

Final Motivation for the Postponement of Compliance Timeframes in terms of Regulation 11 of the Section 21 NEM:AQA Minimum Emissions Standards

Motivation Report Prepared by



September 2014

Final Motivation for the Postponement of Compliance Timeframes in terms of Regulation 11 of the Section 21 NEM:AQA Minimum Emissions Standards

Sasol Chemical Industries (Pty) Limited operating through its Satellite Operations (formerly Sasol Nitro), Ekandustria

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Executive Summary

This is an application for a postponement of the compliance timeframes of the Minimum Emission Standards (“MES”) published in Notice No. 893 in Government Gazette 37054 of 22 November 2013 (“GN 893”), for a point source at the Sasol Nitro facility in Ekandustria.

For various reasons that are detailed in this report, the Mono-methylamminenitrate plant will not achieve compliance with the MES within the prescribed compliance timeframes.

Accordingly, Sasol Nitro makes an application for a postponement, to make provision for time to investigate, design, obtain authorisations, approve, build and commission the necessary equipment to bring about compliance with the MES.

Following conclusion of the public participation process, this application has been updated in three respects. First, based on the stakeholder comments received during the public participation process, Sasol has updated some aspects of the applications. Secondly, Sasol is in the process of restructuring its corporate structure and so the Introduction has been updated to explain those changes. Thirdly, Sasol has updated this report’s Chapter 7, now entitled “Sasol’s roadmap to sustainable air quality improvement”. This is done to consolidate information presented throughout this application to emphasise Sasol’s actions toward compliance with the MES for Category 6 at Sasol Nitro’s plant in Ekandustria,

Sasol Nitro proposes an alternative emissions limit of 100 mg/Nm³ to be incorporated as a licence condition in place of the MES operating automatically during the period of the postponement.

The intended purpose of the alternative emissions limit is to define the proposed licence condition with which Sasol must comply for the duration of the postponement period, should the facility be found not to be able to comply under all normal operating conditions. Sasol does not seek to increase emission levels relative to its current emissions baseline through this application, but rather specifies the alternative emissions limit as a maximum emission concentration, to align with the administrative basis of the MES.

The alternative emissions limit proposed by Sasol Nitro have been informed by independent specialist air quality studies on the basis that these limits do not affect ambient air quality beyond the National Ambient Air Quality Standards (NAAQS), which have as their overarching objective, ambient air quality that is not harmful to human health or well-being.

The application is made in terms of regulation (11) of GN893. Regulation 11 entitles a person to apply in writing to the National Air Quality Officer (NAQO) for a postponement from the compliance timeframes set out in Regulations (9) and (10).

Regulation (12) prescribes that an application for a postponement must include –

- a) An air pollution impact assessment compiled in accordance with the regulations prescribing the format of an Atmospheric Impact Report (as contemplated in section 30 of the NEM:AQA) by a person registered as a professional engineer or as a professional natural scientist in the appropriate category.
- b) A detailed justification and reasons for the application.
- c) A concluded public participation process undertaken as specified in the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations.

Regulation (13) limits the period for which a postponement will be granted to 5 years per postponement.

- The requirements of Regulation (12) have therefore been met. An Atmospheric Impact Report has been included as well as an independent peer review report on the modelling methodology employed in the Atmospheric Impact Report. The detailed justification and reasons are included and have been supplemented by a technical appendix outlining compliance solutions with respect to the selected point sources which are the subject of this application. The public participation process was undertaken as specified in the NEMA Environmental Impact Assessment Regulations and concluded in mid-June 2014.

Sasol respectfully requests a postponement of the compliance timeframe for Existing Plant Standards for its Mono-Methyl Amine (“MMA”) scrubber for 5 years, that is, until 1 April 2020. This postponement will enable Sasol to complete the necessary technical investigations to identify and implement the most appropriate solution to assure compliance with the existing plant standards and the new plant standards under all operating conditions.

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Glossary

Definitions of terms as per GN 893, that have relevance to this application:

Existing Plant - Any plant or process that was legally authorized to operate before 1 April 2010 or any plant where an application for authorisation in terms of the National Environmental Management Act 1998 (Act No.107 of 1998), was made before 1 April 2010.

Fugitive emissions - Emissions to the air from a facility, other than those emitted from a point source.

New Plant - Any plant or process where the application for authorisation in terms of the National Environmental Management Act 1998 (Act No.107 of 1998), was made on or after 1 April 2010.

Point source - a single identifiable source and fixed location of atmospheric emission, and includes smoke stacks.

Point of compliance – Means any point within the off gas line, where a sample can be taken, from the last vessel closest to the point source of an individual listed activity to the open-end of the point source or in the case of a combination of listed activities sharing a common point source, any point from the last vessel closest to the point source up to the point within the point source prior to the combination/interference from another Listed Activity.

Definitions of terms as per the NEM:AQA that have relevance to this application:

Priority area - means an area declared as such in terms of Section 18 of NEM:AQA.

Priority area air quality management plan - means a plan referred to in Section 19 of NEM:AQA.

Additional terms provided for the purpose of clarity in this application:

Alternative emissions limits – The standard proposed by Sasol based on what is considered reasonable and achievable as a consequence of the assessments conducted and which Sasol proposes as an alternative standard to be incorporated as a licence condition with which it must comply during the period of postponement. The alternative emissions limits are specified as *ceiling emissions limits* or *maximum emission concentrations*, as defined in this Glossary. In all instances, these alternative emission limits seek either to maintain emission levels under normal operating conditions as per current plant operations, or to reduce current emission levels, but to some limit which is not identical to the promulgated minimum emissions standards. Specifically, these alternative emissions limits do not propose an increase in current average baseline emissions.

Atmospheric Impact Report - In terms of the Minimum Emission Standards an application for postponement must be accompanied by an Atmospheric Impact Report as per Section 30 of NEM:AQA. Regulations Prescribing the Format of the Atmospheric Impact Report (AIR) were published in Government Notice 747 of 2013).

Ambient standard - The maximum tolerable concentration of any outdoor air pollutant as set out in the National Ambient Air Quality Standards in terms of Section 9(1) of the NEM:AQA.

Ceiling emissions limit – Synonymous with “maximum emission concentrations”. The administrative basis of the Minimum Emissions Standards is to require compliance with the prescribed emission limits specified for existing plant standards and new plant standards under all operational conditions, except shut down, start up and upset conditions. Whereas average emission values reflect the arithmetic mean value of emissions measurements for a given process under all operational conditions, the ceiling emission would be the 100th percentile value of emissions

measurements obtained. Hence, ceiling emission values would be higher than average emission values, with the extent of difference between ceiling and average values being dependent on the range of emission levels seen under different operational conditions. Since the Minimum Emissions Standards specify emissions limits as ceiling emissions limits or maximum emission concentrations, Sasol has aligned its alternative emissions limits with this format, to indicate what the 100th percentile emissions measurement value would be under any operational condition (excluding shut down, start up and upset conditions). It is reiterated that Sasol does not seek to increase emission levels relative to its current emissions baseline through its postponement applications and proposed alternative emissions limits (specified as ceiling emission limits), but rather proposes these limits to conform to the administrative basis of the Minimum Emissions Standards.

Criteria pollutants – Section 9 of NEM:AQA provides a mandate for the Minister to identify a national list of pollutants in the ambient environment which present a threat to human health, well-being or the environment, which are referred to in the National Framework for Air Quality Management as “criteria pollutants”. In terms of Section 9, the Minister must establish national standards for ambient air quality in respect of these criteria pollutants. Presently, eight criteria pollutants have been identified, including sulphur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), carbon monoxide (CO), lead (Pb), particulate matter (PM₁₀), particulate matter (PM_{2.5}), benzene (C₆H₆). In this document, any pollutant not specified in the National Ambient Air Quality Standards (“NAAQS”) is called a “non-criteria pollutant”.

Existing plant standards - The emission standards which existing plants are required to meet. Emission parameters are set for various substances which may be emitted, including, for example, particulate matter, nitrogen oxides and sulphur dioxide.

Listed activity - In terms of Section 21 of NEM:AQA, the Minister of Water and Environmental Affairs has listed activities that require an atmospheric emissions licence. Listed Activities must comply with prescribed emission standards. The standards are predominantly based on ‘point sources’, which are single identifiable sources of emissions, with fixed location, including industrial emission stacks.

Maximum emission concentrations – Synonymous with “ceiling emissions limits”. Refer to glossary definition for ceiling emissions limits.

Minimum emissions standards – Prescribed maximum emission limits and the manner in which they must be measured, for specified pollutants. These standards are published in Part 3 of GN 893.

New plant standards - The emission standards which existing plants are required to meet, by April 2020, and which new plants have to meet with immediate effect. Emission parameters are set for various substances which may be emitted, including, for example, particulate matter, nitrogen oxides and sulphur dioxide.

Postponement – A postponement of compliance timeframes for existing plant standards and new plant standards and their associated special arrangements, in terms of Regulations 11 and 12 of GN 893.

GN 893 – Government Notice No. 893, 22 November 2013, published in terms of Section 21 of the National Environmental Management: Air Quality Act (Act No 39 of 2004) and entitled ‘*List of Activities which Result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment, Including Health and Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage*’. GN 893 repeals the prior publication in terms of Section 21, namely Government Notice No. 248, 31 March 2010. GN 893 deal with aspects including: the identification of activities which result in atmospheric emissions; establishing minimum emissions standards for listed activities; prescribing compliance timeframes by which minimum emissions standards must be achieved; detailing the requirements for applications for postponement of stipulated compliance timeframes.

Sasol Nitro –Sasol Chemical Industries (Pty) Limited operating through Satellite Operations, formerly Sasol Nitro, a division of Sasol Chemical Industries (Pty) Limited, which manufactures, markets and supplies industrial explosives, blasting accessories and fertiliser products. For the purposes of this document, “Sasol Nitro” refers to the facility at Ekandustria, in the City of Tshwane Metropolitan Municipality.

Special arrangements – Specific compliance requirements associated with a listed activity’s prescribed emissions limits in Part 3 of GN 893. These include, among others, reference conditions applicable to the listed activity prescribed emission limits, abatement technology prescriptions and transitional arrangements.

List of Abbreviations

AIR - Atmospheric Impact Report

AN – Ammonium nitrate

BID - Background Information Document

CRRs - Comment and Response Reports

DEA - Department of Environmental Affairs

EIA – Environmental Impact Assessment

I&APs - Interested and Affected Parties

LOA – Level of Distinct Odour Awareness

MES - Minimum Emission Standards

MMA – Mono-methylamine

MMAN – Mono-methylaminenitrate

NAAQS - National Ambient Air Quality Standards

NAQO - National Air Quality Officer

NEMA - National Environmental Management Act (Act No. 107 of 1998)

NEM:AQA - National Environmental Management: Air Quality Act (Act No. 39 of 2004)

SCI - Sasol Chemical Industries (Pty) Limited

US EPA - United State Environmental Protection Agency

1 Introduction

Sasol is an international integrated energy and chemical company that employs more than 34 000 people working in 37 countries. In South Africa, Sasol owns and operates facilities at Secunda in the Mpumalanga Province, Sasolburg in the Free State Province and Ekandustria in Gauteng. Sasol's facility in Ekandustria is operated by Sasol Nitro, which manufactures, markets and supplies industrial explosives, blasting accessories and fertiliser products.

Sasol is currently undergoing corporate restructuring which involves consolidating the majority of its operations into a single business, namely, Sasol Chemical Industries (Pty) Limited ("SCI"). However, in order to avoid unnecessary confusion, references to Sasol's entities have been kept in this report as previously described. This postponement application relates to Sasol Chemical Industries (Proprietary) Limited, operating through its Satellite Operations, formerly Sasol Nitro ("Sasol Nitro").

In March 2010, the Department of Environmental Affairs (DEA) published Minimum Emissions Standards (MES), in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA). In November 2013, the regulation within which the MES were contained, was repealed and replaced, and this application is therefore aligned with the 2013 MES.

The MES serves to define maximum allowable emissions to atmosphere for a defined range of pollutants and specific activities that can result in such emissions. The MES also prescribe special arrangements which prescribe, amongst other things, reference conditions applicable to the listed activity prescribed emission limits, abatement technology prescriptions and transitional arrangements.

In terms of GN 893, existing production facilities are required to comply with MES prescribed for existing plants by 1 April 2015 ("existing plant standards") unless otherwise specified, as well as with MES applicable to new plants by 1 April 2020 ("new plant standards") unless otherwise specified. The MES apply to many of Sasol's activities including those of Sasol Nitro at Ekandustria.

It is Sasol's intention to comply with the DEA's objective to improve air quality in South Africa. For reasons that are detailed in this report, however, Sasol Nitro makes an application for postponement of the compliance timeframe within which the existing plant standard for one point source must be met.

This document serves as Sasol Nitro's motivation for postponement.

The application for postponement of the obligation to comply with Category 6 of the MES includes:

- This motivation report outlining detailed reasons and a justification for the postponement application.
- An independently compiled Atmospheric Impact Report (AIR) compiled in accordance with the Atmospheric Impact Report Regulations of October 2013.
- A Stakeholder Engagement Report outlining the public participation process that is being conducted in accordance with the National Environmental Management Act: Environmental Impact Assessment Regulations. This includes an overview of comments received from Interested and Affected Parties, along with Sasol Nitro's responses.

This motivation report is accordingly structured to present more detailed information on the activities of Sasol Nitro. Thereafter, the MES are presented in general, together with the minimum emissions standards applicable to the Mono-methylamine ("MMA") scrubber before the reasons compelling the postponement request are presented. In order to demonstrate the implications of the postponement requests for ambient air quality the key findings of the AIR are then presented, before presenting a summary of the public participation process that has been conducted in support of this application.

2 Sasol Nitro

Sasol's integrated value chains, which apply largely to its South African operations, involve diverse and interdependent businesses. Sasol's main activities in South Africa are at facilities located in Secunda, Mpumalanga and Sasolburg, Free State.

Sasol Nitro manufactures and markets fertilisers, commercial explosives and related products. It also markets sulphur produced by other Sasol divisions. Its facilities are located at Sasol's Secunda complex and Ekandustria.

Sasol Nitro's Ekandustria facility is located approximately 65 km east of Pretoria and approximately 18 km north of the centre of Bronkhorstspuit. The facility is located within the City of Tshwane Metropolitan Municipality in the Gauteng Province. Amongst several activities at Ekandustria, Sasol Nitro produces Mono-methylamminenitrate ("MMAN"). MMAN is an explosive chemical somewhat similar in explosive properties to ammonium nitrate (AN). The addition of the carbon-containing methyl group in methylammonium nitrate imparts better explosive properties and helps create a more favourable oxygen balance.

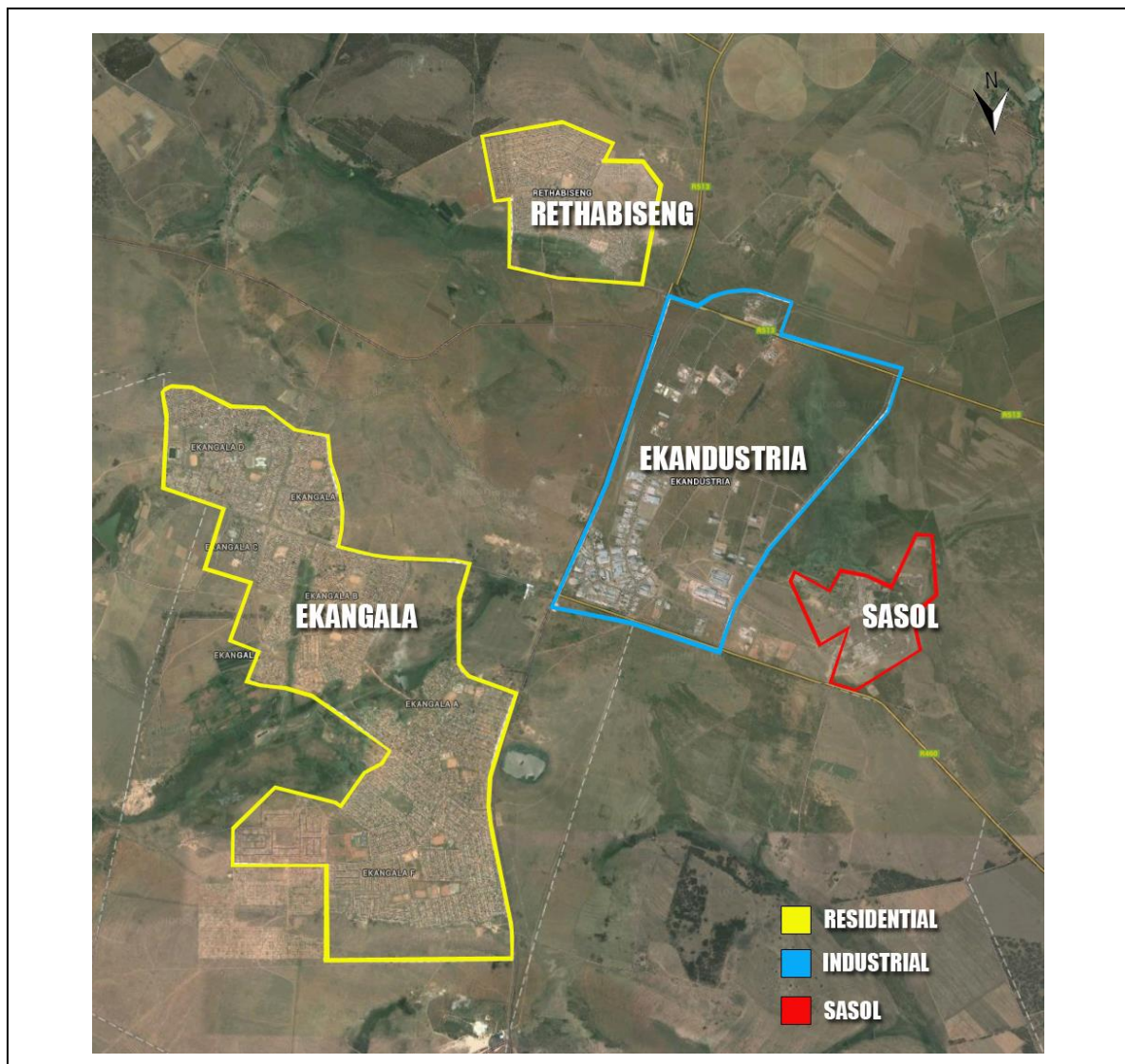


Figure 1: Location of Sasol Nitro facility in Ekandustria, Gauteng

MMAN is produced by combining MMA with nitric acid in a reactor. The chemical reaction that occurs is exothermic (it produces heat) and steam is generated which is emitted to atmosphere via stack, as illustrated in Figure 2. The steam contains some unreacted MMA and it is the emissions of that unreacted MMA that are limited by the MES.

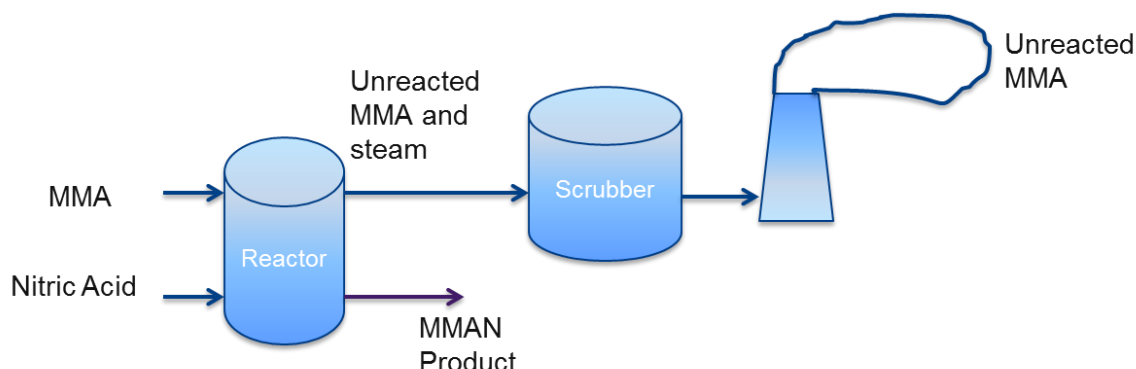


Figure 2: Schematised illustration of the MMAN Production process

To Sasol's knowledge, there are no other activities emitting MMA in the vicinity of Ekandustria.

3 The Minimum Emissions Standards

NEM:AQA is a specific environmental management act as contemplated in the National Environmental Management Act (Act 107 of 1998) (NEMA), and aims to give effect to the Constitutional right to an "environment that is not harmful to health or wellbeing and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development". In this context, therefore, Sasol makes this application.

The Regulations identifying listed activities and prescribing MES for those activities were made in terms of Section 21 of the NEM:AQA, and promulgated in Government Notice No. 893 on 22 November 2013 (GN 893). Amongst others, Part 3 of the Regulations includes MES, which oblige existing production facilities to comply with certain emission limits and associated special arrangements by 1 April 2015 ("existing plant standards") unless otherwise specified, as well as with certain emission limits and associated special arrangements applicable to new plants by 1 April 2020 ("new plant standards") unless otherwise specified. GN893 includes amongst others, the identification of activities which result in atmospheric emissions; establishing MES for the listed activities, including emission limits and associated special arrangements; prescribing compliance timeframes by which MES must be achieved; and detailing the requirements for applications for postponement of stipulated compliance timeframes.

The 2013 Regulations of GN 893 repealed and replaced the Regulations that had been published in March 2010 under Government Notice No. 248. GN 893 contains substantial amendments to the previous MES, including changes to the listed activities and their associated special arrangements, additional activities subject to regulation and changes to some of the prescribed emission limits. Notwithstanding the amendments, the compliance timeframes prescribed in the 2010 Regulations remain unchanged.

There is a small number of different MES listed activity categories that apply to the Ekandustria facility. The applicable MES are summarised in Table 1 together with an indication of whether or not Sasol will comply with the prescribed limits and associated special arrangements. Green colour coding reflects compliance with the MES and orange reflects the application for postponement of the compliance timeframes for emission limits specified for methylamines at the MMAN plant as detailed in this motivation report.

Table 1: Summary of compliance with the MES for Sasol Nitro's affected entities (note that this is a summarised version of the MES)

MES Category	Substance(s)	Emission limits or special arrangements*		Applicable Sasol Activities
		New plant standards	Existing plant standards	
Category 4: Sub-category 4.13	Particulate matter	30	30	Lead smelting furnace
	Lead	2	2	
Category 6: Organic Chemicals Industry	Sulphur trioxide	30	100	MMAN Plant
	Acrylonitrile	5	5	
	Methylamines	10	10	
	Total volatile organic compounds (thermal)	150	150	
	Total volatile organic compounds (non-thermal)	40 000	40 000	
Category 8: Sub-category 8.3	Particulate matter	Three months running average not exceed limit value for adjacent land use according to dust control regulations in terms of Section 22 of NEM:AQA (Act No. 39 of 2004), in eight principal wind directions.		Burning grounds
	Sulphur dioxide	Twelve months running average not to exceed limit value as per GN 1210 of 24 December 2009.		

*Emission limits are specified as mg/Nm³ under normal conditions of 273 Kelvin and 101.3 kPa

Colour coding:

	Seeks postponement of compliance timeframes for the prescribed emission limit.
	Will comply with the prescribed emission limit within prescribed compliance timeframes.
	Standard not applicable to Sasol Nitro Ekandustria.
	Compliance to be confirmed through measurements, however full compliance is expected.

The MES Category 6 (Table 2) prescribes emission limits applicable to Sasol Nitro's MMAN production process. Sasol Nitro is expected to already comply with all the emissions limits included in Category 6 for all its process units at the Ekandustria facility, except for the emission limits specified for methylamines at the MMAN plant.

Table 2: Excerpt from MES Category 6 – Organic Chemicals Industry: Methylamines

Description	<p>The production, or use in production of organic chemicals not specified elsewhere including acetylene, acetic, maleic or phthalic anhydride or their acids, carbon disulphide, pyridine, formaldehyde, acetaldehyde, acrolein and its derivatives, acrylonitrile, amines and synthetic rubber.</p> <p>The production of organometallic compounds, organic dyes and pigments, surface=active agents.</p> <p>The polymerisation or co-polymerisation of any unsaturated hydrocarbons, substituted hydrocarbon (including vinyl chloride).</p> <p>The manufacture, recovery or purification of acrylic acid or any ester of acrylic acid.</p> <p>The use of toluene di-isocyanate or other di-isocyanate of comparable volatility; or recovery of pyridine.</p>		
Application:	All installations producing or using more than 100 tons per annum of any of the listed compounds.		
Substance or mixture of substances		Plant status	mg/Nm³ under normal conditions of 273 Kelvin and 101.3 kPa.
Common name	Chemical symbol		
Sulphur trioxide (from sulphonation processes)	SO ₃	New	30
		Existing	100
Acrylonitrile (from processes producing and/or using acrylonitrile)	CH ₂ CHCN	New	5
		Existing	5
Methylamines (from nitrogen-containing organic chemicals)	CH ₅ N	New	10
		Existing	10
Total volatile organic compounds (thermal)	N/A	New	150
		Existing	150
Total volatile organic compounds (non thermal)	N/A	New	40 000
		Existing	40 000

Sasol Nitro intends to comply fully with the MES compliance timeframe of April 2020 for the new plant standard, but will not be able to make the changes to its activities required for MES compliance by April 2015, the compliance timeframe for the existing plant standard. The reasons for not being able to comply with the prescribed time frame are detailed in the following section of the application.

4 Reasons for applying for postponement

The reasons for applying for postponement are based on the time it will take Sasol Nitro to complete technical investigations, and approve, obtain necessary authorisations for, and fully implement the abatement interventions needed to comply with the MES. In order to elaborate on that timing constraint, abatement options are first described and thereafter the timing challenges are detailed.

4.1 Emissions abatement options

Prior to the publication of the initial MES in 2010 there had been no regulatory limits on amine emissions. When the first MES were published in 2010 Sasol Nitro started investigating the efficacy of the existing emissions abatement measures in place to determine what additional measures might be required in order to fully comply with the newly published limits. These investigations led Sasol Nitro to implement various process modifications which were successful in reducing MMA emissions.

While the MMAN production facility has an existing air emission scrubber system in place, Sasol Nitro is not as yet certain that it alone can achieve the required emission reduction under all operating conditions. To reduce emissions further and consistently maintain MMA emissions below MES, a heat exchanger condenser system connected to the scrubber system was recently commissioned. The condenser system is designed to significantly improve the MMA emission removal process. Successful test runs conducted during the second half of 2013 showed that, by incorporating the condenser system, the MMA emissions would be fully compliant with the MES.

The condenser system by design generates an effluent which needs to be accommodated by the sites effluent management facility as shown in Figure 3. A portion of the effluent is routed back to the reactor to control the reactor temperature.

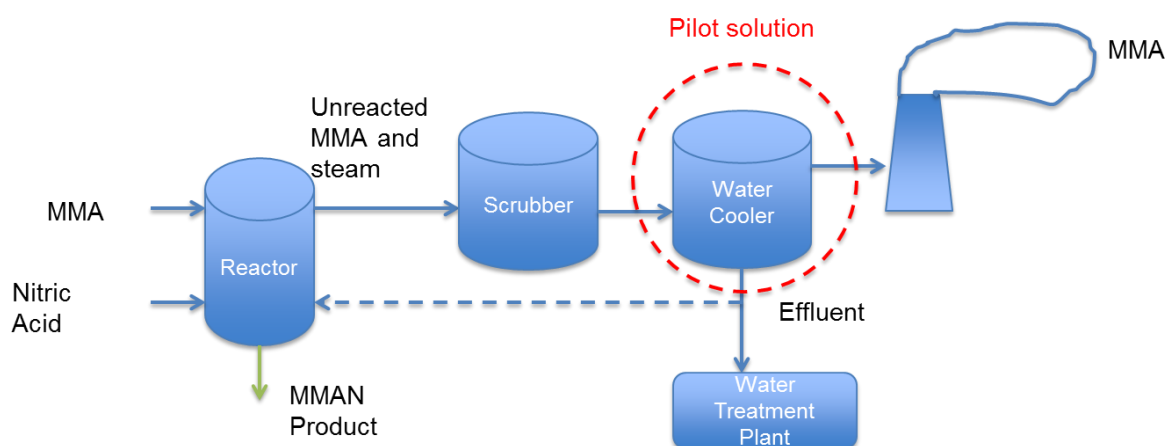


Figure 3: Introduction of condenser system to MMAN production process

Sasol Nitro has undertaken a detailed site water and effluent study which has identified areas requiring improvement. Sasol Nitro first needs to establish the extent to which the condenser/ heat exchanger may be required to operate the MMA facility within air emission compliance limits and the associated effluent that will be generated. Once this is known then the consequential impact on the project to upgrade the existing effluent management facility can also be established.

The request for a five year postponement is made to ensure that these committed actions can be achieved.

4.2 Schedule challenges

In order to comply with new plant standards under all normal operating conditions, an effective solution to address the downstream process of the condenser's additional effluent volumes must be identified, designed, approved, obtain necessary authorisations, be built and commissioned. An example of such a solution would be performing upgrades to the water treatment plant to accommodate the additional capacity required. This solution could not be implemented immediately since technical investigations must first be completed. In addition, any expansion of the water treatment plant would require an environmental authorisation, and the associated completion of a Basic Assessment¹. The completion of the Basic Assessment and the completion of the design, all take time and would have to be completed before construction could commence. As a result, an upgrade to the site's effluent management system would not be completed before the existing plant standards compliance deadline of April 2015.

4.3 Due diligence obligations

Sasol has an established project development and governance framework to manage an extensive portfolio of capital projects, which is a "stage-gate" model.

The importance of this model to Sasol's capital projects is two-fold:

- From a project development perspective, bringing learnings from previous project experience to bear, the model provides a framework to carefully guide the solution design process towards successful projects. Among the many important aspects guided by the model, are detailed investigations and design considerations required to address the additional complexities of interfacing new (or altered) equipment into an integrated and operational brownfields facility. For example, such considerations would include whether additional steam or power is needed for the new piece of equipment, and whether the equipment changes the throughput or capacity requirements of other process units upstream or downstream of it.
- From a governance perspective, the model prescribes rigorous project development quality standards and business requirements to be met at each successive stage of project development, before a project is approved to proceed to the next development stage. This governance process is aimed at assuring the robustness of solution development, towards implementation of successful projects that achieve their objectives and are aligned with business intent. Good project governance means that all projects need to be properly motivated, evaluated and approved in a systematic and consistent manner. The need for good governance is heightened further by the fact that Sasol is a listed company on two stock exchanges.

The duration of the various development phases (the "stages") is typically linked to the solution's complexity, its number of interfaces with surrounding processes, and upstream and downstream process impacts. The governance processes (the "gates") serve as a crucial quality control to ensure that effective projects are ultimately successfully implemented and integrated into the facility's business model. The model is summarised in Table 3.

¹ In terms of Environmental Impact Assessment Regulations (2010), Government Notice No. 543 and Government Notice No. 544.

Table 3: Overview of Sasol's stage-gate project governance model

Project Phase	Purpose
Idea Generation	Formulate a project's "opportunity statement", to crisply explain the driver for the project. In so doing, articulate the nature and scope of a project.
Prefeasibility	Identification of possible operational improvements and technology options to address the opportunity statement, and initial assessment of each option's applicability/feasibility, to narrow down a sub-set of prioritised solutions. Depending on the project, this phase could require extensive piloting to ensure identified options are operationally feasible.
Feasibility	Identify the most feasible technology option following appropriately detailed technical, business and operations investigations; evaluate potential technology providers; obtain necessary authorisations and approvals from authorities for the preferred solution.
Engineering	Detail design of the identified technology including design of the interfaces with the rest of the existing facility, including upstream and downstream process impacts; detailed resource planning including sourcing equipment and other project resources.
Construction	Execution of the project; construction of the required technology; physical integration of the new technology with existing equipment and systems. The construction phase for new equipment within an operational facility is coordinated within plant maintenance schedules, to mitigate against production impacts.
Commissioning	Commissioning of the installed equipment and ensuring the technology operates in accordance with the equipment's design basis; modifications to equipment or plant operating philosophy if required to reach equipment's design basis.

The Sasol stage-gate model is a sequential process, and upon successful completion of business and development requirements for each stage, a project is formally approved to enter the next stage. For Sasol Nitro's project to bring about compliance with new plant standards for its MMAN plant, pre-feasibility studies have been completed. The project is hence in the feasibility phase, where the optimal technology solution will be selected upon conclusion of detailed technical and business investigations. Given the current project phase and the necessary ongoing and remaining steps to be concluded to successfully implement the selected solution, including completion of a Basic Assessment if necessary, a solution to address the downstream impacts of the implemented condenser will not be operational by April 2015.

Sasol Nitro however commits to comply with both existing plant standards and new plant standards for MMA emissions concurrently, by 1 April 2020.

5 The Atmospheric Impact Report

The AIR is a regulatory requirement and has to be compiled and submitted as part of an application for postponement. The purpose of the AIR is to provide an assessment of the implications for ambient air quality and associated potential impacts, of the emissions that will occur if the postponement of the compliance time frame is granted. The AIR was completed by independent consultants and not Sasol Nitro itself. Airshed Planning Professionals (Airshed) was appointed to this end. The full AIR is included in Annexure A, with key elements of the report and the findings being summarised in this section of the report.

5.1 Study approach and method

5.1.1 Dispersion modeling

Dispersion modelling is a key tool in assessing the ambient air quality implications of atmospheric emissions. A dispersion model serves to simulate the way in which emissions will be transported, diffused and dispersed by the atmosphere and ultimately how they will manifest as 'ground-level' or 'ambient' concentrations. For the purposes of this assessment, the US Environmental Protection Agency's (US EPA) approved regulatory suite of models – AERMET/AERMOD were used. AERMET/AERMOD is a Gaussian plume model and was selected because of the limited domain size, the flat terrain and the simplicity of the analysis (namely single source of a non-criteria pollutant with no chemical transformations to be modelled).

5.1.2 Emissions scenarios

For the purposes of this postponement application the emissions of MMA from the MMAN plant were modeled for three emission scenarios as detailed below:

1. **Current baseline emissions (scenario 1).** The *average* emissions measured when the condenser is operational and thus representative of typical current operating conditions. Average emissions in this scenario are well within the prescribed existing and new plant standards, however it remains to be confirmed that ceiling emission levels are also below the prescribed standards under all operating conditions. Baseline emissions were derived from accredited (ISO/IEC17025) third parties and laboratories. Emissions measurements follow the requirements prescribed in Schedule A of GN 893.
2. **Worst case scenario (Scenario 2).** Ceiling emission levels prior to the abatement measures that have been implemented since 2010 (see Section 4.1 for a description of the abatement measures already in place). Scenario 2 is a 'worst-case' scenario, but is exaggerated somewhat as it is highly unlikely that all the control measures implemented since 2010 would not be in operation concurrently. This scenario is chosen to reflect a condition where the condenser is not in operation.
3. **Compliance with MES (Scenario 3).** Compliance with *ceiling* emission limits specified in the MES under all operating conditions.

5.2 Health effect screening levels

Once ambient concentrations have been predicted using the dispersion model, the predicted concentrations are typically compared to defined standards or thresholds to assess the health and or environmental risk implications of the predicted air quality. In South Africa, National Ambient Air Quality Standards ("NAAQS") have been set for criteria pollutants at limits deemed to uphold a *permissible* level of health risk. Ordinarily, that would mean that the predicted concentrations could simply be compared to the defined NAAQS to ascertain whether or not there would be compliance with the standards. MMA is not, however, a criteria pollutant and as such there is no standard included in the NAAQS for MMA. For non-criteria pollutants, such as MMA, a corresponding limit or

threshold must be identified from international guidelines that allows potential health and environmental risks to be ascertained.

Benchmark limit values that could be used to assess the health risks potentially posed by MMA from international guidelines were identified through a desktop study (Annexure B) commissioned by Sasol by an independent toxicologist. MMA is widely used in the chemical industry and is also produced naturally. Importantly, MMA does not accumulate in the environment. In order to identify a suitable limit value the carcinogenic, non-carcinogenic toxicity and reproductive and developmental effects of methylamine were all reviewed. A chronic toxicity threshold could not be identified due to a lack of published toxicity studies.

One of the recognised environmental effects of MMA is odour. Although the presence of an odour may not necessarily imply adverse human health effects, odour has a nuisance effect that has also been considered in this assessment. Studies on odour effects and odour thresholds were also reviewed. The net outcome of the investigation was to propose the following thresholds for the purposes of the air quality assessment. The acute exposure limit is for human health while the odour limit refers to the concentration at which odour could be detected.

Table 4: Air quality screening levels for MMA

Effect	Exposure Period	Exposure Limit
Acute Exposure Limit	14 days	170 $\mu\text{g}/\text{Nm}^3$
Odour Limit	1 hour	710 $\mu\text{g}/\text{Nm}^3$

5.3 Key findings

Predicted hourly average and 14-day average MMA concentrations for each of the three emissions scenarios presented in Section 5.1.2, were compared to the health and odour thresholds presented above. The scenarios are further described in Section 5 of the AIR. In presenting these findings it is necessary to briefly describe the use of the second highest predicted concentration rather than the highest. As a simulation (and simplification) of reality, dispersion models will always contain some degree of error. Model validation studies elsewhere have indicated that typically the highest predicted concentration is an overestimate as a result of the way that meteorological processes are parameterised in the model. As a result the United State Environmental Protection Agency (US EPA) recommends using the second highest predicted value and not the highest predicted value, which is supported by the DEA as well. The second highest predicted values are summarised in Table 5 together with the screening levels from Table 4.

Table 5: Summary listing of 2nd highest predicted concentrations for the three emissions scenarios together with the derived Acute Exposure Limit and odour limits (in $\mu\text{g}/\text{m}^3$)

Scenario	Hourly average	14-day average
<i>Units</i>	$\mu\text{g}/\text{Nm}^3$	$\mu\text{g}/\text{Nm}^3$
<i>Acute Exposure Limit</i>	<i>Not applicable</i>	170
<i>Odour Limit [Level of Distinct Odour Awareness (LOA)]</i>	710	<i>Not applicable</i>
Current emissions baseline (average) (Scenario 1)	0.110	0.015
Worst case scenario Baseline with no emission controls (Scenario 2)	295	41
Compliance with MES under all operating conditions (ceiling limit) (Scenario 3)	0.670	0.094

Not unexpectedly Scenario 2 (chosen to reflect no emissions controls being operational) results in the highest predicted ambient concentrations, but even under this scenario neither the Acute Exposure Limit (14-day average) nor the odour limit (hourly average) is exceeded off-site. The ambient concentrations predicted for the other two scenarios are less than 1% of the limits. The other way of presenting the dispersion modeling results is isopleth maps that show the spatial distribution of the predicted concentrations. Isopleths are lines that connect points of equal air pollution concentrations and so these are typically overlaid on maps or satellite photographs of the areas that will be affected.

Such isopleth maps are shown in Figure 4 and Figure 5 to show the spatial distribution of the predicted concentrations for the two different averaging periods. It can be seen from Figure 4 that much of the area surrounding the MMAN plant is predicted to have concentrations of less than 200 $\mu\text{g}/\text{m}^3$ implying no risk at all of odour episode (the limit is 710 $\mu\text{g}/\text{m}^3$) even under the worst case emissions scenario. The predicted ambient concentrations for the 14 day averaging period, shown in Figure 5, are less than 80 $\mu\text{g}/\text{m}^3$ for much of the area around the plant, which is well below the limit of 170 $\mu\text{g}/\text{m}^3$.

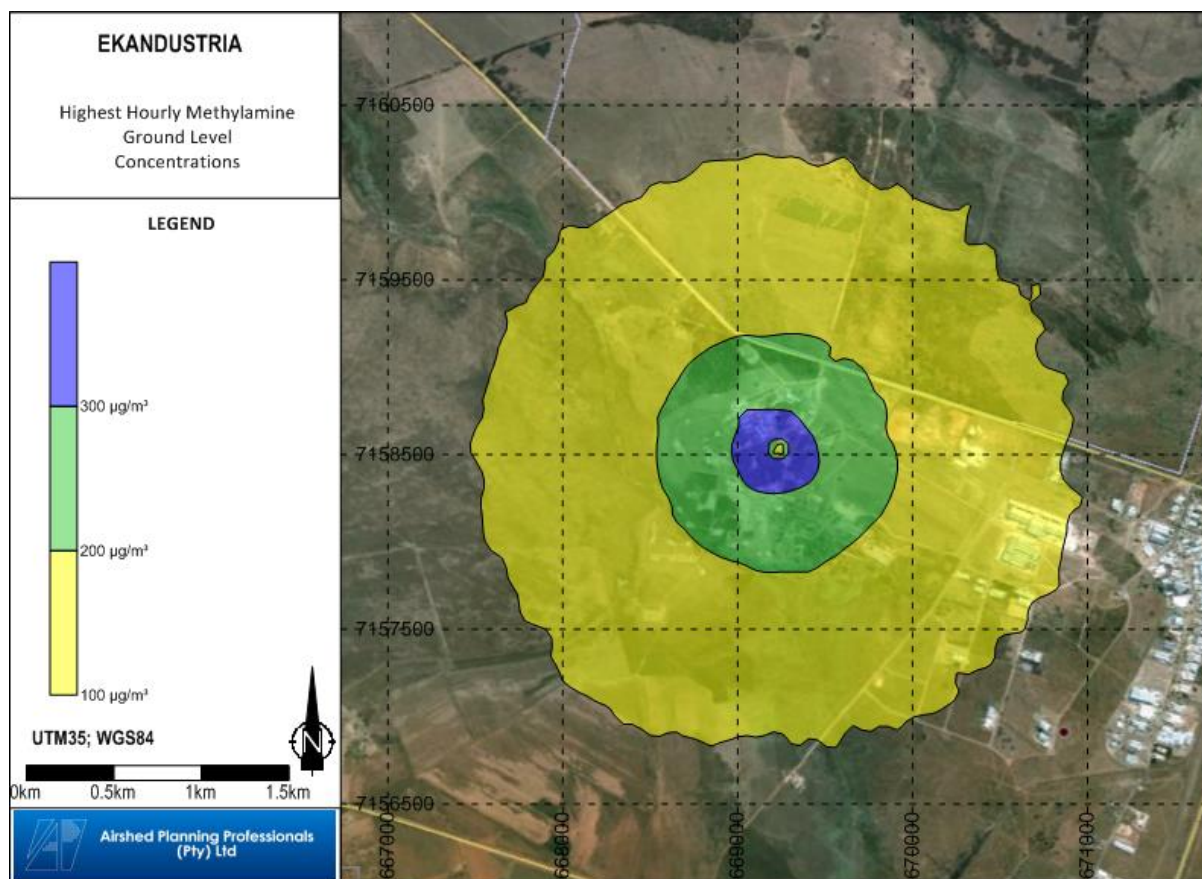


Figure 4: Predicted second highest hourly MMA average ground-level concentrations for worst-case emissions (Scenario 2). The relevant limit is the Odour Limit which is 710 $\mu\text{g}/\text{m}^3$

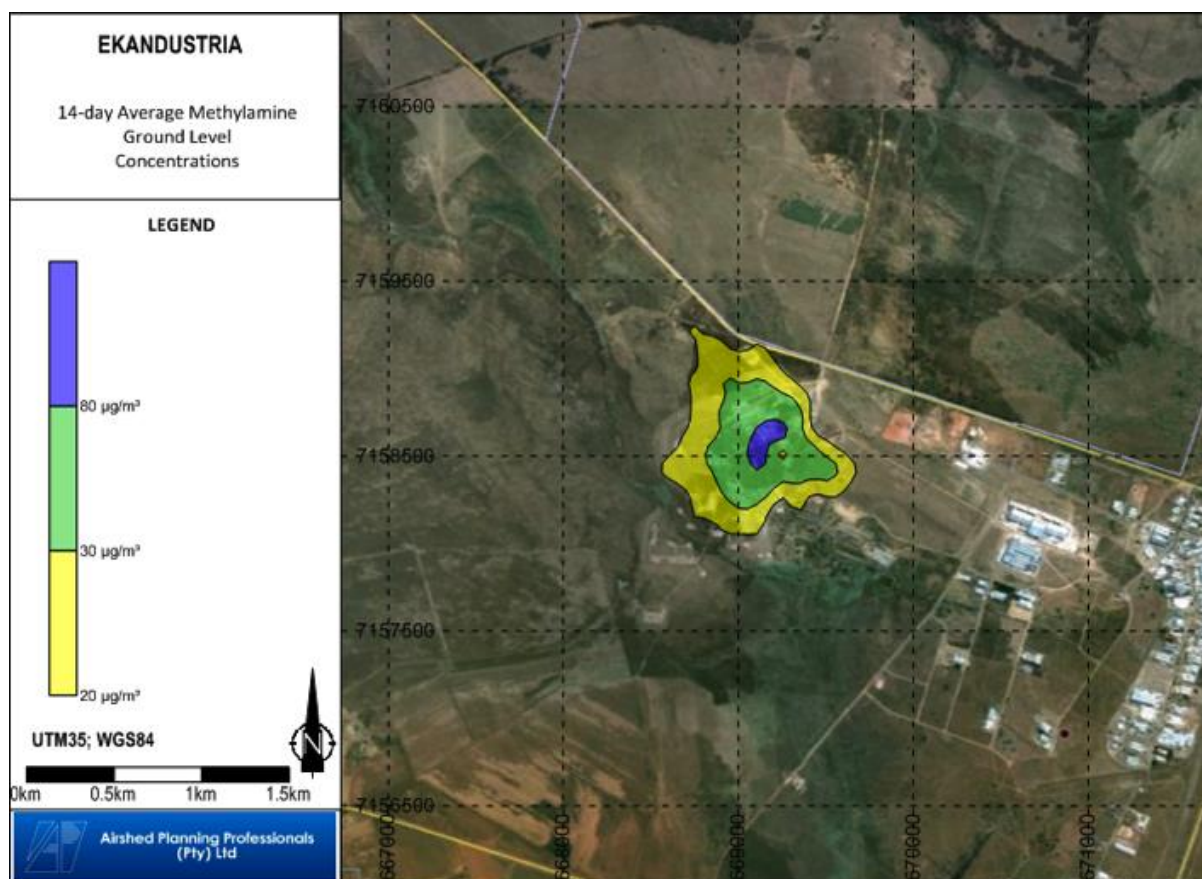


Figure 5: Predicted second highest 14-day MMA average ground-level concentrations for worst-case emissions (Scenario 2). The relevant limit is the Acute Exposure Limit which is $710 \mu\text{g}/\text{m}^3$

5.4 Study limitations

The main limitation to the study is that there are no ambient MMA monitoring data that could be used to verify the dispersion modeling results. Model uncertainty is managed, however, through quality assurance of model inputs, namely collection of emissions data by an accredited laboratory and the use of internationally accepted simulated meteorological data. In addition, the model has been vetted by the US Environmental Protection Agency. On that basis the model results are deemed to be adequately representative of the air quality likely to prevail under the different emissions scenarios.

5.5 Overall findings of the AIR

The overall assessment as to how air quality would be affected by the emissions that will result if the postponement is granted is that even under worst case emissions there is no suggested risk of either odour episodes or adverse human health effects. As importantly, there is almost no distinction between the predicted concentrations from the current baseline operations (average emissions) versus what is likely to manifest once there is full compliance with the MES, with the maximum predicted ambient concentrations being less than 1% of the derived limits for both circumstances.

6 Postponement Request

Sasol Nitro applies for a five-year postponement from the existing plant standard for MMAN emissions from its MMA plant, as illustrated in Table 6.

The alternative emissions limit requested to apply during the period of the postponement is aligned with the administrative basis of the MES, namely to comply under all operational circumstances excluding shut down, start up and upset conditions. That administrative requirement means that Sasol Nitro must request ceiling emission limits rather than average emission limits to ensure that it can comply given the variability of emissions under normal operational circumstances. Sasol Nitro is believes that ceiling emissions will not exceed 100 mg/Nm³ during the period of postponement.

Table 6: Alternative emission limit request for Sasol Nitro MMAN plant, in terms of applicable prescribed limits in MES Category 6 – Organic Chemicals Industry

Emission component applying for postponement	MES for existing plants	MES for new plants	Alternative Emission Limit Requested for the duration of the postponement	Averaging period for compliance monitoring
	All values specified at 273 K and 101.3 kPa, mg/Nm ³			
Methylamines (from nitrogen-containing organic chemicals)	10	10	100	Daily average

7 Sasol's roadmap to sustainable air quality improvement

Table 1 presents a summary of Sasol Nitro, Ekandustria's compliance with the MES. It is only in the case of the MMAN plant, for MMA emissions, where compliance with the existing and new plant standard under all normal operating conditions needs to be confirmed, and if necessary, further implementation of solutions be implemented.

Section 4.1 describes the interventions implemented, and to be implemented, to enable the condenser to run permanently, if required.

Figure 6 summarises this roadmap to compliance for the MMAN plant.

Summary of steps to attain compliance at MMAN plant	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20
Implementation of process modifications to reduce MMA emissions, following promulgation of MES																
Implementation of heat exchanger condenser system to scrubber																
Measurement to confirm compliance under all normal operating conditions																
Implementation of downstream measures to manage cross-media impacts, if required																

Figure 6: Roadmap to sustainable air quality improvement for Sasol Nitro's MMA emissions at the MMAN plant

8 Stakeholder Engagement

Sasol has structured its public participation process in support of postponement applications along the Environmental Impact Assessment (EIA) regulations published under the National Environmental Management Act (Act 107 of 1998) (NEMA), as specified in the November 2013 Minimum Emissions Standards (MES) regulations.

The stakeholder engagement process is an important component of the application process and is closely linked to the technical steps and activities required in the preparation of Motivation Reports (Figure 9).

The initial stakeholder engagement process comprised two rounds of engagement; public meetings that took place during the announcement phase and a second round of public meetings and focus group meetings that took place when the Draft Motivation Reports in support of postponement applications were made available for public comment.

Since the conclusion of the initial stakeholder engagement process in June 2014, the Minister of Environmental Affairs has formally notified Sasol that she will not consider its exemption applications, and has advised that postponement applications should be made instead. Sasol will therefore submit its previous exemption applications as additional postponement applications. While the additional applications contain materially the same content as the original exemption applications, a further opportunity will be provided to stakeholders to comment on these as additional postponement applications.

The final postponement applications that have not been affected by the Minister's notification were submitted to the National Air Quality Officer (NAQO) for decision-making in September 2014. Stakeholders were notified that their comments on final postponement applications could be submitted directly to the NAQO.

A copy of the Stakeholder Engagement Report is attached in Annexure C.

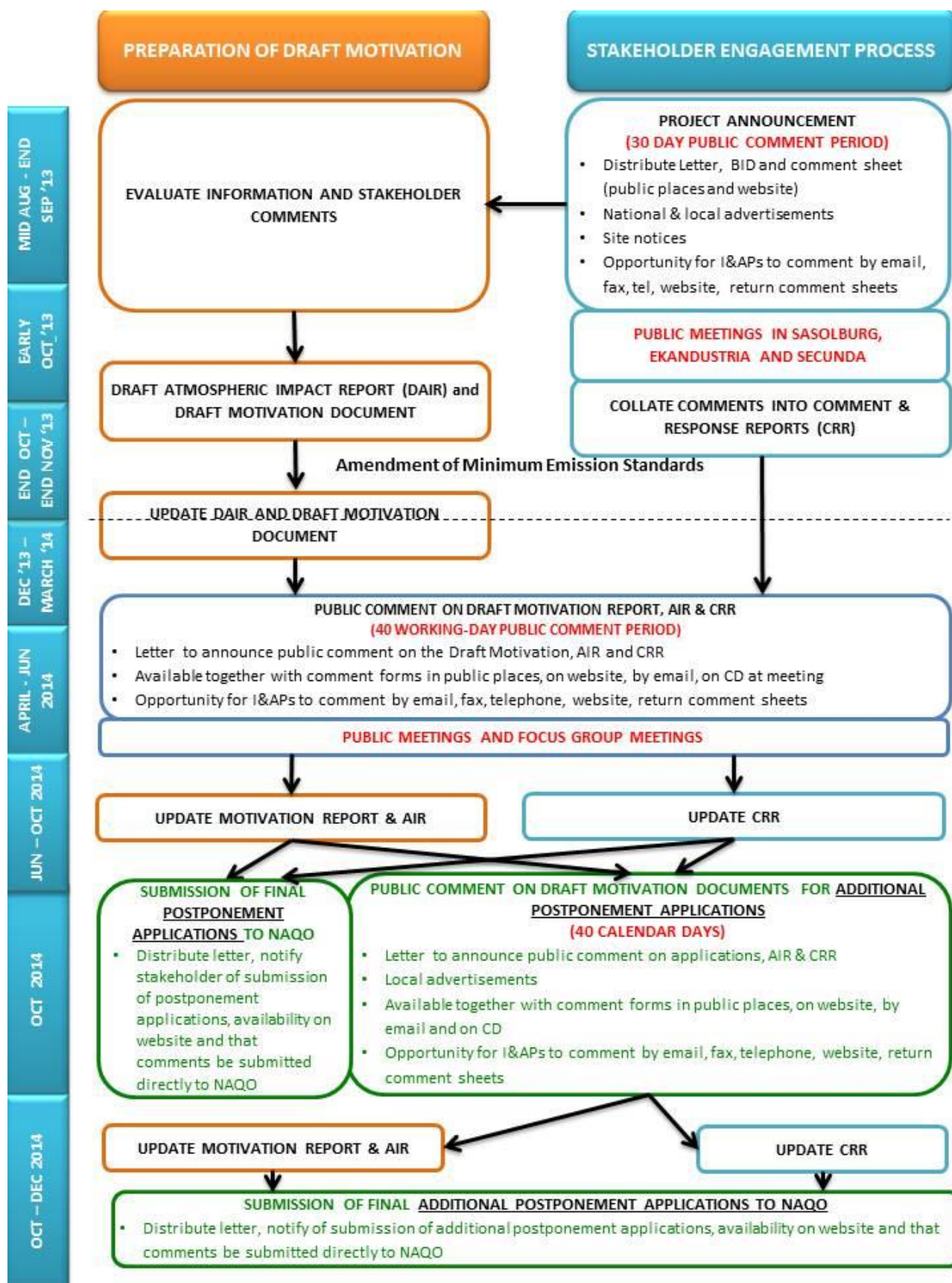


Figure 7: Technical and Stakeholder Engagement Process

8.1 Project announcement

Sasol's application process was announced between **15 September and 15 October 2013**. Stakeholders were invited to separate public meetings which were held from 7 – 10 October 2013 for the different Sasol operations. The public meeting for the Ekandustria operation took place on Wednesday, 9 October 2013, from 11:00 – 13:00, at the Kaia Manzi Conference Centre, near Bronkhorstspuit Dam. Stakeholders received notification of public meetings and were invited to participate in the process as follows:

- A letter of invitation was sent to stakeholders to invite them to public meetings and register as stakeholders.
- The invitation letter was accompanied by a Background Information Document (BID), providing more information on Sasol's operations and a comment form for stakeholders to submit their comments.
- Advertisements were placed in national and local newspapers to announce Sasol's application process.
- The BID, invitation letter and comment forms were made available in public places and on the SRK website www.srk.co.za.
- Telephonic and sms notification were made to stakeholders to inform and remind them of public meetings and opportunities to comment.

Key issues and comments raised by stakeholders

The key comments, concerns and suggestions raised by stakeholders during announcement are summarised below. For a comprehensive record of stakeholder comments, please refer to Annexure D.

- **Comments relating to Sasol's application process** - Stakeholder's comments focused on Sasol's reasons for applying for postponement, legal requirements, timeframe for compliance and requests for details regarding which plants and processes require postponement.
- **Stakeholder engagement** - It was noted that the BID did not provide sufficient information for meaningful stakeholder comment. Stakeholders commented on the poor attendance at the public meeting and made suggestions for more convenient venues and meeting times. Some stakeholders requested an extended public comment period.
- Only one stakeholder attended the Ekandustria public meeting. Concern was expressed that attendance was not representative of stakeholders and that notification of the public meeting did not reach affected communities. The stakeholder stated that not enough was done to explain the legal process and the technical information to affected communities to assist them in understanding how the application process will affect them.
- **Environmental concerns** - Stakeholders expressed concern regarding Sasol's air emissions and actual contribution to air pollution in the area. Other environmental concerns regarding the impact of Sasol's emissions on water quality, health and socio-economic aspects, such as Sasol's obligation to re-invest in communities in their area of operation, and to empower communities to care for the environment, were also raised.

8.2 Presentation at the Ekandustria Safety, Health and Environmental (SHE) Forum

Due to a recommendation made by a stakeholder at the public meeting to consult with a wider range of stakeholders and organisations in Ekandustria, the project team made contact with the Ekandustria Safety, Health and Environmental (SHE) Forum and presented background information about Sasol's application process and associated stakeholder engagement process at a forum meeting on 19 February 2014. Stakeholders such as the Tshwane Metropolitan Municipality, Wilge River Conservancy, and businesses in the Ekandustria area attended this meeting. Comments made at this meeting are included in the Ekandustria CRR (Annexure D).

8.3 Public comment on the Draft Motivation Report

Due to the fact that the public meetings held during the first round of stakeholder engagement was poorly attended, despite reasonable efforts, it was proposed to hold focus group meetings with key stakeholders, in addition to public meetings during the second round of engagement to encourage greater stakeholder participation in Sasol's application process.

The public meeting for the Ekandustria operation took place on Wednesday, 21 May 2014, from 11:00 – 13:00, at the Mega Conference Centre in Ekandustria. Stakeholders received notification of public meetings and were invited to comment on the Draft Motivation Report during the comment period from **15 April 2014 to 13 June 2014**, as follows:

- Distribution by email and mail, of an invitation letter to attend public meetings, accompanied by a Comment Form in English. These documents were available in, Afrikaans and isiZulu upon request.
- Posting the letter, Comment Form and Draft Motivation Reports on the SRK website (www.srk.co.za).
- Placing the letter, Comment Form and the Draft Motivation Reports in publicly accessible venues close to the Ekandustria operation, as during the announcement phase.
- Advertisements in two national newspapers to announce the availability of the Draft Motivation Report for public comment:
 - Sunday Times (English), Sunday 30 March 2014;
 - Beeld (Afrikaans), Tuesday 1 April 2014;
- Advertisements in local newspapers:
 - Streeknuus/ Streek News (English and Afrikaans), Friday, 4 April 2014; and
- Telephonic and SMS notifications were sent to stakeholders to notify them of opportunities to comment.

Focus group meeting with key stakeholders

A focus group meeting was held with key stakeholders such as NGOs, environmental and conservation groups and organised sectors of society (business and labour, organised civil society groups and community based organisations) on 23 May 2014, at the Hacklebrooke Conference Centre in Johannesburg. All comments made at this meeting have been included in the CRRs of all Sasol operations.

Key issues and comments raised by stakeholders

The key issues, comments and concerns raised by stakeholders during the comment period of the second round of engagement are summarised below:

- **Application process** – Sasol Nitro does not lie in a priority area, but lies within a industrial complex. Ambient concentrations have been modelled without considering other sources of organic vapours in the area. The request for a postponement at Ekandustria should not be granted, as Sasol has sufficient time to comply with the MES and such as small installation as required at Sasol Nitro should not require more than 12 months
- **Environmental concerns** – questions relating to the health impacts of odorous gas from the Ekandustria operation, health and safety impacts of the plant, as well as the impact of the Sasol Nitro operation on surrounding biodiversity and climate change. In addition, questions were raised regarding the emissions used to predict worst case scenario modelling for Ekandustria.

- Some stakeholders were of the opinion that postponements from the MES should not be granted for Sasol operations as there was no legal basis for their application, and that Sasol has not addressed the adverse health impacts of their operations, or cumulative impacts. Applications have not been submitted within the appropriate time of compliance date and postponement should be allowed for hazardous air pollutants, such as PM and other hazardous emissions.
- **Stakeholder engagement** - Questions were asked regarding the methods used to involve stakeholders in Sasol's application process and the success of public meetings to engage stakeholders. It was noted that the information presented at public meetings were too technical and that capacity building initiatives should have been engaged to assist stakeholders to contribute more meaningfully to this process. In addition, that the 40 day comment period was not sufficient to comment on reports and consult with specialists.

8.4 Notification of submission of Final Motivation Report

Stakeholders were advised in writing (mail, email, fax and sms) that the final postponement application was submitted to the NAQO for decision-making and that comments on the Motivation Report (including the updated CRR) can be submitted directly to the NAQO within 21 days. The Final Motivation Report was available electronically for stakeholder's information, on the SRK website (www.srk.co.za), or on request from the stakeholder engagement office.

8.5 Comment and Response Report

All comments, concerns, questions and suggestions raised for Sasol Nitro during the stakeholder engagement process, including comments during public meetings and written comments received from stakeholders have been recorded in the Comment and Response Report (CRR). The CRR provides a consolidated record of stakeholder comments, as well as responses from the SRK, Airshed and the Sasol project team members. The CRR is attached as Annexure D.

9 Summary and Conclusions

As part of the larger Sasol group, Sasol Nitro manufactures and distributes explosives and blasting products from its Ekandustria site near Bronkhorstspuit. Amongst other activities, Sasol Nitro produces an explosive known as MMAN. In manufacturing MMAN, the plant emits MMA to atmosphere. The publication of the initial MES in 2010 introduced for the first time a MMA emissions standard to South Africa. Since that time, Sasol Nitro has taken measures to reduce MMA emissions from its MMAN plant, with success. At present however, it is uncertain whether the existing air emission scrubber system is able to adequately remove the MMA air emission under all operating conditions. Should this not be shown to be achievable then an already installed heat exchanger (water driven condenser) can be operated to improve the MMA emission removal process. This heat exchanger would generate an additional effluent which would need to be accommodated through upgrade of the site's effluent management facility to create additional capacity.

Sasol Nitro cannot currently confirm whether it will be able to meet the existing plant standard compliance timeframe for MMA emissions but can readily comply with all other industrial emissions from the Ekandustria operations. As such Sasol Nitro has applied for a postponement until 1 April 2020 of the existing plant standard compliance timeframe for MMA emissions, whereupon it intends to comply with both the existing plant standard and new plant standard concurrently.

Sasol Nitro has undertaken a detailed site water and effluent study which identified areas requiring improvement. Once the extent to which this additional heat exchanger condenser may be required and the associated quantities of effluent generated to operate the MMA facility within air emission compliance requirements is known, then the consequential impact on the project to upgrade the existing effluent management facility can be established. Hence the request for a five year postponement is to ensure that this can be achieved.

Technical investigations must be completed to identify, approve, obtain necessary authorisations, build and commission a feasible compliance solution to address effluent impacts of the implemented condenser. It is not possible to complete this before the April 2015 deadline for compliance with the existing plant standard. All capital projects within Sasol are subject to strict project due diligence processes whereby the different project phases must be evaluated and approved before the next phase can commence. There is not enough time to complete the design, build and commission a solution before the MES compliance deadline.

An independently conducted assessment of the air quality implications of the postponement application is presented in an accompanying Atmospheric Impact Report (AIR). Dispersion modeling has been used to predict the ambient air quality that would likely prevail for three different MMA emissions scenarios. Included in these emissions scenarios was a worst-case emissions scenario that assumed no emissions abatement. Because there are no NAAQS for MMA, an investigation was conducted by an independent toxicologist to identify suitable threshold limits that could be used in the assessment. These limits were for human health effects and possible odour events.

Predicted ambient concentrations of MMA were found to be well less than the identified guidelines for both human health and odour, even under the very conservative worst-case emissions scenario. Importantly, there is almost no difference between the ambient air quality that would prevail during the postponement period (under the baseline scenario) and that that would prevail once there is full compliance with the MES. Under both these circumstances ambient air quality concentrations are predicted to be <1% of the defined limit values. As such it can be safely concluded that the postponement of the existing plant compliance timeframe for MMA will have a negligible impact on ambient air quality.

Annexures

Annexure A: Atmospheric Impact Report

Annexure B: Toxicological Review for Mono-methylamine

Annexure C: Volume 1 - Stakeholder Engagement Report

Annexure D: Volume 2 – Comments and Response Report