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Leading Practice Adoption Guide for:

Continuous Real-time Monitoring

of

Airborne Pollutant Engineering Controls

Rev 2

November 2016

Note: This guide is for use at adopter mines.
The guide will be updated regularly to take account experience gained and input received during the adoption process.

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THE MOSH LEADING PRACTICE ADOPTION SYSTEM

Milestones in Health and Safety

In June 2003, at the third Mine Health and Safety Council (MHSC) Summit, the Chamber of Mines of South Africa and its social partners, government and labour, established occupational safety and health milestones to be attained over a 10 year period. This was followed in 2005, and later reinforced in 2008, by the Chief Executive Officers in the mining industry expressing the commitment of industry to the achievement of the milestones and continuous improvement towards zero harm. In 2014 a new set of milestones for the next 10 years were established.

The MOSH Leading Practice Adoption System

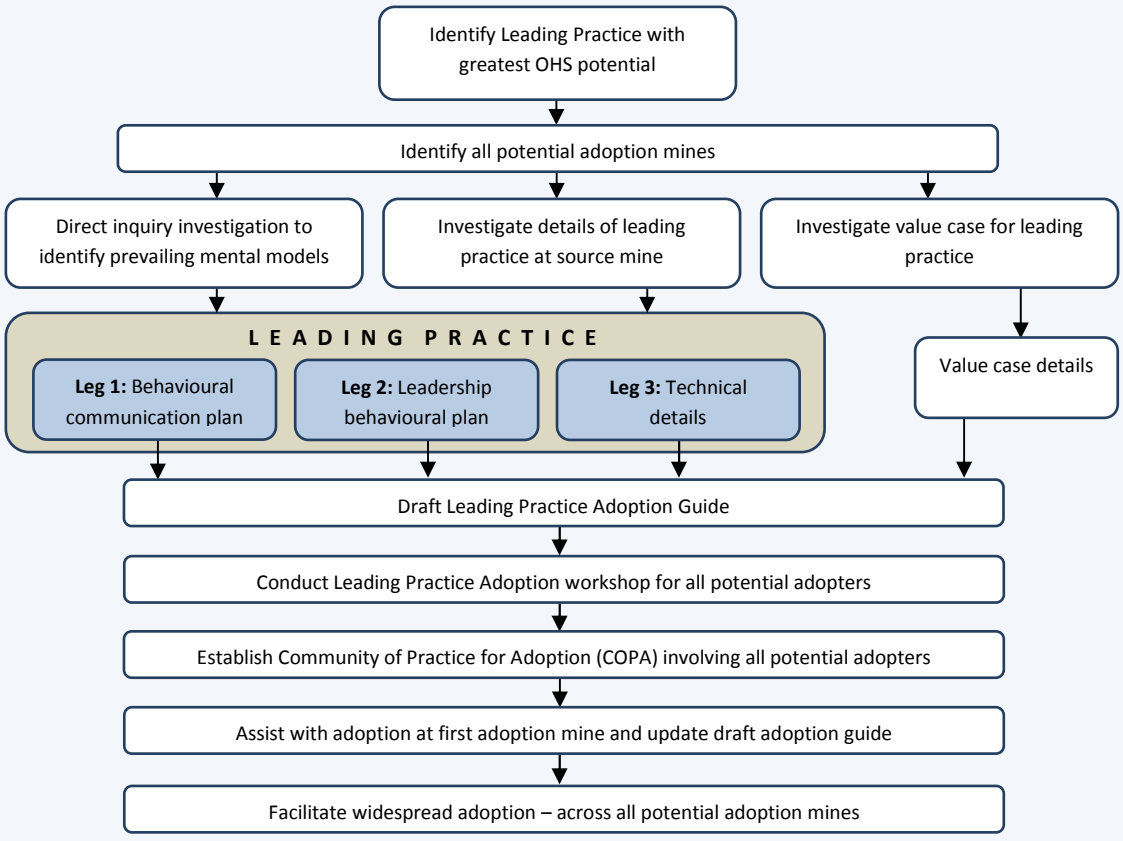
The MOSH Leading Practice Adoption System is a process that finds promising leading practices, selects the best of these, documents it (possibly with refinements) at the operational mine (the source mine) and identifies possible aids and barriers to its adoption at potential adoption mines. Technological details of the leading practice together with detailed leadership behaviour and behavioural communication plans, and procedures for their adoption are then compiled by the relevant MOSH Adoption Team into a Leading Practice Adoption Guide. This guidance is tested at the first adoption mine, or at a special demonstration mine, and then updated by the MOSH Adoption Team to take account of lessons learned. The MOSH Adoption Team facilitates dissemination of this guidance throughout industry by presenting details at a Leading Practice Adoption Workshop and establishing a Community of Practice for Adoption (COPA). The COPA includes key persons from all potential adoption mines and used as a forum for providing ongoing assistance to mines, and for mines to learn from each other in adopting and continuously improving the practice.

The MOSH Leading Practice Adoption System fully recognises that, while a technological or procedural solution may have demonstrated effectiveness, success in adoption of the leading practice at another operation will depend on the key people at that operation - at all levels of employment and leadership. It is the behavioural communication (to address knowledge gaps and misperceptions) and leadership behaviour (to facilitate desired behaviour) aspects of the MOSH Leading Practice that address this challenge. Without the buy-in and support of these key people at the mine, enforced "top down" implementation of the practice at the mine is likely to be short-lived.

The two distinguishing features of the Adoption System and why it is so different from other approaches are thus, in addition to the usual necessary technical detail about the practice, the inclusion of:

- a structured communication strategy to achieve appropriate behaviours of key people at the mine, and
- a leadership behaviour strategy to set out and achieve the desired behaviours of key people at all levels.

Fundamental to the development of leadership behaviour and behavioural communication strategies is an understanding of stakeholder and adopter perceptions (mental models) with regard to the risk/hazard being addressed by the recommended leading practice. The behavioural communication and leadership behaviour strategies that form part of the leading practices have been developed to align with and respond to these mental models of potential stakeholders and adopters of the leading practice at each mine that decides to adopt the practice.



Simple Schematic of MOSH Leading Practice Adoption System

EXECUTIVE SUMMARY

The objective of this practice is to move away from a reactive management mode into a proactive approach that will enable industry to do predictive and preventative maintenance management on engineering interventions that control airborne pollutants. This practice allows for immediate intervention when the continuous real-time monitoring system detects excessive airborne pollutants levels.

Industry experts (known as the MOSHIAT-D) identified Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls as one of the leading practices for addressing the risk of harmful airborne pollutants at source. This practice offers outstanding management of the effectiveness of engineering controls of airborne pollutants. It has broad applicability, offers easy installation, has low maintenance requirements and has the potential to have a significant impact on a large number of affected employees across a broad range of commodities.

The MOSH Dust Adoption Team commenced with investigations at the source mines, AngloGold Ashanti's Kopanang and Anglo American's New Vaal Colliery Mines to determine verifiable benefit of the systems in ensuring the reduction of airborne pollutants at source. Trends of airborne dust measurements taken at both Kopanang Mine and New Vaal Colliery indicate a significant decrease in respirable dust as a result of the application of real-time dust monitoring to manage the performance of engineering devices used to mitigate the hazard.

Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls and associated behavioural communication and leadership behaviour strategy are included in the guide for industry-wide adoption.

The strategic context of this work is one of continuous improvement towards zero harm from silica dust and other airborne pollutants to which Chief Executive Officers in the mining industry have duly committed. The objective of this document is to serve as a guide to decision makers and adopters to facilitate the adoption of technology whilst addressing the 'people' issues that aid the process. The scope of the identified leading practice is clearly defined.

The guideline is presented in three parts: the first part outlines the practice, the second part outlines the guidance on adoption of the leading practice at adoption mines and the third part provides reference or example material considered vital to successful adoption.

Key elements of the Leading Practice

The leading practice is a means to prevent worker exposure to harmful airborne pollutants. Key features to address unresolved issues are listed. For areas with existing engineering controls relevance starts with element 3.

1. **Identify**: Document areas and activities associated with sources of airborne pollutants.
2. **Evaluate**: Interpret the airborne pollutant data and propose appropriate interventions and controls.
3. **Communicate:** The Management Team must sanction adoption. To facilitate sustainability Behavioural Communication and Leadership Behaviour plans must be in place early in the Adoption Process.
4. **Demonstrate:** Prove the effectiveness of the engineering intervention tailored to control the airborne pollutant. Upgrade the controls until the desired outcome is consistently achieved.
5. **Monitor:** Select a suitable Continuous Real-time Monitoring system and install to monitor the effectiveness of the engineering controls.
6. **Protect:** Create interventions to protect workers from exposure to the hazard and incorporate them into the protection logic.
7. **Review:** Include the procedures and criteria for review and refinement of the practice that are outlined in the Leading Practice Adoption Guide.

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B4 Example documents e.g. communications and signage (flyer, video) – refer to MOSH web-site: www.mosh.co.za

B5 Example training material – *under construction*

NOTE:

[1]Refers to the LPAS Guidance document available on the MOSH web-site: www.mosh.co.za

Part 1 – THE PRACTICE

1.1. INTRODUCTION

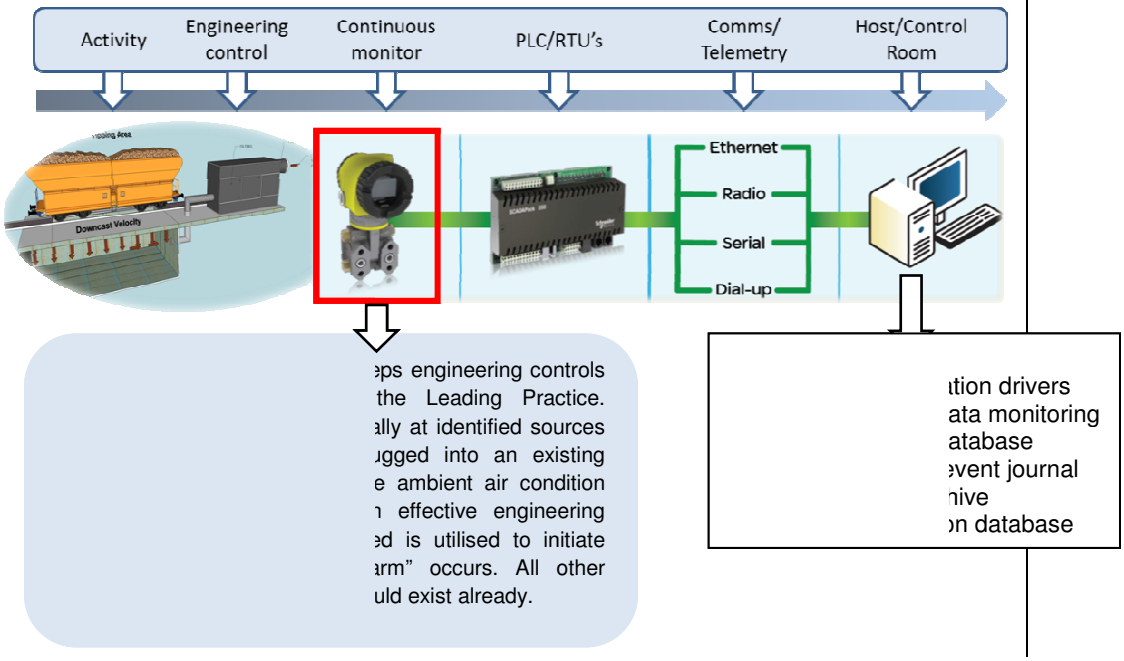
There is a real need for a practice that consistently provides assurance of the sustained integrity of appropriate engineering controls tailored to mitigate airborne pollutants. This practice, which serves that purpose, provides indications to:

- Detect working places or processes with unsatisfactory airborne pollution conditions.
- Determine sources or causes of such conditions.
- Determine the effectiveness of airborne pollutant suppression methods or equipment.
- Upgrade control measures.
- Confirm that satisfactory conditions have been achieved following remedial measures.
- Confirm that satisfactory conditions are being maintained.
- Improve design of ventilation systems.
- Determine trends of ambient conditions.
- Define risk levels through appropriate risk assessments.

The practice incorporates work from the Mine Health and Safety Council (MHSC)' Safety in Mining Research Advisory Committee (SIMRAC) Project '*03 06 03 Track B: Environmental and Engineering Controls*'.

1.2. DESCRIPTION OF PRACTICE

Basic concept of real-time monitoring:

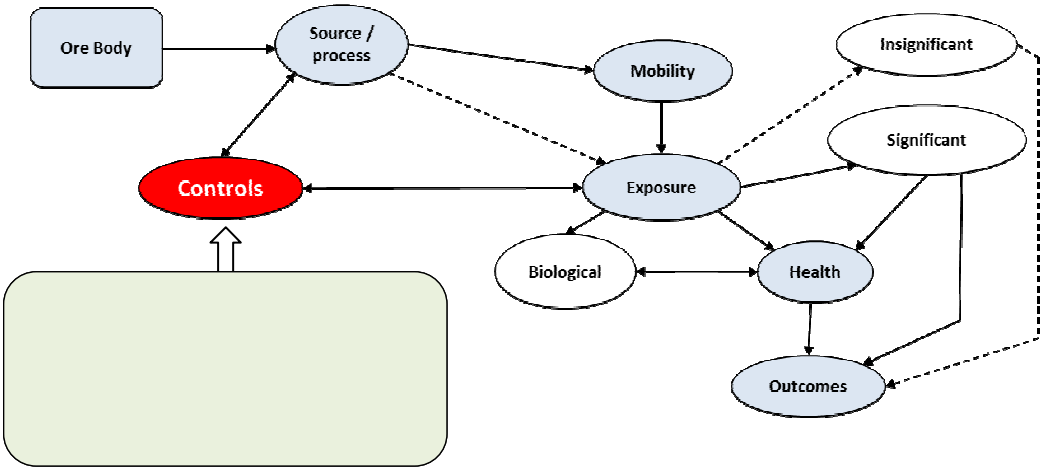


Continuous monitors are placed strategically and plugged into an existing telemetry network to monitor the ambient air condition continuously in real-time at an engineering control. The data generated is utilised to initiate protection logic if a “dust alarm” occurs.

1.3. THE PROBLEM ADDRESSED (exposure to airborne pollutants)

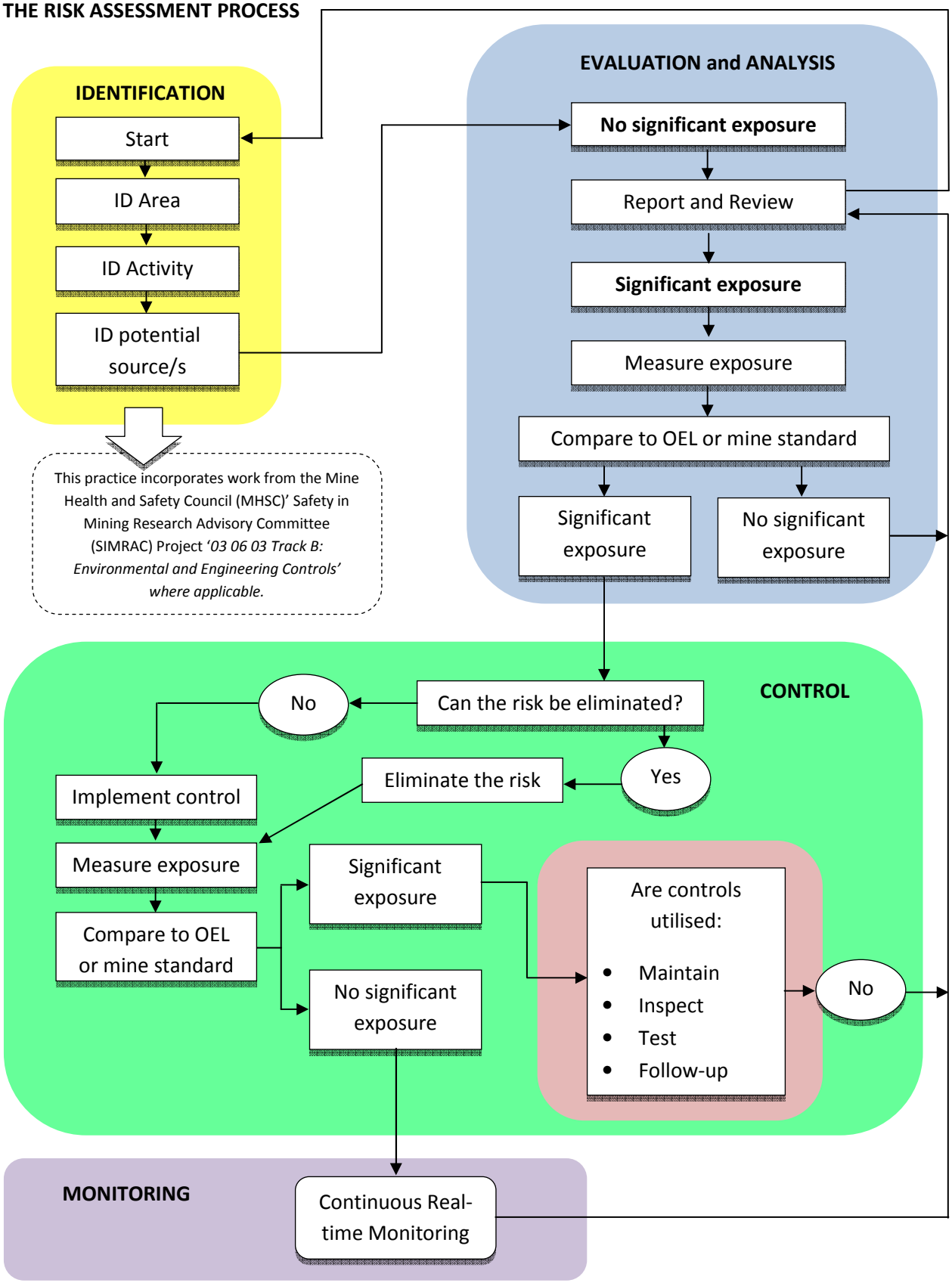
In addressing the problem of exposure to airborne pollutants a risk based approach must be used as shown below taking cognisance of the dust “expert model”:

BASIC DUST EXPERT MODEL: (detailed version attached and explained later in *Part 3* in this document)

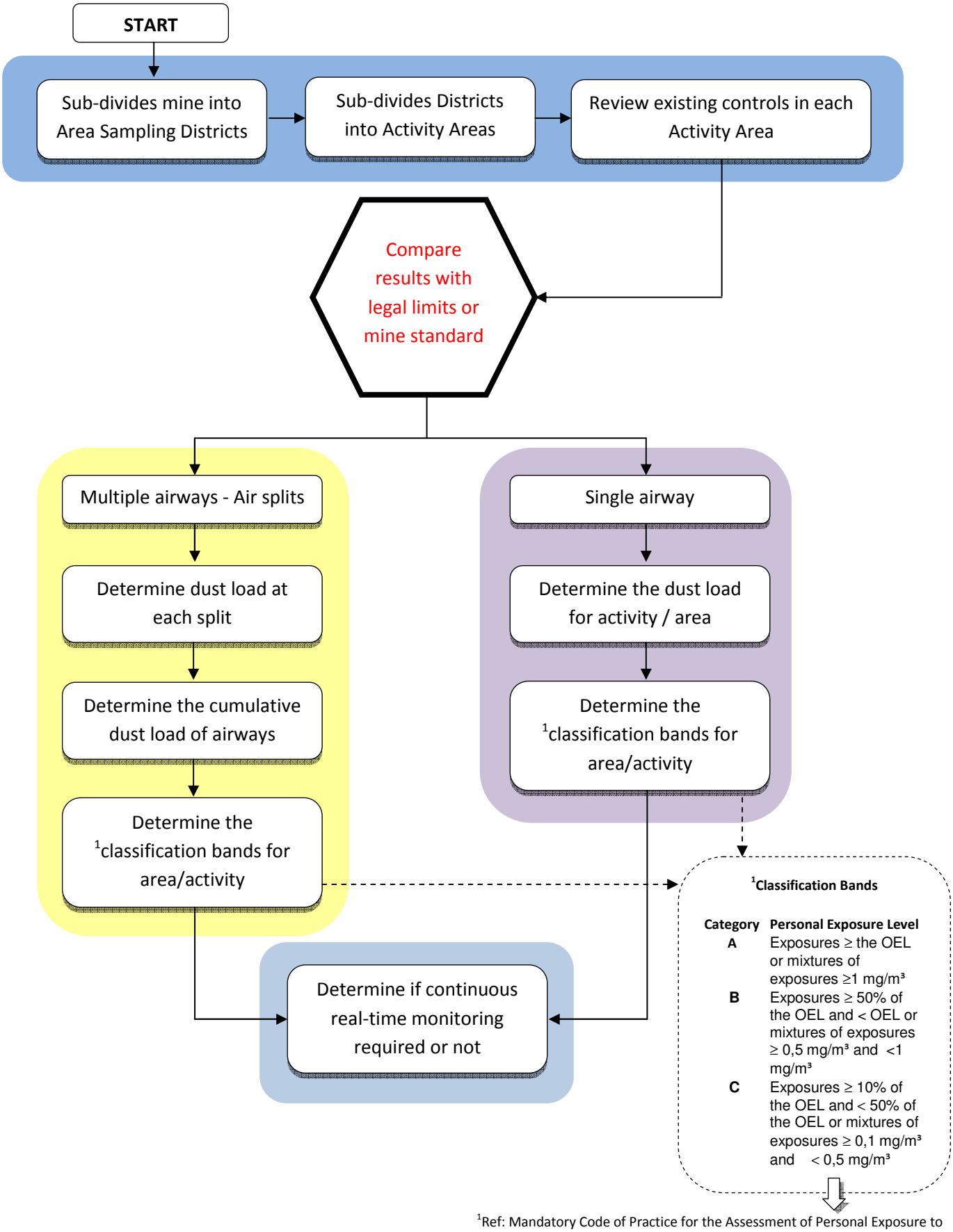


The importance of an “expert model” is to develop an expert understanding of the risk situation. Without such an understanding, the risk of addressing symptoms and not causes is real. In the adoption system, there is another equally important reason called mental models. Unless one has such an understanding, it is not possible to identify the knowledge gaps, misperceptions and mistaken beliefs of adopters and key stakeholders. It is these mental models that can act as barriers to adoption of a selected leading practice.

THE RISK ASSESSMENT PROCESS



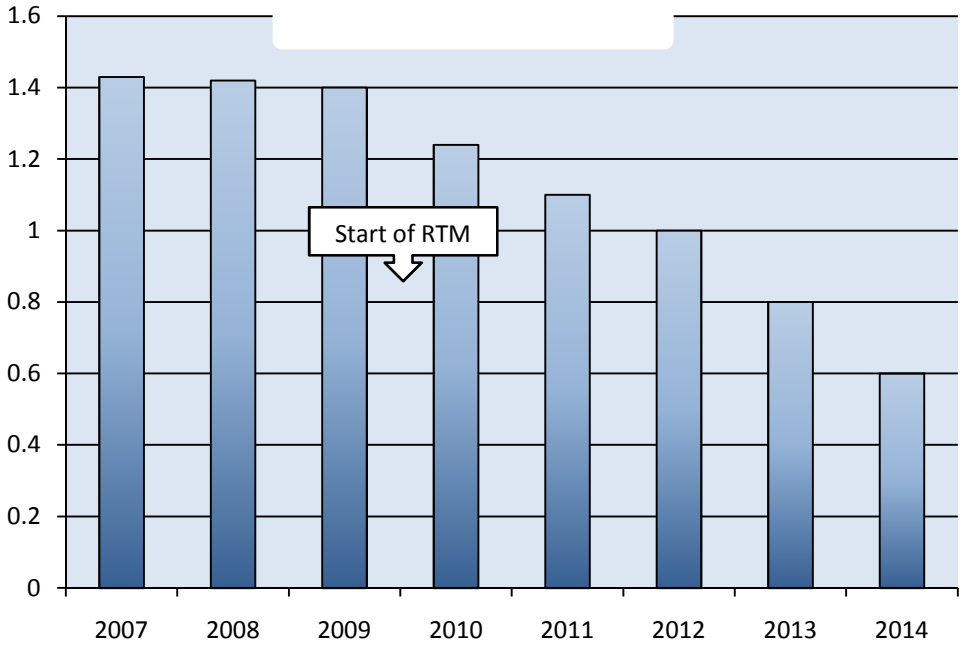
The following process can be used to determine areas for continuous real-time monitoring:



[1]Ref: Mandatory Code of Practice for the Assessment of Personal Exposure to Airborne Pollutants (current)

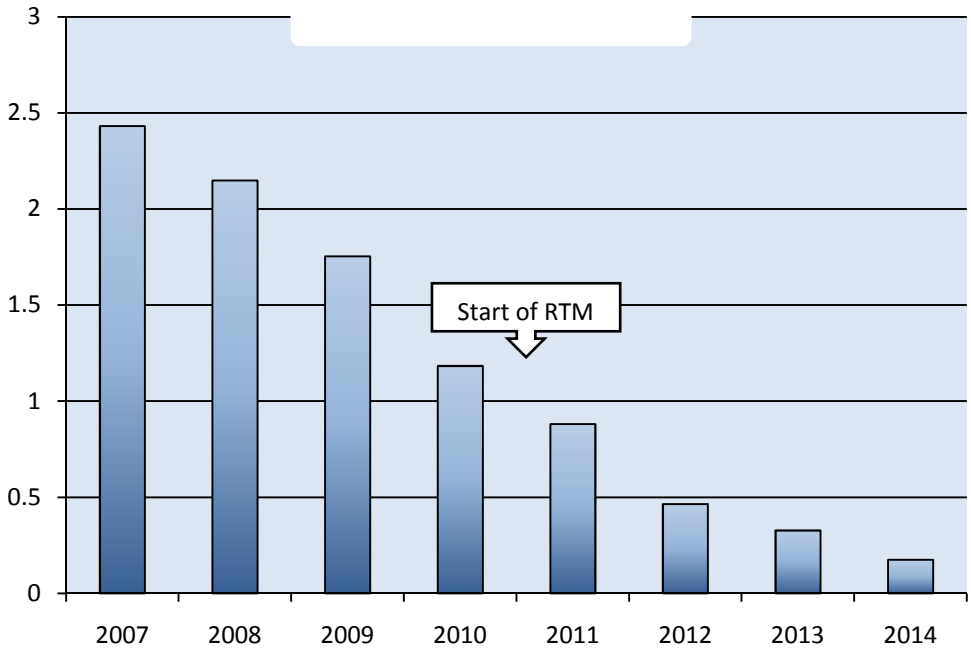
1.4. SUMMARY OF PERFORMANCE AND IMPACTS

Kopanang - Source Mine



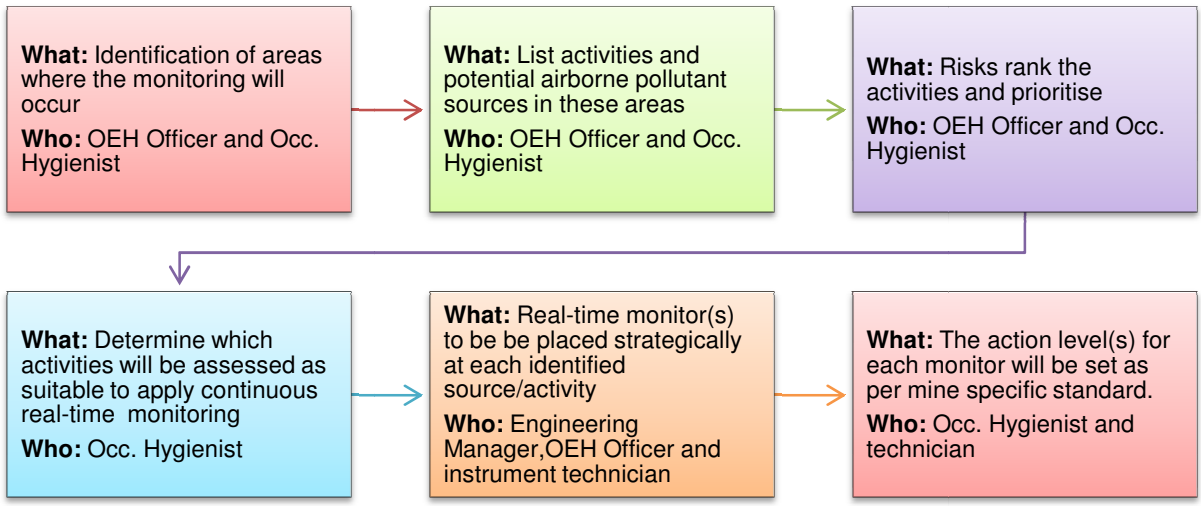
New Vaal Colliery – Source Mine

The average annual workers' exposure to respirable coal dust is shown below. The improvement from 2010 on is attributed to the introduction of Real-time Monitoring of the effectiveness of the dust controls at the Primary Tip. This is an 85% improvement between sampling results (annual averages) for 2010 and 2014.



METHODOLOGY

PROCESS FLOW OF THE PRACTICE AT BOTH SOURCE MINES



1.5. CRITICAL SUCCESS FACTORS

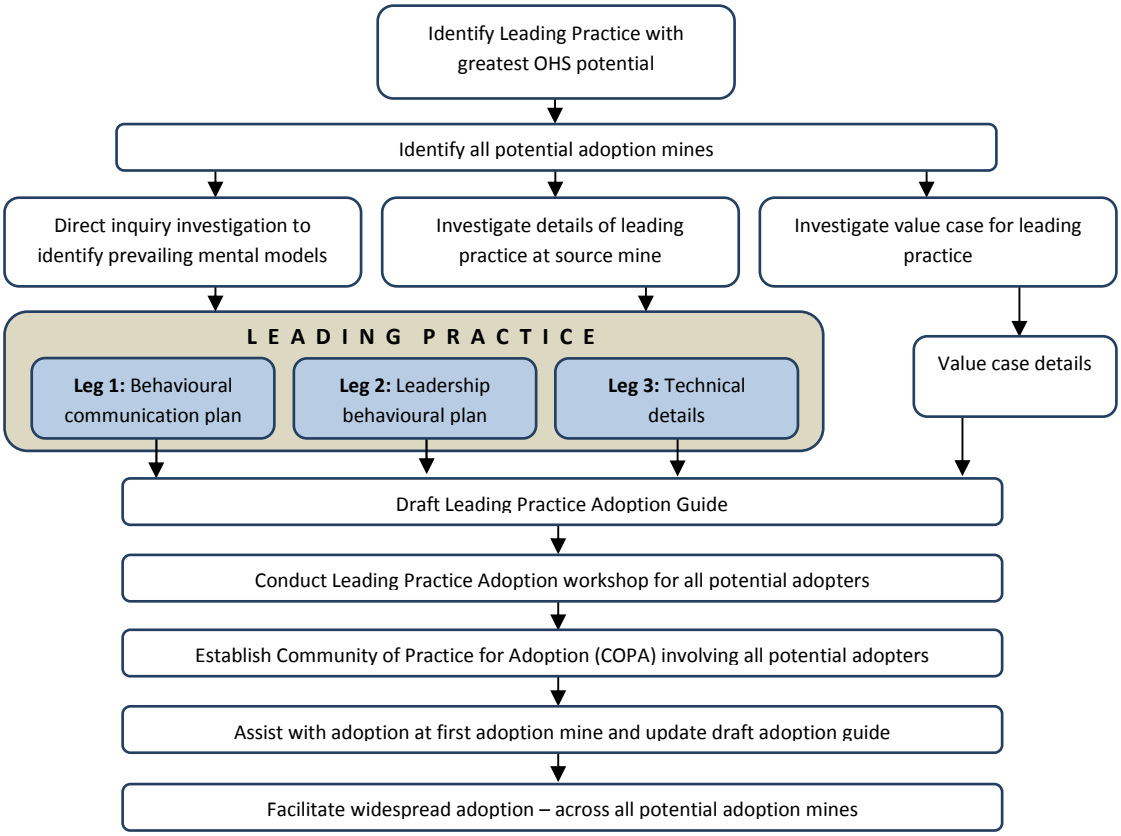
Identification of critical issues and potential unintended consequences at industry level				
No	**Critical issues / Unintended consequences**	**Assessment of urgency for action (high – moderate – low)**	**Possible mitigating action**	**Possible pre-emptive communication**
Affected workers				
1	Early engagement	High	Ensure that workers are briefed through the Health and Safety Structures	We as a mine are serious about taking care of the health of our workers in terms of reducing the effect of airborne pollutants
Risk specific group (airborne pollutant team)				
2	Lack of awareness and understanding of the problem	High	Establish sub teams within the mine Health and Safety Structure to assist with awareness and adoption plan Give continuous feedback to workforce on progress and impact achieved (closing the loop)	Appoint people to form part of the sub-committee
Senior Management				
3	Lack of commitment and support towards health related issues	High	Senior management should "walk the talk" and ensure a multi-disciplinary sustainable approach is embedded. LIVE your company's and personal values of caring	It is a requirement in terms of the MHSA, the CTF and the MHSC tri-partite milestones.

Part 2 – ADOPTION GUIDE

2. Introductory comment

The objective of this section is to provide guidance to adopters of the leading practice on how the adoption process works and also to provide supporting templates where applicable for use.

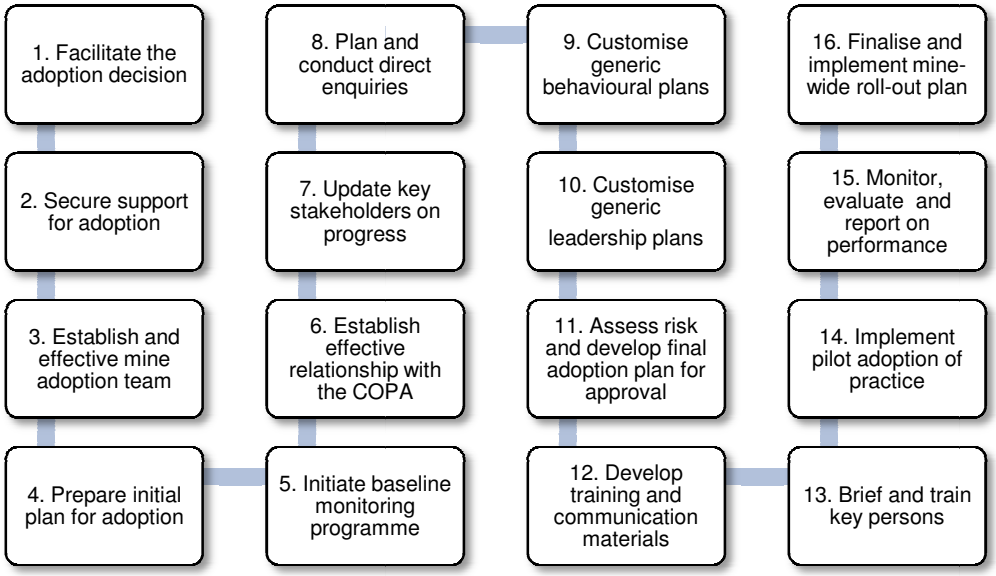
Before starting with the adoption process it is important to have a basic understanding of the MOSH Leading Practice System. Below is a simple schematic diagram of the MOSH Leading Practice System:



2.1 Summary framework of overall adoption plan

The adoption process comprises of 16 interrelated steps involving various activities that need to be systematically and fully undertaken to achieve successful adoption. A summary of the adoption process is provided below.

Detail of the 16 steps and the various activities are shown in the activity schedule presented later in part 3 of this document together with a one page summary of the adoption process.



2.3 Detail guidance per activity

2.3.1 Facilitate the adoption decision

2.3.1.1 Prepare and present a case for adopting the leading practice at the mine:

- The relevant specialist at the mine should evaluate the case for adopting the leading practice. (This is an implicit requirement of both the Mine Health and Safety Act and the Mining Charter).
- The mine specific benefit and value of adopting the leading practice, or lack thereof, should be clearly identified and documented. The generic value case prepared by the MOSH Adoption Team should be consulted in undertaking this assessment. It is available on MOSH website at www.mosh.co.za.

2.3.1.2 Obtain top management decision about adoption of the practice:

- Top management at the mine need to be fully aware of what the MOSH Leading Practice and the adoption process entail, before deciding about whether or not to adopt. To achieve a fully successful outcome they must be supportive of both the practice and the adoption process.
- The simple explanation and diagram presented earlier, and the brochure about the adoption system presented later in part 3 of this document are provided to assist in the preparation of a brief explanation of the MOSH Adoption System to top management. A 15 minute explanatory DVD is also available from the MOSH website
- Should additional assistance be required in preparing or presenting the case to top management, the MOSH Adoption Team Manager should be contacted.

- The Senior General Manager at the mine should record the decision about adoption on the assessment form as provided below and arrange for the signed form to be returned to the MOSH Adoption Team Manager.

A typical example is provided below:

RISK REVIEW AND ADOPTION DECISION

I, the undersigned have been made aware of the risk review checklist in terms of the following Leading Practice(s): ……

……

I am representing ……(Group), …… (Mine) and based on the findings as per risk review checklist below made the following decision:

Decision: Adopt the Leading Practice:	Yes	No

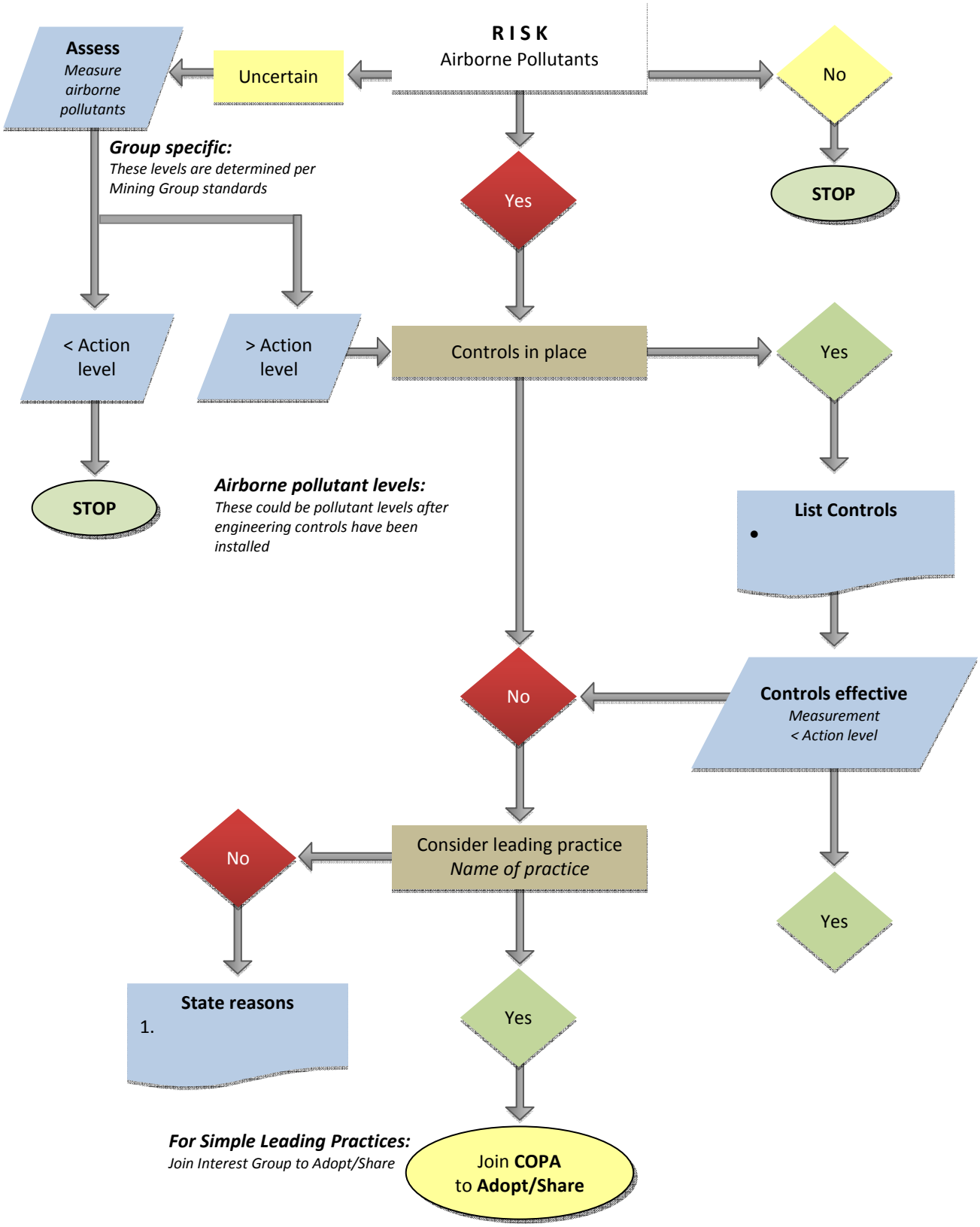
Signed: …….

Name: …….

Designation: …….

Date: …….

LEADING / SIMPLE LEADING PRACTICE REVIEW CHECKLIST



The Leading Practice Review Checklist, presented above also provides an easy-to-use aid in assessing the applicability and motivating the implementation of a particular practice for a potential adoption mine.

Signature and Designation

2.3.2. Secure support for adoption

2.3.2.1 Secure support of regional and mine-level union representatives:

- Regional and mine-level Union Representatives should be engaged as soon as possible to secure their understanding, buy-in and support for the leading practice. This is crucial. The extent of the support provided, or withheld, can greatly facilitate or inhibit the adoption process.

2.3.2.2 Issue written mine-wide briefing note advising of decision to adopt:

- A mine-wide briefing note should be issued by management to inform employees of the intention to adopt the leading practice at the mine. This should be done as soon as possible after engaging the unions, and preferably with their support.
- The note should advise that the adoption process will involve detailed discussions with various employees at all levels to get their input into the adoption process. (These discussions are the one-on-one direct enquiry interviews described in part 2 under 2.3.8)

A typical mine-wide brief is provided on the following page

COMPANY LOGO

TO	**:**	All D-Band and above employees Union Representatives
FROM	**:**	General Manager
DATE	**:**	xx/xx/xxxx
SUBJECT	**:**	MOSH - ADOPTION OF LEADING PRACTICES

Photo of General Manager pasted here

Dear Colleagues

This is to inform you that we have made a decision to adopt the following Leading Practices as per the MOSH Learning Hub methodology:

- **Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls**

We are of the opinion that by adopting this leading practice the health of our workers will immensely benefit in terms of reducing the dust load underground and therefore reduce the dust exposure levels to our workers. By doing so we re-iterate our commitment to zero harm and that we will do anything possible to ensure our workers return home safely and healthy.

Please ensure that the content of this brief is communicated through the entire mine's communication channels to all workers.

Together we can!

XYZ

Designation *(General Mine Manager)*

2.3.3. Establish an effective mine adoption team

2.3.3.1 Identify and appoint a suitable project leader / champion:

- An important aspect of top management's decision to adopt the leading practice must be that a suitable person will be assigned the task of leading the project and championing the leading practice and the adoption process at the mine. This is crucial to the success of the adoption process.
- The selected person must have time to properly fulfil the role of adoption team manager, and the leading practice mine champion. This is not an understatement and the mistake of overloading a competent person must not be made.
- Systematic execution of the adoption process and successful adoption of the leading practice should become a key performance criterion in the selected person's performance contract with the mine.
- The attributes of this ideal leading practice adoption team manager and champion are provided in the check-box table below to assist the mine making this selection.

	Attributes of a Leading Practice Mine Adoption Team Manager / Champion	☑
1	**Credibility:** An essential requirement is that the champion should be credible. This individual should preferably be someone linked directly to the specific discipline and should be at an appropriately high level in the organisation. He/she should have good levels of knowledge, energy, leadership, communication skills and personal credibility	☐
2	**Involvement:** Having selected an individual with the right potential, it is essential that he/she has sufficient time available to adequately perform the functions of project management and championship. To do this, the person needs to become deeply involved in the details of the technology as well as the people components of the leading practice, to appreciate the issues and problems, and to assist in, or be knowledgeable about their solution	☐
3	**Leadership:** An important role of the person selected will be that of providing leadership in overcoming adoption problems that arise, including that of energising lagging aspects of the process. It will also include the provision of insightful input into the development of strategies and plans for the progressive adoption of the leading practice across the mine.	☐
4	**Communication:** A particular key role will be that of being an effective spokesperson for the leading practice being championed. To do this effectively, the champion should accumulate key data and prepare appropriate documents and presentations to communicate such performance and technical data to interested parties, initially at the mine, but in due course on behalf of the mine at industry workshops, conferences, and so on.	☐

A typical appointment letter for appointing mine adoption team is provided below:

COMPANY LOGO

APPOINTMENT OF MINE ADOPTION TEAM

In terms of the adoption of Simple and/or Leading Practices methodology as per the Mine Occupational Safety and Health (MOSH) process you are hereby appointed to be part of the Mine's adoption team for the following Leading Practice:

1. Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls

Signed: …….

Name: …….

Designation: …….

Date: …….

I, the undersigned accept the appointment as member of the following Leading Practice:

1. Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls

Signed: …….

Name: …….

Designation: …….

Date: …….

2.3.3.2 Identify a person to oversee customisation of behavioural plans:

- A specific person needs to be identified and allocated the responsibility for overseeing the process of customising the generic behavioural plans to take account of the mine specific circumstances and integrating them into the mine's adoption plan. To gain the people related benefits of the MOSH adoption process it is essential that this process is properly carried out. A *behavioural plans overseer* is required to ensure that this is the case.
- The generic behavioural communication and leadership behaviour plans are provided in Part 3 later in this document. They are integral parts of the MOSH Leading Practice – they address the knowledge gaps and other identified barriers to successful adoption, and help ensure the behaviours needed at all levels for a sustainable adoption. They must be customised to take account of mine specific circumstances and then implemented for adoption of the MOSH Leading Practice to be *complete.*
- To assist in clarifying what needs to be overseen, and why oversight responsibility needs to be allocated to a specific person, an outline of the eight-step process for customising the behavioural plans is presented on the following page.

Step	What	Check – go/no-go decision question
1	**Identify adopters and key stakeholders at the mine**	Do we have a good understanding and complete identification of potential adopters and stakeholders?
2	**Select people to be interviewed**	Have we chosen the appropriate people to interview?
3	**Identify and brief the interviewers**	Are the interviewers ready to interview?
4	**Conduct the interviews**	Have all the interviews been done and full worksheets completed and returned for processing?
5	**Summarise the interview results**	Have the interview results been systematically assessed and significant new findings clearly identified?
6	**Use the findings to customise the leadership behaviour communication plan**	Are the customised plans coherent and properly understood by the mine team and can they be implemented and effectively monitored in behavioural terms?
7	**Use the findings to customise the behavioural communication plan**	Are the customised plans coherent and properly understood by the mine team and can they be implemented and effectively monitored in behavioural terms?
8	**Integrate the customised plans into the implementation plan at the mine**	Is the overall implementation plan coherent and properly understood by the mine project team?

- Given that the mine may in future adopt other MOSH leading practices with similar customisation requirements, consideration should be given to identifying a person well placed to assist future adoption teams at the mine. The nature of the work suggests that such a *Behavioural Plans Overseer* could well be drawn from the Human Resources department.
- For other MOSH leading practices this responsibility has sometimes been allocated to the Mine Adoption Team Manager but this has not worked well.

2.3.3.3 Train the Mine Adoption Manager and behavioural plans overseer:

- The *Mine Adoption Team Manager* should liaise with the MOSH Adoption Team Manager and the *Group Adoption Coordinator,* (if the mining company has appointed one) to identify suitable training arrangements for himself and the identified *behavioural plans overseer.*

In the event that more specific training arrangements become available this section will be appropriately updated to reflect this.

- No formal training courses are yet available and at this stage one of the MOSH Adoption Team Managers or one of the Learning Hub Specialists may need to provide the necessary training and mentorship.
- An alternative that should also be explored with the MOSH Adoption Team Manager is that of arranging for the two mine persons to spend time with their equivalents at a mine that has already successfully worked through an adoption process.

Secure establishment of an appropriate adoption team at the mine:

- In addition to the Mine Adoption Team Manager and the Behavioural Plans Overseer, the mine adoption team should include:
  - a person from the training department,
  - the line manager of the section in which the adoption process is to be initiated,
  - a person representing labour,
  - a mine safety specialist, and
  - a specialist in the area of the leading practice.
- All of the persons in the Mine Adoption Team must have sufficient time available to fulfil their role and responsibilities on the adoption team, and this should be appropriately reflected as a key performance area in their performance contracts with the mine.

2.3.3.4 Provide mine adoption team with copies of leading practice adoption guide:

- This should be done at least a few days prior to holding a workshop to review and initiate the adoption proc
- Team members should familiarise themselves with the guide before the workshop

2.3.4. Prepare initial mine adoption plan

2.3.4.1 Workshop leading practice adoption guide - mine project team:

- A workshop should be arranged to enable all members of the Mine Adoption team to have a good and common understanding of both the leading practice and the adoption process. The agenda for the workshop should include the following:
  - Opening by Mine manager to explain the steps already taken.
  - The case for adopting the leading practice
  - Key elements of the MOSH Adoption System
  - Potential assistance from the COPA and the MOSH Adoption Team
  - Key technical elements of the leading practice
  - The concepts of leadership behaviour and behavioural communication
  - The leading practice adoption guide
  - The mine's role in facilitating industry-wide adoption of the practice
  - Modus operandi of the Mine Adoption Team
- Much of the material required for the initial agenda points is in the leading practice adoption guide, but these agenda points should be presented and discussed before going through the guide. These presentations and

discussions will provide a context that will be helpful when working through the guide.

- The Mine Adoption Team Manager should consider inviting the MOSH Adoption Team Manager to attend the workshop for assistance in presenting some of the concepts and in answering some of the questions that could arise.

2.3.4.2 Review refine example adoption plan:

- The Mine Adoption Team must properly understand and take ownership of the adoption plan to be implemented. The framework plan provided later in Part 3 of this document must thus be carefully reviewed and adjusted as appropriate to take account of mine and team specific requirements. The adoption guide should then also be adjusted / annotated / and used accordingly.
- The mine team needs to allocate date specific timing to each of the various activities. Particular attention must be given to the time required for arranging access to any intellectual property, capital funds or major equipment, and scheduling early actions to minimise the impact of such time requirements.
- The team should ensure that any adjustments to the example plan do not compromise proper customisation and implementation of the behavioural plans. The MOSH Adoption Team Manager should be consulted in the event of any uncertainty on this point.

2.3.4.3 Identify an appropriate piloting section / area at the mine:

- Initiation of the adoption process at the mine should be piloted in a carefully selected site. The selected site should be:
  - of sufficient size to meaningfully implement all aspects of the leading practice that will be encountered in extending its adoption across the mine, and
  - well managed, and not beset with unusual operational problems.
- Ensuring that these criteria are met will minimise risks and enable adoption challenges to be appropriately addressed.
- Engaging the potential operation manager of the selected section earlier

2.3.4.4 Identify/arrange any specialist technical support considered necessary:

- During the course of reviewing and updating the framework adoption plan the mine team should identify any areas where they consider a specialist technical support necessary.
- Training or specialist support required for handling the direct enquiry and analysis work involved in customising the behavioural plans is dealt with in

part 2 under points 2.3.8.3 and 2.3.8..4. Requirements additional to these should be arranged as appropriate.

2.3.4.5 Agree on critical enabling factors for successful adoption of the practice:

- The Mine Adoption Team and senior management at the mine should be clear about, and agree upon, the factors which are critical enablers for adoption of the practice.
- These factors should be identified by the Mine Adoption Team for discussion and agreement with senior and top management.
- Consideration should be given to factors such as:
  - Understanding and ownership of the adoption process
  - Effective communication with all key stakeholders and operational adopters
  - Adequate allocation of time and resources
  - Effective customisation of the practice and behavioural plans
  - Management involvement, interest and support
  - Union involvement
  - Other factors identified by the Mine Adoption Team.

2.3.4.6 Ensure that sufficient time / resources have been provided:

- At this point the Mine Adoption Team Manager should make an explicit and careful assessment of the time allowed for the project, and of the resources allocated to it.
- The Mine Manager should be advised of the outcome of this review and at that time any shortcomings that cannot be readily addressed by the team should be raised with the Mine Manager.
- Both the Mine manager and the Mine Adoption Team Manager have a special responsibility to ensure that no inappropriate short cuts or omissions occur due to understaffing or the imposition of deadlines that are too tight.

2.3.5. Initiate baseline monitoring programme

2.3.5.1. Identify key measurements to determine performance of the practice:

- Identification and planning of the monitoring process to acquire data to quantify the impact of the leading practice should start as soon as possible after the decision to adopt.
- The key measurements needed to quantitatively indicate the performance and impact of the practice must be identified by the Mine Adoption Team well before adoption of the practice begins.
- Consideration should be given to measuring parameters such as:
  - Relevant OHS indicators

- Operational problems encountered
- Equipment availability
- Non-compliance incidents
- Relevant production indicators
- Absenteeism

- The identified parameters, the procedure and responsibility for making the measurements should be written up in a brief document. The document should also indicate the envisaged analysis and the responsibility for its execution. The document should thus cover:
  - Data collection procedures
  - Quality assurance
  - Data storage
  - Data analysis
- These details must be regarded as an important aspect of the adoption plan and not as a nice to have.

2.3.5.2. Identify key measurements to determine performance of the practice:

- Arrangements to gather the necessary baseline data must be implemented as soon as possible, otherwise the opportunity to credibly quantify the performance / impact of the leading practice will be lost.
- The data routinely collected by the mine may simply be assumed to be adequate. They are unlikely to be fully sufficient for this purpose and additional measurements will probably be necessary.

2.3.6. Establish effective relationship with the COPA

2.3.6.1 Meet with COPA coordinator to establish a working relationship:

- The Mine Adoption Team Manager should meet with the MOSH Adoption Team Manager to clarify the mine's membership of the COPA, and the nature and extent of support and assistance that might be sourced from either the MOSH Adoption Team, the source mine, or COPA members.
- A number of key people at the mine should already have been contacted by the MOSH Adoption Team Manager and some may thus already be members of the COPA. The Mine Adoption Team Manager should become the regular member, with the Behavioural Plans Overseer attending when necessary. It would be appropriate for someone from the mines top management team to also be a member.
- A modus operandi for active and productive membership of the COPA, including obtaining assistance when needed, should be discussed and agreed with MOSH Adoption Team Manager.

2.3.6.2 Secure support / input / training via COPA interaction:

- This must be seen as an on-going activity. Particular needs are likely to arise as the adoption process unfolds and these should be explored through the COPA according to the modus operandi agreed upon in point 2.3.6.1. Active participation in the COPA will help enable this.
- Depending of the skills of identified team members, the need for support through the COPA, in one form or another, could well emerge at an early stage – see point 2.3.4.4. This should be acted on without delay.

2.3.7. Update key stakeholders on progress

2.3.7.1 Provide feedback on implementation challenges / successes to COPA (This must be seen as an on-going activity):

- Detailed feedback should be provided to the COPA on significant difficulties encountered and on key successes achieved.
- Voluntarily sharing of problems encountered and successes achieved should be regarded as an important way of learning and of passing on hard earned experience.

2.3.7.2 Prepare and issue progress updates to key stakeholders (This must be seen as an on-going activity):

- The Mine Adoption Team Manager must ensure that key stakeholders are kept informed of progress.
- Brief progress updates should be prepared and issued regularly to the Union leaders, mine management, and the MOSH Adoption Team Manager.
- Progress on the adoption process should be reported to and discussed with the Mine Manager at least once per month.

2.3.8. Plan and conduct direct enquiries

2.3.8.1 Review / update expert causal chain risk summary:

- The Mine Adoption Team, with the assistance of relevant experts at the mine, should critically review the causal chain expert risk model provided in Appendix A6.
- The expert risk model should be updated to include any important mine specific being addressed by the leading practice that is not reflected in the expert model of Appendix A6.
- Discarded or added aspects should be identified and retained as they may assist the process of customising the behavioural plans.
- In concluding the review process it is essential to ensure that all participants have the same understanding of the risks situation at the mine

that is being addressed by the leading practice. (*It is this expert understanding of the mine's risk situation that allows the team to identify important knowledge gaps or misperceptions that must be addressed through the customised behavioural communication plan*.)

2.3.8.2 Identify adopters and key stakeholders:

- The Mine Adoption Team must identify the adopters and stakeholders that will be involved in the process of adopting the leading practice at the mine. This should be done with the guidance provided by:
  - the list of anticipated adopters and key stakeholders identified in Appendix A7 , and
  - The notes included on the Worksheet of Appendix A8 to facilitate identification of the appropriate people at the mine.

2.3.8.3 Identify persons to conduct direct enquiry interviews:

- Persons trained in conducting direct enquiry interviews should be used to conduct the interviews.
- The mining company's *Group Adoption Coordinator*, if appointed, is expected to maintain a list of persons in the Group who have been trained in direct enquiry interview techniques, and should be contacted to establish whether trained persons can be made available to conduct the interviews.
- In the event that trained persons are not available through with the *Group Adoption Coordinator*, the Mine Adoption Team Manager together with the Behaviour Plans Overseer should select persons for training in direct enquiry interview skills.
- The persons selected should not be directly involved in adopting or operating the leading practice. They should be persons who are most likely to:
  - Cause interviewees to feel comfortable within an interview setting, that is, feel free to speak openly and candidly about their observations and views,
  - Be considered credible by those being interviewed,
  - Diligently complete each scheduled interview on time and in the required manner, and

2.3.8.4 Train and brief the interviewers:

- The Mine Adoption Team Manager should liaise with the MOSH Adoption Team Manager to arrange any required training.
- The trained interviewers should be provided with the briefing material provided in Appendix A9.
- They should collectively be briefed about the leading practice, the risks being addressed, the objectives of the interview process, the procedures and logistics of arranging the interviews, the persons they are scheduled to

interview, and the time scale of the process. They should also be taken through the briefing material provided to them.

- The Behavioural Overseer must ensure that all interviewers know that they must prepare for their interviews by:
  - Studying and discussing the updated summary risk story with an appropriate member of the Mine Adoption Team to ensure that they have a thorough understanding of the risks being addressed by the leading practice.
  - Ensuring that they are fully familiar with the interviewer's briefing and guidance provided in Appendix A9, on conducting a one-on-one direct interview properly.
  - Practicing the interview at least once (perhaps with a mine adoption team member), and finally,
  - Reviewing with them, their understanding of the interview process and how it should be conducted and documented.

2.3.8.5 Select persons to be interviewed:

- The people selected should range across the various categories of adopters and stakeholders in such a way as to ensure good representation of those most involved in accomplishing adoption of the practice.
- The number of persons to be interviewed should be between 25 and 30. This has been shown to be an appropriate number to get meaningful interview results.
- The sample should be drawn from across the entire mine and not just the site selected to pilot the adoption process.
- Identifiers for the selected interviewees should be entered into the worksheet of Appendix A8. The names of those to be interviewed should not be entered as they should be kept confidential to the Mine Adoption Team.

2.3.8.6 Conduct the interviews:

- The direct enquiry interview questions to be used in the direct enquiry interviews are provided in Appendix A10. The interview seeks to establish the following:
  - Stakeholders/ Adopters beliefs about the causes and outcomes of the risk
  - Stakeholders/ Adopters beliefs about the leading practice and how best to protect people from the risk, and
  - Stakeholders/Adopters beliefs about key leader behaviours and behavioural communication needs

- Each interviewer should schedule all of their allotted interviews to be conducted one-on-one in a place suitably private and free from noise and other distractions.
- Interviewers should ask all questions fully, prompting for as complete and in-depth answers as possible. It is the prompting aspect of the interviewing procedure that should be focused upon in the practice sessions
- Interview responses should be carefully documented at the time of the interview using the Interview Protocols of Appendix A10 and the Interviewee's own words. It should be typed up to facilitate the analysis process.
- Recorders may be used to assist the process of accurately capturing the interviewees responses, but only if the interviewee is explicitly asked and clearly gives approval.

2.3.9. Customise generic behavioural plans

2.3.9.1 Identify persons to analyse the interview results:

- Persons capable of reliably summarising the interview results must be chosen to undertake this work. A number of the members of the Mine Adoption Team should be well suited for this task.
- Alternatively, the task may be assigned to two or more individuals associated with the adoption effort, but not to only one person.

2.3.9.2 Analyse results of direct enquiry interviews:

- Each analyst must ensure that they have a sound understanding and familiarity with the updated expert risk model, as well as the generic mental models report provided in Appendix A12.
- Analysts must carefully read each set of interview responses and make notes against key questions posed in the direct enquiries analysis worksheet of Appendix A11.
- Working alone, each analyst should read and note their observations against the questions posed in the analysis worksheet.
- Once all interviews have been analysed in this way, the analysts should meet in a group session to share and compare the results of their analyses. The analysts should identify where their individual analyses agree, and why, and where they disagree and why. Unresolved disagreements between analysts should be noted.
- As a group the analysts should address the main questions in the worksheet for analysis, writing mutually agreed detailed answers to the questions, and identifying the most influential beliefs, and their underlying rationale in the process of doing so.

- As a final check, the analysts should re-read the interviews to ensure that they have adequately captured and described the key beliefs expressed in the answers to the questions asked of the stakeholders and adopters.
- Using their completed direct enquiries analysis worksheet Appendix A11 Analysis Worksheet, and with a view to identifying any important differences, the results of their analyses should be compared with the updated expert risk model and the generic mental models report provided in Appendix A12. It is these differences that need to be taken into account in customising the behavioural plans.

2.3.9.3.1 Customise generic leadership behaviour and behavioural communication plans:

- The Mine Adoption Team Manager and the Behavioural Plans Overseer must ensure that they fully understand the leadership behaviour and the behavioural communication plans and their derivation, before proceeding with the process of customising the plan. These plans are provided in Part 3.
- Customisation of the generic behavioural plan must be based strictly on answers to the guiding questions in Appendix A11 and the analysis, an example provided in Appendix A12.
- New material to be introduced into either of the plans should be expressed in the form of behavioural outcomes - actions that can be observed (what should they be seen to do?) or the expression of an understanding or beliefs in particular circumstances (what should they be heard to say?).
- In customising the behavioural communication plans the contents of each communication should be adjusted to take account of the answers to the questions in Appendix A11, and also the modes of communication that are available at the mine
- The material in the generic plans Appendix A12 should be taken as guidance on the formulation of new content. Once updated each of the customised plans should be checked and adjusted to ensure that it is both coherent and self-consistent.
- The Mine Adoption Team Manager should liaise with the MOSH Adoption Team Manager to explore the possibility of having the customised plan reviewed, by either the MOSH Adoption Team Manager or by an appropriate Specialist at the MOSH Learning Hub.

2.3.9.4 Ensure that customisation checks have been fully satisfied:

- The Behavioural Plans Overseer must ensure that that each of the 8 steps in the process of customising the behavioural plans has been properly done before allowing the team to progress to the next.

- On completion of the customisation process, a final overall check should be done jointly by the Mine Adoption Team Manager and the Behaviour Plans Overseer

2.3.9.5 Identify any new special communication requirements:

- The Mine Adoption Team should critically review the customised plans in relation to the example materials provided with this guide to identify any new communication material considered necessary, such as signage, posters, slides, video etc.

2.3.9.6 Secure top management approval of customised behavioural plans:

- Given the nature of the behavioural communication and leadership behaviour plans, and their potential impact on the management culture at the mine, the customised behavioural plans should be presented in detail to top management to get their buy-in and approval.
- The Mine Manager should be asked to explicitly approve implementation of the plans
- In presenting the plans, the results of the direct enquiry process should be highlighted – in particular the generic mental model and the new mine specific findings should be brought out and their broad implications for the mine discussed.

2.3.10. Harmonise leading practice with mine standards

2.3.10.1 Review leading practice against current mine operational standards:

- The operational details of the leading practice must be reviewed in relation to mine standards to identify any potential conflicts or operational problems.
- The practicality and acceptability of the operational details in adopting the leading practice should also be tested and confirmed with the operational managers at the mine as outlined under section 2.3.4.3.

2.3.10.2 Identify non-core adjustments to harmonise practice with mine standards:

- Any changes or adjustments to the leading practice that need to be made to harmonise the practice with mine standards must be carefully assessed to ensure that they do not detract from the essence and effectiveness of the leading practice.
- In particular the identified changes must not impact negatively on the core aspects of the leading practice.
- In the event that that this assessment cannot be made with certainty, the MOSH Adoption Team Manager should be consulted.

2.3.10.3 Adjust leading practice to harmonise with mine standards:

- The Mine Adoption Team should work out when and how best to implement and test the identified adjustments to harmonise the leading practice with mine standards.
- If possible, this should be done before initiating the full piloting process.
- Details of successfully implemented harmonisation adjustments should be shared with members of the COPA.

2.3.11. Assess risks and develop final mine plan for approval

2.3.11.1 Plan roll-out of adoption across the mine:

- The Mine Adoption Team needs to initiate planning of the process for extending adoption of the leading practice across the mine at an early stage. Such planning should involve:
  - Obtaining input from the relevant operational managers at the mine.
  - Scheduling of feedback sessions to senior management and operational managers on progress, problems encountered and solutions found – see 2.3.7.
  - Arrangements for operational persons to visit the piloting site at appropriate times.
  - Scheduling of the envisaged roll-out activities.

2.3.11.2 Conduct "what if" exercise and adjust plans as necessary:

- Most mines routinely conduct a “what if” exercise in planning their project work and a similar due diligence exercise is envisaged here, to identify and put in place any contingency plans considered necessary.
- Each of the implementation actions should be systematically considered by the Mine Adoption Team in a session arranged for this purpose.
- The adoption implementation plans should be adjusted as necessary.

2.3.11.3 Conduct risk assessment of planned changes:

- In many respects the “what if” exercise should deliver the same outcomes as a systematic risk assessment of the planned changes. The risk assessment must however involve a more holistic assessment. In practice the two exercises may be combined and be outcomes from the same session of the Mine Adoption Team.

2.3.11.4 Update and finalise adoption plan:

- Having completed the planning process the adoption plan should be updated to reflect any changes considered necessary and finalised for presentation to top management at the mine. The plan should be in a convenient format and form for on-going review and use.

2.3.11.5 Clarify and agree criteria and time scale for completion of the roll out plan:

- The Mine Adoption Team should critically review the finalised adoption plan and agree the criteria and timescale for completion of the adoption process.
- It is important to specify criteria for completion of the adoption process so that both the Mine Adoption Team and Mine Management have the same understanding of when the adoption process is complete.
- The criteria for completion should include successful mine-wide adoption to the point where the leading practice is operating to the satisfaction of the responsible operational management.

2.3.11.6 Secure top management sign-off of adoption plan:

- In the event that top management has been kept properly informed of progress and developments, a formal sign-off on the implementation plan may appear to be unnecessary at this stage. The temptation to skip this step should be resisted.
- Arrangements should thus be made to present the finalised adoption plan to top management in order to maintain their involvement and support.

2.3.12. Plan and develop training and communication materials

2.3.12.1 Plan training necessary for successful adoption:

- The Mine Adoption Team Manager, the Behaviour Plans Overseer, the Training Manager and the Production Manager or his nominee should together plan the training necessary for successful adoption of the leading practice.
- The starting point of this planning process should be an in-depth consideration of the following:
  - The customised leadership behaviour and behavioural communication plans, to identify key elements that need to be built into the training materials for each level of the hierarchy involved in adoption of the practice.
  - The example training materials included in this guide.
  - Any special training requirements identified by equipment or other service providers associated with supply of the leading practice.
- The mine's existing training arrangements should also be considered in relation to the findings from the above to clearly identify the scope and content of the additional training considered necessary for successful adoption.
- A schedule of who is to receive what training and when should be developed and agreed, initially for those involved in the pilot adoption and others involved in adoption of the practice as it is rolled-out across the mine.

2.3.12.2 Prepare training documentation:

- The Mine Adoption Team Manager, the Training Manager, and the Behavioural Plans Overseer should agree on the roles and responsibilities as well as procedures for preparing the necessary training material and training lesson plans.
- The Training Manager and the Behavioural Plans Overseer should oversee the process of developing the necessary training documents, and for ensuring a quality outcome.

2.3.12.3 Develop required behavioural communications material:

- The Behavioural Plans Overseer and the person at the mine responsible for developing mine communications material should meet to review and decide upon how best to produce all of the behavioural communications materials that arise from the behavioural communication and leadership behaviour plans. Much of this will be for use in the training programme, but some should also be for use elsewhere, such as in the briefing sessions and in various other operational situations not covered in the training programme.
- The Behavioural Plans Overseer must ensure that materials produced are of acceptable quality, and that they are produced in good time for use as planned.

2.3.12.4 Prepare documentation / signage to assist in implementing the practice:

- The Mine Adoption Team Manager and the Behaviour Plans Overseer must together identify and arrange for production any additional documents, posters, and signage needed to secure successful adoption of the leading practice.
- Together they must ensure that all of the communication materials for successful implementation of the adoption process have been identified and appropriately addressed in one way or another.

2.3.13. Brief and train key mine persons

2.3.13.1 Brief supervisory levels involved in adopting the practice:

- The Mine Adoption Team Manager should discuss and agree arrangements for briefing supervisors and workers involved in adopting the leading practice.
- The first of the two briefings should be held soon after identifying the key stakeholders and adopters involved in the adoption process. The primary point of the initial briefing should be to explain the direct enquiry process to alert them to the fact that some key people would be randomly selected to participate in confidential interviews which will make input into the adoption process.

- It should also be explained that in due course all people involved in adoption of the leading practice would receive appropriate training.
- A brief description of the practice should also be given and an opportunity provided for any uncertainties to be raised and addressed either then or in follow-up sessions.
- The need for all mine workers to be properly briefed about what lies ahead should also be appropriately covered.
- The second of the two briefings should be held prior to implementation of the training programme. The Mine Adoption Team Manager should brief all supervisors including operational managers of the training and other arrangements relevant to implementation of the adoption process.
- As part of this briefing, and as an *aide memoir*, the supervisors should be provided with a schedule setting out details and timing of their and their staff's training, as well as a brief document summarising key operational aspects of the adoption process.

2.3.13.2 Brief the workers involved in adopting the practice:

- The first of the two briefings by supervisors must be focused on informing staff about the direct enquiry process to obtain input into the adoption process, that some staff from all levels will be invited to participate, and that all persons involved with the practice would be appropriately trained prior to its adoption.
- A brief description of the practice should also be given and an opportunity provided for any uncertainties to be raised and addressed, either then or in follow-up sessions if necessary.
- In the second of the two briefings, details about the nature and timing of the impending training should be provided, along with any other detail considered necessary prior to the training sessions. The briefing may also include delivery of certain elements of the behavioural communications plan.

2.3.13.3 Implement aspects of the two behavioural plans not included in training:

- Much of the behavioural communication and leadership behaviour plans will have been integrated into the training programme in one way or another (some for delivery directly by the trainer, and some to be provided to supervisors for their use in operational communications with those who report to them).
- Those aspects of the two behavioural plans that are not included in the training programme should be identified by the Mine Adoption Team, along with the persons responsible for their delivery or for ensuring that they are implemented. This may involve persons at higher levels of management.

- The Mine Adoption Team Manager along with the Behaviour Plans Overseer should arrange to meet with these people individually or collectively as appropriate to properly brief them on what is required, to clarify any points of uncertainty, and to provide them with the necessary communication material.
- Follow up sessions with various individuals should be arranged as necessary to ensure a full understanding of what is required.

2.3.13.4 Train the persons involved in adopting the practice:

- Initiate the training process according to the training programme that has been developed, with the initial focus being on those who require training to enable successful adoption of the leading practice at the piloting site.
- Follow-on with the training programme according to plan, which should extend right through to completion of the mine-wide roll-out process for the leading practice.

2.3.14. Pilot adoption of the practice

2.3.14.1 Arrange access to any required intellectual property:

- As indicated in the example adoption plan, access to any required intellectual property should be one of the first actions taken by the Mine Adoption Team. This requirement should seldom arise. However, when it does, the need to obtain such access and the process for doing so should be highlighted at the time of presenting the case to top management for adopting the leading practice.
- The Mine Adoption Team Manager, in liaison with the *Group Adoption Coordinator* and with the support of legal counsel when necessary, should secure access to the required intellectual property if the Group has not already done so.

2.3.14.2 Arrange purchase of the required equipment:

- As with intellectual property, arrangements for the purchase of the equipment may need to start at the same time with that of arranging access to any required intellectual property, particularly if long delivery times apply, or if the purchase is subject to a lengthy capital approval process.
- Depending on the time scale on the procurement process, scheduling of the various adoption activities may need to be substantially adjusted, and perhaps to some extent reordered.

2.3.14.3 Set up the required maintenance arrangements:

- The Mine Adoption Team Manager must arrange for any required maintenance arrangements to be set up as an integral part of the leading practice, as outlined in Part 3 of this guide.
- In doing so, any aspects of the behavioural plans that are applicable to the maintenance arrangements should also be put in place.

2.3.14.4 Conduct preliminary pilot-scale adoption of the practice:

- Most of the arrangements for implementing the practice at the pilot site should already have been taken through the training or briefing activities outlined above.
- The Mine Adoption Team Manager should meet with the team of supervisors and operational managers responsible for installing the required equipment and or procedures to arrange adopt the practice, and to deal with any other issues that need attention, including those raised by the operational supervisors.

2.3.15. Monitor, evaluate and report on performance

2.3.15.1 Set up monitoring and data collection arrangements:

- The Mine Adoption Team manager should ensure that effective arrangements are put in place for making and recording the necessary measurements, and for gathering any other data needed to assess the performance and impact of the leading practice being adopted.

2.3.15.2 Implement the monitoring and reporting programme:

- The Mine Adoption Team Manager must ensure consistent implementation of the monitoring and reporting arrangements that have been put in place, and that quality gathered data is being gathered, and regularly reported.

2.3.15.3 Store key data in an electronic data base for later analysis:

- The Mine Adoption Team Manager should ensure that all data is entered into an electronic data base for later analysis. This should be seen as an integral part of activities 2.3.15.1 and 2.3.15.2

2.3.15.4 Analyse data to establish the performance and impact of the practice:

- Once sufficient data has been collected, the Mine Adoption Team Manager should arrange for the data to be analysed to establish the performance of the practice and the impact that it has had at the mine.
- This should be written up in the form of a brief report for presentation to key stakeholders, starting with top management, who should be given the chance to comment on the report before it is finalised for wider distribution.

- The report should then be distributed to all key stakeholders, including those directly involved in the adoption process. Supervisors should be tasked with sharing outcomes with their staff at the earliest opportunity.
- At least one follow up report should be prepared within the next 6 to 12 months to identify any longer-term impacts, and consistency of the performance achieved.

2.3.15.5 Report on adoption and performance achieved - to COPA:

- In the example adoption plan provided in Appendix A1, a number of the activities are identified as key milestones. The Mine Adoption Team Manager should advise the MOSH Adoption Team Manager when each of these key milestone activities have been completed. This will assist in keeping the COPA and Executive Management in Industry advised of the extent to which the leading practice has been adopted at mines.
- On completion of the brief report referred to in point 2.3.15.4, the Mine Adoption Team Manager should arrange to make a presentation at a COPA meeting about the mine's experience in adopting the leading practice.

2.3.16. Finalise and implement mine-wide roll-out plan

2.3.16.1 Decide/document any refinement to practice prior to roll-out:

- The Mine Adoption Team Manager must monitor progress at the piloting site closely to identify any particular difficulties encountered. Any special measures taken to address such difficulties should be carefully documented.
- Depending on operating experience during of the piloting phase, at an appropriate time the Mine Adoption Team Manager should convene a meeting to review the adoption experience and consider and decide whether any refinements to the practice are necessary.

2.3.16.2 Introduce and confirm effectiveness of identified refinements:

- In the event that some form of refinement is considered necessary, the Mine Adoption Team should arrange for any necessary refinements to be implemented and tested until their effectiveness has been satisfactorily confirmed.
- The details of the refinements introduced should then be documented in detail to ensure consistent implementation as the practice is rolled-out across the mine. Details of the refinement should be provided to the MOSH Adoption Team Manager for presentation at a future COPA meeting.

2.3.16.3 Finalise plans and commence mine-wide roll-out:

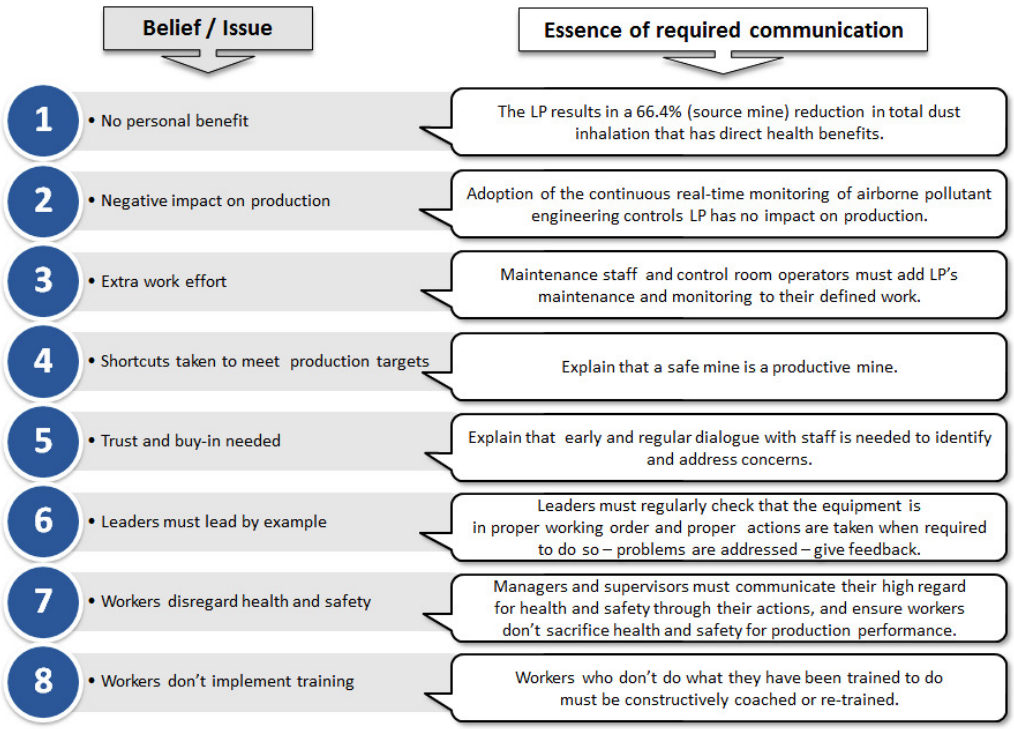
- As soon as the leading practice is working satisfactorily at the pilot site, the roll-out process should be initiated.
- This should begin with a critical review of the roll-out plans developed earlier, to identify any adjustments that may need to be made to take account of experience to date.
- Once these adjustments have been made and effectively communicated to all concerned, implementation of the roll-out plan should proceed.

Part 3 – BEHAVIOURAL PLAN

3.1 GENERIC LP BEHAVIOURAL PLANS

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

BEHAVIOURAL COMMUNICATION REQUIREMENTS



Communication materials

It is the responsibility of the mine to develop the required communication material to effectively (convincingly) convey the substance of the key messages set out in this generic behavioural communication plan which has been customized for the Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls LP.

It is 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 Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls LP are set out below. The provision of appropriate briefing and training will be necessary to achieve the leadership behaviours identified in this plan

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 Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls LP.

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

LEADERSHIP BEHAVIOUR REQUIREMENTS

A Antecedents	B Behaviour
Operational adopters (Control Room Operators , Instrument Technician), workers in surrounding area of monitors)	
Require:	Responsibilities:
Operational and maintenance training on new LP	Install system as instructed – no short cuts
Briefing before it's implemented	Report any problems with LP
Regular performance enquiries by supervisors	Request explanations to ensure full understanding

A Antecedents	B Behaviour
First-level Supervisors (Occupational Environmental Officers, Ventilation Shiftboss and Unions):	
Require:	Responsibilities:
Briefing on operation, installation and required maintenance of new LP	Monitor equipment and maintenance crew's performance
Briefing before it's implemented	Ensure maintenance crew receive necessary training/instruction
Regular meetings with next level supervisor	Ensure no short cuts are taken
	Prompt action on any reported problems
	Provide immediate positive feedback on observing desired behaviour
	Provide constructive coaching on observing sub-standard behaviour

A Antecedents	B Behaviour
Second-level Supervisors (Shift Boss/Mine Overseer, Engineer, Hygienist):	
Require:	Responsibilities:
Briefing before LP is implemented	Ensure no short cuts are taken and practice is understood
Regular meetings with next level supervisor	Ensure operators and supervisors receive necessary training/instruction
	Enquire about SLP's performance/problems at regular meetings with supervisors
	Provide immediate positive feedback on observing desired behaviour
	Provide constructive coaching on observing sub-standard behaviour

C Consequence

Everyone's responsibilities:
Responsibilities:
Provide immediate positive feedback on observing desired behaviour
Constructive coaching to address observed problems – no abuse
Special recognition for exceptional performance

3.2 BEHAVIOURAL GUIDANCE DOCUMENT

Introduction and Purpose – A Platform for Change

The purpose of this document is to provide guidance ***towards building a platform for behavioural change*** when initiating health and safety improvements practices, in particular MOSH Leading Practices.

Health and Safety is acknowledged as a ***shared value*** in the mining industry and provide the opportunity and responsibility for all stakeholders to use their unique ***skills-sets, talents and experience*** in building this platform needed for sustained change, in an industry striving for zero harm.

These identified guidelines are documented as part of the [1]"Kopanang Continuous Real Time Monitoring of Airborne Pollutant Engineering Controls – A Source Mine Report" – a case study of the key learning's as part of their implementation and adoption process.

Key Learning's on how a platform for behavioural change should be initiated were documented as well as experiences shared from ***other industry adoption processes***. Brief reverence is also made to relevant ***academic resources*** in the field of behavioural sciences are referenced in footnote areas. The information gathered were utilised towards building a solid set of guidelines for a change platform when dealing with the behavioural side of the MOSH Leading Practices and the adoption of these practices.

In essence the platform for behavioural change requires a solution impacting on health and safety, mostly of ***technical nature and the behavioural process*** as a holistic approach to introduce the proposed change in practice. A MOSH leading practice however does not exist if this perfectly designed process or practice, that no one follows, produces no improvement in performance. The key is that the benefit of the practice is only realized once individuals embrace and adopt it and change their behaviour accordingly.

It is envisaged that MOSH leading practices adoption process will create this change platform and that practices will not be implemented in a mechanistic manner alone but embrace the essence of stakeholder ***"particip-action"*** towards identifying meaningful solutions to real zero harm challenges.

To build a platform for change requires a methodology which can guide us through the critical stages as we learn from each other and participate in building a meaningful behavioural practice.

Statement of Opportunity - SOAR

The [2]Dust Risk Story highlight the reality of working in an industry where we mine and beneficiate the richness of our earth. To do so without harm to the environment and the people is the zero harm quest. The Dust Risk Story was developed by industry experts and make us aware of the combination of the useful vs the harmful

resources and the associated risks we deal with in the mining process and the story further lead us to the identification of the best solution known at this stage, control the dust at source – a focussed approach on the effectiveness and efficiency of engineering controls for airborne pollutants. The specific practice as a solution required the source mine investigation team to move the strategic conversation from a traditional SWOT planning and documentation approach towards a futuristic or forward-looking investigation methodology referred to as [3]SOAR.

This fact finding methodology lead us into the Kopanang Dust Story with an open agenda, a methodology to determine the effectiveness of the change platform and the manner in which the practice and associated behavioural processes were introduced. The source mine investigation team realised that engagement and appreciative inquiry will be the key ingredient to elicit information and key learnings. The statement of opportunity was to identify what we have done at Kopanang and how the practice was approached through structuring the investigation using the SOAR approach as explained in the table below:

SWOT ANALYSIS	SOAR APPROACH
Analysis orientated	Action orientated
Weaknesses and Threats focus	Strengths and opportunity focus
Competition focus – *just be better*	Possibility focus – *Be the best*
Incremental improvement	Innovation and breakthroughs
Top down	Engagement of all levels
Focus on Analysis Planning	Focus on planning implementation
Energy depleting – *There are so many weaknesses and threats!*	Energy creating – *We are good and can become great!*
Attention to gaps	Attention to results

[1] Kopanang Source Mine Report dated November 2014
[2] Dust Adoption Team notes dated September 2012
[3] Stavros, Jacqueline M.; Hinrichs, Gina; Hammond, Sue Annis (2009-06-21). The Thin Book of SOAR; Building Strengths-Based Strategy (Kindle Locations 178-179). Thin Book Publishing. Kindle Edition

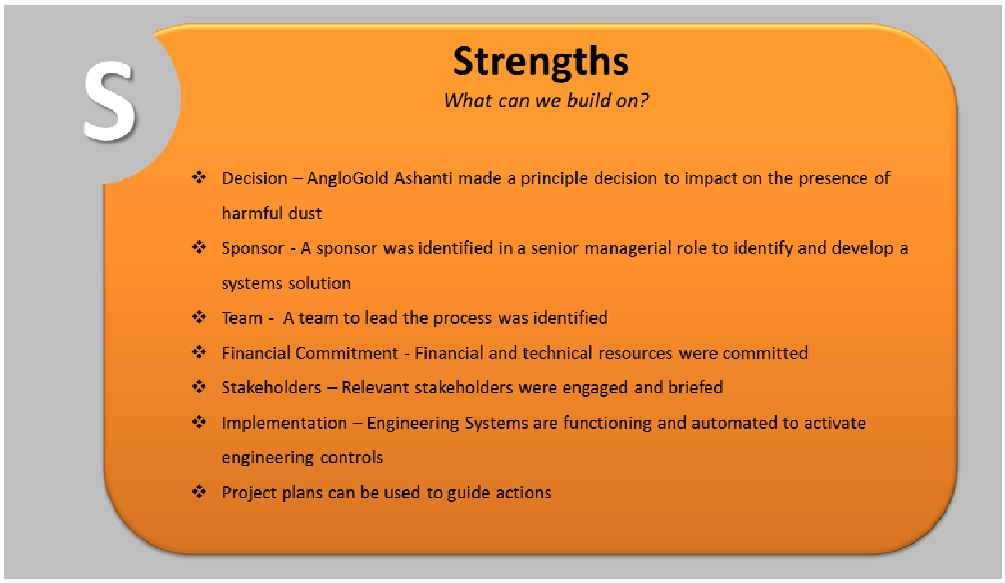
The SOAR approach is in its essence a conversation approach to elicit information and report that high performing teams talk to each other differently than low performing teams. High performing teams are more positive, ask more questions, and are more focused outside of themselves (other-focused). These are also the characteristics of SOAR's strength focused strategic conversations. SOAR is a way to help people learn how to have positive and other-focused inquiry. The opportunity of the dust-risk story was to explore from a more ***strengths-based approach*** when dealing with the behavioural side of the adoption process.

Source Mine Behavioural Investigation Approach Followed

The process to identify and understand the behavioural processes followed commenced with a planning session with management stakeholders whom were involved during the initiation and execution phases of real time dust [4]monitoring . The second opportunity to elicit information was during interviews held at worksites to construct the [5]ABC analysis and discussion opportunities were used to engage with various stakeholders, mimic control room operators responsible for monitoring function in specific. A third opportunity to elicit information involved an [6]underground visit and opportunity to engage with workers in the area where engineering control units were installed and actual measuring are taken place.

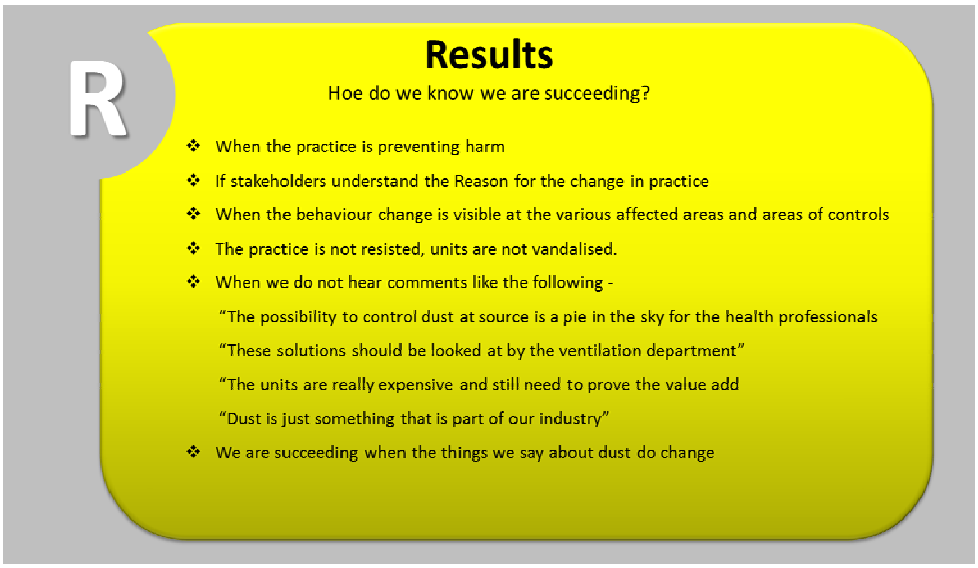
The SOAR methodology as indicated as **S**trengths, **O**pportunities, **A**spirations and **R**esults were used as a framework for gathering and presenting information of these investigations as presented below.

[4] Kopanang Leading Practice Planning session dated 21 July 2014
[5] Kopanang ABC analysis reports dated August 2014
[6] Kopanang Underground visit report dated September 2014


S
Strengths
What can we build on?
Decision – AngloGold Ashanti made a principle decision to impact on the presence of harmful dust
Sponsor - A sponsor was identified in a senior managerial role to identify and develop a systems solution
Team - A team to lead the process was identified
Financial Commitment - Financial and technical resources were committed
Stakeholders – Relevant stakeholders were engaged and briefed
Implementation – Engineering Systems are functioning and automated to activate engineering controls
Project plans can be used to guide actions

O
Opportunities
What are our stakeholders asking for?
Engagement – Unions asked to be fully informed throughout the process and continuation of role players impact on understanding
Understanding – Employees request more clarification of the purpose and benefit of the installed units in their area of work
Induction and Training - A more integrated manner to inform employees about dust and controls and specific workplace induction process
Managerial Routines - Availability of information at different functions to be able to openly engage with employees around the issue of dust
Communicate success and provide review information
Ask us for our opinion and manners to make the solutions work

A
Aspirations
What do we really care about?
Top Executive and sponsor support to be more vocal around health management and prevention
More regular engagements on the technical and behavioural aspects as the team mostly focussed on technical implementation
Greater multi-stakeholder involvement to ensure that the required practice is reinforced from various angles
A champion for change and a project leader do differ and a practice require both
Engagement and understanding requires support from a communication expert and a support function
Clarify roles and responsibilities and differentiate on the different technical and behavioural tasks
Ensure that the practice is technically sound and resolve issues before commencing



The SOAR approach reminds us that impact is possible when a variety of stakeholders enters into conversation and are engaged and working together in a focussed manner to "build a platform for change and find solutions.

Leading Practice Adoption Process

The leading practice adoption process is fundamentally a process leading the industry to sustained change. The platform for change is created through conversation and seeking zero harm practices and solutions – being a combination of technical and behavioural. The LPAP requires the presence of a technical solution or practice and a behavioural change process facilitated through a planned behavioural communication plan and leadership behavioural plan. [7]The source mine used a project management framework to plan the technical implementation -

1. Identification of the need
2. Procurement/acquiring instrumentation for managing the risk
3. Stakeholder engagement and communication
4. Installation of units and set-up of controls
5. Coaching and training of involved employees
6. Testing the instruments and controls
7. Problem solving and OEM engagement
8. Monitoring and feedback

It is advisable to use project management principles for example PMBOK to plan for good technical execution and can improve the planning and execution phases.

[7] Kopanang Leading Practice Planning session dated 21 July 2014

The Kopanang dust story is no different as the success of adopting the real time dust monitoring engineering controls is about people. It requires the individuals as listed in the [8]stakeholder map to get on board with the change and move towards developing proficiency in the practice, in other words the speed of adoption will determine if the benefits of the practice is realized.

The [9]stakeholders should be guided through coaching and resistance management and the current state of adoption should be measured consistently. We also realise that the various individuals will move at their own pace and a one size fits all solutions does not address the full range of behavioural change.

At Kopanang we concluded that:

1. People need to understand the reason for the change.
2. Anxiety and fear are powerful emotions that by themselves create resistance to change.
3. Individuals in the stakeholder map need to make personal values, skills and attitudinal changes.
4. Adoption can only realize if the individuals collectively change
5. A platform for managing the change enables the change towards realization of the benefit of the practice.
6. In the absence of a good technical project plan, the engagement process will cause resistance

[8] Dust Leading Practice Adoption Guide
[9] Dust Leading Practice Adoption Guide

One page summary of adoption process

Important note: Most of the activities described below overlap and need to be undertaken in parallel. Guidance on the sequence of their initiation is provided in an example plan and a chronological check list, which the mine adoption team must review and update according to the mine's needs.

1. **Facilitate adoption decision**
   The mine must properly investigate the case for adopting the leading practice – a check-box investigation process is provided. The decision must be endorsed by senior general manager and the completed form sent to the MOSH Adoption Team Manager. More

2. **Secure widespread support for adoption**
   The support of regional and mine level union representatives must be secured as soon as possible and a mine-wide briefing note issued to advise of the decision to adopt the leading practice. More

3. **Establish an effective adoption team**
   A suitable person must be tasked with leading the mine adoption team, and another to assist in overseeing customisation of the behavioural plans that form part of the leading practice. Training of these persons should be discussed / arranged through the MOSH Adoption Team Manager. The Mine Adoption Team Manager must ensure establishment of a multi-disciplinary team with the competencies required for successful adoption of the practice. More

4. **Prepare first version adoption plan**
   The Mine Adoption Team Manager must arrange a team workshop to ensure that all team members have a common understanding of the adoption process and to prepare an initial adoption plan. An example plan and process check-list is provided. At this stage the team must select the piloting area for the practice, schedule acquisition of the practice and agree the critical enablers for successful adoption. The MOSH Adoption Team Manager can assist with this workshop. More

5. **Initiate monitoring programme**
   The key measurements needed to quantify performance and impacts must be identified at an early stage collection of the necessary base-line data must be initiated as soon as possible. More

6. **Establish effective relationship with COPA**
   A meeting with the MOSH Adoption Team Manager should be arranged as soon as possible after the decision to adopt to set up appropriate COPA membership and arrangements for obtaining support, training and other assistance through the COPA and its members. More

7. **Update key stakeholders on progress**
   Arrangements for keeping key stakeholders informed of progress, challenges and key developments must be established at an early stage to pave the way for eager adoption. This should include top management at the mine and the COPA. More

8. **Plan and conduct direct enquires**
   A common expert understanding of the risk situation must be established as a datum for identifying any gaps or misunderstanding at the mine. The generic expert risk summary must therefore be reviewed and updated. Key persons involved in adopting the practice must be identified and about 30 people from all levels identified for direct enquiry interviews – Worksheet. Most importantly, suitable persons must be selected, trained and properly briefed to conduct the interviews. Only then should the interviews be conducted using the questions provided. More

9. **Customise generic behavioural plans**
   Suitable persons must be selected to analyse the interview results using the guidance provided in an analysis worksheet. The results must then be compared to the updated expert risk summary, the generic mental models report, and the generic behavioural communication and leadership behaviour plans to identify any adjustments needed. Having made the identified adjustments the new communication requirements should be identified. The updated behavioural plans should then be presented to top management for approval. More

10. **Harmonise practice with mine standards**
    The technical elements of the leading practice must also be reviewed and adjusted to ensure that the practice does not result in undue disruption. Adjustments needed to harmonise the practice with mine standards should be identified and introduced, provided that they do not compromise the core-elements of the practice. More

11. **Develop approved mine-wide adoption plan**
    Having customised the three legs of the leading practice to take account of mine specific circumstances, the adoption team must conduct a detailed risk assessment of the planned changes. Identified risks must be addressed and mine-wide roll-out planned. The initial adoption plan should then be reviewed, updated and finalised for sign-off by top management. More

12. **Develop training and communication materials**
    The customised behavioural plans and technical elements and supplier documents must be reviewed to carefully identify and plan the required training and both worker and supervisory levels. The training schedules should then be established and the training documentation and training lesson plans prepared. Arrangements must be made to develop the required behavioural communication material and to prepare any special documentation of signage needed for successful adoption. More

13. **Brief and train key mine persons**
    Prior to implementing the training programme all supervisory levels and the workers should be briefed about the training and adoption programme. Aspects of the behavioural communication not included in the training programme should be implemented in these briefing sessions and In other activities as appropriate. The required training should then be provided as planned. More

14. **Pilot adoption of the practice**
    Access to intellectual property and purchase of the required equipment must be arranged as early in the adoption process as is reasonably possible to minimise delays due to long delivery times. The necessary maintenance infrastructure / arrangements must also be set up in good time so that adoption of the practice is not delayed. Adoption at the piloting site should commence on completion of the briefing and training. More

15. **Monitor, evaluate and report on performance and impacts**
    Procedures schedules and responsibilities for making, recording and reporting on the necessary measurements to monitor and determine the performance of the practice must be set up and implemented. The performance and impact of the leading practice should be written up and presented to management and to the COPA. More

16. **Finalise and implement mine-wide roll-out plans**
    Once the leading practice has been successfully adopted at the piloting site the mine adoption team need to test and document any refinements to the practice considered necessary, and then finalise and implement the plans for mine-wide roll-out of the leading practice. More

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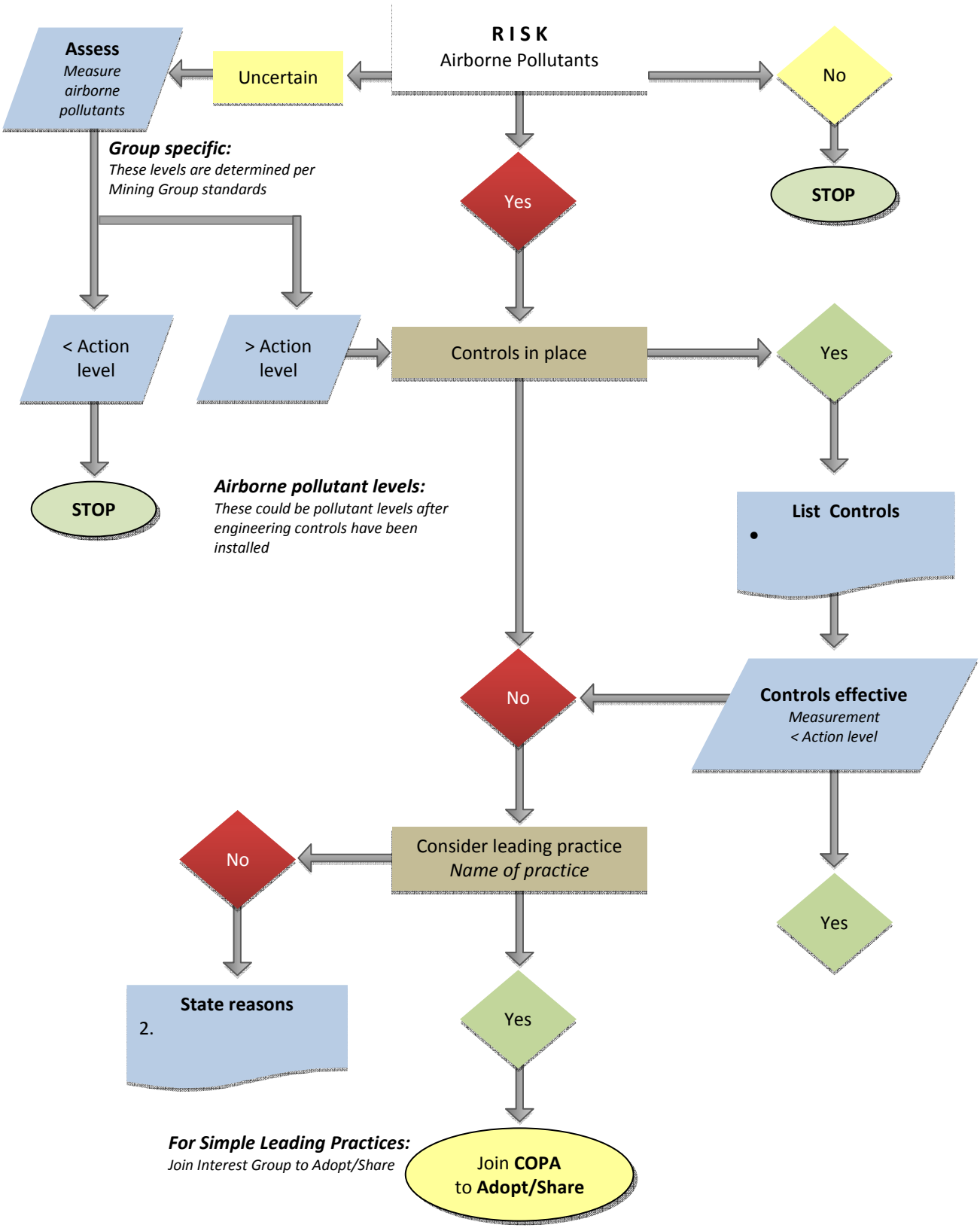
Appendix A1

Framework of overall adoption plan

	Activity (See Guide sections G1 to G16 for guidance)	Weeks 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Comment
1	**Facilitate adoption decision**																	
	1.1-Prepare and present case for adopting the leading practice at the mine.																	
	1.2-Obtain top management decision about adoption of the practice																	Key milestone T97
2	**Secure support for adoption**																	
	2.1-Secure support of regional and mine level union representatives																	
	2.2-Issue written mine-wide briefing note advising of decision to adopt																	
3	**Establish and effective mine adoption team**																	
	3.1-Identify and appoint a suitable project leader / champion																	
	3.2-Identify person to oversee customisation of behavioural plans																	
	3.3-Train project leader and behavioural plans overseer																	
	3.4-Secure establishment of an appropriate adoption team at the mine																	Key milestone T98
	3.5-Provide adoption team with copies of leading practice adoption guide																	
4	**Prepare initial plan for adoption**																	
	4.1-Workshop leading practice adoption guide - mine project team																	
	4.2-Review / refine example adoption plan																	Key milestone T100
	4.3-Identify an appropriate piloting section / area at the mine																	
	4.4-Identify/arrange specialist technical support considered necessary																	
	4.5-Agree critical enabling factors for successful adoption of the practice																	
	4.6-Ensure that sufficient time / resources have been provided																	
5	**Initiate baseline monitoring programme**																	
	5.1-Identify key measurements to determine performance of the practice																	
	5.2-Initiate collection of baseline data																	
6	**Establish effective relationship with the COPA**																	
	6.1-Meet with COPA coordinator to establish working relationship																	
	6.2-secure support / input / secondment / training via COPA interaction																	
7	**Update key stakeholders on progress**																	
	7.1-Provide feedback on adoption challenges / successes to COPA																	
	7.2-Prepare and issue progress updates to key stakeholders																	
8	**Plan and conduct direct enquiries**																	
	8.1-Review / update expert causal chain risk summary																	
	8.2-Identify adopters and key stakeholders																	
	8.3-Identify persons to conduct direct enquiry interviews																	
	8.4-Train and brief the interviewers																	
	8.5-Select persons to be interviewed																	
	8.6-Conduct the interviews																	Key milestone T103
9	**Customise generic behavioural plans**																	
	9.1-Identify persons to analyse the interview results																	
	9.2-Analyse results of direct enquiry interviews																	Key milestone T105
	9.3-Customise leadership behaviour & behavioural communication plans																	Key milestone T104
	9.4-Ensure that customisation checks have been fully satisfied																	Including NORMS
	9.5-Identify any new special communication requirements																	
	9.6-Secure top management approval of customised behavioural plans																	Key milestone T100
10	**Harmonise leading practice with with mine standards**																	
	10.1-Review leading practice against current mine operational standards																	
	10.2-Identify non-core adjustments to harmonise practice with standards																	
	10.3-Adjust leading practice to harmonise with mine standards																	Key Milestone T102
11	**Assess risks and develop final adoption plan for approval**																	
	11.1-Plan roll-out of adoption across the mine																	
	11.2-Conduct "what if" exercise and adjust plans as necessary																	
	11.3-Conduct risk assessment of planned changes																	Key milestone T106
	11.4-Update and finalise adoption plan																	
	11.5-Clarify and agree criteria and time scale for completion of the project																	
	11.6-Secure top management sign-off of adoption plan																	Key milestone T108
12	**Develop training and communication materials**																	
	12.1-Plan training necessary for successful adoption																	
	12.2-Prepare training documentation																	Key milestone T107
	12.3-Develop required behavioural communication material																	
	12.4-Prepare documentation / signage to assist in adopting the practice																	
13	**Brief and train key mine persons**																	
	13.1-Brief supervisory levels involved in adopting the practice																	
	13.2-Brief the workers involved in adopting the practice																	
	13.3-Implement aspects of the two behavioural plans not included in training																	
	13.4-Train the persons involved in adopting the practice																	
14	**Implement pilot adoption of the practice**																	
	14.1-Arrange access to any required intellectual property																	
	14.2-Arrange purchase of the required equipment																	
	14.3-Set up the required maintenance arrangements																	
	14.4-Conduct preliminary pilot scale adoption of the practice																	Key milestone T109
15	**Monitor evaluate and report on performance**																	
	15.1-Set up monitoring and data collection arrangements																	
	15.2-Implement the monitoring and reporting programme																	
	15.3-Store key data in an electronic data base for later analysis																	
	15.4-Analyse data to establish the performance and impact of the practice																	
	15.5-Report on adoption and performance achieved - to COPA																	
16	**Finalise and implement mine-wide roll-out plan**																	
	16.1-Decide/document any refinement to practice prior to roll-out																	
	16.2-Introduce and confirm effectiveness of identified refinements																	
	16.3-Finalise plans and commence mine-wide roll-out																	Key milestone T110

Adoption process checklist



Adoption process – functional check list ☑

1. Facilitate adoption decision
- 1.1. Prepare and present case for adopting the leading practice at this mine. ☐
- 1.2. Obtain top management decision to adopt the practice at the mine ☐

2. Secure widespread support for adoption
- 2.1. Secure support of regional and mine level union representatives ☐
- 2.2. Issue mine-wide briefing note advising of decision to adopt ☐

3. Establish an effective adoption team
- 3.1. Identify and appoint a suitable project leader / champion ☐
- 3.2. Identify person to oversee customisation of behavioural plans ☐
- 3.3. Train project leader and behaviour plan overseer ☐
- 3.4. Secure establishment of appropriate adoption team at the mine ☐
- 3.5. Provide adoption team with copies of leading practice adoption guide ☐

4. Prepare first version adoption plan
- 4.1. Workshop leading practice adoption guide - mine project team ☐
- 4.2. Review / refine example adoption plan ☐
- 4.3. Identify an appropriate piloting section / area at the mine ☐
- 4.4. Identify/arrange specialist technical support considered necessary ☐
- 4.5. Agree critical enabling factors for successful adoption of the practice ☐
- 4.6. Ensure that sufficient time / resources have been provided ☐

5. Initiate monitoring programme
- 5.1. Identify key measurements to determine performance of the practice ☐
- 5.2. Initiate collection of base line data ☐

6. Establish effective relationship with COPA
- 6.1. Meet with COPA Coordinator to establish a working relationship ☐
- 6.2. Secure support / input / training via COPA interaction ☐

7. Update key stakeholders on progress
- 7.1. Provide feedback on adoption challenges / successes to COPA ☐
- 7.2. Prepare and issue progress updates to key stakeholders ☐

8. Plan and conduct direct enquires
- 8.1. Review / update causal chain risk summary ☐
- 8.2. Identify adopters and key stakeholders ☐
- 8.3. Identify persons to conduct direct enquiry interviews ☐
- 8.4. Train and brief the interviewers ☐
- 8.5. Select persons to be interviewed ☐
- 8.6. Conduct the interviews ☐

9. Customise generic behavioural plans
- 9.1. Identify persons to analyse the interview results ☐
- 9.2. Analyse results of direct enquiry interviews ☐
- 9.3. Customise leadership behaviour and behavioural communication plans ☐
- 9.4. Ensure that customisation checks have been fully satisfied ☐
- 9.5. Identify any new special communication requirements ☐
- 9.6. Secure top management approval of customised behavioural plans ☐

10. Harmonise practice with mine standards
- 10.1. Review leading practice against current mine operational standards ☐
- 10.2. Identify non-core adjustments to harmonise practice with mine standards ☐
- 10.3. Adjust leading practice to harmonise with mine standards ☐

11. Develop approved mine-wide adoption plan
- 11.1. Plan roll-out of adoption across the mine ☐
- 11.2. Conduct "what if" exercise and adjust plans as necessary ☐
- 11.3. Conduct risk assessment of planned changes ☐
- 11.4. Finalise integrated adoption plan ☐
- 11.5. Clarify and agree criteria and time scale for completion of the project ☐
- 11.6. Secure top management sign-off of adoption plan ☐

12. Develop training and communication materials
- 12.1. Plan training necessary for successful adoption ☐
- 12.2. Prepare training documentation ☐
- 12.3. Develop required behavioural communication material ☐
- 12.4. Plan training arrangements ☐
- 12.5. Prepare documentation / signage to assist in adopting the practice ☐

13. Brief and train key mine persons
- 13.1. Brief supervisory levels involved in adopting the practice ☐
- 13.2. Brief the workers involved in adopting the practice ☐
- 13.3. Implement aspects of the two behavioural plans not included in training ☐
- 13.4. Train the persons involved in adopting the practice ☐

14. Pilot adoption of the practice
- 14.1. Arrange access to any required intellectual property ☐
- 14.2. Arrange purchase of the required equipment ☐
- 14.3. Set up the required maintenance arrangements ☐
- 14.4. Conduct preliminary pilot scale adoption of the practice ☐

15. Monitor, evaluate and report on performance and impacts
- 15.1. Set up monitoring and data collection arrangements ☐
- 15.2. Implement the monitoring and reporting programme ☐
- 15.3. Store key data in an electronic data base for later analysis ☐
- 15.4. Analyse data to establish the performance and impact of the practice ☐
- 15.5. Report on adoption and performance achieved - to COPA ☐

16. Finalise and implement mine-wide roll-out plans
- 16.1. Decide/document any refinement to practice prior to roll-out ☐
- 16.2. Introduce and confirm effectiveness of identified refinements ☐
- 16.3. Finalise plans and commence mine-wide roll-out ☐

The MOSH Leading Practice Adoption System – a leading practice in its own right

There has been a remarkable improvement in the safety performance of the South African mining industry since 2003. Many factors and initiatives have been responsible for this, but ultimately, they all find expression in action taken by operational management on mines. Ideally, this action should be voluntary and originate from on-mine considerations of how best to provide and maintain a working environment that is safe and without risk to the health of employees. Although legislative or other top down dictates may sometimes result in short-term improvements, if the action taken constitutes reluctant compliance, it is unlikely to stand the test of time. It is in this context that the MOSH Leading Practice Adoption System has an important role to play, in that it is focussed on achieving conditions that lead to voluntary and eager adoption of identified leading practice. Cutting edge techniques derived from behaviour science have been embedded in the detailed systematic approach of the adoption system to achieve this intrinsically sustainable outcome. In this sense, the MOSH Adoption System is a leading practice in its own right. Its potential contribution in addressing the lesser improvements achieved to date in the area of occupational health, as well as the substantial the safety challenge that still remains should be clear to those committed to achieving zero harm work places in the South African mining industry. The primary purpose of this paper is to present the MOSH Leading Practice Adoption System in a readily understood format. A graphical style presentation with brief supporting notes is used for this purpose.

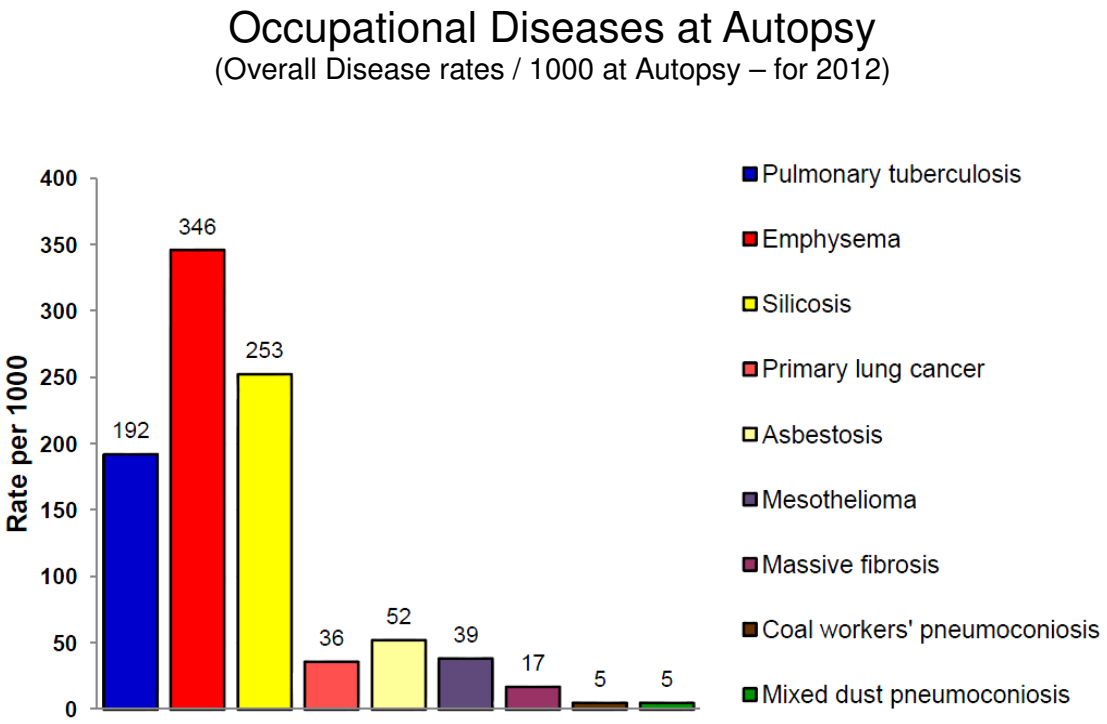
Motivating context for development of the System

2024 Tripartite Industry DUST Milestones

ELIMINATION OF OCCUPATIONAL LUNG DISEASES	Milestone	Objective
To eliminate Silicosis:	By December 2024, 95% of all exposure measurement results will be below the milestone level for respirable crystalline silica of 0.05 mg/m3 (these results are individual readings and not average results).	Elimination of: Silicosis Pneumoconiosis Coal Workers Pneumoconiosis (CWP)
To eliminate pneumoconiosis (Platinum Dust)	By December 2024, 95% of all exposure measurement results will be below the milestone level for platinum dust respirable particulate of 1.5 mg/m3 (<5% crystalline silica)	Elimination of: Silicosis Pneumoconiosis
To eliminate Coal Workers Pneumoconiosis	By December 2024, 95% of all exposure measurement results will be below the milestone level for coal dust respirable particulate of 1.5 mg/m3 (<5% crystalline silica)	Elimination of: Silicosis Coal Workers Pneumoconiosis (CWP)

Notes

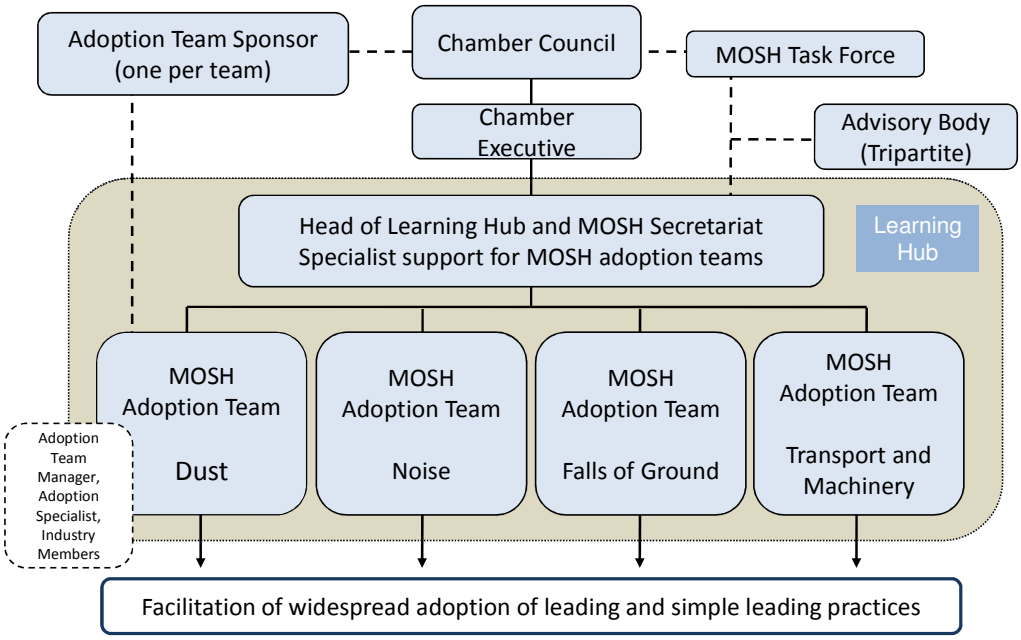
1. The MOSH Leading Practice adoption system was developed to assist industry in its efforts to meet the Tripartite agreed Occupational Safety and Health milestones.
2. The milestones were agreed to in 2003 and in 2005 the CEOs of the major mining companies committed their companies to achieve the 2013 milestones. A new set of milestones were agreed to in November 2014 for the next 10 years.
3. The MOSH Adoption system was developed in 2007 and piloted in 2008.



18. It is recognised that Industry has made considerable progress since 2003, but attainment of the milestones will require further sustained effort for the foreseeable future.

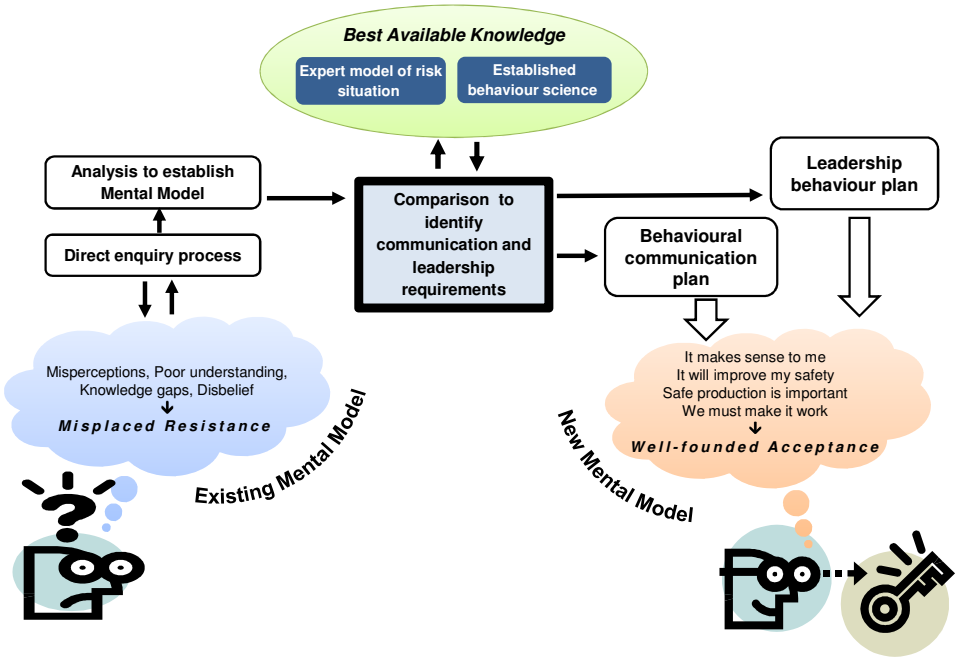
Key features of the adoption system – industry ownership and behaviour modification

Industry ownership – schematic of the MOSH structures



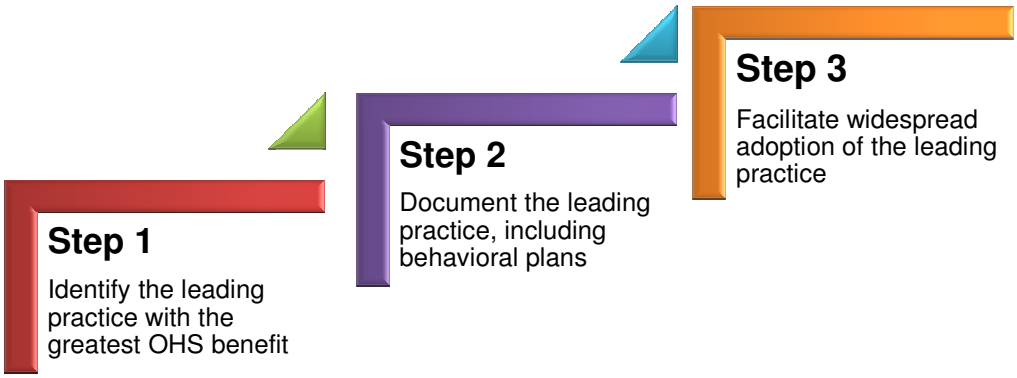
19. The Task Force is comprised of senior executives from mining companies. It decides on the major areas of risk to be addressed by the adoption system.
20. The MOSH Adoption Teams are led by experienced persons seconded to the Learning Hub by mining companies. The teams, which include representatives from the mining companies, are supported by a specialist secretariat.
21. Leading Practices having the greatest OHS improvement potential are selected at a workshop involving technical experts drawn from the mining companies and other organisations as appropriate.

Schematic of the Behaviour Change Process



Simple logic of the MOSH Adoption process

The Basic MOSH process



8. The adoption system recognises that a change in people's behaviour is fundamental to the adoption of any new practice or technology. Without this, adoption will not occur.

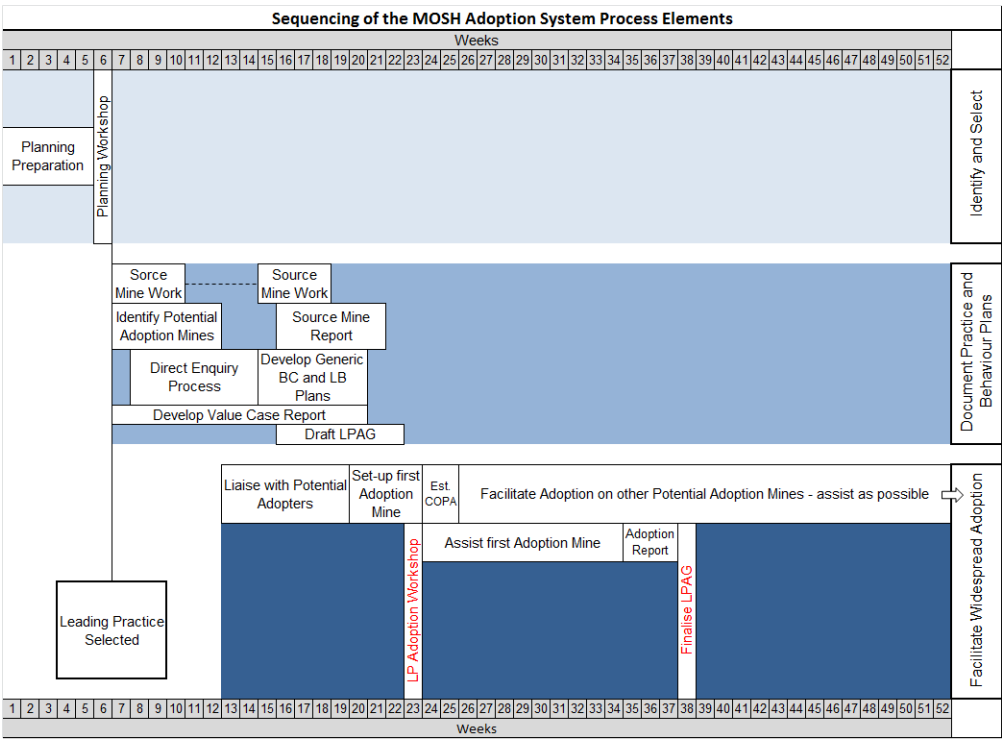
9. It also recognises that sustainable adoption requires prevailing mental models, which can act as barriers to adoption, to be identified and addressed through appropriate behavioural communication and leadership behaviour programmes.

10. Importantly, the required behavioural programmes are derived from a comparison of the prevailing mental model with scientifically established best available knowledge.

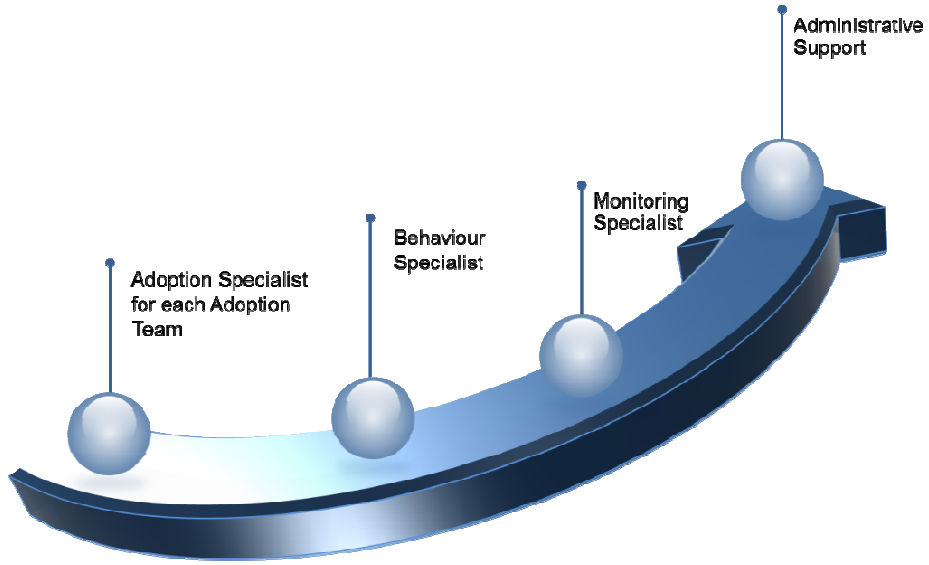
11. Industry ownership and behaviour modification are two key features of the MOSH Leading Practice Adoption System. Together they distinguish it from all previous approaches at facilitating the transfer and adoption of new technology or practice.

12. The essence of the MOSH Adoption Process is extremely simple. It is not new. What makes it special is the detail –full implementation of the detail is thus most

Sequencing of the MOSH Adoption System process elements

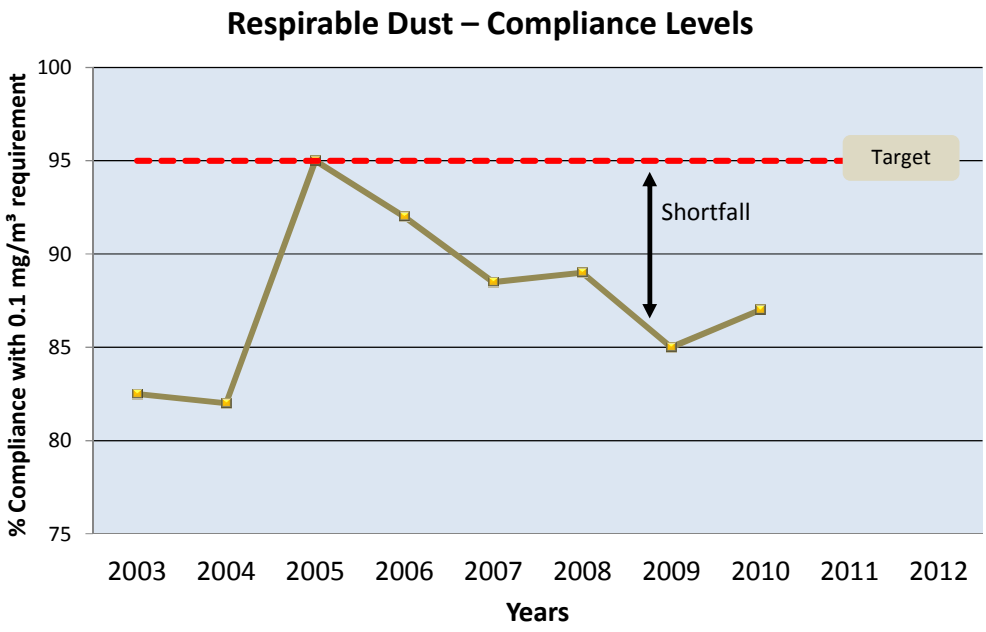


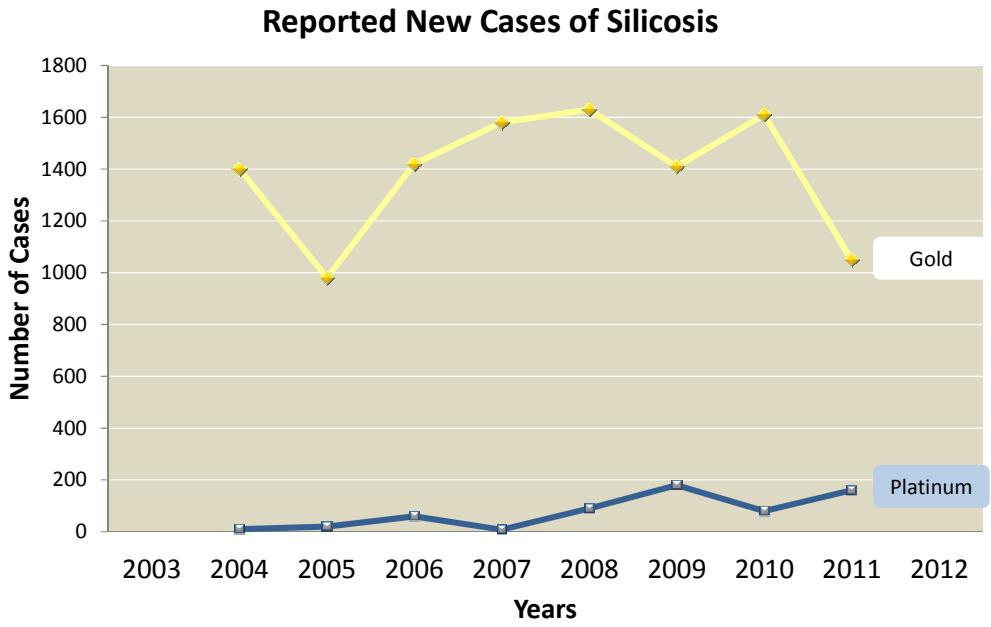
13. The schematic representation of the process shown here illustrate the systematic step by step approach, as well as the time scale and detailed nature and of the process, which is presented here in broad terms.



14. In order to ensure that the industry led MOSH Adoption Teams are fully effective in executing the MOSH adoption process, they are supported by a dedicated full-time secretariat with the necessary specialist and administrative skills. *This is a very important enabling aspect of the adoption system*

Establishment of MOSH Adoption Teams in key risk areas

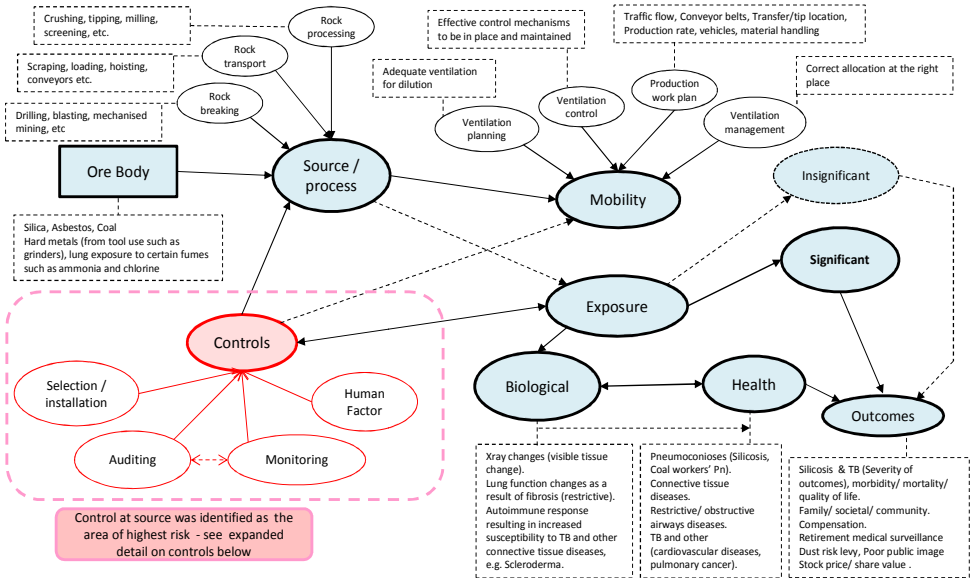




15. Eliminating silicosis is one of the major challenges facing the mining industry. It is responsible for more deaths than any other risk area.

Part A	Description of the causal chain				
No	Nature of the hazard	No	Exposure to the hazard	No	Outcomes of exposure
	Description of the identified hazard / s (substances / equipment / events / etc.)		Description of the different categories of exposed persons ,the nature and duration of exposure, and any other details that		Description of all the ways in which workers might be affected and harmed by exposure to the risk including biological or physiological effects.
	Data Gaps				
	Identify any gaps that need to be investigated		Identify any gaps that need to be investigated		Identify any gaps that need to be investigated
Part B	**Current risk mitigation controls and strategies**				
	Identify and describe		Identify and describe		Identify and describe
	Weaknesses				
	Identify and describe		Identify and describe		Identify and describe
Part C	**Possible improvements in risk mitigation controls and strategies**				
	Identify and describe		Identify and describe		Identify and describe
	Possible new practices				
	Identify and describe		Identify and describe		Identify and describe

Example expert model influence diagram - for the dust risk

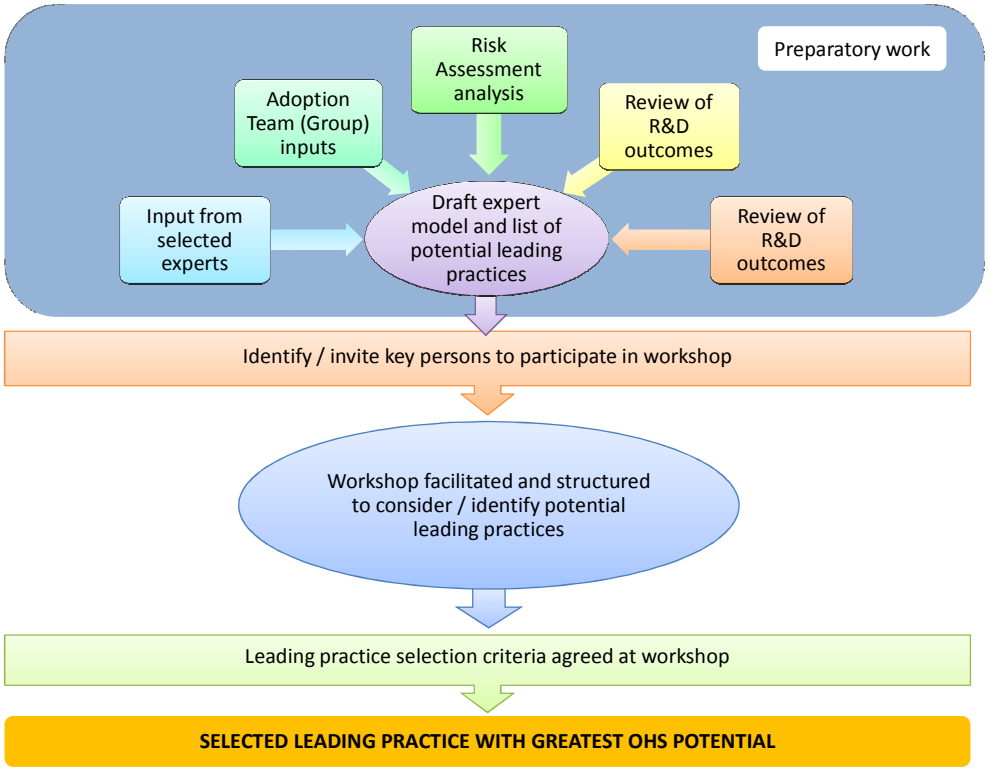


22. The need for an expert understanding of the risk area being addressed is obvious. Without such an understanding the risk of addressing symptoms and not causes is real

23. In the adoption system there is another equally important reason. Unless one has such an understanding, it is not possible to identify the knowledge gaps, misperceptions and mistaken beliefs of adopters and key stakeholders. It is these mental models that can act as barriers to adoption of a selected leading practice

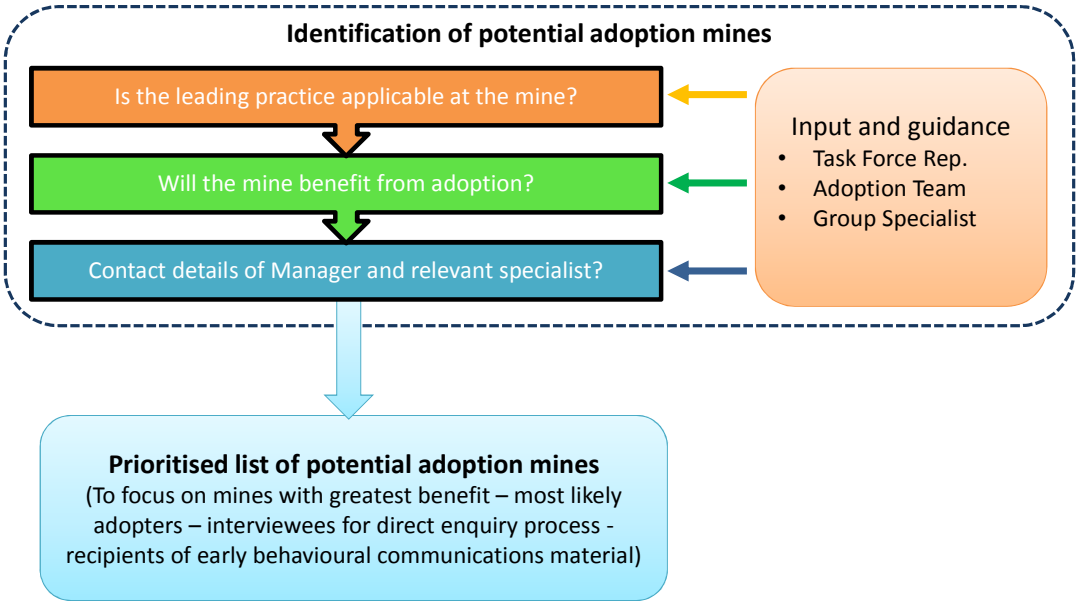
20. In the adoption system this expert understanding is captured in an expert model. The model may take the form of a causal chain risk summary table and / or an influence diagram

Selection of the leading practice with greatest potential



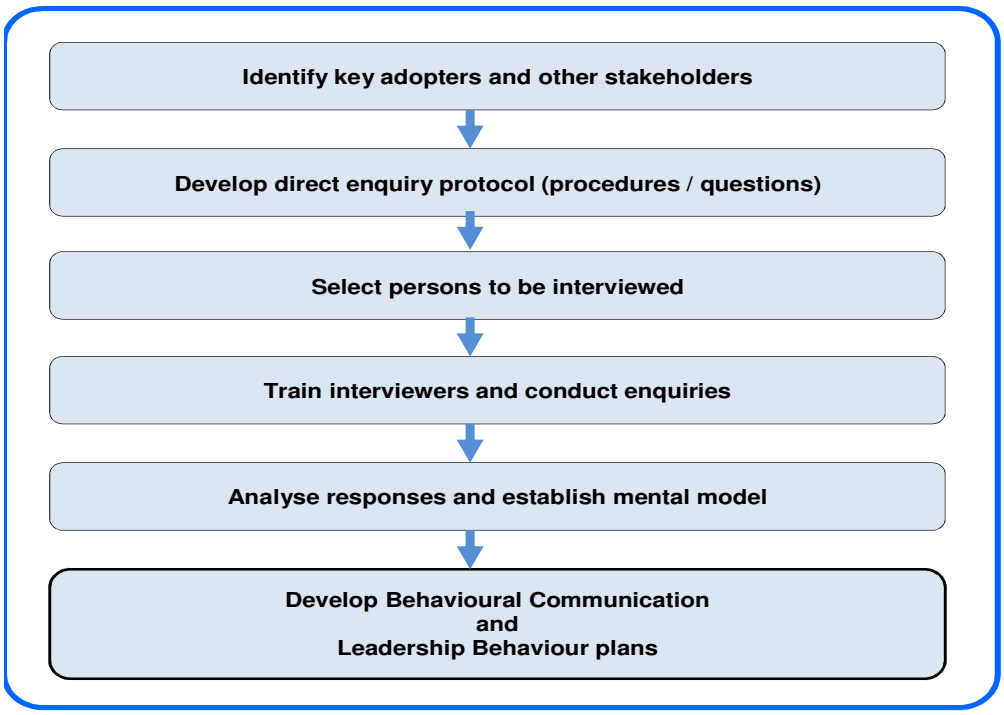
21. A special workshop involving the most experienced and knowledgeable people in industry is held to select the leading practice that has the greatest potential to improve OHS in the risk area in question
22. The practice is selected using a rigorous procedure and relevant selection criteria agreed upon by workshop participants.

Identification of potential adoption mines and their key persons



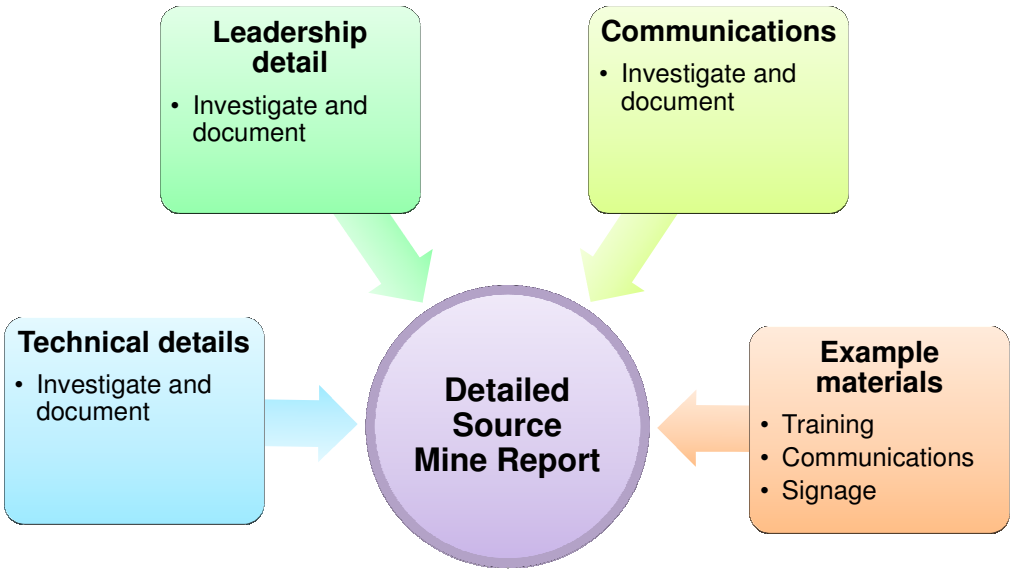
23. With input from the task Force and mining company representatives of the MOSH Adoption Team, all potential adoption mines, and the key people at these mines are identified.
24. This enables:
    - The identification of key adopters, decision makers and other key stakeholders.
    - The selection of an appropriate group of persons to be interviewed in the direct enquiry process to establish the prevailing mental models, and
25. The initiation of a communication process to inform key persons of relevant findings and developments

Identification of prevailing mental models



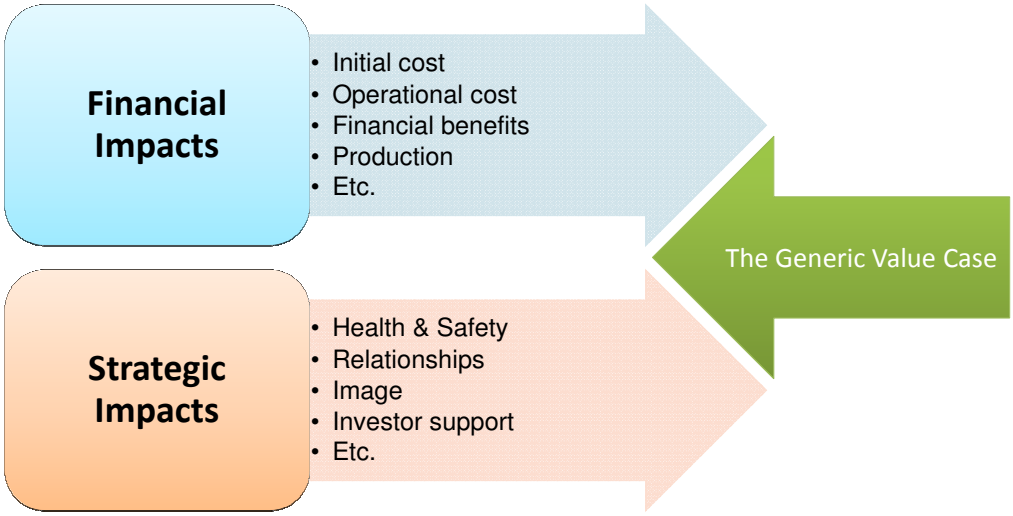
26. The direct enquiry process recognises that all interviewees are experts about what they experience. It is thus a respectful process. It is used to identify the mental models of the key adopters, deciders and other stakeholders
27. The carefully developed open ended questions of the direct enquiry process provide the interviewees with an opportunity to confidentially say exactly what they think.
28. The empirically determined mental models provide the basis for developing behavioural communication and leadership behaviour plans that are generically applicable to the complete spectrum of identified potential adoption mines

Documenting the leading practice at the Source mine



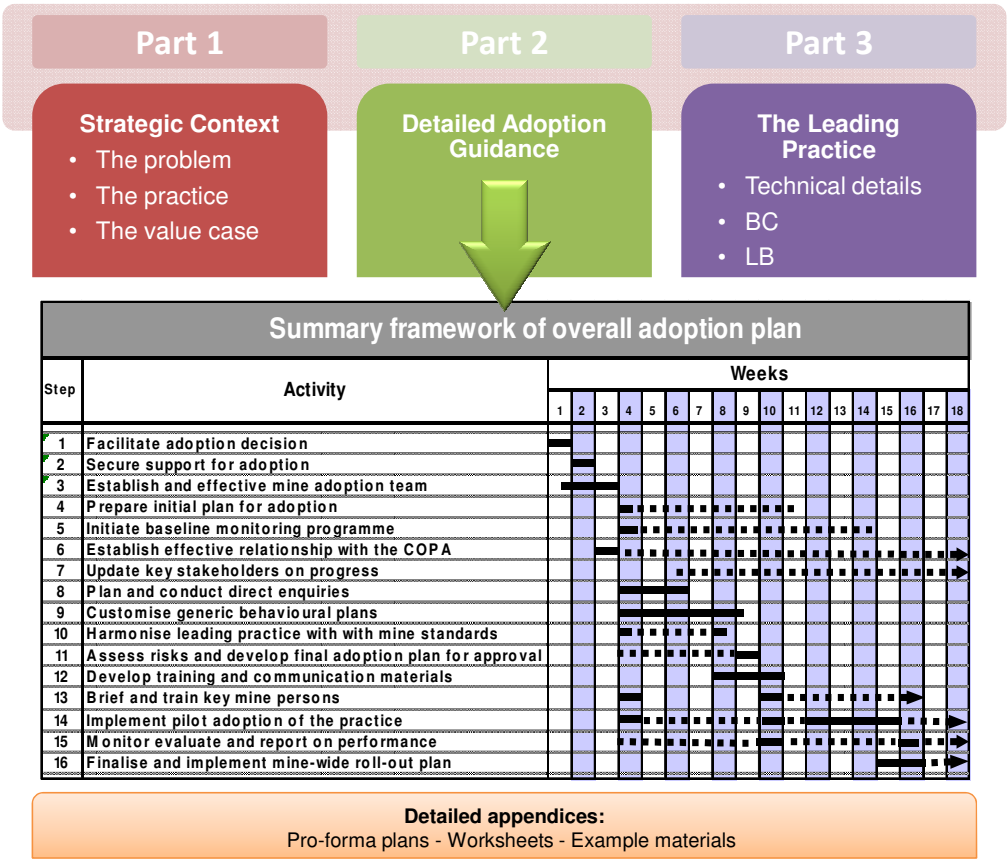
29. A detailed plan is developed for conducting the investigations at the source mine.
30. Investigation of the behavioural aspects is based on the insights gained in developing the generic behavioural plans.
31. The behavioural aspects observed at the source mine are used to update the generic behavioural plans.
32. The investigations seek to capture all the information needed to enable the practice to be replicated at another mine

Identifying and documenting the full value case



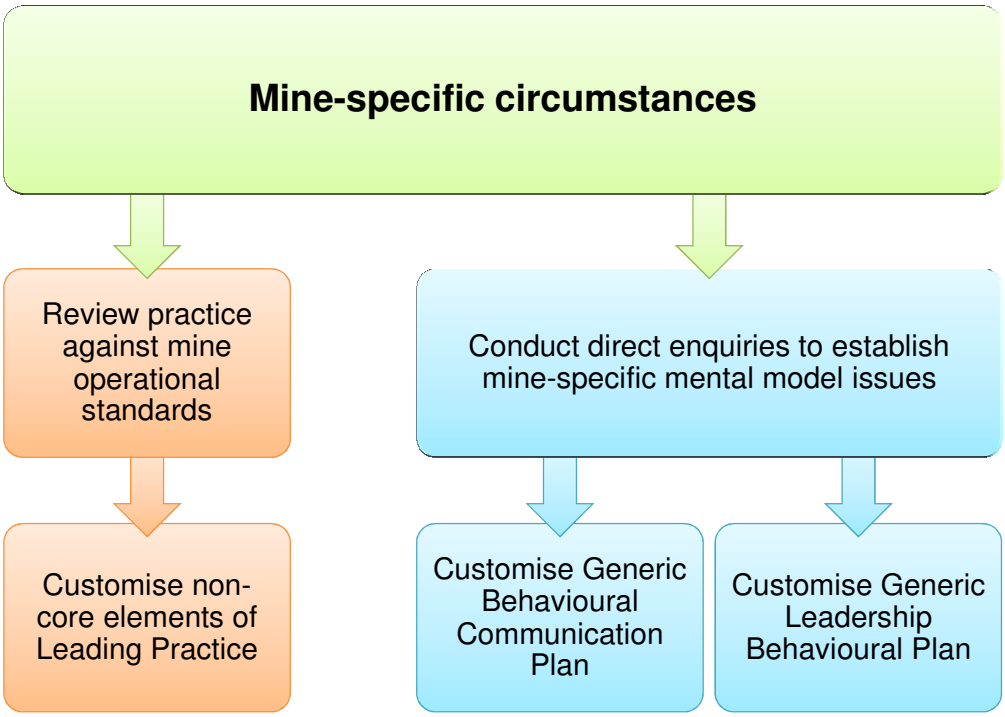
33. The value case is determined for each leading practice through a process of careful investigation.
34. The value case includes business case considerations but it also identifies the often more important strategic benefits associated with adoption of the leading practice.
35. Setting the goal of achieving zero harm at work is aspirational and admirable: adopting and appropriately acting on it requires high-level strategic decision making

Provision of a Leading Practice Adoption Guide to facilitate widespread adoption



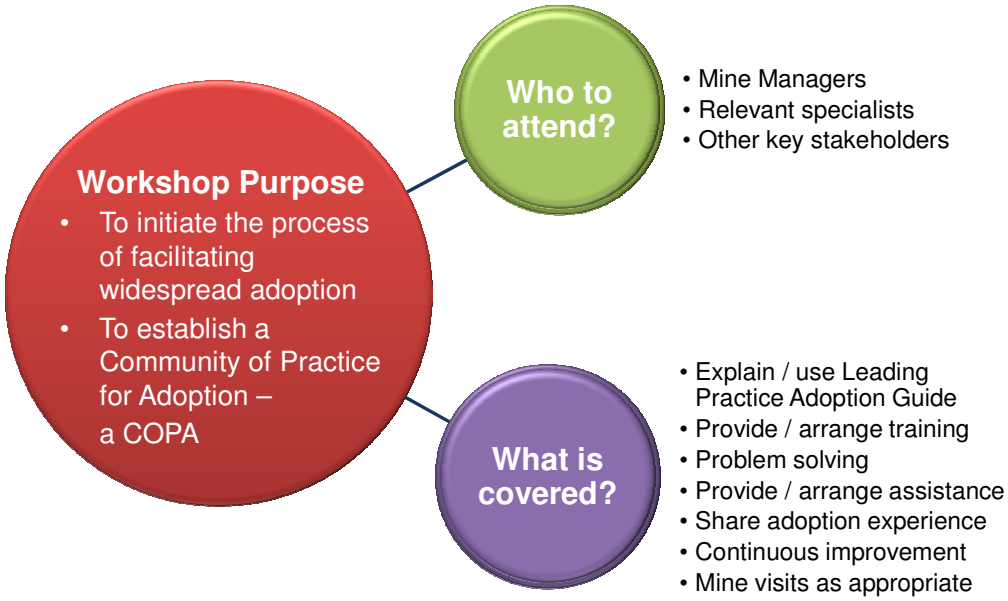
36. This is a user-friendly document that contains all the information that a potential adoption mine needs to voluntarily decide whether or not to adopt the practice, and to then successfully adopt the practice should it decide to do so.
37. The LPAG makes it clear that the leading practice comprises of three equally important legs. All three need to be implemented for adoption to be complete and sustainable

Customisation of the leading practice at adoption mines



38. The adoption procedures outlined in the LPAG include guidance on customising the leading practice to fit in with mine-specific circumstances.

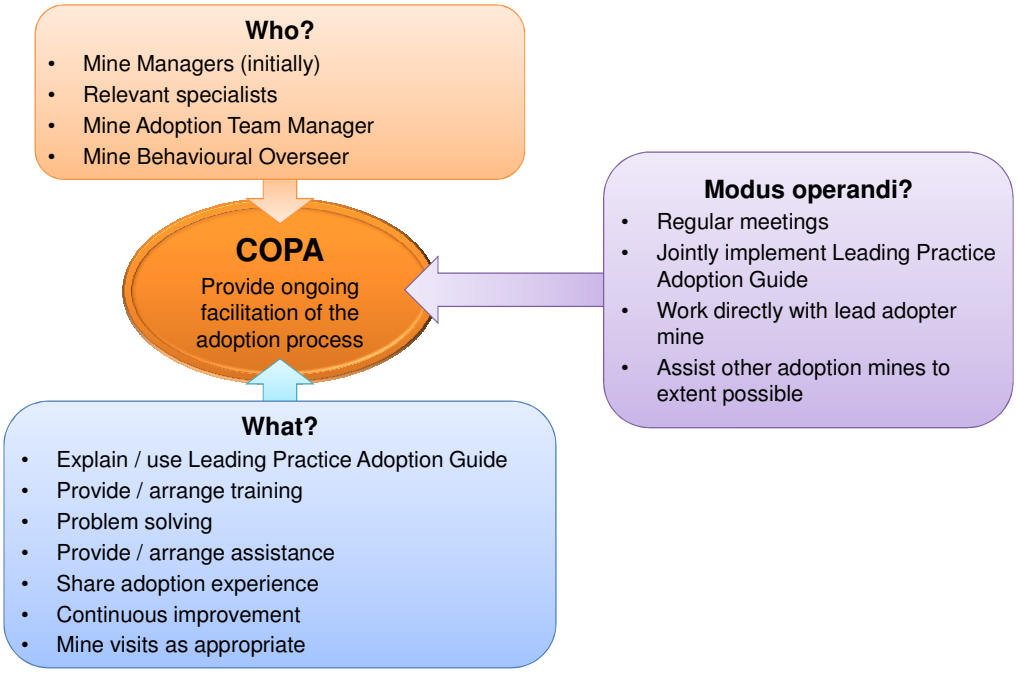
The Leading Practice Adoption Workshop - initiates facilitation of widespread adoption



39. Key persons from all identified potential adoption mines are invited to attend the Leading Practice Adoption Workshop.

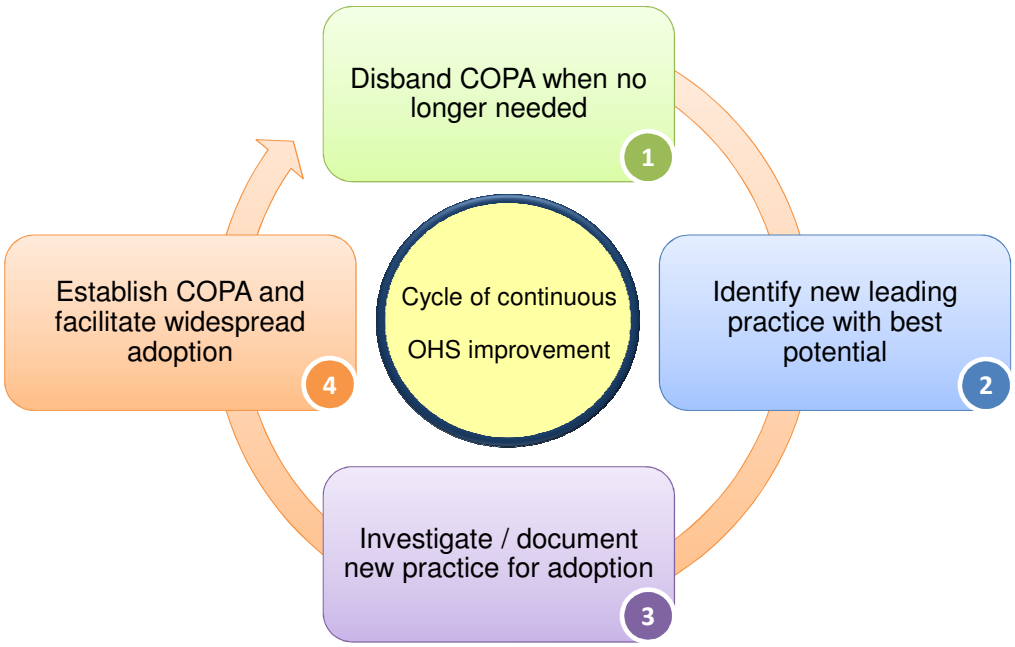
40. The workshop, which leads to the establishment of a Community of Practice for Adoption, a COPA, actively starts the process of facilitating industry wide adoption of the selected leading practice

Establishment of a Community of Practice for Adoption – for on-going facilitation



41. The COPA serves as a mechanism for mines to acquire guidance, assistance and specialist training to achieve successful adoption of the Leading Practice.
42. The COPA terminates its existence when its members feel that it is no longer needed.

Conclusion – the process is continuous



43. The process of continuous improvement never stops

Brochure

THE MOSH LEADING PRACTICE ADOPTION SYSTEM

MOSH LEARNING HUB

The MOSH Leading Practice Adoption System identifies **leading practices** in health and safety and helps with their widespread adoption across the industry. It also focuses on the **people** aspects, namely **behaviour communication** and **leadership behaviour**, which helps overcome resistance to adoption.

WHAT IS A LEADING PRACTICE?

It is a practice particularly effective in delivering good occupational health and safety performance and has potential for widespread adoption.

WHAT MAKES UP A MOSH LEADING PRACTICE?

- Technical details
- Leadership behaviour
- Behaviour communication

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HOW DO WE ADOPT A MOSH LEADING PRACTICE?

PROCESS 1
TECHNICAL DETAILS

Phase One: IDENTIFY

Identify the Leading Practice with the greatest potential and OHS benefit.

Preparatory work undertaken by adoption teams to identify a new leading practice include **risk assessment analysis**, review of **research** and **development outcomes, visits and discussions at mines**, input from selected **experts**, development of a risk story and **listing of potential leading practices**.

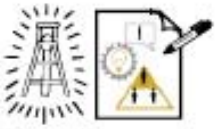
This happens through a **facilitated and structured industry planning workshop** involving people who have the best industry knowledge in the risk area in question. At this workshop potential leading practices are identified, considered and selected using a **rigorous selection criteria** agreed upon at the workshop.

Parallel to this is the identification of **potential adoption mines** and their key persons and the selection of appropriate groups of **people** to be **interviewed** in the direct enquiry process to establish their prevailing perceptions, attitudes and knowledge gaps.

Phase Two: DOCUMENT

All aspects of the Leading Practice are documented at its Source Mine:

At the source mine, all **technical aspects** such as standards and procedures are recorded.



All **behavioural aspects** are also recorded such as communications and the leadership behaviours.

What is the Value Case? Answers the question 'what's in it for us?'

The investigations, including the documentation of the full value case at the source mine, seek to **capture all the information needed** to **enable** the practice to be **replicated** at another mine.

The value case includes **business case considerations** and important **strategic benefits** associated with adoption of the leading practices.

HOW DO WE ADOPT A MOSH LEADING PRACTICE?

PROCESS 2
LEADERSHIP BEHAVIOUR & BEHAVIOUR CHANGE COMMUNICATION

Phase One: DIRECT INQUIRY

The direct inquiry process involves one-on-one interviews with stakeholders where any misperceptions or knowledge gaps are identified.

These are held at **all potential adoption mines**, as well as at the **Source Mine**. Mental models of the 'dedders' and the 'adopters' are unpacked. We ask what will **facilitate voluntary adoption** and what will cause **resistance**.

The direct enquiry process recognises that all interviewees are experts about their experiences. The carefully developed **open ended questions** of the direct enquiry process provide the interviewees with an opportunity to confidentially say exactly what they think.

The mental models provide the **basis** for developing **behavioural communication and leadership behaviour plans**.

What is a mental model?
It includes a person's experience, perceptions, beliefs, values, emotions.

Phase Two: DEVELOPING BEHAVIOURAL COMMUNICATION AND LEADERSHIP BEHAVIOUR PLANS

Using the information drawn from the Direct Inquiries, Leadership Behaviour Plans and Behavioural Communication Plans are drafted.

What is Leadership Behaviour?
Leaders MUST communicate and lead by example. Everything a leader does or does not do, sends out a message.

What is Behavioural Communication?
It provides the best knowledge to address the gaps in peoples mental models.

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HOW DO WE ADOPT A MOSH LEADING PRACTICE?

PROCESS 3

INITIATION OF WIDESPREAD ADOPTION PROCESS

Phase One: PROVISION OF A LEADING PRACTICE ADOPTION GUIDE TO FACILITATE WIDESPREAD ADOPTION

The **Leading Practice Adoption Guide** is a **user-friendly document** that contains all the **information gathered** from Process 1 and 2 that a potential adoption mine needs to voluntarily decide whether or not to adopt the practice, and to then successfully adopt the practice.

Phase Two: CUSTOMISATION OF THE LEADING PRACTICE AT ADOPTION MINES

The adoption procedures outlined in the Leading Practice Adoption Guide include **guidance on customising** the leading practice to fit in with the **mine-specific circumstances.**

Phase Three: THE LEADING PRACTICE ADOPTION WORKSHOP

Key persons from all identified **potential adoption mines** are invited to attend the **Leading Practice Adoption Workshop.**

The **2 main aims** of the workshop are:
1. **To present** the Leading Practice Adoption Guide
2. Get mines to **sign up** with the **Community of Practice for Adoption (COPA)**

COPA is very important to facilitate widespread adoption. Experiences and learnings can be shared and training needs are identified.

ADOPTION PLAN

ADOPTION
1✓ 2✓ 3✓ 4✓
5✓ 6✓ 7✓ 8✓
9✓ 10✓ 11✓ 12✓
13✓ 14✓ 15✓ 16✓

Remember, adoption is said to have happened once all 16 steps in the Adoption Plan have been completed.

We aim for something called **voluntary, eager adoption** - people doing things correctly because they want to and they see the benefit. **This is what makes the MOSH Adoption System different.**

It is like adopting a child.

For further information and contact details, please see www.mosh.co.za

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Guidance document for the eight- step customisation of behaviour-based plans

Background

Research and experience have shown that communications of all kinds and the actions (and inactions) of leaders at all levels are the most powerful influence on people's decision-making, judgment and behaviour. Tellingly, communications and leaders' behaviour occur continuously every day in mines. It is impossible to get anything done in the course of a day without communications and leaders' behaviour of various sorts and combinations: *Persons cannot not communicate; Leaders cannot not act.*

A leading practice within the Adoption System is described in three parts involving inextricably linked and interdependent activities. They are:

1) Technology, knowledge or procedure;

2) Communication to achieve desired behaviours and;

3) Leadership behaviour to evoke and re-enforce desired behaviours for adoption.

These three elements have been documented at the source mine and developed by the Adoption Team using results derived from a direct enquiry process conducted across the spectrum of potential adoption mines.

The challenge is to ensure that these key elements of the leading practice are customised to appropriately take account of mine specific circumstances at the demonstration project mine, and in due course at the various adoption mines. In respect of leadership behaviour and behavioural communication, this is the challenge addressed in this section, which is applicable to the customisation process that needs to be conducted first at the demonstration project mine, and then later at all subsequent adoption mines.

To distinguish between the Adoption Team responsible for facilitating widespread adoption of the Leading Practice across industry, and the team established at a particular mine to facilitate adoption of the Leading Practice at that mine, the former is called the *Industry Adoption Team* and the latter the *Mine Adoption Team.*

Purpose

The purpose of this section is to:

- Present a simple illustration, outlining the steps involved in customising the generic behavioural communication and leadership behaviour plans to meet the needs of the mine in question.

- Provide guidance on conducting and using a direct enquiry process to identify insight-based adjustments to the generic behaviour-based plans that have been developed.
- Provide guidance on integration of the customised plans into the overall plan for implementing the leading practice at the mine in question.

Key considerations

1. **Implementation of the customisation process should be kept as simple as possible:** The key elements of the customisation process are presented in the following simple diagram, which identifies what needs to be done in an eight step process, along with the quality checks that need to be implemented to ensure a quality outcome.

Step	What	Check – go/no-go decision question
1	**Identify adopters and key stakeholders at the mine**	Do we have a good understanding and complete identification of potential adopters and stakeholders?
2	**Select people to be interviewed**	Have we chosen the appropriate people to interview?
3	**Identify and brief the interviewers**	Are the interviewers ready to interview?
4	**Conduct the interviews**	Have all the interviews been done and full worksheets completed and returned for processing?
5	**Summarise the interview results**	Have the interview results been systematically assessed and significant new findings clearly identified?
6	**Use the findings to customise the leadership behaviour communication plan**	Are the customised plans coherent and properly understood by the mine team and can they be implemented and effectively monitored in behavioural terms?
7	**Use the findings to customise the behavioural communication plan**	Are the customised plans coherent and properly understood by the mine team and can they be implemented and effectively monitored in behavioural terms?
8	**Integrate the customised plans into the implementation plan at the mine**	Is the overall implementation plan coherent and properly understood by the mine project team?

A key point about the process outlined above is that it enables the behavioural communication and leadership behaviour plans to be customised on the basis of insight and not guesswork about the thinking, key beliefs and values of the adopters and stakeholders. This allows communication and leaders actions to be

tailored to the critical behaviours needed to accomplish adoption of the leading practice.

An expanded diagram indicating how the various steps would be implemented and the practical implications of who needs to do what is provided at the end of the note. More detailed guidance is set out in the points that follow.

2. **The Industry Adoption Team should facilitate and support the work of the Mine Adoption Teams:** At the demonstration project mine the Industry Adoption Team should facilitate and support the Mine Adoption Team in its implementation of the procedures outlined in this section, but not lead or actively do the work. An important objective of the Industry Adoption Team should be to identify particular pitfalls and difficulties encountered with a view to formulating guidance to be included in the Leading Practice Adoption Guide that they will in due course prepare. At subsequent adoption mines the Industry Adoption Team the facilitation and support will flow largely through the COPA that is to be established, but also through direct interaction with the Mine Adoption Teams to the extent that this is logistically possible.
3. **Attention must be focussed on ensuring that the key tasks in each step are completed as described in order to produce a quality result:** Behavioural communication and leadership behaviour plans typically have goals, or desired outcomes, that are expressed in behavioural terms. They are expressed in the form of what a person could observe happening in the workplace, or hear in a conversation or interview in the workplace. Both should be as a clear result of communications implemented and the behaviour of leaders. Accomplishing desirable goals of this nature is what is needed to achieve the adoption being sought. This can best be done by following the guidance provided.
4. **Responsibilities for overseeing the process to completion must be clearly assigned as must responsibilities for completing the requisite individual tasks:** Implementation responsibilities should be clearly set within the Mine Adoption Team in order to ensure that the entire process outlined in this note is appropriately managed. In the event that the mine has appointed a senior person to take responsibility for coordinating consideration and implementation of adoption activities at the mine, this *Mine Adoption Coordinator* should facilitate this in consultation with the person appointed to lead the Mine Adoption Team. This will ensure that individual tasks are completed as required, and that the outcomes for plans are appropriately measured and reported. This could involve spreading the tasks across many individuals, or perhaps concentrating the process in a small number of key individuals. While the use of a small number of key individuals may be more manageable, the group should be large enough to reduce the risk of personal bias and to spread the benefits derived from meaningful interaction with staff on a matter that is of direct concern to them.

However, either the Mine Adoption Team Leader, or a team member with appropriate skill and orientation should be allocated the personal responsibility for overseeing the process. The person taking on this responsibility should be experienced in interacting effectively with a wide variety of people, be at ease with and be able to effectively listen to people, and to correctly interpret conversations with people.

The various persons selected to be responsible for execution of the process outlined in this note, including the Mine Adoption Coordinator and the Mine Adoption Team Leader, should meet to workshop the process to ensure that those responsible for undertaking the work are adequately skilled to effectively to do so. To the extent considered necessary, this workshopping of the process may thus need to include, or be followed by, training sessions to acquire the necessary skills. Such training may need to involve a person who has experience in successfully implementing the process, such as the Industry Adoption Team Manager, or a person from an earlier adoption mine. The Mine Adoption Coordinator and the Mine Adoption Team Manager should together decide upon this.

5. **The eight-step customisation process must be systematically executed:** To facilitate easy application of the process at adoption mines, each of the eight steps describes an essential task and a small number of sub-tasks. The steps and sub-tasks should be completed in the recommended order without any skipping or reordering of tasks. Guidance on how to complete the tasks is typically offered in the form of key questions to be answered by those at the mine responsible for preparing and implementing the plans.

   At the end of each step, a checkpoint question and action is indicated. The checkpoint question is intended to act as a "go/no-go" decision point for the Mine Adoption Team. If the Mine Adoption Team cannot satisfactorily answer the checkpoint question, then they should not go to the next step. Instead, they must take action to rectify the matter.

Step one - Identify adopters and key stakeholders at the adoption mine.

Adopters and stakeholders are those people and groups who will be the focus of behavioural communication and leadership behaviour efforts. Key points for identifying adopters and stakeholders are as follows:

- The Industry Adoption Team should provide the Mine Adoption Team with a one page or otherwise simple summary of the risk "story" being addressed by the leading practice, based on the risk summary table finalized during their planning workshop. Similarly, a brief description of the leading practice should be provided. Both of these should be included in the adoption guide that the Industry Adoption Team will need to prepare on completion of a successful demonstration project. The risk story should identify anticipated adopters and

stakeholders for the leading practice. In some cases it is possible that the Mine Adoption Team may need to modify the risk story to take account of special circumstances at the mine.

- The Adoption Mine Team should review the risk story summary and confirm or elaborate on the identified adopters and stakeholders to ensure that:
  - All members of the team have the same understanding of the risks being addressed by the leading practice and,
  - They have identified the particular adopters and stakeholders at the adoption mine that will be involved in achieving implementation of the leading practice.

Guided by the list of anticipated adopters and key stakeholders identified by the Industry Adoption Team, and the notes on the worksheet of [1]Doc #39, a list of the adopters and stakeholders that will be the focus of behavioural communication and leadership behaviour efforts at the mine should be prepared by the Mine Adoption Team.

The Mine Adoption Team should address the checkpoint question of whether the team has a good understanding and has a complete identification of the potential adopters and stakeholders in order to make a "go/no-go" decision in respect of proceeding to the next step in the process.

Step two - Select people to be interviewed

The only way to accurately understand people's thinking is to directly enquire into it. People are complicated and their thinking is unpredictable. One cannot successfully guess or predict people's thinking and their information needs. The process of direct enquiry requires that an appropriate number of persons be interviewed, as follows:

- From the prepared list of adopters and stakeholders at the mine, the persons to be interviewed should be selected. The people selected should range across the various categories of adopters and stakeholders in such a way as to ensure good representation of those most likely to be most involved in accomplishing adoption of leading practice. The number of persons to be interviewed should be between 25 and 30. This has been shown to be an appropriate number to get useful interview results.
- The worksheet in [1]Doc #39 for listing adopters and key stakeholders includes provision for the identification of the selected interviewees.

The Mine Adoption Team should address the checkpoint question of whether the appropriate people have been chosen to be interviewed in order to make the "go/no-go" decision in respect of proceeding to the next step in the process.

Step three – Identify and brief interviewers.

Interviews with the selected adopters and stakeholders should be done confidentially and one-on-one. No interviews of people in groups or in a group

setting should be done because of challenges in accurately interpreting such results. Also, the circulation of printed questionnaires where people are asked to fill-in answers to questions is to be avoided because of challenges in producing satisfactory insights into people's thinking. Key points in selecting and training the interviewers are as follows:

- From the pool of persons at the mine who have had training in interview techniques, the Mine Adoption Team should choose as interviewers those people who are most likely to:
  - Cause interviewees to feel comfortable within an interview setting, that is, to feel free to speak openly and candidly with the person conducting the interview, and
  - Are most likely to complete each assigned interview in the manner prescribed.
- Should it be necessary to select persons who have not been trained in interview techniques, they should be sent for appropriate training before they take the steps outlined below in preparing for the interviews.
- Interviewers should ensure that they are well equipped to conduct the interviews by:
  - Studying and discussing the updated risk summary / simple risk story, with an appropriate member of the Mine Adoption Team to ensure that they have a thorough understanding of the risks being addressed by the leading practice.
  - Reading the interviewer's briefing and guidance on the list of questions to be asked and on conducting a one-on-one interview properly. A draft of such a briefing is attached as Reference [1]Doc #40. The Industry Adoption Team should update this draft note in the light of their experience at either the source or demonstration mines. The updated document should be made available to the demonstration mine ant to later adoption mines by including the updated version in the leading practice adoption guide.
  - Practicing the interview at least once (perhaps with an adoption mine team member), and
  - Reviewing with the Mine Adoption Team their understanding of the interview and how it should be conducted and documented.

The Mine Adoption Team should check that the interviewers are ready to conduct the interviews in order make a "go/no-go" decision in respect of proceeding to the next step in the process.

Step four – Conduct the interviews.

The interview process consists of two parts which seek to establish the following:

- Stakeholders/ Adopters beliefs about the causes and outcomes of [the risk/hazard]

- Stakeholders/ Adopters beliefs about the best ways to protect people from [the risk/hazard], and
- Stakeholders/Adopters beliefs about key leader behaviours and behavioural communication needs.

In these points the term beliefs should be taken to include attitudes and views that form part of a person's mental model. Similarly, use of the term [the risk/hazard] means the risk associated with the particular hazard that is under consideration. It encompasses the complete picture of the risks associated with a specific hazard in a way that is consistent with the treatment of both concepts in the risk summary.

- Each interviewer should schedule all of their allotted interviews to be conducted one-on-one in a place suitably private and free from noise and other distractions. The interviews should be conducted as planned and as practiced. Interviewers should ask all questions fully, prompting for as complete and in-depth answers as possible. This is a particular aspect of the interviewing procedure that should be focused upon in the practice sessions.
- Interview responses should be carefully documented at the time of the interview using the Interview Worksheet and the Interviewee's own words. An example worksheet is provided in [1]Doc #41. Immediately after the interview, the brief notes taken during the interview should be expanded upon in the interview worksheets to fully document the detail of the interviewee's responses. One Interview Worksheet should be completed for each interview conducted. Worksheets should be collected into sets for reading and analysis.

The questions to be asked in the interview are provided in the worksheet and are given in the accompanying box.

Before going to the next step, the Adoption Mine Team should check that all the interviews have been done and that full worksheets have been completed and returned for processing in order to make a "go/no-go" decision in respect of proceeding to the next step in the process.

Interview Questions - Doc #41

Part A: Adopter/Stakeholder beliefs about [the risk/hazard] (Causes and Outcomes)

- Please describe your role and responsibilities at the mine.
- Please describe [the hazard] in your own words.
  - How may [the hazard] occur? *or* What are the possible causes of [the risk/hazard]?
- What happens as a result of [the risk/hazard]?
  - How might you be affected by [the risk/hazard]?
  - Who else may be most affected by [the risk/hazard]? What may happen to people who are affected by [the risk/hazard]?
- How important do you think it is to find a way to better protect people from [the risk/hazard]? Why do you say that?

Part B: Adopter/Stakeholder Beliefs about Leading Practices

- What do you think could be done to better protect people from [the risk/hazard]? Why?
- This mine is currently working to bring about leading practices to better protect people from [the risk/hazard]. The interviewer should describe the proposed leading practice in simple neutral terms.
  - What should leaders and supervisors in the mine do to help make sure that these practices are successful?
  - What should leaders not do in order to make sure that these practices are successful?
  - What other kinds of things might stand in the way of the leading practice being successful at this mine? How should these things be addressed?
  - What information would be important for people like you to know about how people can be affected by the risk and what is being done to protect them?
- What is the best way for people like you to receive this information?

Step five – Summarize the interview results.

The simple analysis outlined below is designed to allow the Mine Adoption Team to better understand the thinking of their stakeholders and adopters and to compare the thinking at their mine with:

- The most informed understanding of the hazard, as summarized in the Risk Story provided by the Learning Hub Adoption Team, as adjusted by the Mine Adoption Team – see step 1, and
- The thinking of adopters and stakeholders at the demonstration mine, and to this end the Industry Adoption Team should include in the leading practice adoption guide a summary of the mental models that they have previously identified for these persons at the demonstration mine.
- Persons capable of reliably summarising the interview results must be chosen to undertake this work. The Mine Adoption Team should find the analysis process relatively straightforward. In essence, the analyst will need to carefully read each set of interview notes and make observations against key questions provided in an analysis worksheet. The analysis worksheet is provided in [1]Doc #42.
- Members of the Mine Adoption Team could be selected as analysts. This would have the advantage of ensuring that some or all of the adoption team members would have a first-hand understanding of the interview results. Alternatively, the task may be assigned to two or more individuals associated with the team and adoption effort, but not to only one person. Importantly, in preparing for the analysis task, each analyst should ensure that they have a sound understanding and familiarity with the updated risk summary, as well as the interview results from the direct enquiry process undertaken by the Industry Adoption Team in developing the generic leadership behaviour and behavioural communication plans for the leading practice.
- Working alone, each analyst should read and note their observations against questions posed in the analysis worksheet. Once all interviews have been analysed in this way, the analysts should meet in a group session to share and compare the results of their analyses. The analysts should identify where their individual analyses agree, and why, and where

Questions in the Analysis Worksheet – Doc #42

Part A: Adopter/Stakeholder Beliefs about [the risk/hazard] (Causes and Outcomes)

- What are the most frequently mentioned causes of [the risk/hazard]?
  - Which, if any, of these causes agree with the Risk Summary / Previous interview results?
  - Are there causes that disagree with the Risk Summary / Previous interview results? Describe any areas where people may have a difference in their thinking.
  - Is there any information on causes that they say they want to know?
- What are the most frequently mentioned outcomes of [the risk/hazard]?
  - Repeat Prompts above

Part B: Adopter/Stakeholder Beliefs about Leading Practices

- What are the most frequently mentioned opportunities to better protect people from [the risk/hazard].
  - What reasons do they give?
  - Which, if any, of these ways agree with the features of the leading practice?
  - Are there any ways mentioned that differ from the features of the leading practice? Explain the possible reasons for this disagreement.
- What are the most frequently mentioned leadership behaviours that should be done, and should not be done.
  - Repeat Prompts above.
- What information do people say they want? What are the most frequently mentioned best ways to communicate with people.
  - Repeat Prompts above.

they disagree and why. Disagreements between analysts should be noted. As a group the analysts should address the main questions in the worksheet for analysis, writing detailed answers to the questions, and identifying the most influential beliefs, and their underlying rationale in the process of doing so.

- As a final check, the group should re-read the interviews to ensure that the group has adequately captured and described the key beliefs on the questions asked of the stakeholders and adopters.

The questions in the analysis worksheet of [1]Doc #42, which form the basis of the analysis, are given in the accompanying box.

Using the worksheet of [1]Doc #42, analysts should then compare the results of their analyses of adopter and stakeholder interview findings with the results of interviews conducted by the Industry Adoption Team with similar individuals across the spectrum of adoption mines, and with the key elements of the risk that the leading practice seeks to address. This analysis should note where mine results are similar to those noted for the spectrum of adoption mines and where they are different. These similarities and differences are to serve as the basis for customising the behavioural communication and leadership behaviour plans to address the particular circumstances identified at the mine in question.

The questions in the analysis worksheet that guide the comparison process are provided in the box alongside.

Before going to the next step, the adoption mine should check whether all of the interview results have been systematically reviewed and all of the significant differences clearly identified as a basis for making a "go/no-go" decision in respect of proceeding to the next step in the process.

Questions to guide the analysis – Doc #42

Part A: Adopter/Stakeholder Beliefs about* [the risk/hazard] *(Causes and Outcomes)

- What, if any, are the key similarities between the results in Part A and those of the demonstration mine that should be emphasized?
- What, if any, are the key differences between the results in Part A and those of the demonstration mine that should be emphasized?

Part B: Adopter/Stakeholder Beliefs about Leading Practices

- What, if any, are the key similarities between the results in Part B and those of the demonstration mine that should be emphasized?
- What, if any, are the key differences between the results in Part B and those of the demonstration mine that should be emphasized?

Step six – Adjust the leadership behaviour plan.

The Industry Adoption Team should provide the updated version generic leadership behaviour plan that they have developed to serve as the base plan to be customised by the Mine Adoption Team. The plan should set out the required antecedents, key leader behaviours and re-enforcing consequences for those behaviours. In the case of the demonstration mine this should be the plan that was developed prior to the demonstration project, and which takes into account the findings at the source mine. In the case of a subsequent adoption mine, it should in

principle be the same plan, but modified as necessary to take account of the experience gained in customising the plan at the demonstration mine.

In presenting the plan in the Leading Practice Adoption Guide, the Industry Adoption Team should provide a clear description of the process that was used to arrive at the plan. The Mine Adoption Team should ensure that they fully understand the plan provided by the Industry Adoption Team, and its derivation, before proceeding with the process of customising the plan to suit their mine specific circumstances. An example leadership behaviour plan is provided in Reference Doc #43.

The Adoption Mine Team should prepare the customised leadership behaviour plan based strictly on answers to the guiding questions provided in the worksheet of [1]Doc #44. These are given in the box alongside.

Guiding Questions for customisation of the Leadership Behaviour Plan – Doc #44

- With respect to the stakeholders and adopters involved, who are the additional or different key leaders involved in accomplishing adoption of the leading practice?
- For each of these new leaders or type of leader, what key behaviours or actions must they perform to appropriately influence the decisions and actions of the key stakeholders and adopters? (The set of Desired Behaviours in the centre column)
- What must the leaders be provided with to enable them to perform these behaviours? (The set of Antecedents in the first column)
- What consequences – positive, immediate and certain – must follow performance of the key behaviours that will encourage them to be repeated and sustained? (The set of Consequences in the third column)
- What, if any, of the key behaviours, antecedents and consequences in the demonstration mine's leadership behaviour plan should be included in this mine's leadership behaviour plan?
- What, if any, of the key behaviours, antecedents and consequences in the demonstration mine's leadership behaviour plan should be omitted from this mine's leadership behaviour plan?
- What is the best way to go about implementing the leadership behaviour plan?

- Where customisation results in new material being introduced into the generic plan, measurable objectives should be identified. These should be in the form of behavioural outcomes. That is, they should be expressed as actions of leaders that can be observed and which clearly follow from the leadership behaviour plan, as intended (the key desired behaviours - what could leaders be seen to do?). They could also be understandings, concepts or beliefs expressed in conversations or interviews with leaders or others that clearly follow from the leadership behaviour plans, as intended. (What could leaders be heard to say or what could they be accurately reported to say?) While the material preserved from the generic base plan should provide examples of what is required, they should also be checked, and modified if necessary to ensure consistency.
- The Mine Adoption Team should explore the possibility of reviewing their customised plan with one or other of the following: the relevant Industry Adoption Team Leader, the Programme Manager at the Learning Hub, the Behavioural Specialist at the Learning Hub, the Mine Adoption Team Leader at a mine that has successfully adopted the practice, or a qualified external resource. The Learning Hub should be approached for assistance in securing an appropriate external resource in those instances where this is considered to be necessary. The input received should be used to adjust the plan as appropriate.

The adoption mine project team should then check whether the customised leadership behaviour plans are coherent and properly understood, and that they can be readily implemented as a basis for making a "go/no-go" decision in respect of proceeding to the next step in the process.

Step seven – Customise the behavioural communication plan.

In a manner similar to that for customising the leadership behaviour plan, the Industry Adoption Team should provide the updated version generic behavioural communication plan that they have developed to serve as the base plan to be customised by the Mine Adoption Team. In the case of the demonstration mine this should be the plan that was developed prior to the demonstration project, and which takes into account the findings at the source mine. In the case of a subsequent adoption mine, it should in principle be the same plan, but modified as necessary to take account of the experience gained in customising the plan at the demonstration mine. As with the leadership behaviour plan, the Mine Adoption Team should ensure that they fully understand the plan provided by the Industry Adoption Team, and its derivation, before proceeding with the process of customising the plan to suit their mine specific circumstances. An example behavioural communication plan is provided in Reference [1]Doc # 31.

The Mine Adoption Team, and not just a single person, should prepare the customised behavioural communication plan based strictly on answers to the guiding questions provided in the worksheet of [1]Doc #44, which are given in the box alongside.

- In respect of the modes of communication and the contents of each communication, on the basis of the answers to the above questions, and the modes of communication available at the mine, the Mine Adoption Team should adjust the modes and content of the base plan provided by the Industry Adoption Team.

Guiding Questions for customisation of the Behavioural Communication Plan – Doc #44

- What, if any, of the modes of communication in the demonstration mine's behavioural communication plan should be included in the adoption mine's plan? Can any be removed without affecting the overall quality of the plan?
- What, if any, of the content or key messages in the different modes in the demonstration mine's behavioural communication plan should be kept in the adoption mine's plan?
- What, if any, new content or key messages should be added to the behavioural communication plan for the adoption mine?
- Will these changes best match with the modes that should be used and key messages that should be conveyed in the adoption mine as revealed through the interview results?
- What is the best way to go about implementing the behavioural communication plan?

Additional questions that should be answered in considering the communication content of the new plan are as follows:

- From the interview results, what correct understandings about [the hazard] should be emphasized in communications?
- What incorrect beliefs or misunderstandings about [the risk/hazard] should be corrected through communications? What key messages should be emphasized in order to do so?
- What do people not know that is important to understand in order to fully appreciate the nature of [the hazard], and which should therefore be emphasized in communications?
- What information about [the risk/hazard] do people most want to know, and which should therefore be emphasized in communications?
- What sorts of messages should be emphasized to help people judge the trustworthiness and competence of their fellow employees and leaders involved in addressing [the risk/hazard]? (The creation of trust is a fundamental aspect of all behavioural communication plans.)

- Where new material is introduced into the plan, measurable objectives should be identified. These should be in the form of behavioural outcomes. This means that they should be expressed as actions that can be observed as the intended outcome from the communication in question. (What could people be seen to do?) They could also be understandings, concepts or beliefs expressed in conversations or interviews that clearly follow from the communications, as intended. (What could people be heard to say?) While the objectives preserved from the base plan should provide examples of what is required, they should also be checked, and modified if necessary to ensure consistency.
- As with the leadership behaviour plan, the Mine Adoption Team should explore the possibility of reviewing their customised plan with one or other of the following: the relevant Industry Adoption Team Leader, the Programme Manager at the Learning Hub, the Behavioural Specialist at the Learning Hub, the Mine Adoption Team Leader at a mine that has successfully adopted the practice, or a qualified external resource. The Learning Hub should be approached for assistance in securing an appropriate external resource in those instances where this is considered to be necessary. The input received should be used to adjust the plan as appropriate.

The Adoption Mine Team should then check whether the customised plans are coherent and properly understood, that they have readily measurable behavioural goals for communication, and that they can be readily implemented, as a basis for making a “go/no-go” decision in respect of proceeding to the next step in the process.

Step eight – Integrate behavioural communication and leadership behaviour plans into the implementation plan at the adoption mine.

In the case of the demonstration project mine, detailed guidance for implementing the demonstration project mine has been outlined in section 6.4. Similar guidance needs to be presented in the Leading Practice Adoption Guide to be prepared by the Industry Adoption Team. A modified version of the implementation plan outlined in section 2.3.9 is presented in Reference [1]Doc #45 for this purpose. Within the framework of the example plan of Reference [1]Doc #45, and based on the experience gained at the demonstration mine, the Industry Adoption Team should then:

- Prepare detailed notes to guide and assist future Mine Adoption Teams in integrating their customised behavioural communication and leadership behaviour plans into the overall implementation plan at the adoption mine.
- Include this guidance in the Leading Practice Adoption Guide that is to be distributed to potential adoption mines.

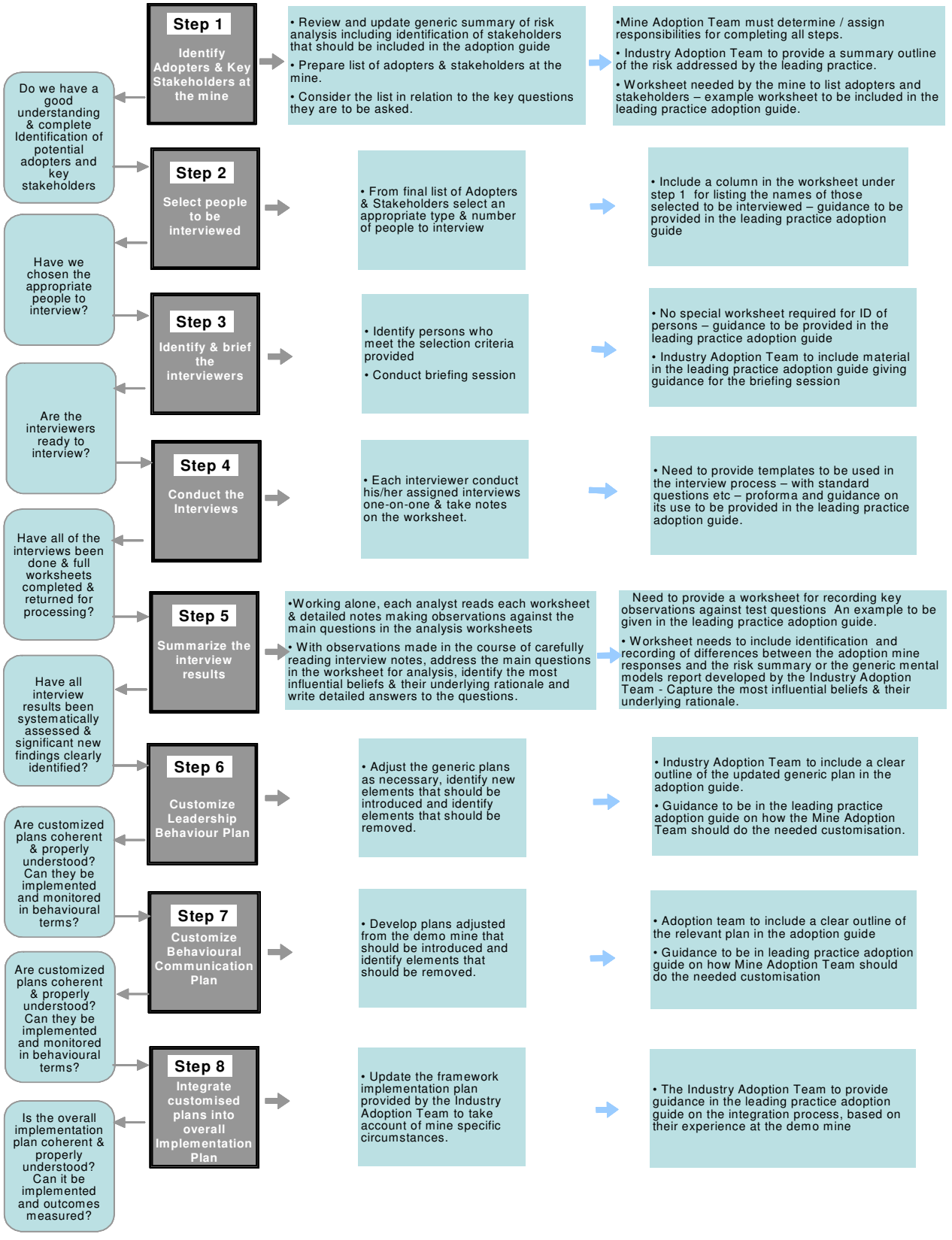
- Include a component of the integrated implementation plan should be a monitoring programme that includes appropriate checking and reporting on the occurrence of the desired observable behaviours, as well checking and reporting on provision of the necessary antecedents and re-enforcing consequences.

Before beginning implementation of the leading practice at the mine, the Mine Adoption Team should check to ensure that the overall implementation plan is coherent and properly understood by the team, as a basis for making a "go/no-go" decision in respect of proceeding with implementation of the adoption plan.

Concluding comment

It will be essential for the Industry Adoption Team to include in the Leading Practice Adoption Guide appropriate guidance on the customisation process described in this section. It is anticipated that with minimal adjustment much of the content of this section may be used for this purpose, either in the Guide, or in an appropriate companion document.

Procedure for customising behavioural communication and leadership behaviour plans



An EXPERT understanding of the risk (expert model)

Develop an expert understanding of the risk situation

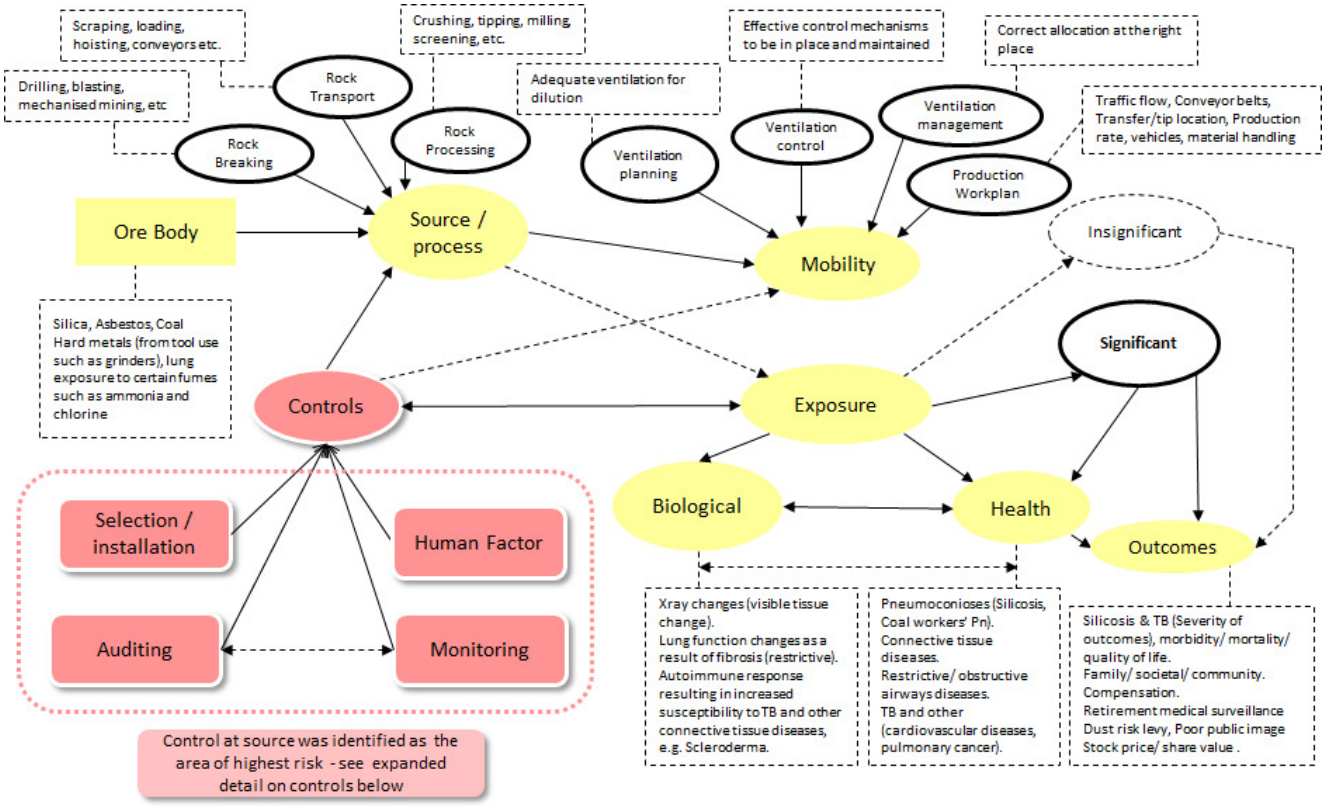
1

Without such an understanding the risk of addressing symptoms and not causes is real

In the adoption system this expert understanding is captured in an expert model. The model may take the form of a causal chain risk summary table and / or an influence diagram

2

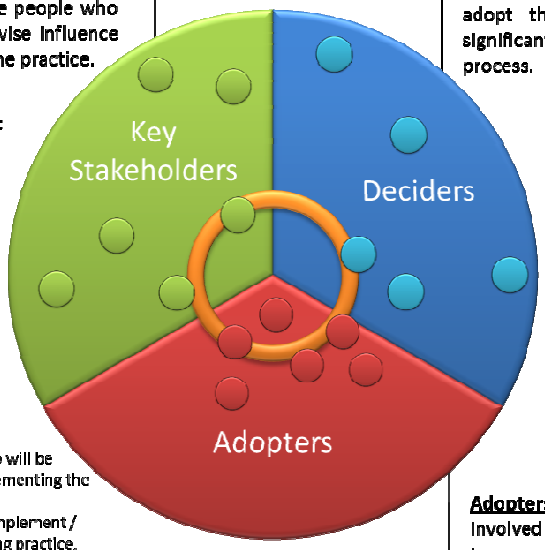
In the adoption system there is another equally important reason. Unless one has such an understanding, it is not possible to identify the knowledge gaps, misperceptions and mistaken beliefs of adopters and key stakeholders. It is these mental models that can act as barriers to adoption of a selected leading practice



Stakeholder map

Key Stakeholders are those persons who are not directly involved in implementation of the leading practice, but who have a vested and direct interest in its success or failure. They are the people who are in a position to enable or otherwise influence those responsible for implementing the practice.

- Group 1 - Persons at risk, but who are **not** responsible for implementing the leading practice
- Group 2 - 3 levels of line management above the first line supervisor
- Union leadership at the mine
- Affected or interested support functions at the mine
- Other e.g. OEM's, DMR



Deciders are those persons who are directly involved in making the initial decision at a mine to adopt the leading practice, or who have a significant influence on the decision making process.

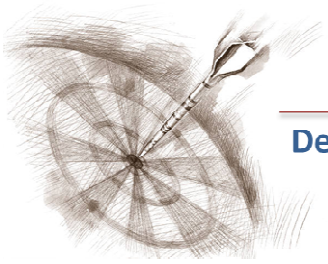
- Key persons at Group Head Offices
- Senior manager at the mine
- Relevant departmental managers at the mine
- Relevant specialists at the mine
- Other e.g. Snr Union Officials

- Group 1 - Persons at risk who will be directly responsible for implementing the leading practice
- Group 2 - Persons who will implement / operate / maintain the leading practice, but who are not directly at risk
- First line supervisors / direct managers of the practice
- Other who will directly be responsible for implementation

Adopters are those persons who are directly involved in implementation of the leading practice in one way or another. They are the people who will be directly responsible for the success or failure of the adoption.

Identification of adopters and stakeholders at the mine

Target interviewees



HR involvement is key

Deciders	Vice President, Safety and Risk
	General Manager - Kopanang
	Manager Occupational Environment
	Snr. Union Officials
Key Stake-holders	Workers in surrounding area of instrumentation
	Section Mine Overseer / Section Manager
	Union Leadership
Adopters	Control Room Operators
	Occupational Environment Officers
	Ventilation Shiftboss
	Instrument Technician

Guide to interviewers for direct enquiry interviews

Explanatory note for conducting Mental Models Research into Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls

1. Ensure you have gone through the questionnaire and you understand it.
2. Interview a cross section of employees from Management down to worker levels with the broader base being aimed at workers working in the direct area of the instrumentation, Loco Drivers and Guards, Tip Attendants, instrument technicians and control room operators.
3. Ensure that you have set your interviewee at ease and have created the right climate for him or her to get an open discussion.
4. This is an interview, not an inquisition – it is important to get from the employee what he thinks in relation to the subject at hand – it is not a “Fill in the blank spaces” questionnaire and should not be treated as such.
5. Please fill in the required information in the top 4 blocks of the first question sheet, as requested and keep this as the cover sheet for the answers to your interview.
6. When asking questions, note the number of that question and then note down the corresponding number in the accompanying answer sheet followed by that persons reply – (you may have to print several answer sheets in order to record your whole interview.)
7. Please record the answer of the person as stated or as close to that as practicable, the analysts will extract the data as needed.
8. Please mark the page numbers at the bottom of each sheet so that the bundle can be stapled, and remain together.
9. If a person does not know an answer to a question or cannot answer it accordingly, please indicate so against the number of the question in the answer sheet.
10. Should you have any questions about this process, or should anything not be clear to you, please contact any of the MOSH Dust Adoption Team Managers.

Questions for direct enquiry interviews at the mine

CONTINUOUS REAL-TIME MONITORING OF AIRBORNE POLLUTANT ENGINEERING DUST CONTROLS

INTERVIEW PROTOCOL

Deciders, Adopters and Key Stakeholders

Management; Unions; Labour; Section 12 Appointee; Technician; OEMs; Maintenance crew (as per the Stakeholder Map)

Interview Purpose: *To identify the need / value / priority and risks associated with adopting the proposed leading practice -* **the application of Continuous Real-time Monitoring of Engineering Dust Controls as part of the broader dust control strategy as a leading practice for mines** *– and what is required to make adoption successful.*

In the adoption system there is another equally important reason. Unless one has such an understanding, it is not possible to identify the knowledge gaps, misperceptions and mistaken beliefs of adopters and key stakeholders. It is these mental models that can act as barriers to adoption of this proposed leading practice.

Solicitation

Hello, my name is <*name*>, I am doing research for <*name of mine/department*>. Are you aware of this initiative to install real-time monitors to enable continuous real-time monitoring of engineering dust controls? <*wait for response and if necessary, give brief explanation and promise to send further information later.* > As this is an important initiative for the mine, supported by the industry's leaders, we are speaking to stakeholders like you to learn more about how we can assist in the adoption of leading practice at the mine.

We would be grateful for your participation and to ask if you would participate in a personal interview. Our conversation should take about 30 minutes and I will be asking you some in-depth questions. If now is not convenient, I can re-schedule at a time that is better for you. Would you be interested in participating?

- <*If "no"*>. Thank you for your time
- <*If "not now*">: What time would be more convenient for you? <*schedule a time and date at the interviewee's earliest convenience.*

- <If “yes”>: Proceed with Introduction

Introduction

I’d like to give you a brief overview on the Continuous Real-time Monitoring of Engineering Dust Controls leading practice and then ask you for your thoughts on the specific challenges you face with dust in your mine and how the proposed leading practice might work.

I have some questions to help guide our discussion, but please feel free to raise any topic related to this subject that comes to mind as we go along. There are no right or wrong answers, and all of the comments you provide will add value to our research.

Before we start, I’d like your permission to have <<name>> take notes throughout the interview or have our conversation recorded for accuracy purposes which ever you prefer. Please be assured that we will not attribute any specific answers to you. What you say will be kept confidential to our research team and

We will only report the results in a summarized form for all interviews. Therefore, no personally identifying information will be passed along to anyone associated with your company or other companies

May we proceed on that basis? Thank you.

INTERVIEW PROTOCOL

DECIDERS *(Management/EXCO/Head Office – as per Stakeholder Map)*

Opening

Share your agenda

Our conversation will cover two topics. First, I'm going to ask you about the risk of dust at your mine, and then I'm going to ask you about how the proposed leading practice might be adapted for your mine.

Provide background

The Continuous Real-time Monitoring of Engineering Dust Controls was identified by the MOSH Industry Adoption Team – Dust (MOSHIAT-D) as a means of significantly reducing dust and more specifically crystalline silica dust in mining operations. Our goal as an industry is to ensure going forward, 100 % of all exposure measurement results will be below the occupational exposure limit for respirable crystalline silica of 0.1mg/m^3, and by using present diagnostic techniques, no new cases of silicosis will occur amongst previously unexposed individuals from 2014 (new milestones has been set and this will assist in achieving the desired outcome).

(Researcher: If Interviewee thinks that he or she does not know enough to answer the question, please use follow-ups, however, don't press if the Interviewee still does not want to answer a question).

- I'm just interested in hearing what you think. Again, there are no right or wrong answers.
- Based on what you know, what are your thoughts on this topic?

Question	Answer
(1) and (2) Perceived risk of Technology or Leading practice : Perceived Risks – Questions for revealing thinking and the need and priority for addressing dust in this mine and also context.	
To start, perhaps you could tell me a bit about your role in the mine/group. What is your position? 1.1) Do you have people reporting to you? 1.2) What is your interest in dust exposure at your mine/group?	

Question	Answer
Now, let's talk a bit about the potential risks of dust at your mine/group 2.1) What are the likely sources of dust being released into the ventilating air at your operations? 2.2) Of the causes you mentioned, what is the most likely cause? 2.3) Is this also the most harmful to people? 2.4) If no, which one that you mentioned would be? 2.5) Thinking about the most harmful cause to people, to what extent is this repetitive? 2.6) Thinking about the most harmful cause << name it>> is there anything that is not understood about why it happens 2.7) From your perspective, what is the single most important thing that can reduce << this cause>> dust on your mine/group? 2.8) Please explain your answer? 2.9) Thinking about current operations at the mine, what is being done well to prevent << this cause>> dust exposure? 2.10) And what still needs to be improved? Thank you. This has been very helpful. Now I'd like to move on and talk about the Continuous Real-time Monitoring of Engineering Dust Controls practice.	

3) Adoption of Technology or Leading practice : (Provide scenario): The mine is considering the application of Continuous Real-time Monitoring of Engineering Dust Controls supported by a comprehensive dust management system manual as part of the broader dust control strategy. This would entail installing the latest available technology to ensure that all people are exposed to the minimum levels of dust at a working area. It would also ensure that everyone implements all procedures for minimizing the creation of dust in a working area and while working in it. **Value and Priority**		
3.1)	So, having heard a bit about the leading practice the team is considering, do you think this would achieve the intended objective of ensuring that all people are exposed to the minimum levels of dust?	
3.2)	If not, what would achieve this objective?	
3.3)	What do you think would be the greatest benefits of adopting the leading practice at your mine/group?	
3.4)	In your opinion, would there be any downsides of adoption?	
3.5)	What do you think it would take for the adoption of this leading practice to be seen as a top priority in your mine/group?	
3.6)	Please explain your answer?	

4) Aids and Barriers to Adoption : Broad Mental Models questions to prompt thinking about aids and barriers.	
4.1) When you think about adopting the Continuous Real-time Monitoring of Engineering Dust Controls leading practice at your mine/group, what will be the most important things to enable successful adoption? 4.2) Tell me why that would be important? <<If they do not mention it, prompt>>: 4.3) What functional requirements would be most important? By that I mean the equipment or the people to do the leading practice? 4.4) What leadership behaviours would be most important? By that I mean the actions that employees can observe leaders doing or not doing? 4.5) And what behavioural communications requirements would be most important? By that I mean, communications that enable people to act in a new way? 4.6) When you think about people who will be primarily responsible for implementing Continuous Real-time Monitoring of Engineering Dust Controls leading practice, what things would be particularly important for them to have in order to implement it successfully? 4.7) And why would that be important? <<If they don't mention it, prompt>> 4.8) How important would training be? 4.9) How about proper tools? 4.10) How about leadership by their supervisors? 4.11) How about behavioural communications? 4.12) Does anything else come to mind that would be important? 4.13) What barriers might prevent successful adoption? 4.14) How might <<take the ones mentioned one at a time>> be addressed?	

5) Leadership behaviours : Specific questions about two major areas of focus that will be aids or barriers to adoption	
Thinking about leadership now… 5.1) What will be important for you to <u>see</u> supervisors <u>do</u> to demonstrate support for adoption of this leading practice? 5.2) Why would this be particularly important? 5.3) Is there anything supervisors <u>should not</u> do? 5.4) When you think about the adoption of the leading practice, what should the supervisors in your mine do that they are not doing right now? 5.5) Why would that be particularly important?	

6) Behavioural Communications :	
Now I'd like to discuss communications about Continuous Real-time Monitoring of Engineering Dust Controls leading practice. 6.1) Which leaders in your mine would be most trusted by teams working to ensure a safe working environment? 6.2) Please explain why that leader << if more than one, take them one at a time>> is most trusted? 6.3) For the most trusted leader, what messages will be important for << this leader>> to stress in their communications when they introduce this leading practice to the mine workforce? 6.4) Why might those things be really important? 6.5) What messages will be important for direct supervisors to stress in their communications when they introduce this leading practice to the teams working to ensure that underground workings are free from dust? 6.6) Why might those things be really important? 6.7) What sorts of messages must be avoided by the direct supervisors? 6.8) Why? 6.9) What forms of communications would be most effective for introducing this leading practice to the	

teams? 6.10) Why those? 6.11) Any forms of communications that should be avoided? 6.12) Why?	

7) Close: Wrap up	
You have been very helpful and I really appreciate the time you have taken to speak with me. In closing: 7.1) Is there anything else that came to mind while we were talking that you would like to be sure the team considers? 7.2) If you could offer one piece of advice to the Continuous Real-time Monitoring of Engineering Dust Control project team, what would it be? That now concludes this interview. Your comments have been very interesting and valuable. On behalf of the project team, and the mine, I'd like to thank you for your time.	

INTERVIEW PROTOCOL

KEY STAKEHOLDERS *(underground workers working in direct vicinity of monitoring instrumentation and section Mine Overseer – as per Stakeholder Map)*

Provide Background

The Continuous Real-time Monitoring of Engineering Dust Controls was identified by the MOSH Industry Adoption Team – Dust (MOSHIAT-D) as a means of significantly reducing dust and more specifically crystalline silica dust in mining operations. Our goal as an industry is to ensure that every employee returns home healthy.

This proposed leading practice ensures that all dust control measures are working well and when not working an alarm will be signalled to the control room for people to take action before workers are exposed to harmful dust concentrations. This will be monitored 24 hours around the clock.

Question	Answer
1. Do you understand the purpose of this practice 2. Why is dust dangerous 3. What do you think cause dust 4. What do you think can be done to reduce dust in the working places (controls) 5. Are you aware of management doing anything to reduce dust 6. How have you been made aware of this 7. Has your supervisor been helpful to make you aware of the dangers of dust – how 8. What should you do if you notice that dust controls are not working as it should or if you see a lot of dust in the working place 9. What will be important for you to <u>see</u> supervisors or management <u>do</u> to demonstrate support for adoption of this leading practice 10. Is there anything supervisors or management <u>should not</u> do 11. When you think about the adoption of the leading practice, what should the supervisors or management do that they are not doing right now 12. Why would that be particularly important 13. Do you think this practice will make a difference in your 14. Do you know where you can go for help if you see a lot of dust in the working area	

15. If you report that there is a dust problem is something being done about it 16. What form of communication will you prefer for understanding this leading practice better	
Closure You have been very helpful and I really appreciate the time you have taken to speak with me. In closing: 1. Is there anything else that came to mind while we were talking that you would like to be sure the team considers? 2. If you could offer one piece of advice to the Continuous Real-time Monitoring of Engineering Dust Controls project team, what would it be? That now concludes this interview. Your comments have been very interesting and valuable. On behalf of the project team, and the mine, I'd like to thank you for your time.	

INTERVIEW PROTOCOL

ADOPTER (Technician)

Provide Background

The Continuous Real-time Monitoring of Engineering Dust Controls was identified by the MOSH Industry Adoption Team – Dust (MOSHIAT-D) as a means of significantly reducing dust and more specifically crystalline silica dust in mining operations. Our goal as an industry is to ensure that every employee returns home healthy.

Question	Answer
1. You have been primarily involved for implementing the Continuous Real-time Monitoring of Engineering Dust Controls leading practice; in your opinion what things would be particularly important to implement it successfully? 2. And why would that be important <<If he/she don't mention it, prompt>> 3. How important would training be? 4. OEM involvement? 5. How about proper tools? 6. How about leadership by your supervisors? 7. Does anything else come to mind that would be important? 8. What in your mind might prevent successful adoption? 9. How might <<take the ones mentioned one at a time>> be addressed? 10. Do you understand the purpose of this practice 11. Why is dust dangerous 12. What do you think cause dust 13. What do you think can be done to reduce dust in the working places (controls) 14. Are you aware of management doing anything else to reduce dust 15. How have you been made aware of this practice 16. Do you think this practice will make a difference in the workers life/health? If so explain why	

Closure You have been very helpful and I really appreciate the time you have taken to speak with me. In closing: 1. Is there anything else that came to mind while we were talking that you would like to be sure the team considers? 2. If you could offer one piece of advice to the Continuous Real-time Monitoring of Engineering Dust Controls project team, what would it be? That now concludes this interview. Your comments have been very interesting and valuable. On behalf of the project team, and the mine, I'd like to thank you for your time.	

INTERVIEW PROTOCOL

ADOPTERS *(Control Room Operators)*

Provide Background

The Continuous Real-time Monitoring of Engineering Dust Controls was identified by the MOSH Industry Adoption Team – Dust (MOSHIAT-D) as a means of significantly reducing dust and more specifically crystalline silica dust in mining operations. Our goal as an industry is to ensure that every employee returns home healthy.

This proposed leading practice ensures that all dust control measures are working well and when not working an alarm will be signalled to the control room for people to take action before workers are exposed to harmful dust concentrations. This will be monitored 24 hours around the clock.

Question	Answer
1. Do you understand the purpose of this practice 2. Do you think dust is dangerous 3. Explain your answer 4. What is your responsibility i.t.o. of this proposed leading practice 5. Has your supervisor been helpful to make you aware of your responsibilities i.t.o. this proposed practice 6. How have you been made aware of this 7. Are you aware of management doing anything to reduce dust 8. What should you do if you notice a dust alarm on the monitoring system 9. Do you think this practice will make a difference in workers life/health – explain why 10. What will be important for you to <u>see</u> supervisors or management <u>do</u> to demonstrate support for adoption of this leading practice 11. Is there anything supervisors or management <u>should not</u> do 12. When you think about this practice, what should the supervisors or management do for you that they are not doing right now 13. Why would that be particularly important 14. If you report that there is a dust problem (alarm) is something being done about it 15. What form of communication will you prefer for	

understanding this leading practice better	
Closure You have been very helpful and I really appreciate the time you have taken to speak with me. In closing: 1. Is there anything else that came to mind while we were talking that you would like to be sure the team considers? 2. If you could offer one piece of advice to the Continuous Real-time Monitoring of Engineering Dust Controls project team, what would it be? That now concludes this interview. Your comments have been very interesting and valuable. On behalf of the project team, and the mine, I'd like to thank you for your time.	

INTERVIEW PROTOCOL

ADOPTERS *(Occupational Environment Officers and Ventilation Shiftboss – as per Stakeholder Map)*

Provide Background

The Continuous Real-time Monitoring of Engineering Dust Controls was identified by the MOSH Industry Adoption Team – Dust (MOSHIAT-D) as a means of significantly reducing dust and more specifically crystalline silica dust in mining operations. Our goal as an industry is to ensure that every employee returns home healthy.

This proposed leading practice ensures that all dust control measures are working well and when not working an alarm will be signalled to the control room for people to take action before workers are exposed to harmful dust concentrations. This will be monitored 24 hours around the clock.

Question	Answer
1. Do you understand the purpose of this practice 2. What is your responsibility i.t.o. of this proposed leading practice 3. Has your supervisor been helpful to make you aware of your responsibilities i.t.o. this proposed practice 4. How have you been made aware of this 5. Are you aware of management doing anything to reduce dust 6. What should you do if you are notified of a dust alarm on the monitoring system 7. Do you think this practice will make a significant difference in workers life/health – explain why 8. What will be important for you to <u>see</u> supervisors or management <u>do</u> to demonstrate support for adoption of this leading practice 9. Is there anything supervisors or management <u>should not</u> do 10. When you think about this practice, what should the supervisors or management do for you that they are not doing right now 11. Why would that be particularly important 12. What form of communication will you prefer for workers to understand this leading practice better 13. Explain why	

Analysis worksheets for direct enquiry responses

Doc#49 - Worksheet (Section 5.6)	Leadership behaviour plan		
Details of relevant levels of leadership	**Antecedent** Things that are required to precede or prompt desired behaviour	**Behaviour** Desired key behaviours that are necessary for success	**Consequences** Actions following behaviour to increase, maintain or decrease behaviour
Occupational Hygienist	1.To ensure that the instruments' positions are reviewed and aligned as ventilation changes. 2. This is done to ensure that the installation districts are correct and the same. It may sound simple but it can be mixed up so that the instrument on the intake side is actually unrelated to that on the return side. Therefore this requires proper training and continuous awareness. 3. To know real time problems and react within 24 hours 4. I believe that a multidisciplinary team with a goal to make this work is necessary for success and sustainability coupled with a budget and training document.	1. Instrument adjustment planning in line with ventilation flows and communicate this to the mimic department 2. Confirm with ventilation, the areas where instruments will be installed and communicate this to the instrumentation department 3. Monitor the trends out of sequence daily from the screen and investigate causes. This system works. For an example, we picked immediately that the fans were switched off and were able to remedy this immediately 4. Involvement of multi-diciplinary team at required levels essential to provide support.	1. This will ensure that the desired output of the instrument reflect the situation correctly so that the correct intervention are effect. This will benefit the 4000 plus workers underground at Kopanang. 2. If this is not done, you will not be able to do trouble shooting and also, wrong installation leads to the instruments being broken by removal and re-installation or blasting for an example. This might create a false sense of no problem and ultimately, not benefiting the exposed 4000 plus employees 3. If there is no monitoring, one will never know real time whether the engineering controls are working and long term high exposures will not be prevented. Without monitoring trends, causes and remedial action, proper budgeting of maintenance and repairs will not occur and the workers would have been failed. 4. If there is no multi-diciplinary involvement and understanding there will be no sustainability for the practice.
Ventilation Shiftboss (Corp 1)	1. Incorrect installation is costly because the removal instruments and reinstallation; therefore correct strategic positioning is important to ensure the correctness of the data 2. This is necessary for the instrument to monitor intake and return precisely and the ventilation engineer must be clear. For an example in a cross cut, this should be put near the cross cut. Actually I believe it is better to install the instruments on intake and return areas and not near activities and controls 3. Identify which heads need more frequent servicing depending on analysis from the trends. The maintenance must include instrument callbration where necessary 4. Although we have not had a meeting as a team to review what we have and make sense of the graphs, I believe this is important to close the loop to ensure that the system work efficiently and is sustainable. The reaction time.	1. Design of mine ventilation and planning of positioning of instruments based on ventilation changes 2. Demarcate precise areas/points where instruments are to be installed (on intake or return) and their position 3. Maintenance schedule and instrument repairs by technical department 4. Analysing and monitoring the trends	1. If not done precisely, you will not be able to get a correct and clear picture of the dust problem and therefore, the planned solution will be incorrect. Also planning must be ongoing to reduce logistic challenges, of stable versus instable areas. In stable areas (workshops) and relative stable areas (stoping), maintenance is longer that in development areas) 2. The objective of the practice will be missed because of diluted results, although I believe that this practice is still in the test stage because as the team, we have not closed the loop, meet to discuss how we investigate the trends. 3. The instruments will clog and if not calibrated, the results will be false. Lack of maintenance schedule lead to no budget for spares or service when this is required. The lack of maintenance schedule can be construed as lack of close interaction of all team members involved (the hygiene and ventilation departments must work closely) 4. If real time analysis is not done, monitoring will not be possible and the cause will not be found and repaired timeously. Note: I personally believe that the powers that be in head office must really commit to making this work through 'visible' support. The reaction time is crucial and in future maybe an electronic device may come in handy.
Ventilation Shiftboss (Corp 2)	1. To ensure that the lessons learnt are utilised when the instruments are installed in Corp 2	1. I ensure that Corp 2 is properly ventilated, however, the instruments have not been installed yet, however, I believe that team work is important	1. To avoid resource wastage

BACKGROUND:
Kopanang Mine is divided in what is termed Corp 1 and 2. Corp 1 runs up to level 61 and have its own ventilation engineer responsible for ventilating the area (Chris Beukes) and that is where the instruments are installed. Corp 2 is 62 and lower and Seth oversees these levels. These instruments are not installed yet in Corp 2

Doc#49 - Worksheet (Section 5.6)	Leadership behaviour plan		
Details of relevant levels of leadership	**Antecedent** Things that are required to precede or prompt desired behaviour	**Behaviour** Desired key behaviours that are necessary for success	**Consequences** Actions following behaviour to increase, maintain or decrease behaviour
Chief Technician	1. I need to install the monitoring equipment underground 2. Planning is essential before installaation of monitoring equipment. 3. I was told to install the equipment without proper communication of why and what the benefit would be for the workers.	1. In order for me to install the monitoring equipment I need to understand the technical specifications of the equipment. 2. I need to plan the following: 2.1 Length of cable required per installation. 2.2 Number of transmitters required 2.3 Available space on the electronic monitoring system 2.4 Installation and maintenance requirements and schedule. 2.5 The cost involved 3. The risk of dust exposure and the benefits of the practice need to be explained for better understanding on why the project is required.	1. If I do not understand the technical specifications the equipment will be installed wrong and will not function. 2. If no planning is done monitoring equipment will not be installed correctly and in time and ultimately will not be installed at all. Also the equipment will not function properly or function at all. 3. Because I was not well informed why the installation of monitors were required and the benefits it would have for the workers, I did not realy had much interest in the project. If I was well informed I would have shown much more interest and took a personal interest in the operation of the system. My head of department also never take interest in my work and never commend me for what I do - in particular with this project.
Occupational Environmental Manager	1. I need to identify the key occupational risks for all workers and put action plans in place to eliminate or minimise the risk and then manage the progress thereof - in this case dust. 2. I need to ensure that the engineering and/or administrative controls are in place, managed and maintained to ensure that workers are not over exposed to dust. 3. I also need to keep management informed of the dangers of being over exposed to dust and what mitigating strategies need to be put in place.	1. The reason for this is to protect workers from dust exposure 2. The reason for this is to protect workers from dust exposure 3. To create an awareness of the dangers of being exposed to dust and also ensure that there is a a multi-diciplinary understanding of the risk to ensure roles and responsibilities are undertsood.	1. If I do not do this workers will be over exposed to dust and ultimately die from silicosis 2. If engineering controls are not effectively monitored through real time monitoring faulty controls will only be reported if at all at a stage when workers have alreday been over exposed and that will have an effect on their health 3. If management is not well informed initiatives will not be approved and the risk of dust exposure will not be seen as important.

Generic mental models report

Generic Mental Models Report for Continuous Real-time Monitoring of Airborne Pollutant Engineering Controls

Major Theme	Sub theme	Description of Theme	Summary of Research Findings
Cause and risk of Dust	Effect of dust exposure not well understood	People do not understand the long-term effect of being exposed to dust	Interviewees were almost unanimous on this point: 'Induction is inadequate' 'Training done but not understood' 'Supervisors do not have the knowledge to explain the risk properly' 'Lack of or no awareness material especially in a language that the workers can understand'
Barriers or Challenges to Address	Attitudes	People do not wear their PPE as it is most uncomfortable	This was mentioned by a tip attendant however this statement could be more general based as a lot of people where observed not to wear their PPE when needed to.
	Need	People don't perceive the need for new interventions	One interviewee felt that they do not have a dust problem. Another said that management do not care so why should they care about their health.
	Effort	The LP may be seen as causing more work	Everybody interviewed felt that no additional workload is required (installation and monitoring people) and saw it as part of their normal duties.
	Production pressure	The LP may retard production	The LP does not retard production in any way.

Aids that will facilitate implement-tation	Participation	Early involvement of all stakeholders in the process, most importantly, Management must engage with us early to explain the benefits of the proposed practice.	This view was held by the vast majority of interviewees. Examples of what was said are: 'Involve all employees and their union in the process from an early stage' 'Management must not do this things their own way and the tell us afterwards' 'Listen to the complaints of the workers and action them'
	Values	LIVE the mines existing values	Interviewees at all levels made reference to "our values" Examples: 'motivate people using the values of the mine' 'Communication, commitment, respect, honesty and recognition'
	Accountability	People at the appropriate level will be accountable to declare a workplace safe	'People at the lowest level will not be unnecessarily punished; the 'people in charge' will bear the responsibility' We have a right in terms of the MHSA to leave a dangerous workplace – this include dangerous dust levels.
	Communi-cation	People must be properly informed and constantly reminded	Literally all interviewees mentioned the importance of communication: 'Frequent meetings' 'Explain it properly' 'Explain the benefits' 'Create a common understanding' 'Explain fully' 'Be understood clearly' 'Be demonstrated practically' 'Explain to people why' 'Keep reminding the people' 'Do it continuously until it is entrenched' 'Up and down – not telling, rather sharing and getting a common idea' Face to face down the line by far the most preferred method of communication - in team context Written communication not preferred.
	Training	People must be able to work according to the system	A substantial number of interviewees expressed the need for proper training. Induction training is in-adequate and does not include new interventions.
	Management commitment	Leaders at all levels must show their commitment to the project.	Most interviewees agreed that the project must be driven from the top. 'They must practice what they preach' 'Management must be patient' 'The top management must not say it's too expensive, health and safety comes first' 'Management must not preach they care for health but only be concerned about production' 'There is never money for anything"
	Leadership	Effective leadership to motivate the people	'Supervisors must be approachable' 'They must listen to the workers' They must be visible' Supervisors 'must not speak rudely or in an unpleasant manner to the people. They must talk nicely' 'Management must be visible, talk to the people' 'Lots of interaction, talk to the people' 'Work together with the people' 'Physical visits to the working places' Management 'must understand what it is about before explaining it to the people' 'The leader must know what he talks about' 'Honesty is important, tell them if you don't know' 'Clear instructions'

Portfolio of Evidence (PoE)

No	**Portfolio of Evidence** - activity	**Outcome for Evaluation**	Check
1	Facilitate adoption decision	The Risk Review and Adoption Decision document signed by the Senior Manager on the Mine	☐
2	Secure widespread support for adoption	The Registration document and details of the Mine Adoption Team Manager and Mine Behavioural Plans Overseer appointed to participate in the Community of Practice for Adoption (COPA)	☐
3	Establish an effective adoption team	The Appointment letters and contact details of the persons forming the Mine's adoption Team - Own Appointments	☐
4	Prepare first version adoption plan	A copy of the Mine's Leading Practice Adoption Plan	☐
5	Initiate monitoring programme	A copy of the Monitoring Plan (baseline and LP performance monitoring programme) – Own Evaluation Documents	☐
6	Establish effective relationship with COPA	A copy of the Brief to the Mine and its employees – Mine Brief	☐
7	Update key stakeholders on progress	A summary description of the Customised Leading Practice to be adopted	☐
8	Plan and conduct direct enquires	Copies of some of the Mental Models Inquiry questionnaires and replies	☐
9	Customise generic behavioural plans	A copy of the customised Mental Models Report	☐
10	Harmonise practice with mine standards	A copy of the Roll out plan	☐
11	Develop approved mine-wide adoption plan	A copy of the customised Leadership Behaviour Plan	☐
12	Develop training and communication materials	A summary of the Leading Practice operational risk plan assessed	☐
13	Brief and train key mine persons	A copy of the customised Behavioural Communications Plan	☐
14	Pilot adoption of the practice	A copy of the preliminary / finalised Training Lessons Plan	☐
15	Monitor, evaluate and report on performance and impacts	A copy of the Mine's final Leading Practice Adoption Plan, including roll out plan, signed off by the senior person at a mine.	☐
16	Finalise and implement mine-wide roll-out plans	Evaluation of Pre-adoption and Post Adoption Leading and Lagging indicators in terms of the prevention of uncontrolled Falls of Ground incidents and Injuries.	☐

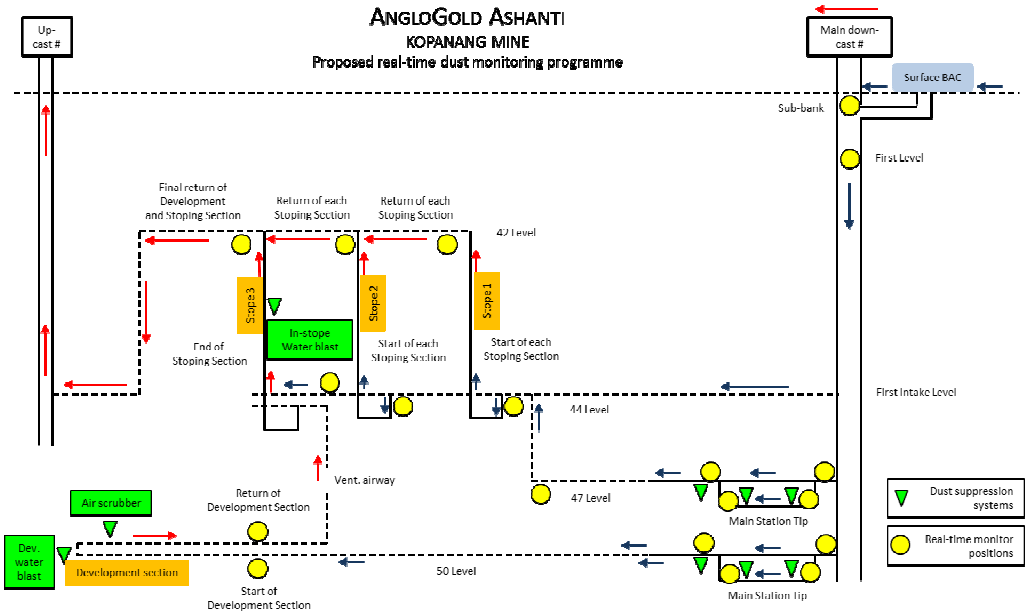
In addition to the above it will be useful to monitor performance from an early stage of adopting the leading practice:

No	**Portfolio of Evidence** - activity	**Outcome for Evaluation**	Check
17	Evaluate Pre-adoption and Post Adoption results of the leading practice and start developing a long-term strategy to determine personal exposure benefits as part of the total dust management strategy.	Evaluation of Pre-adoption and Post Adoption Leading and Lagging indicators in terms of direct total dust reduction and in the long term reduction in personal exposure.	☐

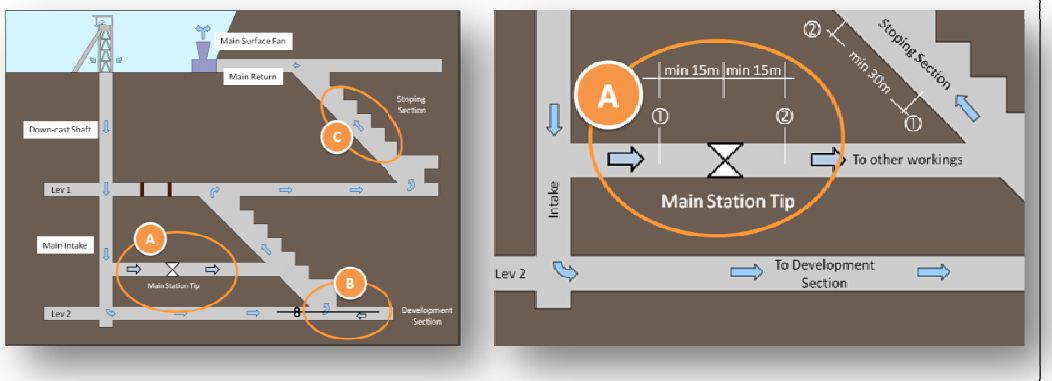
SOURCE MINE: Kopanang Experience

DIAGRAMMATIC DESCRIPTION OF PRACTICE

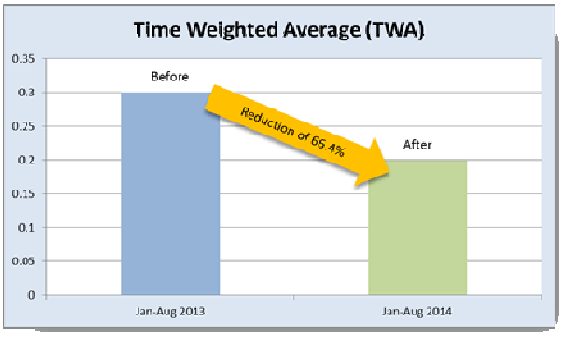
Kopanang - source mine



Typical underground installation



Initial benefit



SUMMARY OF THE GENERIC VALUE CASE

Issue		Details
1	**Initial cost** *(source mine)*	18 Instruments were installed at a cost of R45 000 per instrument. 18 Transmitters had to be installed at a cost of R6 000 per 4 transmitters provided they are not more than 150m apart. (If more than 150m, a new transmitter is required). Fire detection electric cable was installed at a cost of R28 p/m.
2	**Operational costs**	No measurable increase in operational costs have been identified
3	**OHS benefit**	The risk of silicosis to all underground employees who are most at risk, will be very significantly reduced. The source mine has achieved a 66.4% reduction in total dust exposure. This is of real value to both workers and management.
4	**Progress towards zero harm**	Death from silicosis caused by excessive exposure to silica dust is the greatest cause of mortality in mine workers. Reducing this risk to underground employees will constitute a significant step towards achieving the ultimate goal of zero harm
5	**Improved working relationships**	Implementation of the behavioural communication and leadership behaviour plans has the potential to significantly improve the operational working relationship between supervisors and their staff
6	**Buy-in and support**	The mine-wide intervention in the interests of protecting the health of those most at risk will help engender buy-in and support for the intervention, and of employees for management
7	**Legal compliance**	The continuous real-time monitoring of engineering dust controls 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 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 silicosis.

Note:

Costs will be influenced by the following factors:

Various instruments/monitors are available at different costs. The adoption mine/operation will determine the most suitable one to address their need. Price range between R45 000 to R105 000 per instrument/monitor excluding transmitter price.

Availability of "back-bone" on mine – this is the telemetry system (SCADA, fire detection network, wireless etc).

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**.*

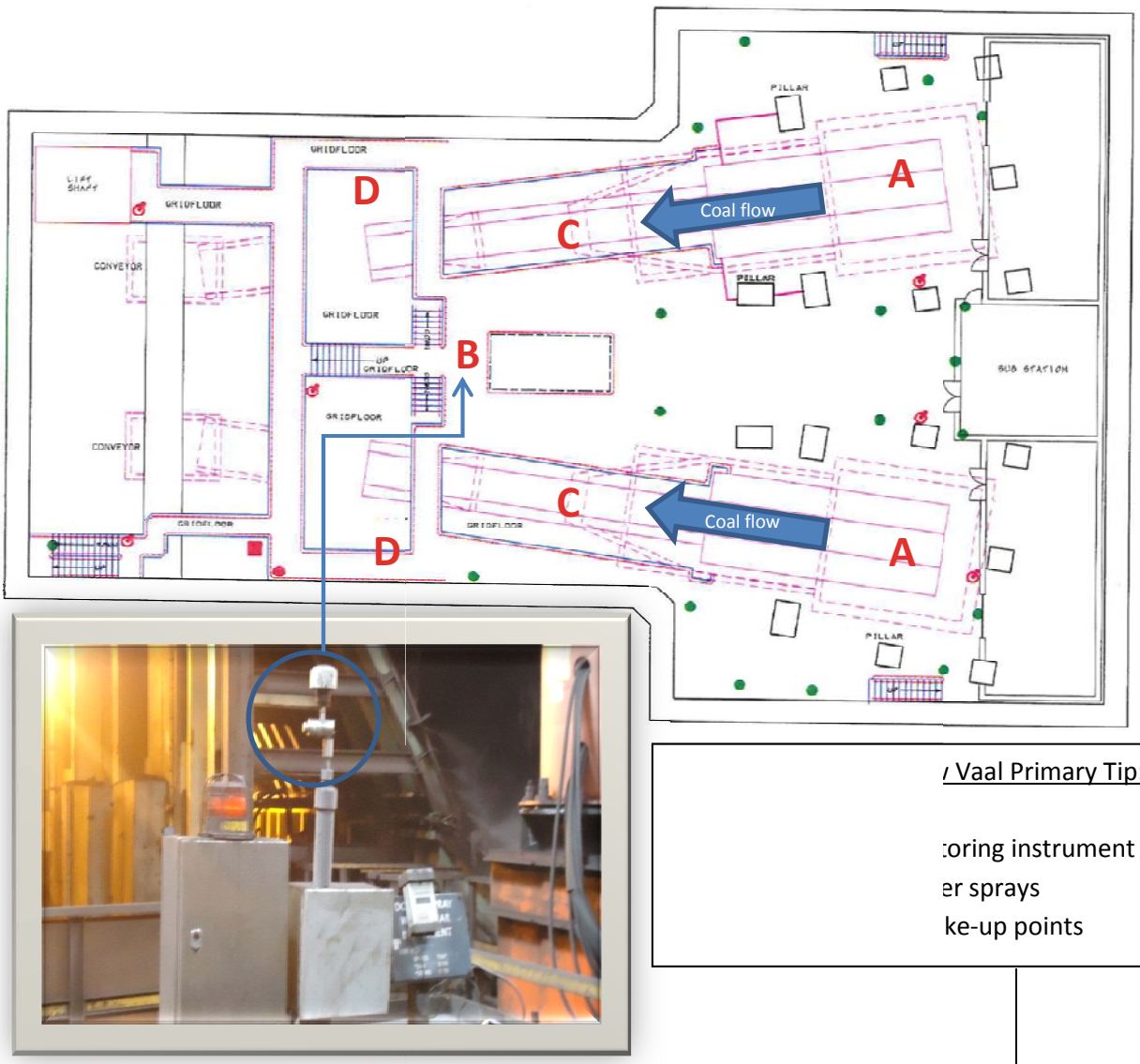
SOURCE MINE: New Vaal Colliery Experience

Total airborne dust is continuously monitored by a dust sampling instrument installed in the Primary Pit area at a point that is representative of the ambient dust load to which workers in the area are exposed. The analogue output signal from this instrument is sent to the mine's Supervisory Control and Data Acquisition system (SCADA). Predetermined action levels have been set for which SCADA commands have been written to ultimately stop product flow through the Primary Tip automatically when airborne dust levels exceed a pre-set limit, prompting positive dust management intervention to reduce the dust levels.

The New Vaal Colliery Primary Tip was originally designed with two open receiving bins with a basic internal tip extraction ventilation system consisting of two wet scrubber fans. The coal produced was tipped directly into these 650-ton surge bins from 180 tonne rear-dumping trucks creating huge volumetric air displacement that generated dust plumes, particularly when dry, dusty product was being loaded. This condition was further exacerbated when product affected by spontaneous combustion was loaded. This airborne dust constituted not only a significant Occupational Hygiene hazard to the Primary Tip employees but also a safety hazard due to poor visibility that affected the area immediately surrounding the Tip, including the nearby Earth Moving Vehicle Workshops. Additional dust was generated within the Primary Tip due to the screening and crushing processes. On numerous occasions, the Primary Tip had to be evacuated due to unacceptable working conditions, resulting in excessive production delays.

The dust management system was upgraded during 2008 with the commissioning of a Passive Dust Hood and the installation of two additional extraction fans, drawing dust from the discharge of the Apron Feeders. Additional high pressure water suppression sprays were added to the now enclosed Primary Tip receiving bins and additional sprays installed within the Primary Tip screening and crushing area.

In 2011 the real-time dust monitor was installed at Primary Tip operators' work area to monitor the effectiveness of the dust management system and to govern employee exposure.



/ Vaal Primary Tip:

:oring instrument
er sprays
ke-up points

KEY FEATURES OF THE LEADING PRACTICE AT NEW VAAL COLLIERY THAT MUST BE ADOPTED FOR THE PRACTICE TO OPERATE SUCCESSFULLY

- The real-time monitor must be positioned at a location with an ambient dust load that is representative of the dust exposure to which the workers in the Primary Pit are subjected.
- The monitor is installed by the mine electrician or technician. It is a simple pre-calibrated "plug-and-play" system requiring the instrument to be mounted, hooked onto a bracket; the earth, power and communication lines to be plugged in to make the dust monitor functional.
- The analogue transducer output must be coupled to the Supervisory Control and Data Acquisition system (SCADA) to affect automatic alarming and process interventions.
- Prior to commissioning the system, the engineering controls at the site must be fully functional and proven to be effective in mitigating the hazard.

- The predetermined action levels must be commensurate with acceptable levels of exposure for workers and must be determined by the Occupational Hygienist at the mine. At New Vaal Colliery SCADA commands have been written as follows:
  (i) @ Total Dust Load of 2.0 mg/m^3 (duration ≥ 5s), a red light is initiated at the monitoring site to warn employees that a high hazard level exists;
  (ii) Simultaneously an alarm is raised at the Central Control Room for intervention by the production team
  (iii) @ Total Dust Load >2.5 mg/m^3 (duration ≥ 60s) the flow of product is electronically interrupted by the SCADA to allow corrective maintenance or production stream mix adjustment and evacuation of employees to surface while the positive intervention takes effect.

Note that the alarm levels are site-specific. It is listed here for the sake of an example and is not considered to be key to successful adoption of the practice.

The adoption of the practice requires the following systematic approach:

- Identify and appoint the champion(s).
- Develop awareness communication to all workers and management.
- List the number and type of engineering controls in place at the adoption site, their baseline efficiencies (known) and what the controls are installed to govern.
- Check the list of controls and fix any components that are defective.
- Develop an action plan to deal with system alarms and process stoppages. (See table below).
- Establish the area where the monitor will be installed. It must be commensurate with acceptable levels of exposure for workers and must have been determined by the Occupational Hygienist at the mine.
- Install the monitor.
- Develop a maintenance plan for both the monitor and the engineering controls.
- Install the dust monitor and initiate the SCADA interface.

The table below outlines the alarms generated by the real-time dust monitor via the SCADA, the processes influenced, and procedures followed:

Trigger	Responsible person	Action	When	How	Closing the loop	Procedure
First alarm raised in Control	Central Control Room (CCR) Operator	Confirms with Team Leader in Tip area	Immediately @ 2.0 mg/m^3 (5s)	SCADA & by radio		SCADA
A red light flashes at tip	Team Leader	Scrutinises the dust suppression & extraction systems for faults. Notifies Control of any. Apron feeder feed rate reduced	Immediately @ 2.0 mg/m^3 (5s)	Control notified by radio.	CCR Operator logs the downtime on his downtime sheet.	Mine STD Procedure
Both Apron feeders stop	Automatic SCADA program interlock	CCR Operator notifies Pit Despatch	Immediately @ >2.5 mg/m^3 (60s)	Radio/ phone	Number of stops recorded in the SCADA Historian	SCADA
	Despatch/ Mining Personnel	Action according to STD Procedure	Immediately	Radio/telephone		
Pre-alarm cleared at Tip as well as SCADA	Automatic reset	Primary Tip operations returns to normal	When dust level monitored falls below 2.0 mg/m^3		Interlock with Apron feeder resets only when dust level reduces to below 2.0 mg/m^3	SCADA

This is an "off the shelf" product, locally manufactured with multiple OEMs as source companies and ready for adoption.

EQUIPMENT DESIGN - ADEQUATELY DESIGNED TO WITHSTAND THE HARSH UNDERGROUND (SIMILAR) ENVIRONMENT

The equipment has been in operation for more than three years at New Vaal Colliery at its Primary Tip and can work in similar environments. Other manufacturers have similar products (tried and tested) that are intrinsically safe, a strict requirement for fiery underground operations.

The various OEMs have capacity to meet the industry supply demand.

MINE APPLICATION – SIMPLICITY OF THE SYSTEM

Yes, the operation of the system is simple and practical. It entails a single transducer installed at the workplace, connected to the SCADA, supported by relevant software that determines the introduction of three alarm levels and associated trips and trip-clearing actions. The installation process is as follows:

- Identify a location with an ambient dust load that is representative of the dust exposure to which the workers at the selected adoption site are subjected.
- Supply a fixed interface for the dust monitor at the selected position.
- Fasten the monitor and plug in the earth, power and communications cables.
- Initiate SCADA.

The schedule of work established for the ***maintenance*** of the monitoring system at New Vaal Colliery requires:

Step	Action	Recommended Frequency
1	Check pump filter and cyclone, clean if necessary	Daily
2	Calibrate pump and monitor plus overhaul of the system	Six monthly
3	Replace filter	Every two weeks depending on dust load

Note: the maintenance requirements are site specific and would also be different for various products from other OEMs.

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Appendix B3

CONTINUOUS REAL-TIME MONITORING OF AIRBORNE POLLUTANT ENGINEERING CONTROLS

LEAD ADOPTION MINE CLOSEOUT REPORT – MOAB/KHOTSONG (AngloGold Ashanti)

- BEHAVIOURAL COMMUNICATION AND LEADERSHIP BEHAVIOUR PLANS – **CUSTOMISED**
- STAKEHOLDER MAP UPDATE
- LESSONS LEARNT AND KEY NOTES

ANGLOGOLDASHANTI

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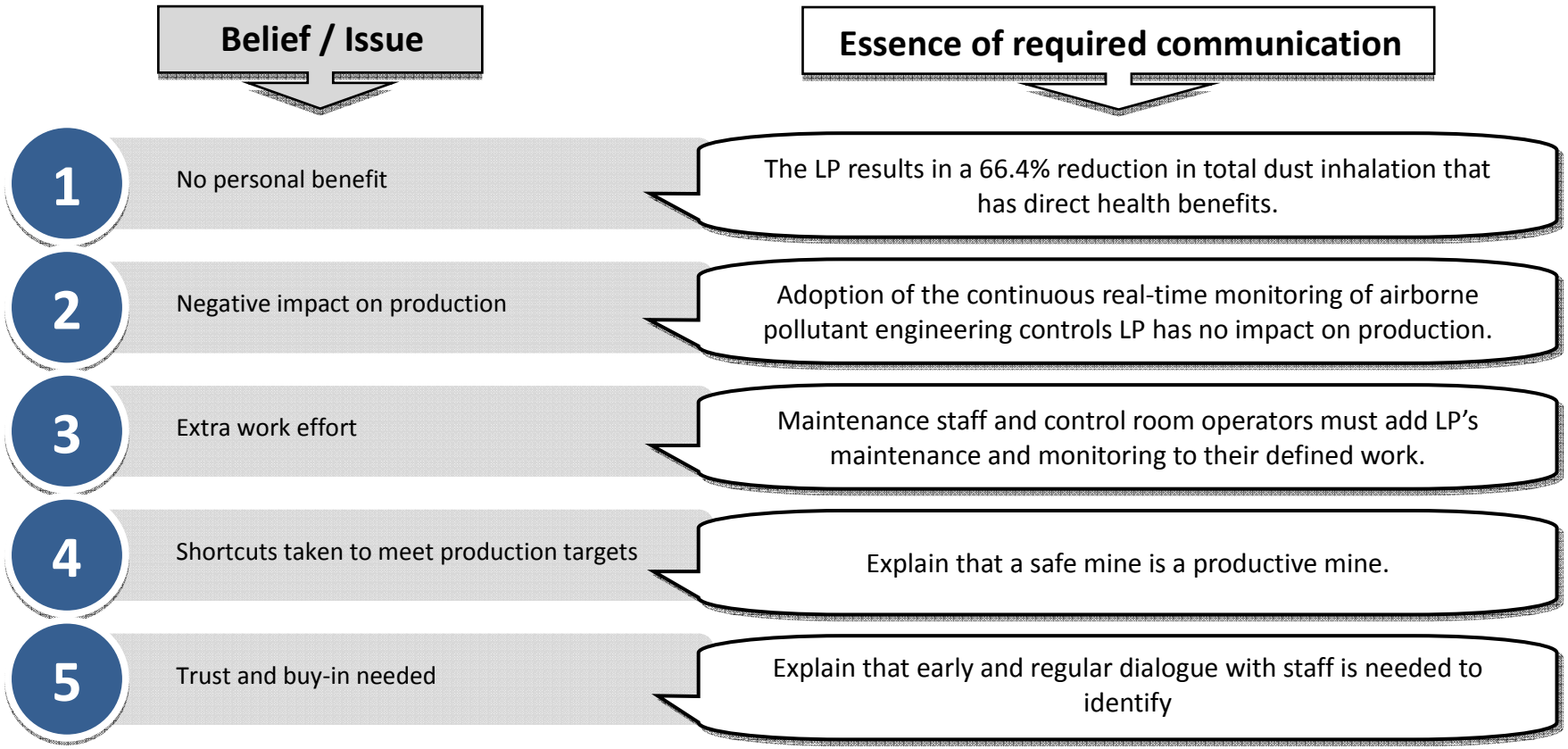
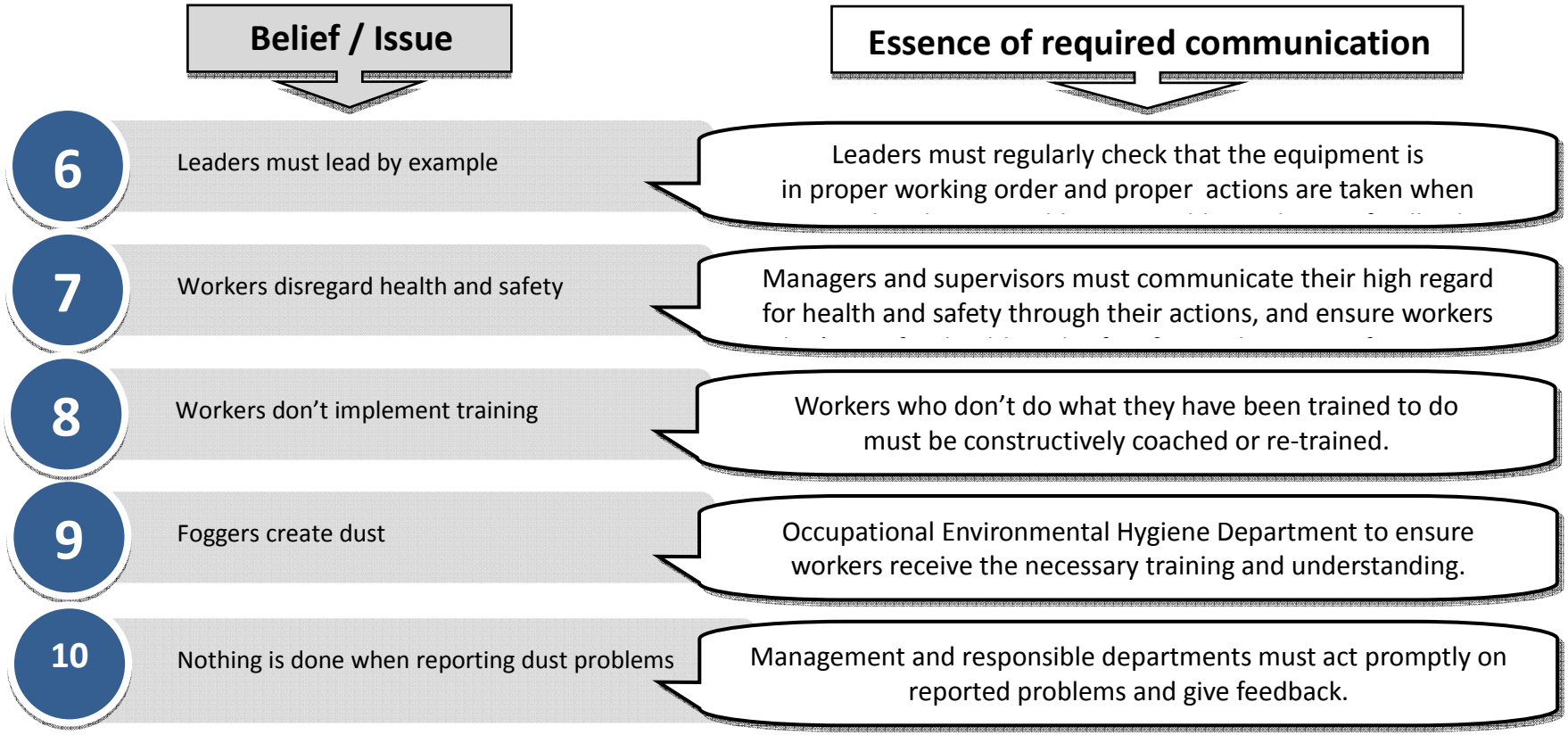
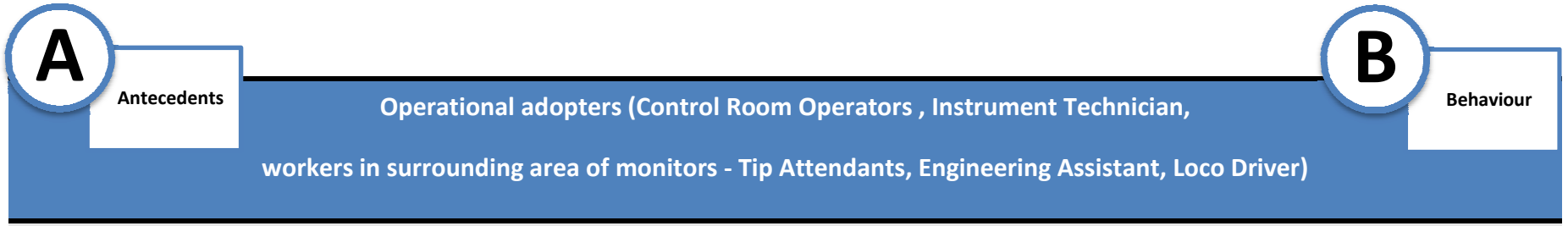
BEHAVIOURAL COMMUNICATION




Belief / Issue
Essence of required communication
6
Leaders must lead by example
Leaders must regularly check that the equipment is in proper working order and proper actions are taken when
7
Workers disregard health and safety
Managers and supervisors must communicate their high regard for health and safety through their actions, and ensure workers
8
Workers don't implement training
Workers who don't do what they have been trained to do must be constructively coached or re-trained.
9
Foggers create dust
Occupational Environmental Hygiene Department to ensure workers receive the necessary training and understanding.
10
Nothing is done when reporting dust problems
Management and responsible departments must act promptly on reported problems and give feedback.

LEADERSHIP BEHAVIOUR



Require:	Responsibilities:
Operational and maintenance training on new LP	Install system as instructed – no short cuts
Briefing before it's implemented	Report any problems with LP
Regular performance enquiries by supervisors	Request explanations to ensure full understanding Determine if dust results as well as remedial action on problems reported have been effectively communicated

A Antecedents	First-level Supervisors (Occupational Environmental Officers, Ventilation Shiftboss, Section Mine Overseer and Unions)	B Behaviour
Require:		**Responsibilities:**
Briefing on operation, installation and required maintenance of new LP		Monitor equipment and maintenance crew's performance
Communication (Briefing before and during it's implementation)		Ensure maintenance crew receive necessary training/instruction Show/inform/talk to workers in the vicinity when the instrument is installed highlighting intake and returned airways, so that they can assist if the instrument shifts positions. Continuous FEEDBACK on the progress of real time monitoring practice to ensure acceptance and sustainability of the thereof.
Regular meetings with next level supervisor		Ensure no short cuts are taken Prompt action on any reported problems Provide immediate positive feedback on observing desired behaviour Provide constructive coaching on observing sub-standard behaviour

Prompt action when reporting malfunctioning of dust engineering controls	Ensure that a system is in place whereby problematic dust engineering controls are logged and actioned for remedial action as soon as possible Prioritise problems Give feedback on remedial action to persons reporting the incident
Results of dust monitoring reports or reports containing such information must be communicated to the workers	Ensure that all reports containing dust results are communicated timeously to the relevant workers
Synchronising of tipping operations with fogger unit operations	Fogger units must be operational when tipping takes place – to be synchronised with one another.
Holistic approach in dust management control	Ensure that all dust controls are in place such as footwall/sidewall treatment, watering down etc.

Everyone's responsibilities:
Responsibilities:
Provide immediate positive feedback on observing desired behaviour
Constructive coaching to address observed problems – no abuse with special recognition for exceptional performance

STAKEHOLDER MAP (Adopters amended)

LESSONS LEARNT and KEY NOTES

1. **Real Time Monitors**
    - It is crucial to comprehend that casing specifications of the instruments where required should include who should measure the velocity in order to determine the parameter of the casing flap and clear demarcation that indicate airflow direction
    - The monitors must be calibrated to mine standard by OEM or Mine Technicians depending on the mine's prerequisite prior to installation.
    - It is highly recommended that the OEM and Technician Department work hand in hand together – especially from commissioning to installation. This is aspect is even more important during piloting stages.
    - Both OEM and mine technicians must ensure that instruments work according to specifications underground
    - The position distance of monitors downstream of engineering controls is important and each mine should determine its own selection criteria up front.
    - Maintenance of the equipment that includes cleaning of instruments installed in high large dust particle sized areas; and calibration should be considered up front and included in the budgeting.

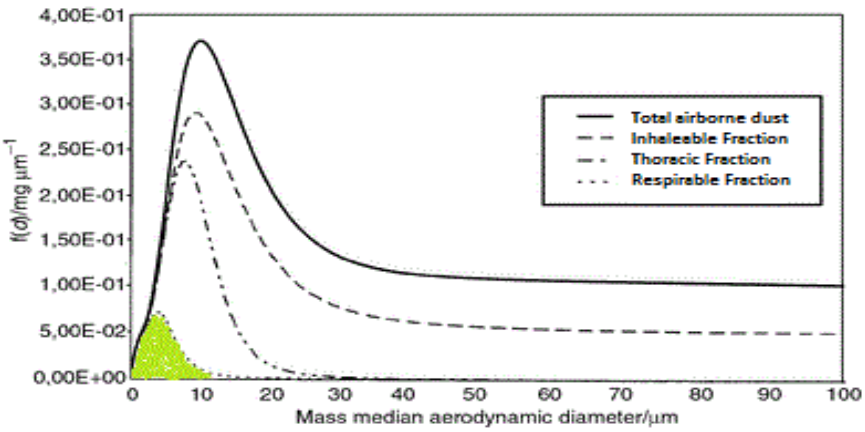
2. **Adhering to MOSH Adoption process**
    - A BIG positive: if you do it the MOSH way, involvement and commitment is just so much greater

3. **Others**
    - The Technical Department is a make or break issue identified –The technician install instruments and control room operator monitor conditions
    - The other make or break issue in addition to the above are workers in the immediate environment of the monitor who need to understand the benefits in order not to feel threatened by the monitor which can lead to sabotaging it.
    - Do not assume that everybody have an understanding of the risks associated with dust exposure, therefore will accept the monitors. Direct enquiries are necessary so that the relevant behavioural communication is developed and implemented.
    - Early involvement of unions and safety reps is crucial in the sustainable success of the practice
    - Involvement the Environmental staff to check monitors during routine inspections and are able to do monitor spike tests and verify at control room.

Background on selecting action flags

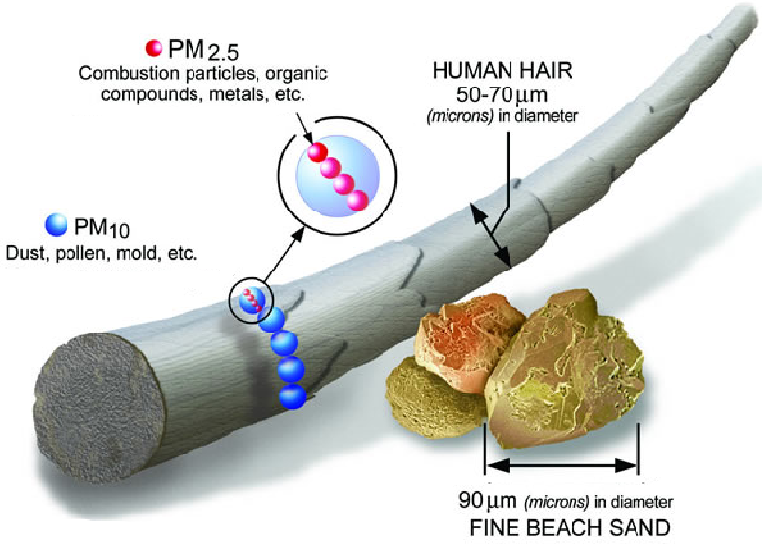
It may be beneficial to the reader of this document to have some understanding of the potent flags selected by the New Vaal team to raise alarms. Both the ambient dust levels for the first and second alarms are for TOTAL AIRBORNE DUST (TAD, <50µm), not Respirable Dust Particles (RDP, <10µm), in comparable aerosols referred to as PM_{10}.

The Occupational Exposure Limit (OEL) for Coal Dust (2.0mg/m^3) is a Time-weighted Average corrected to an 8-hour shift. The OEL is set for an occupational exposure in the workplace and represents conditions under which it is assumed that nearly all workers may be repeatedly exposed day after day for a working life without adverse health effects. There is no ceiling of exposure at any moment in time. Providing that the sample collected for that shift does not exceed 2.0mg/m^3, the person sampled is deemed to have had a safe day at the workplace.



Note: TAD ≈ 2.5*RDP. The Occupational Exposure Level (OEL) for coal dust is 2.0mg/m^3.

Comparing size



The whole idea of the monitoring of the engineering controls at the Primary Tip is to maintain people's exposure at levels that are not harmful to them so that evacuation of personnel from the workplace does not become a solution.

The aggressive flags selected by New Vaal Colliery represent a Gold Standard in the industry. When the hazard levels escalate to >2.0mg/m^3 (TAD) for five seconds it will cause a first alarm. If this TAD level is maintained for the whole shift, it would equate to about 0.5mg/m^3 RDP, well below the OEL. At this time some interventions are immediately initiated to get the airborne dust level down. Some of these are in the control of the Pit Workers, like their ability to increase water sprayed on the product stream and slowing down of the belts delivering the product stream.

If the Pit Crew's efforts are insufficient and the total airborne dust level continues to deteriorate, eventually exceeding 2.5mg/m^3 (TAD) for 60 seconds, the belt supplying the product stream is automatically tripped by the SCADA system, meaning that the dust source is effectively stopped straightaway. That stoppage allows the overwhelmed engineering controls to catch up and regain the upper hand. Again, evacuation is not required, simply because the aggressive TAD flag chosen in effect causes a product stream trip when the RDP is still at an acceptable level, estimated at about 0.7mg/m^3.

Actions that are initiated outside of the Primary Tip are prolonged decreased feed rate and the supply of a less dusty product mix.

The Primary Pit product process resumes after the ambient dust level falls below 2.0mg/m^3 (TAD).

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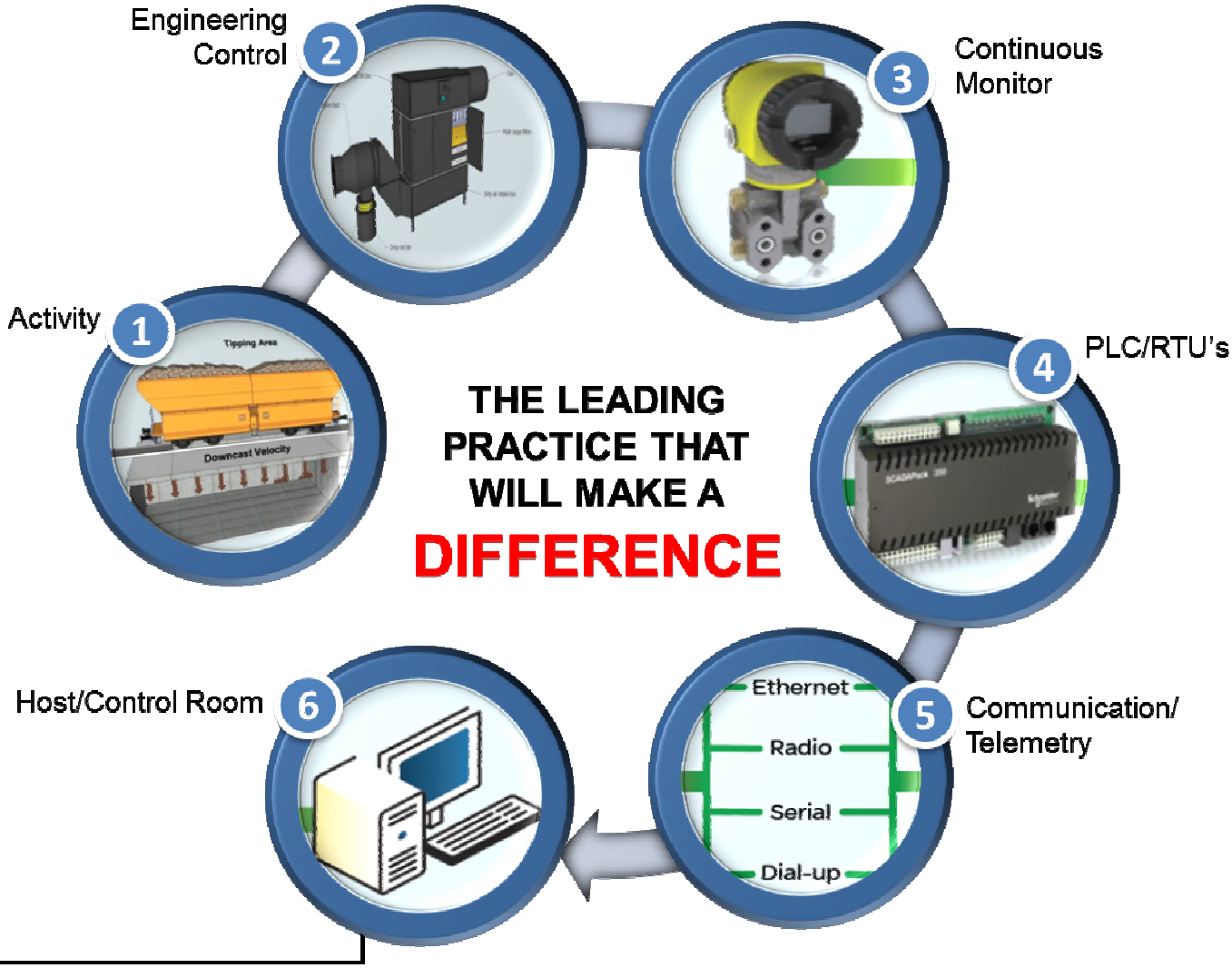
CONTINUOUS REAL-TIME MONITORING OF AIRBORNE POLLUTANT ENGINEERING CONTROLS



Includes:

- Communication drivers
- Real-time data monitoring
- Real-time database
- Alarm and event journal
- Historic archive
- Configuration database

MOSH
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Leading the change to zero harm

CONTINUOUS REAL-TIME MONITORING OF AIRBORNE POLLUTANT ENGINEERING CONTROLS

The first pro-active approach to dust management

Immediate intervention thereby preventing over-exposure to workers

Indicating necessary control measures

Determining the effectiveness of dust suppression methods or equipment

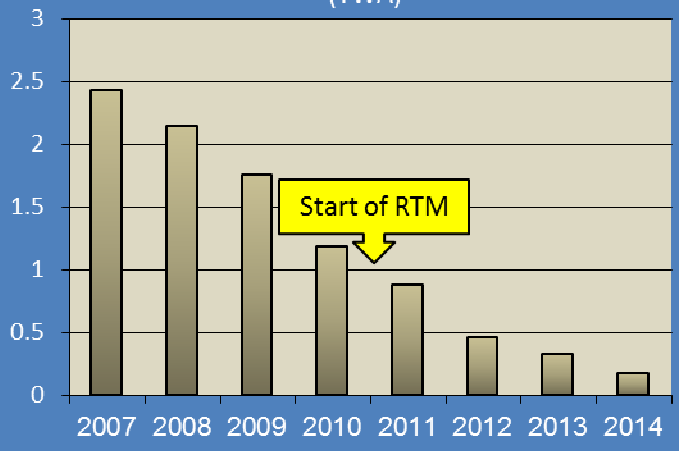
Confirmation that satisfactory conditions have been achieved following remedial measures

Providing records of dust conditions so that trends can be determined

Improve design of ventilation systems

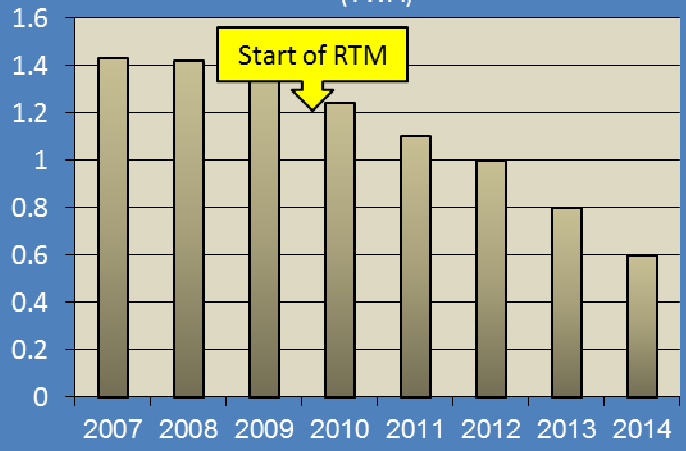
COAL SECTOR

(TWA)



GOLD SECTOR

(TWA)



Applicable for:

Gold | Coal | Platinum | Diamonds | Plants

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