances potency	Grinding and abrasive process.
Dry and freshly cut	Reference point to compare potency	Drilling, crushing.
Wetting	From dust suppression	Wet extraction processes
Aged	Reduces potency	No abrasion, grinding.
Presence of clay	Aluminium reduces potency	Mines extracting low rank coal

Adapted from HSE EH 75/4 page 7



Chronic obstructive pulmonary disease (COPD)

COPD encompasses chronic bronchitis and emphysema.



What is the risk?

What is the risk?

Study in Scottish coal miners.

15 years exposure to RCS in mg/m ³	Predicted risks of developing silicosis within 15 years following exposure
0.02	0.25%
0.04	0.5%
0.1	2.5%
0.3	20%

Study in Scottish Coal Miners Source: HSE EH75/4 2002 p. 73.

“The quality of the exposure data for this study is more detailed and better documented compared to other studies”

HSE 2002 EH75/4 p.67

According to this study:
15 years exposure at $0.1\text{mg}/\text{m}^3$
followed by 15 years of non
exposure,
equals:

**1 in 40 chance of being
diagnosed with silicosis**

(ILO Category 2/1)

There is an additional risk!

What about long periods of low exposure with short periods of high exposure.

IOM_TM0103.pdf - Adobe Reader

File Edit View Document Tools Window Help

56 / 102 129%

Find

Table 4.5 Predictions of risk (%) of silicotic signs of profusion 2/1+ (with standard error in *italics*), 15 years after exposure ends, as a function of years spent in low (0.1 mg.m^{-3}) quartz concentration and months spent in high (2 mg.m^{-3}) quartz concentration. From Table 4.3, population aged 50-74, equation based on ISP 3-7. After reclassification of two suspect cases.

Years in low quartz conc	Months in high quartz concentration													
	0	2	4	6	8	10	12							
15	2.49	<i>0.89</i>	5.21	<i>1.70</i>	10.58	<i>3.72</i>	20.32	<i>7.97</i>	35.46	<i>14.18</i>	54.21	<i>18.86</i>	71.84	<i>18.37</i>
14	2.31	<i>0.86</i>	4.84	<i>1.64</i>	9.88	<i>3.58</i>	19.10	<i>7.73</i>	33.72	<i>13.97</i>	52.29	<i>19.08</i>	70.25	<i>19.05</i>
10	1.70	<i>0.71</i>	3.60	<i>1.40</i>	7.45	<i>3.07</i>	14.78	<i>6.72</i>	27.20	<i>12.90</i>	44.60	<i>19.41</i>	63.43	<i>21.55</i>
9	1.58	<i>0.68</i>	3.34	<i>1.35</i>	6.93	<i>2.94</i>	13.83	<i>6.47</i>	25.70	<i>12.58</i>	42.70	<i>19.37</i>	61.62	<i>22.08</i>
5	1.17	<i>0.56</i>	2.48	<i>1.13</i>	5.19	<i>2.47</i>	10.55	<i>5.49</i>	20.26	<i>11.15</i>	35.37	<i>18.69</i>	54.11	<i>23.72</i>
4	1.08	<i>0.54</i>	2.30	<i>1.08</i>	4.82	<i>2.36</i>	9.84	<i>5.25</i>	19.04	<i>10.77</i>	33.63	<i>18.40</i>	52.19	<i>23.98</i>
0	0.80	<i>0.44</i>	1.70	<i>0.89</i>	3.59	<i>1.95</i>	7.42	<i>4.36</i>	14.73	<i>9.23</i>	27.12	<i>16.89</i>	44.50	<i>24.37</i>

0.1 mg m-3

Low + high

IOM Research Report TM/01/03 February 2001

start

RCS in Queensland q...

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12:02 PM

TABLES

Table 3.1 Distributions of age and smoking status at follow up survey by profusion category

	Profusion category						All	
	0		1		2		n	%
	n	%	n	%	n	%	n	%
Age at survey:								
<40	57	15	2	2	0	0	59	11
40-49	48	12	7	6	4	8	59	11
50-59	86	22	24	22	13	28	123	22
60-69	123	32	42	38	22	47	187	34
70+	75	19	36	32	8	17	119	22
Smoking status:								
smoker	167	43	61	55	21	45	249	46
ex-smoker	152	39	40	36	18	38	210	38
never smoked	70	18	10	9	8	17	88	16
Total	389	100	111	100	47	100	547	100

IOM Research Report TM/01/03 February 2001

Country	Occupational Exposure Limit for Alpha Quartz (mg/m ³)
UK	0.1
Austria	0.15
Netherlands	0.075
France	0.1
Belgium	0.1
Ireland	0.05
Italy	0.05
Australia	0.10
ACGIH	0.025

Occupational Exposure Limits – are not fine dividing lines!

Case in point respirable crystalline silica!

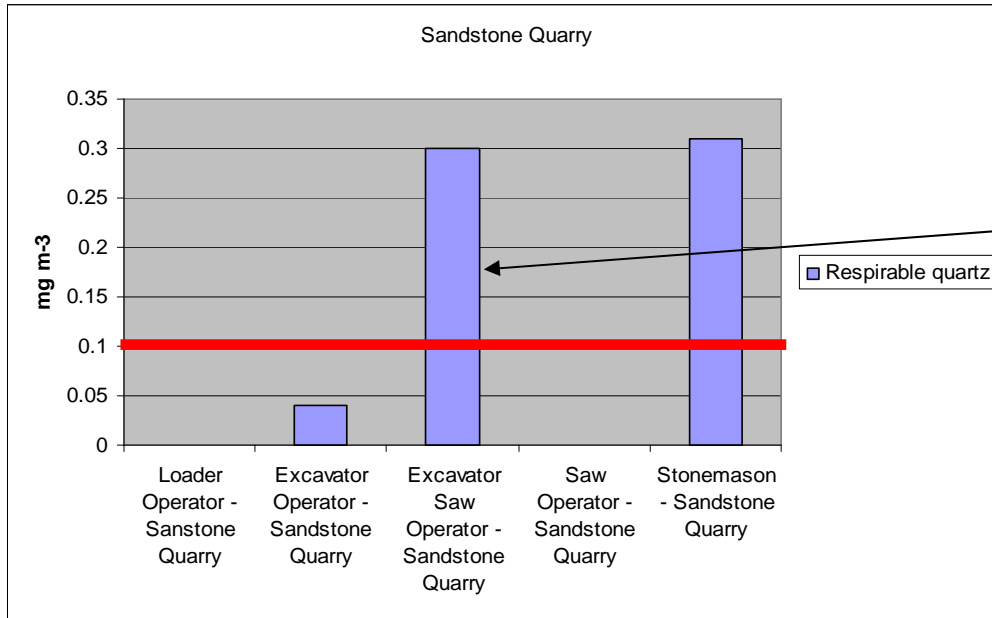
Australian Institute of Occupational Hygienists (AIOH)

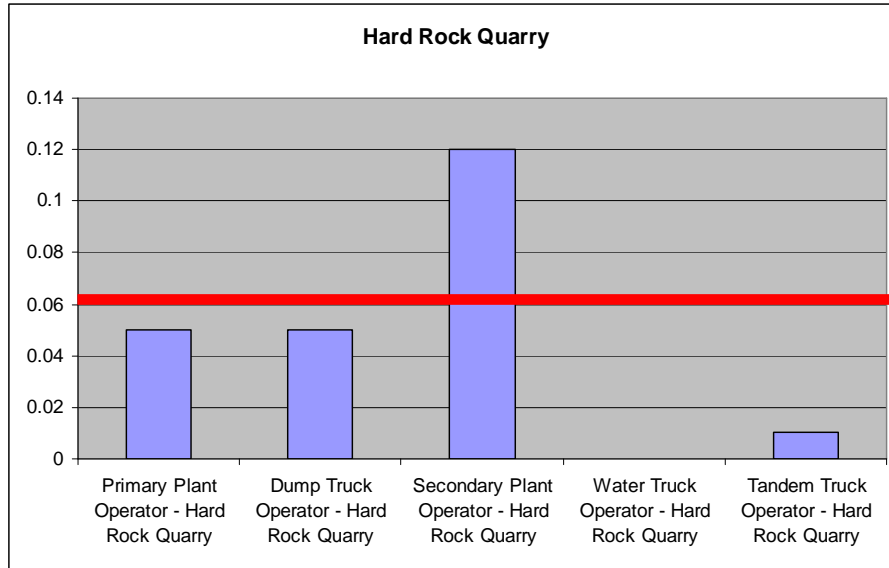
“Where there is a **likelihood** of 50% of the exposure standard being exceeded, control strategies and health surveillance should apply”.

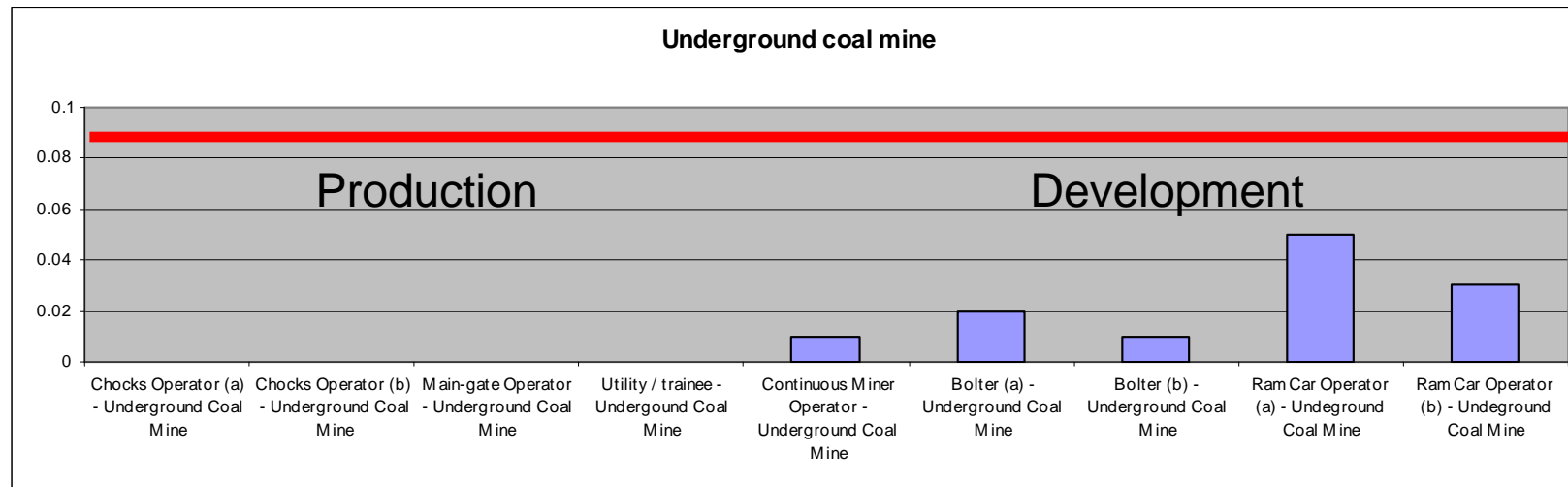
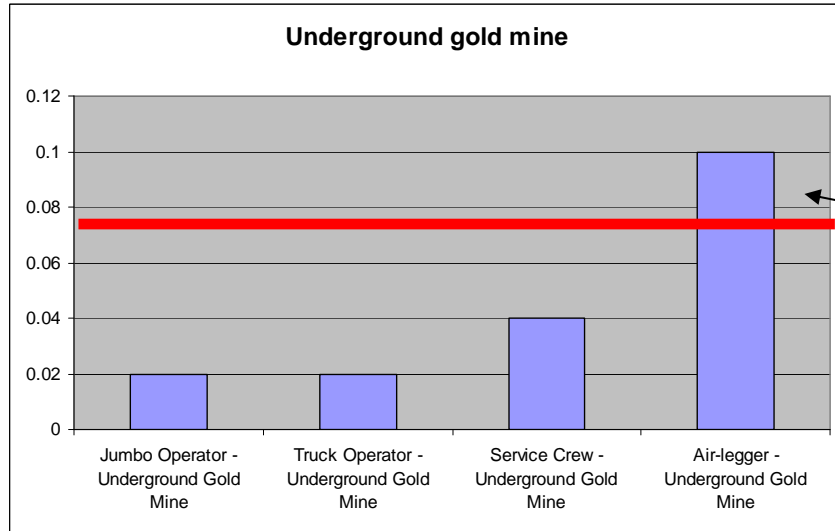
*AIOH draft position paper for respirable crystalline silica.
Rio Tinto also requires health surveillance at 50% of the exposure standard.*

Current situation

“Snapshot of mining”







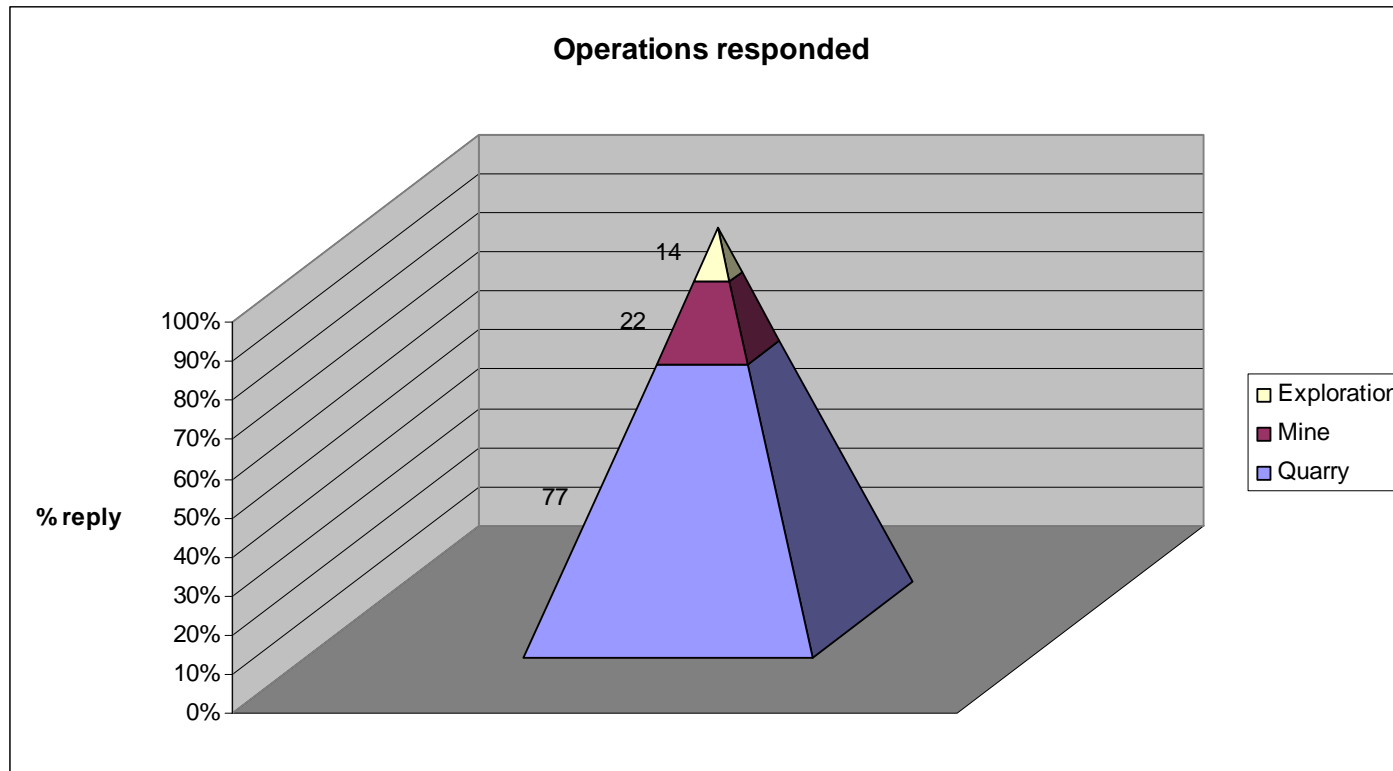
3 of the 23 workers exceeded 0.1 mg m^{-3}
These employees were not wearing
respiratory protective equipment (dust
masks).

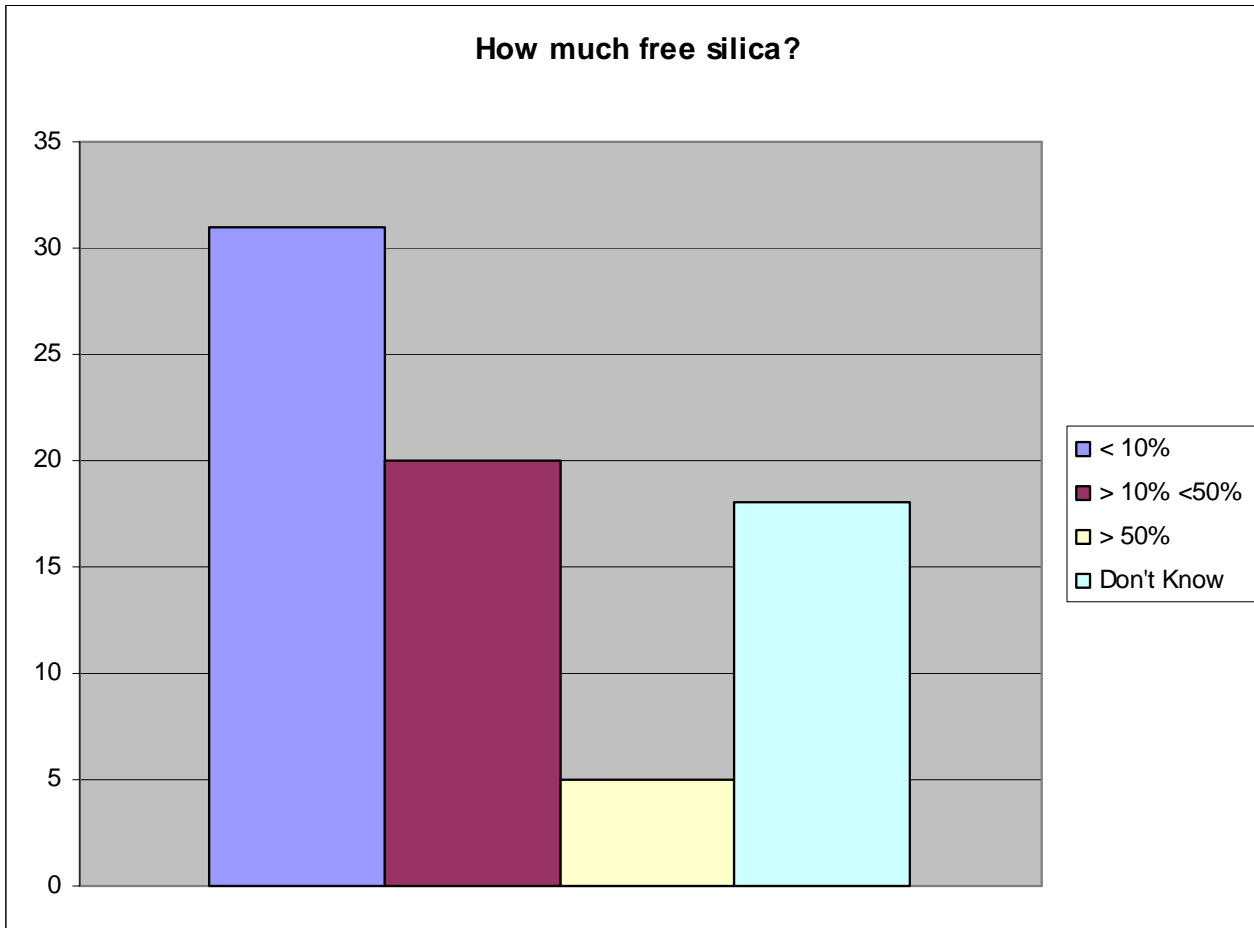
Equates to 13% at risk.

Crude estimate – a lot more data is needed.

Questionnaire Feedback

About 113 completed questionnaires have been assessed





- Silica flour 100%
- Sandstone, quartzite 100%
- Sand / gravel / flint > 70%
- Calcined diatomite 25 – 65%
- Shale 40 – 60%
- Marl up to 60%
- Slate up to 40%
- Granite up to 30%
- Talc up to 30%
- Ball clay 15 to 30%
- Pumice up to 25%
- Ironstone up to 15%
- Basalt, dolerite up to 5%
- Kaolinite < 5%
- Limestone, chalk, marble < 2%

Controls



Controls

Do the controls work?

Have you checked their effectiveness?

Control rooms

**Are the control rooms under positive pressure?
Do the filters remove very fine particles?**



Vehicle cabins

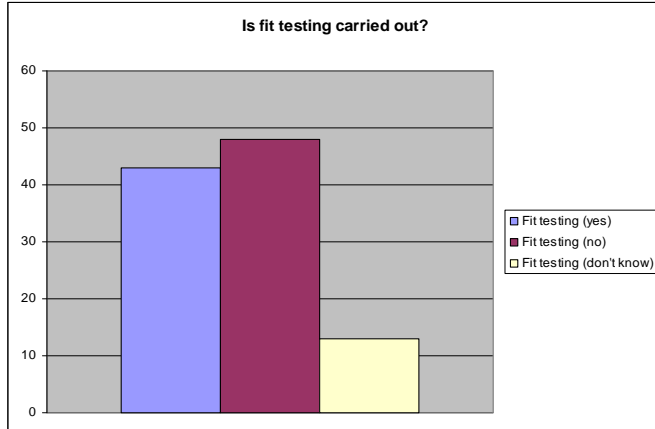
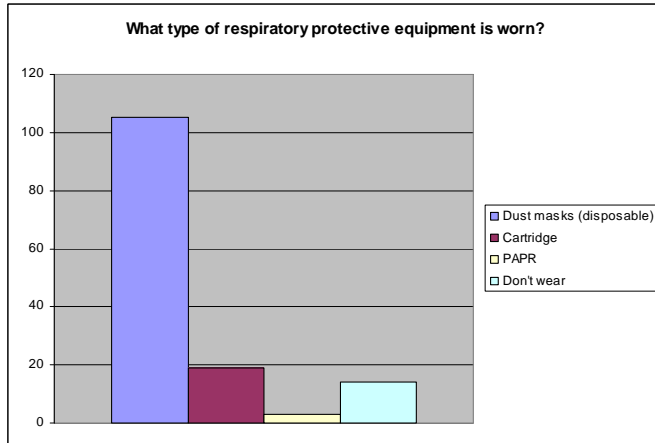
Are the cabins under positive pressure?

Do the filters remove very fine particles?





Dust masks

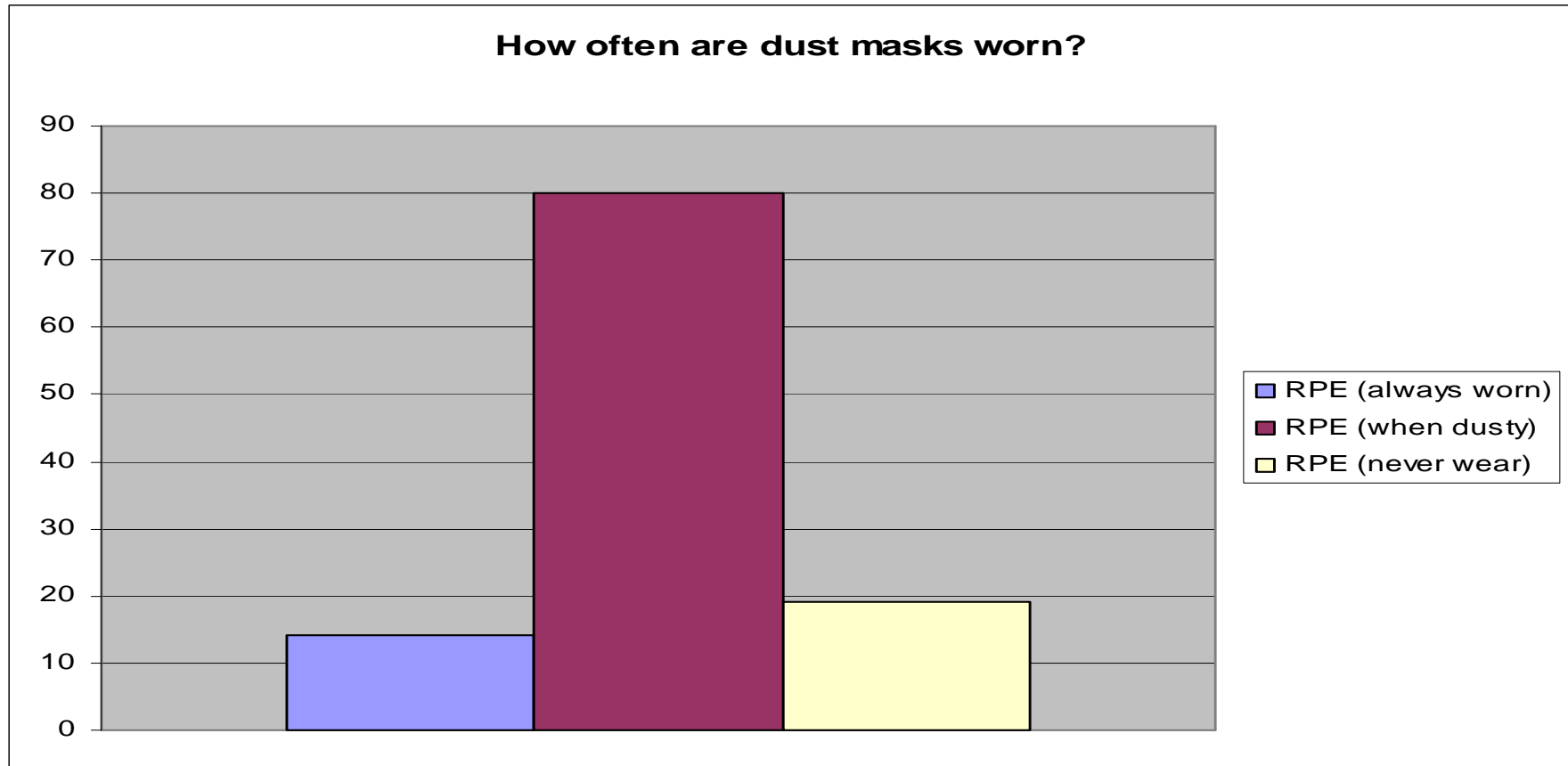


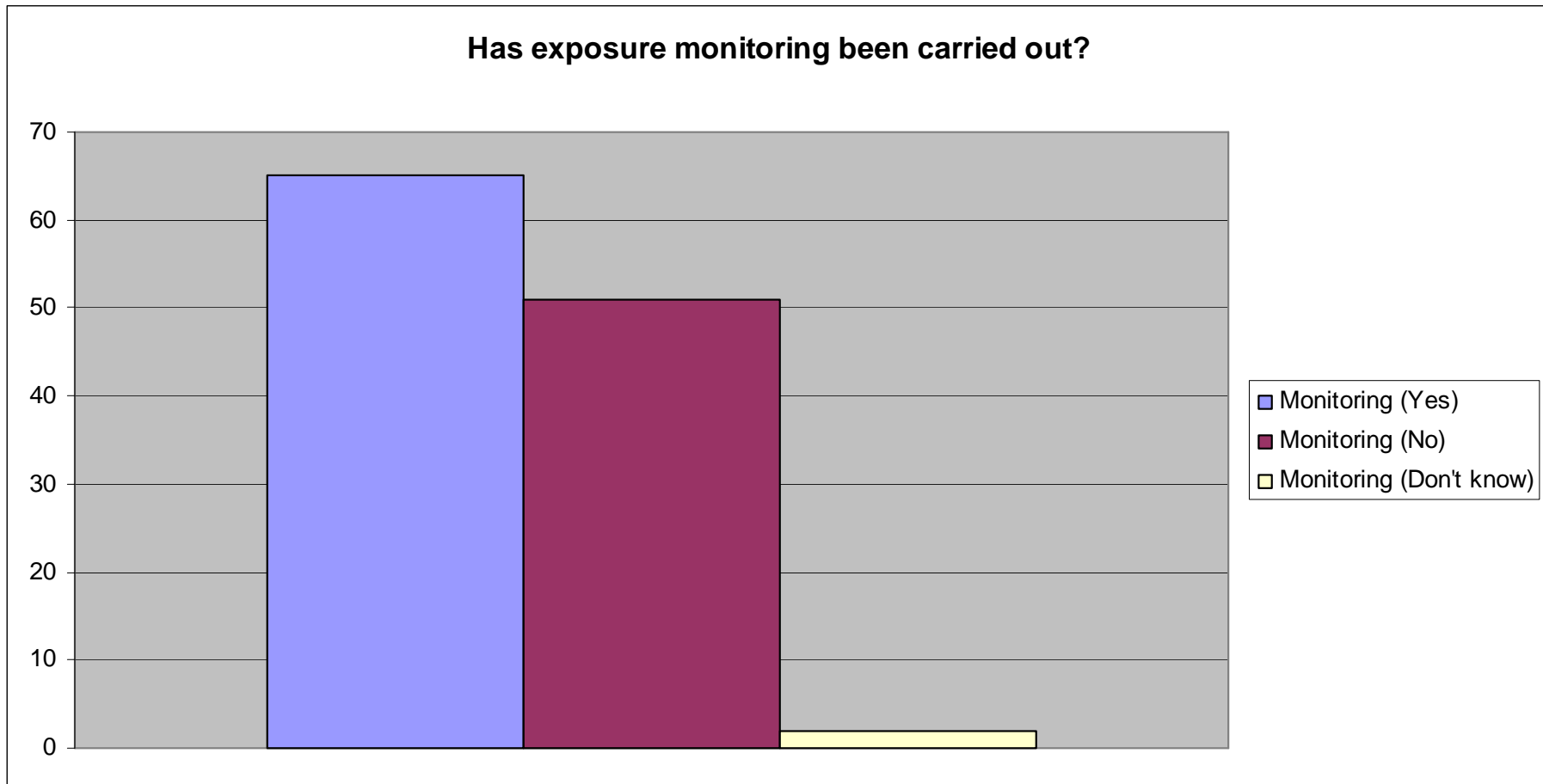
Does your site have a clean shaven policy?



Is fit testing carried out?

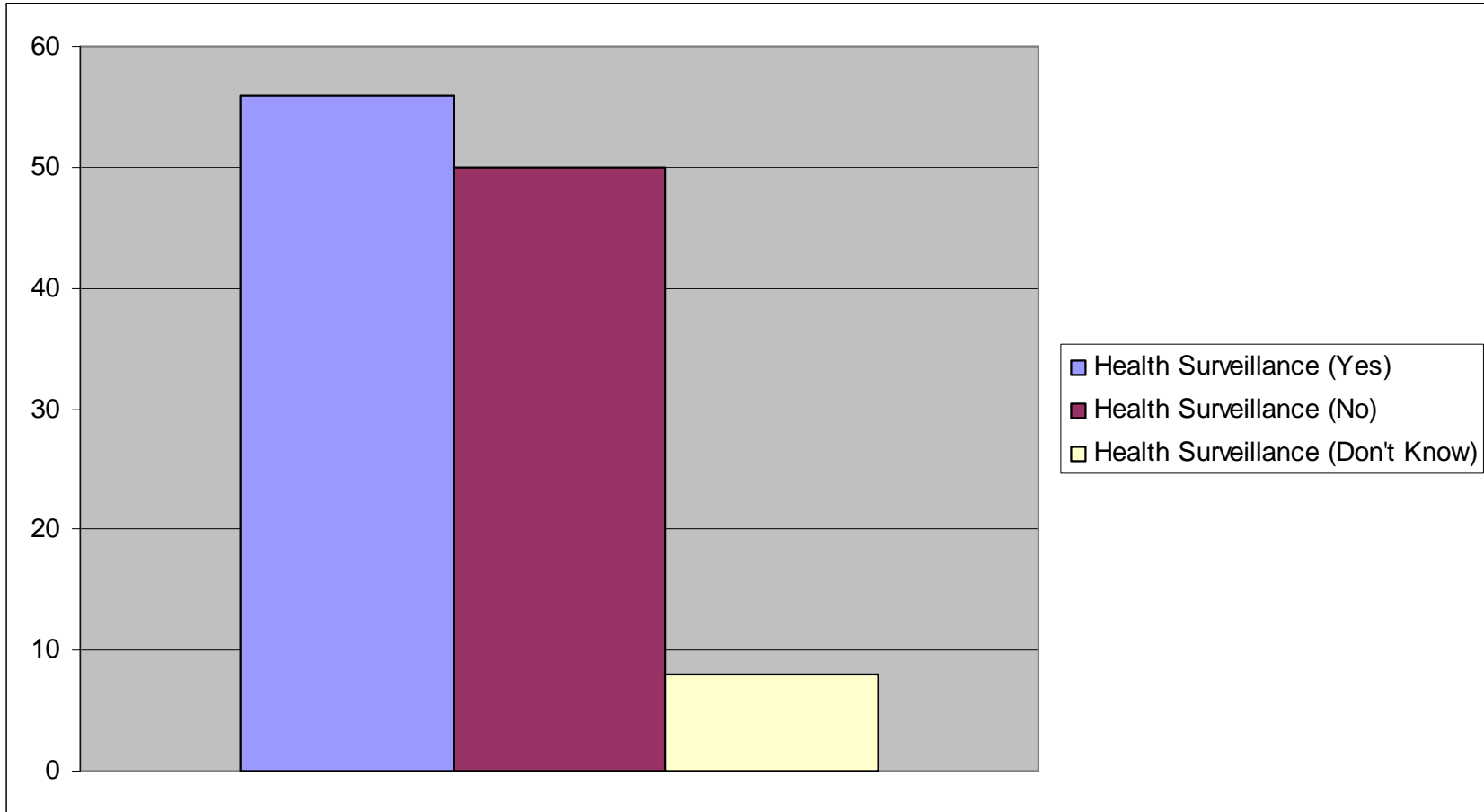
Respirable dust is invisible!





Monitoring should be carried out to evaluate the effectiveness of controls!

Health Surveillance



Do you use an appropriate doctor?

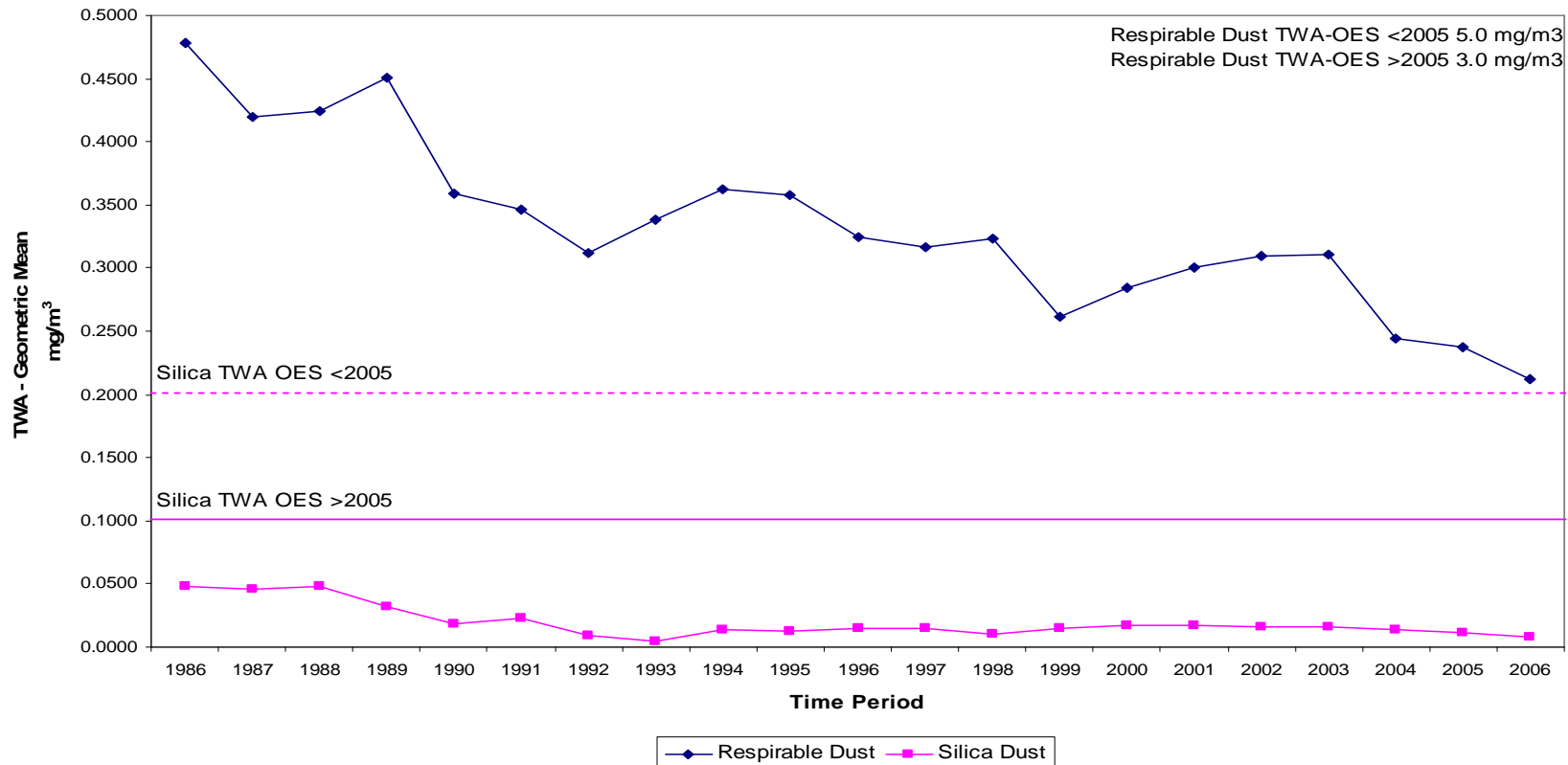
The way forward!

Review and **improve controls** and then monitoring.

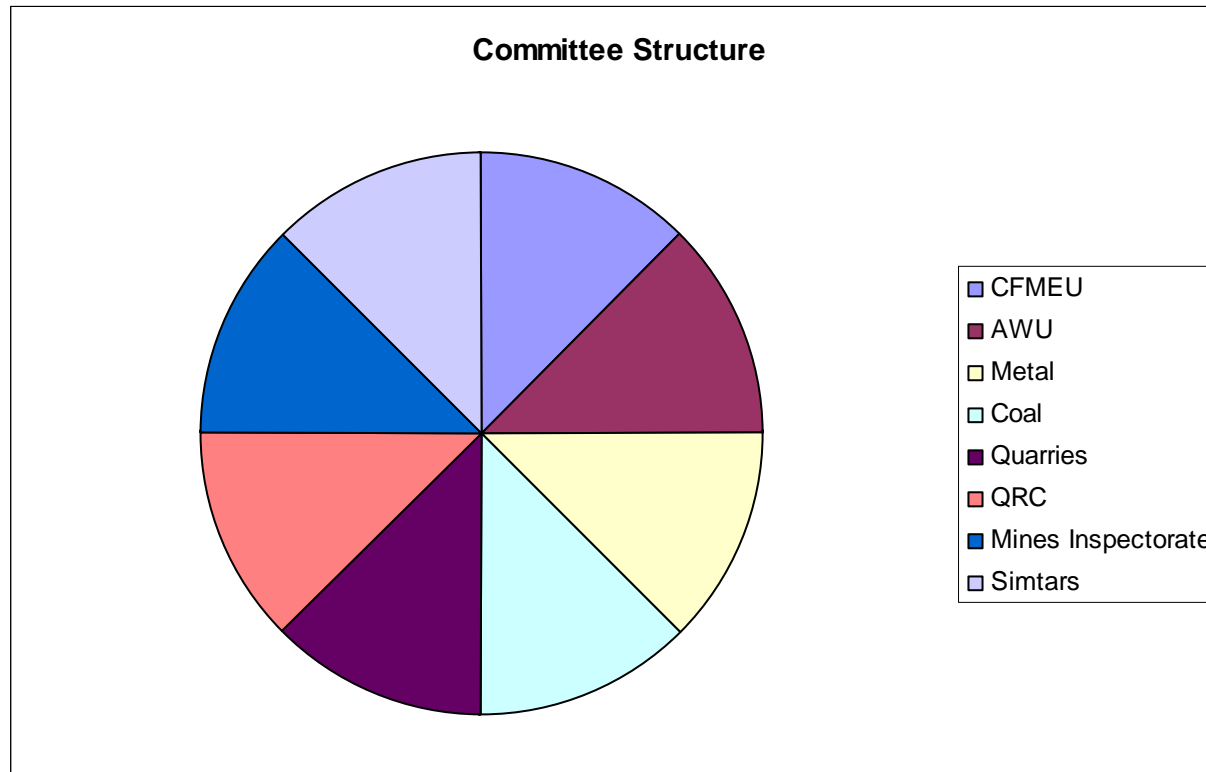
What gets measured gets noticed,
what gets noticed gets action!

Respirable dust and respirable crystalline in WA Mining

CONTAM EXPOSURE TREND REPORT for Contaminant: Respirable and Silica Dust



Queensland Mining Health Improvement and Awareness Committee



2nd Meeting hosted by Xstrata

Topics:

1. Pneumoconiosis in USA
2. Health surveillance
3. Dust control in coal mines
4. Dust control in quarries
5. Dust control in metal mines
6. Exposure assessment
7. Dust plan including research and auditing

Queensland Mining Health Improvement and Awareness Committee Meeting

AGENDA

Event: Health Improvement & Awareness Committee Meeting at Mount by Xstrata
Venue: Ipa Conference Centre, Bulimba Avenue
Site Tour: Surface site tour, Mount by Mines

Date: 27 May 2008
Host: Xstrata Copper
Meeting SSE: Steve de Klerk
Topic: Ipa Conference Centre
Time: 9:00 - 17:00
Meeting Chair: Chris Spelling
Co-ordinator: Kevin Hooper
Contact: 0665 522 984

Topic No.	Agenda Topic	Time	Minion
1	1.1 Meeting Opening - Start 9:00		
	1.1.1 Emergency procedure	5 minutes	Coordinator
	1.1.2 Meeting opened by Chair	5 minutes	Chair
	1.1.4 Introduction of visitors / observers	5 minutes	Chair / Coordinator
	1.1.5 Introduction of visitors / observers	10 minutes	Chair / Coordinator
	1.1.6 Any other business	5 minutes	Chair / Coordinator
2	2.1 Review progress to date		
	2.1.1 Review previous minutes	30 minutes	Co-ordinator (twice)
	2.1.2 Accidents/Incidents	5 minutes	Chair
	2.1.3 New business arising from minutes	5 minutes	Chair
		10:30 - 10:35	
3	3.1 Meeting Tea	20 minutes	
		10:35 - 10:38	
4	4.1 Competence in Compliance and	5 minutes	Coordinator
		10:38 - 10:39	
5	5.1 Presentation from Tim Wilson, General Manager (GEM), Queensland Health	25 minutes	Tim Wilson, GEM
	5.2 Presentation of OHS in the USA, and the World Occupational Health Services Issues	10:35 - 11:00	
6	6.1 Health surveillance	25 minutes	Daniel Smith DME
	6.2 Current situation regarding Mining and Coal	11:00 - 11:25	

Topic No.	Agenda Topic	Time	Minion
7	7.1 Dust control in Coal Mines	25 minutes	Tim Jackson DME
	7.2 Control of dust in the Underground, BSA, and other		
	7.3 General control of dust on the Open-Pit		
	7.4 Control of dust on the Open-Pit (by Dust, belts and roads)		
	7.5 Offsite, RCAPP dust control project at		
	7.6 Offsite, RCAPP dust control project at	11:25 - 11:30	
8	8.1 Dust control in Quarries	25 minutes	NICK MILES (FIFO) Mr. Chris Green
	8.2	11:30 - 11:35	
9	9.1 Exposure Assessment	25 minutes	Jack Page, QFC
	9.2	11:35 - 11:40	
10	10.1 Presentation from SUE	25 minutes	SUEBIE (FIFO) mine
	10.2 Dust control: Assessment and underground		
	10.3 Other activities underway	11:40 - 11:50	
	10.4		
	10.5		
	10.6		
	10.7		
	10.8		
11	11.1 Presentation and discussion on dust plan	15:35 - 15:50	Kevin Hooper and FHE
	11.2		
12	12.1 Site tour	15:50 - 15:55	Chris
13	13.1 Site tour	15:55 - 17:00	All
14	14.1 Lunch	17:00	All
15	15.1 Close of OHS CONFERENCE	17:30	Include open to meeting attendees

Meeting Attendees:

Name	Role	Representing
Chris Spelling	Chair	DME
Kevin Hooper	Co-ordinator	DME
Chris Green	Secretary/Treasurer	DME
Jack Page	Member	DME
Tim Wilson	Member	DME
Chris Fenton	Member	DME - Sulfide
Daniel Smith	Member	DME
DME Missionary Council	Member	Industry - Quarries
Tim Jackson	Member	Industry - Coal
Nick Miles	Member and Chair	Industry - Metall
Tim Wilson	Member	CRMPD
Paul O'Sullivan	Member	IAQI
Jack Page	Member	QFC
Michaela Spelling	Observer	DME Health and Safety
Paul O'Sullivan	Observer	DME Health and Safety
Kevin Hooper	Observer	Manager Health, Safety & Training - Metals Type
Tim Jackson	Observer	Manager Health, Safety & Training - Metals Type
Paul O'Sullivan	Observer	Manager Health, Safety & Training - Metals Type
Jack Page	Observer	Manager Health, Safety & Training - Metals Type

Planning - Resources - Professional - Monitoring - Review - Support
24842388 Revision 1
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