INTEGRATION OF VARIOUS AIR QUALITY MONITORING SYSTEMS

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1. INTRODUCTION

The management of environmental impacts and the importance thereof form an integral part of operational management at Anglo Platinum Waterval Smelter. As the world's leading platinum producer, Anglo Platinum has the vision of protecting the environment for current and future generations. In order to ensure environmental protection it is important to know what the impact on the environment is.

This paper will provide the reader with a brief introduction on the current air quality monitoring system at Waterval Smelter. The operations are towards the eastern side of Rustenburg in the North West Province. The reasons for the monitoring of air quality at Waterval Smelter is to quantify current impacts on the environment and to predict possible future impacts as well as formulate possible management steps in order to minimise the impact on the environment.

2. HISTORY

The monitoring of environmental impacts specifically related to air quality started actively during the middle 1990's. The start of this active phase was marketed by various assessments. These included ambient monitoring as well as some modeling to predict possible impacts. The earlier information gathered on air quality was also used as impact assessment information and formed part of the Environmental Management Program (EMPR) of Waterval Smelter. The monitoring of in-stack conditions started during this period with the installation of opacity meters to monitor dust and the OPSIS equipment to monitor mainly Sulphur Dioxide emissions. The earlier monitoring enabled the Smelter to quantify emissions into the atmosphere as well as predict possible impacts.

As with any system the need for improvement arose and this required improvement in terms of current air quality monitoring. The implementation of various monitoring methods was investigated and the aim was to look at possible deficiencies and make sure that additional monitoring would address any possible gaps.

3. CURRENT AIR QUALITY MONITORING

The current air quality monitoring systems at Waterval Smelter will be described in this section. This will

include all existing monitoring as well as monitoring systems that have been installed recently. An explanation on why the various monitoring systems have been installed will also be mentioned in each section.

3.1. Ambient monitoring

The first phase of emissions quantification started with ambient monitoring of sulphur dioxide in various areas around the smelter site. The Eskom TSI divisions did this monitoring and stations have been allocated at strategic points. At current, the ambient monitoring stations have a compliment of four permanent stations and one mobile station. At two of these stations particulates are measured and at the other stations sulphur dioxide and meteorological conditions are measured.

Information gathered from these stations is collected on a real time basis and fed into an OWL database on a 5-minute interval via radio telemetry. The database information is used together with in-stack information to model and predict possible environmental impacts. The information collected at the various monitoring stations is reported to the public on a monthly basis and fed into the database of the Rustenburg Air Quality Forum (RAQF).

Eskom TSI performs maintenance on the stations and ensures that routine calibrations are done. An annual report on all data collected is used to correlate processed data from the database with raw data collected at the stations.

3.2. In-stack monitoring

All in-stack concentrations of particulates and sulphur dioxide are monitored on a real time basis and this data is fed into the OWL software model. Particulates are measured with opacity meters and the sulphur dioxide concentrations are measured with the OPSIS (AL 600) equipment.

The data from the off-gas ducting as well as the main stack at the smelter operations is collected into a base station that logs the data onto the OPSIS software. The OPSIS software is used to draw trends in environmental emissions on a daily basis and the reliability of the equipment and the data logging software allows it to be used for process control.

The trends on the OPSIS software are correlated with the OWL database system to ensure that all data collected and reported to the production department and regulatory Departments correlates.

C&M Consulting engineers maintain the current OPSIS system and software. They perform the calibration on the equipment and are responsible for the compilation of an annual report to validate data.

3.3. Modeling

Data collected on an ambient level as well as in-stack measurements of particulates and sulphur dioxide are fed into the

HAWK model from the OWL database. This model then calculates and predicts possible ambient concentrations downwind from the operations by means of isopleths. During normal plant operating conditions the model is used as part of the data collection and data logging system. It is however during upset conditions that the model is used to control the production process at Waterval Smelter.

During a period when downtimes are experienced on air pollution abatement equipment the information from the HAWK model is used on a 24-hour basis to manage the production process. An environmental operator monitors the HAWK model predictions in terms of sulphur dioxide concentrations on ambient level. If any two consecutive predicted exceedence of more than 300ppb in a specific area are predicted it will lead to an adjustment in the production process. This method of emission management has lead to an improvement in ambient concentration exceedences of 50% for the period from January – May 2001 compared to the same period in 2000.

The maintenance of the HAWK model is the responsibility of Environmental Management Services and monthly data validations are performed to correlate reported data with other information strings.

Despite this improvement, two areas of concern have been highlighted, namely the calculation of fugitive emissions from the operations and the actual wind direction at the emission release height of 183 meters (main stack).

3.4. Fence-line monitoring

The monitoring and quantification of fugitive emissions is an area of concern at Waterval Smelter due to the possible uncertainty of the calculation thereof. This is the reason why it was decided to include fence-line monitoring at an inhalation height to make that part of the database data for the model.

The fence-line monitoring system that has been installed is the OPSIS open path monitoring equipment. This path is on the southeastern side of the operations. The total length of the path is almost 1 000 meters and this information is also fed into the OWL database. This information is used to predict sulphur dioxide emissions as part of the in-stack information collected.

The incorporation of this information into the model enables a faster adjustment in the production process due to the shorter distance between the fence-line monitoring point and the ambient exceedence distance.

3.5. Visual monitoring

The correlation between the wind direction at a height of 10 meter where it is measured at the ambient monitoring stations and the actual wind direction where the emission release takes place can differ a lot in certain conditions. If this is the case then it can lead to an "over" or "under" prediction of sulphur dioxide concentrations on ambient levels. This can influence management steps quite severely and this is why it became necessary to look at wind direction at 183 meters.

A visual monitor in the form of a camera has been installed at a strategic position in the plant. The camera can monitor and sample the actual plume direction around the top of the main stack. The sampling is done on a 360 degree sampling line and the direction of the plume is thus reported in the same units as the wind meteorological data. This data string is then fed into the HAWK model than can more accurately predict plume direction in the placement of the isopleths.

The visual monitoring system is maintained by Intervid Ltd and studies for further development on plume tracking is under investigation at the moment and it will also be used in future to compliment the HAWK model.

4. MONITORING SYSTEM INTEGRATION

The data collected for air quality monitoring is fed into the OWL database as part of operational management toll together with the HAWK model. The more information

there is available the better the concentration predictions can be. The consolidation of environmental monitoring systems has certain advantages and various areas that need to be looked at.

4.1 Advantages

The following advantages can be highlighted if air quality monitoring systems are integrated.

- All data can be easily consolidated into one management report.
- Incident investigation and reasons for environmental impacts can be highlighted easily due to the availability of information.
- Reporting on monitoring results to regulatory authorities does not cause extra work.
- Data reliability can be easily controlled and audited.
- Process control can be done from one central point that can actually enable emissions management.

4.2 Problem areas

During the setup of an integrated system some problem areas have been identified.

- The method of data feed into one central database is important.
- The data feed system like telemetry and database design must be structured in such a way as to accommodate future expansions.
- Data strings must be exactly the same; otherwise the database will reject it as faulty data that can lead to wrong decisions.
- Operators working with the system must understand the working of the system.

- Good communication is necessary to enable effective process control..
- A backup of all information is necessary and a database backup is a useful asset.

4.3 Future possibilities

New developments on the data collection are ongoing and it is important to ensure continual improvement. Aphase of data consolidation will be undertaken during the first quarter of 2002 together with all specialists.

During this data consolidation phase, discrepancies between various data collection points can be highlighted. Areas of sub-standard data availability will also be highlighted. This will enable Anglo Platinum to look at future expansions of the current system as well as the filling of gaps in the system. After this phase it will be possible to include other emissions sources of Anglo Platinum in the surrounding areas.

5. CONCLUSION

The integration of the above-mentioned air quality monitoring systems provides Anglo Platinum Waterval Smelter with the ability to manage and minimise environmental impacts. It is clear that by integrating these various systems, it is possible to achieve a holistic view on air quality in the region and ensure that all aspects are covered. This in turn ensures the formulation of possible management steps and well-informed decisions. The most positive aspect of air quality management system integration is that it saves time and is independently auditable.

6. REFERENCES

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