Monitoring of dust deposition and determination of mineral composition in the dust in gold mine and coal mine

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Introduction

• Dust fallout (nuisance) monitoring in SA is mostly done by the use of simple non-directional deposition gauge according to ASTM D1739.
• Dust deposition measurement has been used extensively in the South African mining sector as a method to quantify nuisance due to dust.
• High values are an indication that health impact due to fine dust may also have to be investigated.
• Dust is generated during the handling, grinding, crushing, movement of trucks on unpaved roads and wind blowing from mine tailings etc.
Objectives

• Monitor dust deposition in coal mine and gold mine.
• Determine impact of mine dust deposition to the environment due to mining.
• Establish awareness on how to monitor and manage dust deposition rate emanating from mining operations.
Location of the mine per sites

Figure 1: A map showing the location of the mines: Kleinkopje Colliery, Ericson Dam and Tip Area, and Fairview Mine: Fairview Adit and Fairview Biox Plant.
Methodology
Methodology Contin...  

American Standard Testing and Material (ASTM) 1739-1998:  
• Bucket, wind shield, stand of 2m, ropes and pegs.  
• 30 to 33 days onsite.  
• Install far away from trees, buildings etc. (due to dust falling on the leaves and building).  
• Install in a safe area (security guard).
Methodology: dust collection $\rightarrow$ weigh $\rightarrow$ filter $\rightarrow$ dry $\rightarrow$ weigh $\rightarrow$ calculate $\rightarrow$ mineralogy $\rightarrow$ interpret(SANS1929:2005)
Table 1: Dust deposition rates for Kleinkopje Colliery and Fairview Mine from 2012 August till June 2013

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<tbody>
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<td>848</td>
<td>139</td>
<td>88</td>
<td>184</td>
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<td>83</td>
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<td>739</td>
<td>102</td>
<td>122</td>
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<td>FBP</td>
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<td>133</td>
<td>99</td>
<td>11</td>
<td>48</td>
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<td>221</td>
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<td>ED</td>
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<td>204</td>
<td>468</td>
<td>586</td>
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<td>1137</td>
<td>283</td>
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<tr>
<td>TA</td>
<td>863</td>
<td>807</td>
<td>849</td>
<td>1034</td>
<td>1034</td>
<td>11804</td>
<td>647</td>
<td>2.8</td>
<td>902</td>
<td>2286</td>
<td>1434</td>
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</tbody>
</table>

SANS:1929-2005 Target limit: 300 mg/m3/day; Residential limit: 600 mg/m2/day; Industrial limit: 1200 mg/m2/day; Alert limit: 2400 mg/m2/m2/day
Results contin....

Figure 3: Dust deposition rates for Kleinkopje Colliery and Fairview Gold Mine from 2012 August and 2013 June.
Figure 4: Mineral Results (%) for Fairview Mine from 2012 August and 2013.
Results contin....

Figure 4: Mineral Results (%) for Kleinkopje Colliery from 2012 August and 2013 May.
Conclusion

- FBP: August 2012 exceeded the industrial limit of 1200 mg/m$^2$/day and ED: May 2013 and TA: January 2013, May 2013 and June 2013.
- FA: September 2012 and April 2013 and FBP: August 2012 (exceeded the residential limit of 600 mg/m$^2$/day).
- The mineral found in the dust for Fairview Mine: Quartz: 59% for FA in Oct 2012. Plagioclase: 44% Nov 2012 for FA.
- April 2013 for ED Quartz: 38% and Plagioclase: 33% for May 2013.
- The mineral found in the dust for Kleinkopje Colliery: Quartz 59% for ED and TA in Jul 2012 with 53% :Kaolinite.
- Quartz: 78% in January 2013 and Kaolinite: 49% in May 2013 for ED.
## Recommendations

### Table 2: Mitigation control measures for dust generated activities.

<table>
<thead>
<tr>
<th>Location</th>
<th>Source</th>
<th>Mitigation control measures for dust pollution</th>
<th>Timing</th>
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</thead>
<tbody>
<tr>
<td><strong>Fairview Adit and Fairview Biox Plant</strong></td>
<td>Crushing, truck movement, stockpile and mine tailings</td>
<td>Dust suppressant spraying on unpaved roads.</td>
<td>Twice in every week of the month</td>
</tr>
<tr>
<td><strong>Ericson Dam and Tip Area</strong></td>
<td>Blasting, truck movement and Plant Operation</td>
<td>Monitor weather conditions (the wind speed and direction) prior to blasting to ensure minimal dust emissions. Dust suppressant spraying on unpaved roads.</td>
<td>Twice in every week of the month</td>
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</table>
Acknowledgements

Council for Geosciences

- Dr. Mosidi Makgae: Manager for Sustainable Resources and Environment Competency.
- Mr. Supi Tlowana.
- Dr. Henk Coetzee.
- Dr. Bisrat Yibas.
- Ms. Mpumi Msezane: Head of Environmental at TCTA and Mentor.
- Mr. Harold Sello.
- Boitumelo Mahlase.
- Tshinanne Ramukumba.
- Gloria Dube.
Acknowledgements

- All the interns in Sustainable Resource and Environmental Competency.

-Mining houses

• Mr. Richard Nkuna: Environmental Officer of Fairview Mine.
• Ms. Gugu Dlamini: Occupation and Health Officer of Fairview Mine.
• Ms. Bontle Mfolo: Environmental Officer of Kleinkopje Colliery.
• Mr. Jerome Nca: Field Environmental officer of Kleinkopje Colliery.