#### QUEENSLAND MINING INDUSTRY HEALTH & SAFETY CONFERENCE 2016 A Past forgotten is a Future repeated

### Real-time Gravimetric Personal Monitoring of Respirable Dust QMIHS Conference – 16 August 2016







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- Sampling methodology largely unchanged since the 1960s
  - Use of pump, cyclone, and filter which is removed from site and weighed
- Still the standard for sampling today
- Technology has advanced all around us, but has lagged in this field





# Overview

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## Technology

# Anglo's Approach

## • Future Developments





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### **Technology** Gravimetric Sampling

- Principles of Operation
  - Governed by AS2985-2009 (originated in 1987)
- Sample Acquisition and Treatment
  - Condition the filter
  - Pre-weigh filter with five-place microbalance
  - Collect sample at 2.2 L/min
  - Place sampler or filter in a pre-labelled dust-free container
  - Filters handled only by "trained/competent/reliable" person

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- Condition the filter
- Post-weigh sample with five-place microbalance
- Pros
  - Proven, and is the standard
- Cons
  - Wait time for results can be days to weeks
  - Potential for contamination of samples (e.g. transport/handling)

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### A Past forgotten is a Future repeated Technology Light Scattering Photometry

- **Principles of Operation** 
  - Illuminate aerosol passing through a defined volume
  - Detect total light scattered by the particles in the volume
- Sample Acquisition and Treatment
  - Most sample passively dust deposition
  - Factory calibrated to specific particle properties
  - Readings compared to the mass of the calibrated sample to provide an <u>inferred</u> mass
  - Must calibrate to site-specific coal properties
- Pros
  - Lightweight, precise, fast, inexpensive
  - Indicate <u>relative</u> or approximate concentrations
- Cons
  - Accuracy varies significantly based on agglomeration, refractivity, humidity, etc.
  - Not a gravimetric instrument
  - Not compliant with any Australian standard for aerosol sampling

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#### a Past forgotten is a Future repeated Technology Tapered Element Oscillating Microbalance

- **Principles of Operation** 
  - Samples collected on filter positioned on the end of an oscillating hollow tube
  - Direct relationship between oscillation frequency and mass
- Sample Acquisition and Treatment
  - Active sampling at 2.2 L/min
  - Cyclone separates coarse particles
  - Direct, gravimetric measurement of respirable dust
- Pros
  - Precise, accurate, fast
  - Indicate <u>absolute</u> dust concentrations
  - Mandated means of monitoring by MSHA in USA
  - Technology founded on principles within AS3580
- Cons
  - No units with AS/NZ Intrinsically Safe certification









**Technology** ThermoScientific's PDM3700 – TEOM Unit

### What Anglo Recognised in the PDM3700





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### **Technology** ThermoScientific PDM3700 – TEOM Unit



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#### Dust card available after download

#### Output screen on unit



SHIFT I	LIMI	ΓT	2.0	00
PERCNT	OF	LIM	ΓT	25%

30 1	MIN	CONC	0.22
C	UM1	CONC	1.21



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### a Past forgotten is a Future repeated Anglo's Approach Integration of Units

- Introduction
  - First and only units ever purchased in Australia
  - Initially introduced at Moranbah North Mine to prove capability
  - Units for Grasstree and Grosvenor purchased in quick succession
  - Currently 12 units in service
- Implementation
  - Supplement to legislated gravimetric personal sampling regime
  - Launch of site-wide sampling roster
    - Including Secondary Support, Ventilation, Conveyors, Shotcreting, etc.
- Involvement
  - Coal Mine Workers
    - Positive feedback, requests for data

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- Inspectorate
  - Obtaining buy-in
  - Providing more information with the same accuracy, faster



### PDM3700 Data vs Shearer Position (Grasstree Mine)





### a Past forgotten is a Future repeated Anglo's Approach Benefits

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#### a Past forgotten is a Future repeated Anglo's Approach Benefits

- **Coal Mine Workers** 
  - Exposure information continuously available
  - Operators have control over exposure; can modify positioning, instigate task-rotation, adjust ventilation
  - No waiting for results to come back in days/weeks
  - Exceedance interviews more meaningful

#### • Administration/Engineering

- Identification of dust contributions from activities (e.g. secondary support, hosing the face, maingate roof support advance, etc.)
- Creation of "dust maps" to indicate optimum operator positioning
- **Supplementation** to legislated gravimetric personal sampling regime
- Determination of dust source magnitudes (i.e. static monitoring)
- Modifications to equipment design
- Evaluation of dust mitigation controls
- Attention to integrity of all sampling methods





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#### a Past forgotten is a Future repeated **Future Developments** For Anglo American

- Data Reliability
  - Undertaking further data capture to align with current standard gravimetric sampling
- AS/NZ Intrinsically Safe Certification
  - Vigorously requesting provisions be made for unrestricted usage
- Feedback to ThermoScientific for Next Generation
  - Functionality and capability
- Continue to lead the industry in our approach to occupational health and dust monitoring





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