MONITORING COMPLIANCE WITH EMISSION LIMITS SET IN TERMS OF SECTION 21 OF THE NEM-AQA (ACT 39/2004)

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Abstract

Emission standards for Activities listed in terms of S21 of Act 39/2004 were published as a regulation in April of 2010 after a considerable period of public participation. As required by the Act, methods by which the emission values should be determined were published simultaneously as a Schedule to the regulations. A compliance monitoring system does however require more than the prescription of measurement methods. Aspects such as the representativeness of the measurements, the qualifications of the practitioner, quality assurance and quality control, as well as the format of the report all play a role in building up a reporting system that can be used to the benefit of the license holder as well as the regulator. In addition, the steps taken when non-compliance is recorded and reported determine the perception of all parties (including the public) of the rigor, value and practicability of the monitoring system.

This paper looks at established practices regarding emission monitoring in a number of countries in order to develop proposals for a South African system.

Keywords: Emission monitoring and reporting.

1. Introduction

South Africa has recently published the first generation of minimum emission standards for Listed Activities**[1]** as required by the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004). In these standards, government's approach on the regulatory path is reflected in terms of industries to be regulated, how emissions are expressed, and to some level how assessing compliance with the promulgated limits shall be done. However, in the environment in which concentration based emission standards are adopted as a regulatory tool, the scope of requirements is automatically expanded. It becomes important to ensure that samples and measurements obtained provide adequate and accurate data for the purpose of assessment.

The use of stack emission monitoring data has also increased in compilations of emission inventories, environmental impact assessments and other related functions **[2]**. It is then imperative that in instances where this is made a mandatory requirement we analyse underlying implications and suggest ways on how to deal with them.

Established practices regarding emission monitoring and reporting programmes have been developed around the world as part of compliance assessment systems. Although they may vary from country to country, major elements of these are similar as they are based on scientific practices.

This paper attempts to place the requirements of emission monitoring aspects of S21 of the NEM: AQA in context with international best practices.

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2. Elements of a monitoring strategy

Measurement methods, frequency of measurements, measurement techniques, quality assurance and quality control as well as reporting plays a major role in assessing compliance with the limits contained in the standards or emission licences. The United Kingdom guidance note on monitoring of stack emissions to air **[3]** outlines five major elements of successful monitoring as (i) the

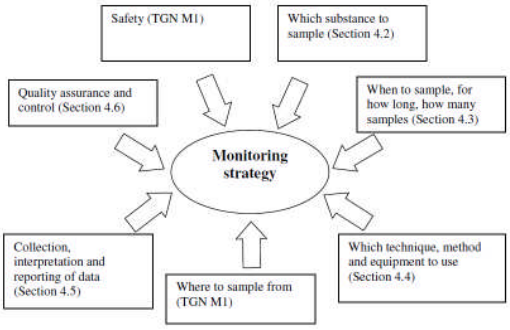

Figure 1: Main elements of a monitoring strategy

importance of representative sampling; (ii) the importance of isokinetic sampling for particulates; (iii) sample conditioning; (iv) reporting of results; as well as (v) access to facilities and services.

Since S.21 Notice minimum emission standards are expressed as concentrations, all these elements are basic requirements.

2.1 Monitoring Standards

Different measurement and analysis methods used to investigate the same object of measurement do not always produce comparable results **[4]**. As a result, measurement and analysis methods are always standardised in order to ensure consistency and comparability of results.

Since compliance with the limits has to be assessed, measurements methods chosen for this must be appropriate for the purpose, thus regulations should clearly establish the relationship of methods with limits.

Technical committees in various standardisation organisations e.g. ISO, CEN are used to establish and/ or assess existing standards for adoption and use for the purpose of environmental protection. These committees are comprised of experts in relevant fields, from science, industry and administration.

Although S.21 Notice scheduled a list of methods to be used in compliance assessment **[5]**, criteria to assess standard reference methods are not yet established under SABS TC 146, thus no comprehensive analysis of whether the methods as promulgated are aligned with the limits, and are “fit-for-purpose” has been conducted.

This might have negative implications on the compliance monitoring once the reporting is required, thus defeating the object of the Notice.

2.2 Representativeness of data

Because of the issues related to homogeneity of stack gases, special measures must be taken to ensure samples are representative. International standards establishing rules on where sampling points should be located are available and should be incorporated as requirements of monitoring.

2.3 Considerations on the choice of monitoring to employ(Averaging period, number of samples and mass emission rates)

The choice of a suitable averaging period is strongly influenced by the expected short-term variability in emission levels (concentrations and/or mass emissions) and whether such peaks are important, for example acute exposure impacts on the sensitive. Also the averaging period chosen must be consistent with the averaging period of the relevant release limit specified in the authorization or permit, with which the data will be compared.

In assessing whether to employ continuous monitoring or periodic sampling, the averaging period (specified either in S.21 or the AEL) over which an individual measurement is made, or the averaging period over which the data is to be expressed needs to be understood.

When monitoring is done for comparison with certain release limits, some of these parameters such as the averaging time for sampling may already be specified in the authorization or permit. In other cases, the decisions will need to be based on how the pollutant concentration is expected to vary with time and the characteristics of the monitoring methods available.

The complexity of deciding between facilities that need to monitor continuously and those that have to follow other less intensive monitoring programmes is reflected in various regulations. E.g. German TA Luft **[6]** uses mass flow rates for selecting industries that shall do continuous emission monitoring. In this case, requirements for mass flow (emission rates) rates are established as part of mandatory requirements. Mass flow thresholds are determined for each pollutant so as to ensure that facilities invest only in monitoring priority pollutants.

2.4 Quality Assurance for emission monitoring (Accreditation programme)

Chemical testing laboratories that wish to carry out stack emission monitoring (i.e. emission testing and calibration of continuous (automated) emission testing instruments) are required by law to be accredited by relevant accreditation institutions. Accreditation is third–party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific assessment tasks[1]. Demonstration of

[1] SANAS A01-07 References, Acronyms and Definitions, 2007

competence is related to criteria established by the accreditation body that the laboratory needs to demonstrate that it meets, including any additional information that may be required for accreditation in specific field. As this is an international best practice, South Africa's minimum emission standards have adopted SANAS accreditation as a requirement for monitoring.

General requirements for competency testing of laboratories are described in the international standard SANS/ISO 17025. In addition to this, it is a norm in countries where stack emission monitoring is mandatory to complement this standard with requirements for accreditation in a specific field as provided for under Annex B of SANS/ ISO 17025 [7]. Two case studies that support this phenomenon are the UK's MCERTS certification scheme **[3]** and Germany which includes "Modul Immissionschutz" under accreditation which is primarily assessed by using ISO 17025 **[4].**

Case Study: MCERTS- UK'S Environment Agency's Monitoring Certification Scheme

The scheme has been developed in collaboration with the Source Testing Association (STA) to set the standards for stack emission monitoring, and is operated on behalf of the Environment Agency by SIRA Test and Certification Ltd. The United Kingdom Accreditation Service (UKAS) accredits SIRA to undertake the product and personnel certification activities which underpin the MCERTS scheme. *Figure 2* provides us illustration of the functions of the scheme.

MCERTS provides assurance to regulatory authorities that stack emission monitoring is fit for purpose and capable of providing results of the required accuracy and reliability. Users of the scheme enjoy the confidence that it is formally recognised by regulatory authorities within the UK.

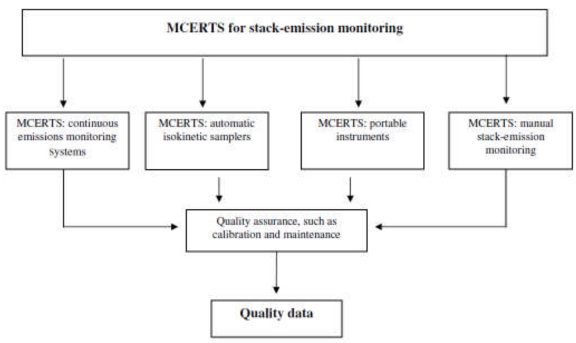

Figure 2: Schematic diagram of MCERTS for stack emission monitoring.

The scheme is split into two components - the certification of personnel and the accreditation of organisations. A certification body accredited to the UK accreditation system has been appointed to run the MCERTS scheme on behalf of government.

One may apply for certification as an individual or as an organisation. If a person applies as an individual, she/ he must meet the Personnel Competence Standard requirements **[18]**. This standard requires an applicant to possess certain qualifications, skills and experience to become certified to monitor pollution released from chimney stacks. It also provides information on exams to be undertaken on this regard. In case of organisations, MCERTS sets a separate performance standard **[19]** for organisations carrying out manual stack emission monitoring (measurement, testing or sampling). Requirements include but are not limited to technical, management and health and safety requirements. Although structured as ISO 17025, this standard does not re-state provisions of ISO 17025 thus laboratories still have to comply with such provisions.

3. Recommendations for stack emission monitoring in South Africa

Establishment of regulatory framework for stack emission monitoring

Stack emission monitoring is a very detailed and complex subsystem of the overall compliance assessment system. Monitoring requirements must be considered and specified alongside limits when they are set for process emissions or receiving environments so that the means of measuring compliance can be readily understood **[8]**. Best practice requires that the relationship between the limits and the monitoring programme be clear and unambiguous and cover all relevant aspects of the limit. The Air Quality Act (Section 8(c)) provides for establishment of national norms and standards for collection and management of data necessary for compliance with ambient air quality and emission standards **[9]**. In future, this requirement should be realized by the regulator.

Standard measurement and reference methods

Internationally accepted reference methods have been incorporated as regulatory methods in S.21 Notice. Although these methods are now part of legal requirements, no criteria was used in their selection. To ensure that only methods which are "fit-for-purpose" are adopted, and relationship of method-and-limit is established, clear criteria for identification and incorporation of methods will have to be established in future.

Technical panel

Currently, SABS TC 146 **[10]** is responsible for the establishment of the emission standards as well as adoption of measurement methods for use in compliance assessments. The composition of the committee however, is not aligned with the concept of "technical expertise" as expressed in the National

Framework **[11]** thus quality of work is compromised.

The National Framework review should look into clear description of the technical and political processes as well as composition of the committees to ensure that maximum benefits are reaped from the use of these statutory scientific bodies. Opportunities to use existing capacity within other bodies such as National Metrology Institute of South Africa (NMISA) **[12]** have to be explored.

SANAS Accreditation of personnel and organisations.

To ensure credibility of data handling and reporting, S.21 Notice requires the SANAS (South African National Accreditation System) accreditation for the stack emission testing and monitoring. This requires additional requirements for laboratories which will be conducting analysis of air samples, and also on the personnel conducting measurement tests and calibration of air quality monitoring equipment.

Currently, there are no specific protocols established for the purpose of air quality. It is recommended that, in the meantime, existing infrastructure such as ISO 17025 based SANAS accreditation protocol(*General Requirements for the Competence of Calibration and Testing Laboratories)* be considered suffcient requirements for organisations conducting air quality measurements and monitoring.

It may be possible to use existing professional bodies to endorse competency of personnel conducting air quality tests. Examples of these are the following:

- Use of SANAS accreditation protocol used in accreditation of metrologists **[13].**
- Registration with South African Council of Natural Scientific Professions **[14]** as a chemist; or
- The Engineering Council of South Africa **[15];** or
- Registration with South African Chemical Institute **[16]**; or
- Southern African Institute for Occupational Hygiene **[17].**

In future, however, the regulator should work with SANAS to establish specific protocols, which shall also address additional capacity building in the specialist area.

4. References

[1] Listed Activities and Minimum Emission Standards, Government Notice No. 537, Gazette Number 33064, 2010.

[2] Andrew G. Clarke, Industrial Air Pollution Monitoring, edition 1, Chapman and Hall, 1998

[3] Technical Guidance Note (M2); Monitoring of stack emissions to air; UK EPA; 2007

[4] German Federal Environment Agency, Air Pollution Prevention Manual on Emission Monitoring, pg 6, 2008.

[5] Listed Activities and Minimum Emission Standards, pg 33, Government Notice No.537, Gazette No.33064, 2010.

[6] TA Luft- BImSchG

[7] ISO 17025- General requirements for the competence of testing and calibration laboratories.

[8] Harrop D.O; Air Quality Assessment and Management, 2002

[9] National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004); Government Gazette No.27318, 2005.

[10] https://www.sabs.co.za/

[11] 2007 National Framework for Air Quality Management in the Republic of South Africa, pg 48, GG No.30284, 2007.

[12] http://www.nmisa.org/

[13] http://www.sanas.co.za/

[14] http://www.sacnasp.org.za/

[15] http://www.ecsa.co.za/

[16] http://www.saci.co.za/

[17] http://www.saioh.org/

[18] Personnel Competency Standard for Manual Stack-Emission Monitoring; Version 7, UK EPA, 2010.

[19] Manual stack emission monitoring Performance standard for organizations; Version 6, UK EPA, 2008.