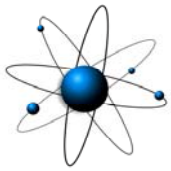
environment & tourism

Department:
Environmental Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

NATIONAL POLICY DEVELOPMENT PROCESS FOR HIGH TEMPERATURE WASTE INCINERATION AND AFR CO-PROCESSING IN CEMENT PRODUCTION

NATIONAL POLICY ON THE THERMAL TREATMENT OF GENERAL AND HAZARDOUS WASTE

Prepared by:



ENVIRONMENTAL
SCIENCE ASSOCIATES

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GLOSSARY OF TERMS

Minister

The Minister of Environmental Affairs and Tourism.

Department

The National Department of Environmental Affairs and Tourism (DEAT).

Alternative Fuels and Raw Materials (AFR)

General and hazardous wastes which are used to substitute conventional or primary fossil fuels and/or virgin raw materials in cement kilns and other industrial processes (also referred to as 'Alternative fuels and resources', 'Secondary materials', 'Refuse derived fuel', or 'Solid recovered fuel').

Best Available Technique (BAT)

The most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and impact on the environment as a whole.

Best Environmental Practice (BEP)

The application of the most appropriate combination of environmental control measures and strategies.

Best Practicable Environmental Option (BPEO)

The option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term.

By-product

A substance that is produced as part of a process that is primarily intended to produce another substance or product and that has the characteristics of an equivalent virgin product or material.

Co-Processing

Utilisation of alternative fuels and/or raw materials in industrial processes for the purpose of energy and/or resource recovery and resultant reduction in the use of conventional fuels and/or raw materials through substitution.

Disposal

The burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

Environmentally Sound Management (of waste)

Taking of all practicable steps to ensure that waste is managed in a manner that will protect health and the environment.

Fossil Fuel

Non-renewable, decayed organic materials that over time have formed geological deposits of carbon, such as oil, natural gas and coal, which are combustible and release energy through burning.

General Waste

Waste that does not pose an immediate hazard or threat to health or to the environment, and includes (a) domestic waste, (b) building and demolition waste, (c) business waste, and (d) inert waste.

Greenhouse Gas (GHG)

Natural and anthropogenic gasses such as methane, carbon dioxide and nitrous oxide that absorb and re-emit infra-red radiation in the atmosphere, thereby retaining heat and resulting in increased atmospheric temperatures.

Hazardous Waste

Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Incineration

Any method, technique or process to convert waste to flue gases and residues by means of oxidation.

Recovery

The controlled extraction of a material or the retrieval of energy from waste to produce a product.

Recycling

A process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.

Reduction

Involves various possible measures to reduce the amount of waste generated, e.g. manufacturing process optimisation, or raw material reduction or substitution.

Re-use

To utilise articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles.

Thermal Treatment

Incineration, co-processing and other high temperature treatment of general and hazardous waste.

Treatment

Any method, technique or process that is designed to (a) change the physical, biological or chemical character or composition of a waste, or (b) remove, separate, concentrate or recover a hazardous or toxic component of a waste, or (c) destroy or reduce the toxicity of a waste, in order to minimise the impact of the waste on the environment prior to further use or disposal.

Waste

Any substance, whether or not that substance can be reduced, re-used, recycled and recovered (a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of, (b) which the generator has no further use of for the purposes of production, (c) that must be treated or disposed of, or (d) that is identified as a waste by the Minister by notice in the *Gazette*, and includes waste generated by the mining, medical or other sector, but — (i) a by-

product is not considered waste, and (ii) any portion of waste, once re-used, recycled and recovered, ceases to be waste.

Waste Management Hierarchy

The Waste Management Hierarchy reflects the different waste management options, from reduction (most preferred) through to re-use, recycling, recovery, treatment/destruction, and lastly disposal (least preferred), that should all form part of an integrated waste management system.

ABBREVIATIONS

AFR: Alternative Fuels and Raw Materials

APPA: Atmospheric Pollution Prevention Act, 1965 (Act 45 of 1965)

DEAT: Department of Environmental Affairs and Tourism

DWAF: Department of Water Affairs and Forestry

BAT: Best Available Techniques

BEP: Best Environmental Practice

BPEO: Best Practicable Environmental Option

ECA: Environment Conservation Act, 1989 (Act 73 of 1989)

EIA: Environmental Impact Assessment

GHG: Greenhouse Gas

IPWM: Integrated Pollution and Waste Management

NEMA: National Environmental Management Act, 1998 (Act 107 of 1998)

NEMAQA: National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)

NWMS: National Waste Management Strategy of South Africa (1999)

POPs: Persistent Organic Pollutants

PURPOSE

This policy document presents Government's position on thermal waste treatment as a waste management option in South Africa, and provides the framework within which the following thermal waste treatment technologies shall be implemented in the country:

(i) The incineration of general and hazardous waste in dedicated incinerators or other high temperature thermal treatment technologies, including but not limited to pyrolysis and gasification; and

(ii) The co-processing of selected general and hazardous wastes as alternative fuels and/or raw materials (AFR) in cement production.

VISION

Environmentally sound management of general and hazardous waste in South Africa, through the integration of a sufficient range of complementary waste management options, in line with the waste management hierarchy and internationally accepted principles of best environmental practice.

IMPLEMENTATION

In terms of the co-operative governance provisions contained in the Constitution of South Africa (Act 108 of 1996), all Government Departments will consider this policy in their decision-making on matters pertaining to the thermal treatment of waste. Relevant provisions and the minimum standards set in the policy would form conditions of different approvals required in terms of South African environmental legislation as appropriate, ensuring that the requirements for thermal waste treatment are applied effectively and consistently across the country.

1 INTRODUCTION

The *National Policy on the Thermal Treatment of General and Hazardous Waste* confirms the South African Government's commitment to the continuous development and implementation of waste management options that are consistent with the principles of the waste management hierarchy. It is Government's intention that a range of different technologies, including thermal waste treatment, are incorporated into the country's waste management system to ensure the environmentally sound management of waste in the country.

Incineration and co-processing are internationally proven technologies for the treatment of general and hazardous waste, as well as the recovery of energy and raw materials. South Africa has a network of cement production plants located across the country, which present an option for the effective treatment of selected general and hazardous wastes through co-processing, and a means of recovering energy and raw materials from the waste. Similarly, incineration is an accepted waste treatment technology, which also allows for the recovery of energy from waste. Not only do these options present a significant opportunity to recover resources (energy and raw materials), it would also facilitate a move away from waste disposal to landfill, particularly of organic waste. It is therefore appropriate that South Africa incorporates these thermal waste treatment technologies into national waste management policy.

2 BACKGROUND

South Africa has an intensive, growing industrial and manufacturing economy, which results in the generation of general and hazardous wastes that is increasing at an estimated rate of 2-3% annually. The disposal of general and hazardous waste to landfill is currently the primary option for waste management in the country. At present, thermal waste treatment options provide a limited opportunity for waste management, as only a small number of commercial and site specific hazardous waste incinerators exist, and these are used to treat specific waste streams. Similarly, the co-processing of waste as AFR in cement production is currently practiced on a limited scale locally.

In many instances, the disposal of waste to landfill is not the best environmental option in terms of the waste management hierarchy. Waste treatment, which includes incineration, and the recovery of resources from waste, including the co-processing of waste as AFRs in cement production, often provides a more environmentally sustainable solution.

South Africa has several notable waste management policies, plans and strategies that support the waste management hierarchy. However, the development and implementation of

certain waste management alternatives, which would allow waste to be better managed within the waste hierarchy, have been restricted partly due to the absence of decisive national policy related to waste treatment and recovery through thermal processes, including dedicated incineration and co-processing in cement production.

The lack in policy direction has resulted in or contributed to a number of constraints. In many instances, these constraints include poor environmental performance related to waste management in the country, the lack of, delayed or conflicting decision-making regarding the authorisation of waste incineration and co-processing activities, uncertainty in Government and industry with regard to exploring and developing these technologies as waste management options, and significant opposition from certain sectors of society that oppose any form of thermal waste treatment.

As a result, Provincial Environmental Departments, NGOs and Industry have in the past requested decisive direction on the application of these technologies. This policy responds to these calls, and provides the certainty required to allow for the development of alternative waste treatment technologies in the country, particularly the establishment and management of waste incineration or co-processing of waste as AFRs in cement production.

3 INTERNATIONAL SITUATION

Worldwide industrialisation and increasing consumption result in the generation of numerous by-products and wastes. Internationally, the management of hazardous waste specifically is a growing concern, as the long term impacts and costs of improper disposal of such waste can be very high. Waste volumes can be minimised to a large extent, but some treatment and residue disposal capacity is still required.

In the pursuit of establishing integrated waste management systems for the environmentally sustainable management of waste, international trends indicate a move away from single waste management solutions such as landfill, towards the integration of various technologies, which include thermal treatment options, with the ability to utilise waste as a resource. In the European Union (EU), which comprises both developed and developing nations, the move from landfilling towards more integrated waste management solutions that reduce GHG methane generation from landfills and utilise the value in waste, is encouraged through legislation. The EU landfill directive sets targets for the diversion of organic waste from landfill.

As recycling and thermal waste treatment with energy recovery are increasingly used, net GHG emissions from municipal waste management in the EU are expected to drop

considerably by 2020. In 2004, only 47 % of the total EU municipal waste generated was landfilled, and it is expected to decrease further to approximately 35 % by 2020 through increased recycling and thermal waste treatment initiatives. It is projected that the increase in recycling and incineration would respectively contribute 75 % and 25 % in savings or avoided greenhouse gas emissions in the EU.

In 2007, at least 595 dedicated waste incinerator plants were operating in the EU with a combined capacity of around 60 million tons of general and hazardous waste, as well as 240 co-processing facilities with a capacity of around 7.5 million tons. The use of properly designed and operated thermal treatment facilities is considered best available technology for a variety of general and hazardous waste streams. These thermal waste treatment technologies are accepted as complementary tools that divert waste from landfills and recover economic value from waste. International experience has shown that combining energy and resource recovery with effective waste management, as achieved through the co-processing of waste as AFR specifically, can be particularly attractive and cost-efficient, especially for emerging economies having insufficient waste treatment capacity.

Monitoring of facilities that co-process selected general and hazardous waste as AFR around the world has shown that emissions from properly designed and operated cement plants are not substantially different from those burning conventional fuel. In addition, current emission standards for incineration and co-processing that are set in line with best environmental practice are very stringent with extremely low emission limits, and are effective to ensure the protection of human health and the environment.

International experience has also shown that waste incineration and co-processing do not reduce the incentive for, or success of, recycling programmes. Records from developed and developing countries have indicated that those with the lowest level of landfilling often have the highest levels of recycling and incineration, and visa versa, which is indicative of the move towards increased waste recycling over time as integrated waste management systems develop.

4 POLICY OBJECTIVES

Through this policy on thermal waste treatment, Government aims to:

1. Accept and advance the implementation of an integrated waste management system for South Africa in line with the waste management hierarchy, by facilitating the move away from single waste management solutions towards the integration of thermal waste treatment technologies, including incineration and cement kiln co-processing.

2. Promote efficient resource use and harmonization of the environment and the economy.
3. Support the development of suitable general and hazardous waste management infrastructure to sustain further development of the economy.
4. Promote waste management options that allow for the recovery of energy and raw materials from waste together with the effective treatment thereof, in order to realise the potential of reducing the pressure on certain non-renewable resources.
5. Provide minimum environmental requirements for the development and implementation of waste incineration and co-processing technologies, in line with international best available techniques (BAT) and best environmental practice (BEP).
6. Enable informed decision-making around the use of thermal waste treatment alternatives, and guide the consistent application of regulatory instruments to encourage the development of a wide range of waste management technologies.
7. Facilitate the use of cement production plants for the effective treatment of selected general and hazardous waste, and the recovery of energy and raw materials.
8. Promote the advancement of technology and the development of skills through international transfer of technology and experience to the South African context.
9. Contribute to South Africa meeting its international commitments in terms of the Stockholm and Basel Conventions, and other applicable requirements.
10. Demonstrate the country's commitment to reducing its GHG emissions, such as methane generation from landfills, and CO_2 from calcination and coal combustion in cement production.

5 EXISTING REGULATORY FRAMEWORK

Several laws and regulatory instruments provide the current framework for achieving environmentally sound and integrated waste management in the country, and the policy on thermal waste treatment has been developed within this framework. The policy accordingly supplements and serves the objectives of the various pieces of legislation, and stipulates the necessary and appropriate details on waste incineration and co-processing activities for incorporation into the national regulatory framework.

The National Environmental Management Act (NEMA) (Act 107 of 1998) introduces a comprehensive legal basis to give effect to the environmental rights contained in the Constitution of South Africa (Act 108 of 1996), and stipulates certain environmental principles that form the legal foundation for sustainable environmental management, and incorporates the concepts of sustainable development, the precautionary and preventative approach, and best practicable environmental option. The NEMA and associated

Regulations governing the Environmental Authorisation of waste activities, also provide for the development of guidelines, norms and standards for specific activities.

The Environment Conservation Act (Act 73 of 1989) requires the permitting of waste disposal facilities, and places an obligation on both generators and disposers to ensure that waste is managed and disposed of appropriately. The National Environmental Management: Waste Act (Act 59 of 2008) acknowledges the internationally recognised hierarchy of waste management, stating that sustainable development requires that waste generation is avoided, or if it cannot be avoided, that it is reduced, re-used, recycled or recovered (which includes co-processing), and as a last resort treated (which includes incineration) and/or safely disposed of. The Bill provides for setting national norms and standards, and specific waste management measures that include the licensing of waste management activities, identification of priority wastes, and prescribing measures for dealing with such wastes.

The Atmospheric Pollution Prevention Act (Act 45 of 1965) makes provision for the approval of Scheduled Processes, which includes cement production and waste incineration. Guidelines related to the scheduled processes include emission standards, and operational and technology requirements for waste incineration. The National Environmental Management: Air Quality Act (Act 39 of 2004) is systematically replacing the Atmospheric Pollution Prevention Act, and provides for the listing of activities resulting in atmospheric emissions, and establishing minimum emission standards for substances resulting from these activities. The National Listed Activities and Minimum Emission Standards Programme include proposed air emission standards for waste incineration and for cement kilns that co-process waste.

The White Paper on Integrated Pollution and Waste Management (2000) is a guiding policy on pollution prevention, waste minimisation, impact management and remediation. The policy introduced the concepts of pollution prevention and waste minimisation, and reflected Government's intention to move away from uncoordinated pollution control and waste management to a holistic and integrated system. A number of priorities and goals were identified, such as setting standards and the regulation of certain activities, including waste incineration and treatment of organic hazardous waste.

The National Waste Management Strategy (1999) initiated action to ultimately implement an integrated waste management system for South Africa, and presented a long-term plan for addressing key issues, needs and problems related to waste management. While the long-term objective of the strategy is waste prevention and minimisation, it includes a number of remedial actions such as improved waste treatment options, e.g. incineration. The strategy

identified the need for hazardous waste treatment capacity in the country, including organic hazardous waste incineration.

The White Paper on the Renewable Energy Policy (2004) intends to promote renewable energy and integration of renewable energies into the mainstream energy economy. One source of energy recognised in the policy is biomass from organic matter, which includes residues from agriculture or forestry, and organic components in municipal and industrial wastes. Energy from waste is accordingly one of the renewable energy resources included in the policy. The White Paper recognises that almost all of South Africa's waste with notable energy content is disposed of to landfill sites.

The Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989; SA Ratification 1994) aims toward the reduction and minimisation of hazardous waste, and treatment and disposal thereof as close to its source as possible. In June 2008 the World Forum on Waste Management for Human Health and Livelihood was constituted, and a decision made by parties to the convention to start the international technical assistance program for the environmentally sound co-processing of hazardous and other waste in the energy intensive industry, including the cement industry, within the context of the Basel Convention implementation. The Stockholm Convention on Persistent Organic Pollutants (2004) aims to eliminate the manufacture and use of particularly toxic POPs. The Convention also aims to clean-up existing stockpiles, dumps and equipment containing POPs, and includes several recommendations for the treatment of POPs containing waste through incineration or co-processing. It further requires from those party to the convention to take appropriate measures so that these wastes are disposed of in such a way that the POP content is destroyed or irreversibly transformed.

6 POLICY IMPLEMENTATION

1. The Department will continue to promote the Waste Management Hierarchy and strive towards waste reduction and minimisation through its plans and programmes for the integrated management of waste in the country.
2. Although thermal waste treatment technologies are accepted waste management options in terms of this policy, each individual project proposal will be considered on its own merit.
3. Proponents of these technologies must comply with the requirements and provisions of current and future legislation relevant to thermal waste treatment.
4. Waste incineration in dedicated installations and co-processing of waste as AFR in cement production shall be conducted in compliance with relevant and prevailing legal

and other requirements, including sector specific guidelines and conditions of authorisation, and must as a minimum comply with the provisions of this policy, specifically those contained in Schedules 1, 2, 3 and 4 as relevant.

5. The Department will ensure procedures are put in place for the efficient and integrated consideration of environmental authorisations required for thermal waste treatment applications in terms of different legal requirements within its mandate, i.e. Environmental Authorisation (NEMA), Air Emission Licence (NEMAQA), and Waste Management Licence (NEM: Waste Act).
6. The Department is committed to supporting the implementation of this policy in terms of monitoring, enforcement and capacity building through the development of an Implementation Plan, specifically as it concerns the current proposals for co-processing of waste as AFR in cement production.
7. The Department will continue to develop the necessary regulatory tools (legislation, norms and standards, sector guidelines and conditions of authorisation) relevant to thermal waste treatment technologies, for the implementation of and compliance with best available technology and best environmental practice, as appropriate.
8. Cement kiln co-processing shall primarily be used for recovering energy and materials as part of the cement manufacturing process, i.e. co-processing of waste that can substitute parts of conventional fossil fuel and/or virgin raw materials.
9. Each cement production plant authorised to co-process waste as AFR must develop a detailed, site-specific Operational and Environmental Management Plan in accordance with the provisions of and framework set by the "Guidelines for the Co-Processing of Alternative Fuels and Raw Materials and Treatment of Organic Hazardous Wastes in Cement Kilns" (DEAT, 2008), obtainable from the Department's website (http://www.environment.gov.za/).
10. No mechanical or other pre-treatment, pre-processing or blending etc. of hazardous waste will be allowed at the cement production plant where waste is co-processed, without a site-specific Environmental Authorisation for this specific purpose of pre-treatment, pre-processing or blending of hazardous waste.

7 KEY REFERENCE DOCUMENTS

The following technical reports and documents generated as part of the policy development process (available from http://www.environment.gov.za/) informed the content of this policy:

1. Literature Review on the Co-processing of Alternative Fuels and Raw Materials and Hazardous Wastes in Cement Kilns (International research report by Dr K Karstensen for DEAT, 06/09/2007).

2. Literature Review on High Temperature Thermal Treatment of Hazardous Waste (International research report by Dr J Lauridsen for DEAT, 06/03/2008).
3. An overview of Cement Production Technology (International research report by Dr K Karstensen for DEAT, 02/10/2007).
4. Cement Production Technology in South Africa, and an Evaluation of their Ability to Co-Process AFRs and Treat Hazardous Wastes (Local research report by Dr K Karstensen for DEAT, 05/11/2007).
5. South African Hazardous Waste Profile (Local research report by Dr J Lauridsen for DEAT 06/03/2008).
6. Guidelines for Co-processing of Alternative Fuels and Raw Materials, and Treatment of Organic Hazardous Wastes in Cement Kilns (Guideline document developed by Dr K Karstensen for DEAT, 25/03/2008).
7. Guidelines for Hazardous Waste Incineration (Guideline document developed by Dr J Lauridsen for DEAT, 04/04/2008).
8. Proposed Air Emission Standards for Treatment of Hazardous Waste and AFR Co-processing in Cement Kilns (Report by Mr H Crous for DEAT, 18/06/2008).
9. Proposed Conditions of Authorisation for the Co-processing of Waste as AFR in Cement Production (Report by Mr H Crous for DEAT, 22/09/2008).
10. Final Comments and Response Report August 2007 – March 2009 (Record of project comments prepared by Mr H Crous for DEAT, 23/03/2009).

8 SCHEDULE 1: AIR EMISSION STANDARDS – WASTE INCINERATION

The Minimum Emission Standards for waste incineration is currently in the process of being formalised in terms of Section 21 of the National Environmental Management: Air Quality Act (2004). In the interim, all general and hazardous waste incinerators brought into operation after the final gazetting of this policy must comply with the air emission standards below. Requirements for existing facilities already operating prior to the policy are currently the subject of review through the APPA Review Process and National Listed Activities and Minimum Emission Standards Programme, and standards of operation for these facilities will be brought in line through these processes in terms of agreed transitional arrangements.

Air Emission Standards for the Incineration of

General and Hazardous Waste in Dedicated Incinerators

EMISSIONS	AIR EMISSION STANDARD [1]
PM (Total Particulate Matter)	10
TOC	10
CO	50
HCl	10
HF	1
SO_2	50
NOx	200
NH_3	10
Hg	0.05
Cd + Tl	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V (Sum total)	0.5
PCDD/PCDF (ng/Nm^3 I-TEQ)	0.1

1. Concentration expressed as mg/Nm^3 (Daily Average) unless otherwise stated, and at 'normalised' conditions of 10% O_2, 101.3 kPa, 273 K / 0 ºC, dry gas.

9 SCHEDULE 2: AIR EMISSION STANDARDS – AFR CO-PROCESSING

The Minimum Emission Standards for AFR co-processing is currently in the process of being formalised in terms of Section 21 of the National Environmental Management: Air Quality Act (2004). In the interim, all cement kilns co-processing AFR must comply with the air emission standards below. Transitional arrangements for compliance with these air emission standards are only associated with particulate and NO_X emissions for existing kilns. All other emission standards will apply immediately upon final gazetting of this policy to existing and new kilns co-processing waste as AFR. Requirements for existing facilities already authorised to co-process AFR prior to the policy are currently the subject of review through the APPA Review Process and National Listed Activities and Minimum Emission Standards Programme, and standards of operation for these facilities will be brought in line through these processes in terms of agreed transitional arrangements.

The transitional arrangements for existing kilns authorised to co-process AFR (excluding POPs waste) after final gazetting of this policy are as follows:

- Particulate emissions must be reduced to 80 mg/Nm^3 within 3 years of promulgation of this policy, and to 30 mg/Nm^3 within 10 years of final gazetting of this policy, provided that the current particulate emissions from the kiln are not increased by the co-processing of AFR.
- NO_X emissions must be reduced to 800 mg/Nm^3 within 10 years of final gazetting of this policy, provided that current NO_X emissions are not increased by the co-processing of AFR.

Air Emission Standards for the Co-processing of Selected

General and Hazardous Waste as AFR in Cement Production

EMISSIONS	AIR EMISSION STANDARD [1]
PM (Total Particulate Matter)	30 [2] (80) [3]
TOC	10 [4]
HCl	10
HF	1
SO_2	50 [4]
NOx	800 [5]
Hg	0.05
Cd + Tl	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V (Sum total)	0.5
PCDD/PCDF (ng/Nm^3 I-TEQ)	0.1

1. Concentration expressed as mg/Nm^3 (Daily Average) unless otherwise stated, and at 'normalised' conditions of 10% O_2, 101.3 kPa, 273 K / 0 ºC, dry gas.
2. PM limit for (i) new kilns (commissioned after promulgation of this policy) co-processing AFR, and for (ii) existing kilns co-processing AFR within 10 years of promulgation of this policy.
3. PM limit effective after 3 years of promulgation of this policy for existing kilns co-processing AFR (excluding POPs waste), provided that current particulate emissions (as established through baseline monitoring) are not increased by the co-processing of AFR.
4. Limits for TOC or SO_2 do not apply where elevated emissions result from conventional fuels or raw material, i.e. not from the co-processing of AFR, provided that current TOC and SO_2 emissions (as established through baseline monitoring) are not increased by the co-processing of AFR.
5. NO_X limit for (i) new kilns (commissioned after promulgation of this policy) co-processing AFR, and for (ii) existing kilns co-processing AFR (excluding POPs waste) within 10 years of promulgation of this policy, provided that current NO_X emissions (as established through baseline monitoring) are not increased by the co-processing of AFR.

10 SCHEDULE 3: WASTE EXCLUDED FROM CO-PROCESSING

The following types of waste are not allowed to be received, stored, handled or co-processed in cement kilns:

- Anatomical, infectious or biologically active medical/health care waste;
- Asbestos containing waste;
- Unsorted electronic waste;
- Bio-hazardous waste;
- Entire batteries;
- Explosives;
- Mineral acids and corrosives;
- Radioactive waste;
- Unsorted municipal waste; and
- Unknown or unidentified wastes.

11 SCHEDULE 4: CONDITIONS OF ENVIRONMENTAL AUTHORISATION

1. INTRODUCTION

Any cement plant co-processing general or hazardous waste as alternative fuels and/or raw materials (AFRs), and any dedicated general and/or hazardous waste incinerator must have the relevant approvals from the competent authority in terms of South African environmental legislation. The following sections set out the conditions that would as a minimum apply to these activities.

2. GENERAL

The following requirements and prerequisites, as appropriate to waste incineration or AFR co-processing, must be in place to prevent and reduce risks prior to commencing with treatment of general and/or hazardous wastes on a routine basis:

1. An approved Environmental Authorisation in terms of Section 24 of NEMA and all other required national/provincial/local licences, permits, authorisations and permissions;
2. Compliance with all relevant national, provincial and local regulations;
3. Suitable location, technical infrastructure, storage and processing equipment;
4. Reliable and adequate power and water supply;
5. Adequate air pollution control devices and continuous emission monitoring of identified parameters ensuring compliance with regulation and permits;
6. Exit gas conditioning/cooling and low temperatures (<200°C) in the air pollution control device to prevent *de novo* dioxin formation;
7. Clear management and organisational structure with unambiguous responsibilities, reporting lines and feedback mechanism;
8. An error reporting system (incident preventive and corrective action) for employees;
9. Qualified and skilled employees to manage wastes and health, safety and environmental issues;
10. Adequate emergency and safety equipment and procedures, and regular training;
11. Authorised and licensed collection, transport and handling of wastes;
12. Safe and sound receiving, storage and feeding of wastes;
13. Adequate laboratory facilities and equipment for hazardous waste acceptance and feeding control;
14. Adequate record keeping of wastes, residues and emissions;

15. Adequate product quality control routines;
16. An environmental management and continuous improvement system certified according to ISO 14001, EMAS or similar internationally accepted standard;
17. Independent audits, emission monitoring and reporting;
18. Stakeholder dialogues with local community and authorities, and mechanisms for responding to comments and complaints;
19. Open disclosure of performance and compliance verification reports on a regular basis.

3. OPERATIONAL MANAGEMENT

Prior to the commencement of the receipt, temporary storage, handling and treatment of waste or co-processing of AFR, a detailed, site-specific Operational and Environmental Management Plan must be developed that addresses as a minimum:

1. Site management and responsible persons specific to different phases of receipt, temporary storage, handling and treatment of waste at the site (adequate resources, roles, responsibility and authority);
2. Health, safety, security, risk and emergency management, training and communication;
3. Environmental compliance, management obligations and systems, record-keeping, monitoring, auditing and reporting;
4. Waste and AFR selection and analyses, acceptance procedures and waste manifest system, transport, receipt, handling, and temporary storage;
5. Waste treatment and AFR co-processing process control (feed, stability, temperatures, pollution control etc.);
6. Accredited laboratory facilities, monitoring equipment, accreditation and calibration, and maintenance;
7. Proposed monitoring equipment, methodologies, monitoring/sampling points etc., and motivation for the proposals, including the acceptability and limitations thereof (considering international best practice), as well as maintenance and calibration procedures for the equipment;
8. Procedures and conditions for feeding to the process, as well as requirements for interlocks and set points for shutting-off waste feed;
9. Start-up and shut-down procedures, and response procedures during upset conditions;
10. Procedures and requirements for employees' health checks, as well as the collection and analysis of process and environmental samples;

11. A maintenance program (planned and preventative maintenance) for the infrastructure associated with all aspects of the waste or AFR process from storage to feeding;
12. Record keeping and dissemination of information;
13. Procedures and frequency for the regular review and update of the Operational and Environmental Management Plan if required to ensure it remains up-to-date, relevant and effective; and
14. Independent review and statement on the adequacy and practicality of the plan in terms of its ability to ensure compliance with the conditions of this and other authorisations, specifically air emission standards, and to prevention significant impacts on the environment.

4. AIR QUALITY MANAGEMENT

1. The facility shall be designed, equipped, built and operated in such a way so as to prevent the emissions into the air giving rise to significant ground-level air pollution (i.e. leading to the exceedance of an accepted ambient air quality threshold standard).
2. Monitoring equipment shall be installed and acceptable techniques used in order to accurately monitor the parameters, conditions and mass concentrations relevant to the co-processing of AFR and incineration of waste.
3. All continuous, on-line emission monitoring results must be reported as a Daily Average concentration expressed as mg/Nm^3, and at 'normalised' conditions of 10% O_2, 101.3 kPa, 273 K / 0 ºC, dry gas.
4. Discontinuous (periodic) emission monitoring results must be expressed as mg/Nm^3, or ng/Nm^3 I-TEQ for PCDD/PCDF, and at 'normalised' conditions of 10% O_2, 101.3 kPa, 273 K / 0 ºC, dry gas.
5. Exit gas temperatures must be maintained below 200 ºC.
6. Pollution control devices (exhaust gas cooling and bag filter or ESP) must have a daily availability of 98% (i.e. maximum downtime of 2% or 30 minutes per running 24 hours). The cumulative annual downtime (total downtime over a one year period) may however not exceed 60 hours (0.685 % per annum).
7. Continuous, on-line measurement of the following emissions and operating parameters is required:
   - Particulate matter (total particulate);
   - O_2;
   - CO;
   - NO_X;
   - SO_2;

- HCl;
- HF;
- VOC/TOC;
- Emission exhaust volume (e.g. Nm^3/hr) and flow rate (e.g. m/s);
- Water vapour content of exhaust gas (humidity);
- Exhaust gas temperature;
- Internal process temperature/s;
- Pressure; and
- Availability of air pollution control equipment (including exit gas cooling).

8. Appropriate installation and functioning of automated, continuous monitoring equipment for emissions to air, which are subject to quality control and to an annual surveillance test. Independent accredited calibration must be undertaken by means of parallel measurements with the reference methods, at a frequency as per the requirements of the equipment, but as a minimum every 3 years.
9. Periodic measurements of heavy metals and dioxin and furan emissions must be undertaken, using national (if available) or internationally acceptable methods, by independent/external, accredited specialists twice during the first 12 months of waste incineration / AFR co-processing, and annually thereafter.
10. Average emission values for heavy metals are to be measured over a minimum sample period of 60 minutes to obtain a representative sample, and a maximum of 8 hours, and the average values for dioxins and furans (expressed as I-TEQ) over a sample period of a minimum of 60 minutes and maximum of 8 hours.
11. Periodic measurements of heavy metals and dioxins and furans are to be carried out representatively to provide accurate and scientifically correct emission data and results, and sampling and analysis must be carried out by independent, accredited laboratories.
12. To ensure valid monitoring results are obtained, no more than five half-hourly average values in any day, and no more than ten daily average values per year, may be discarded due to malfunction or maintenance of the continuous measurement system.
13. All measurement results must be recorded, processed and presented in an appropriate manner in a Quarterly Emissions Monitoring Report in order to enable verification of compliance with permitted operating conditions and air emission standards. Quarterly Emission Monitoring Reports must include, amongst others:
    - Daily average results of all continuous, on-line emission monitoring parameters, reported on line graphs that include individual, daily average data points, and indicating the relevant air emission limit if applicable;

- Results of all continuous, on-line operational monitoring parameters, reported on line graphs that correspond in scale with the emission monitoring results;
- Results of periodic emission measurements of heavy metals, and dioxins and furans;
- Confirmation of residence times and temperatures of specific wastes co-processed as determined by the specific feed points, plant dimensions and material and gas flow rates;
- Discussion on availability or air pollution control equipment, together with reasons for and management of downtime;
- All relevant results must be compared with baseline measurements taken prior to the co-processing of AFR or hazardous waste; and
- Detailed evaluation and discussion of any non-compliance during the reporting period.

14. Treatment of High Level POPs Containing Waste (as defined by the Stockholm and Basel Conventions) are to be preceded by an independently monitored Performance Verification Test to determine the Destruction Efficiency (DE) and Destruction and Removal Efficiency (DRE) of principal organic hazardous compounds (POHC) using a suitable verification compound (e.g. trichloroethane).
15. A plan for conducting a Performance Verification Test must be submitted to the relevant Government Department/s at least 3 months prior to the commencement of such a test, and must include, amongst others, the following:
    - Motivation for why the plant should be used for treatment of High Level POPs;
    - A feasibility study showing that the plant is technically qualified;
    - Planned date for commencement of the test and expected duration;
    - Details on the waste to be co-processed during the test, including source, volume, composition etc.;
    - Motivation for the particular choice of waste and its suitability in providing an accurate and representative indication of the plant's DE and DRE, and therefore suitability to treat High Level POPs Containing Waste;
    - Extension of monitoring regime to include Chlorobenzenes, HCB, PCBs, Benzene, Toluene, Xylenes, PAHs, and NH_3;
    - Monitoring and analysis to be conducted, the associated methodologies and independent parties responsible for monitoring.
16. A detailed, independent report documenting and interpreting the results of the Performance Verification Test must be compiled. As a minimum, a DE/DRE of 99.9999% would be required, as well as compliance with Air Emission Standards.

17. An Air Quality Improvement Plan for achieving emission limits over time must be developed if transitional arrangements apply to compliance with emission standards.

5. WASTE MANAGEMENT

1. All waste management activities on-site, specifically those relating to the transport, temporary storage and handling of waste, must take place in accordance with relevant provisions of the Department of Water Affairs and Forestry's "Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste" (2nd Edition, 1998) and applicable national standards for hazardous chemicals and wastes (as relevant), or with any future guidelines, standards or legislation pertaining to waste classification, handling, storage and/or disposal that may supersede the provisions of the current Minimum Requirements (1998) and/or standards.
2. Waste storage areas on-site must be designed and operated in such a way so as to prevent the unauthorised or accidental release of any polluting substances (gaseous, liquid or solid) into the air, soil, surface water and groundwater. The following must accordingly be taken into account:
    - Possible incompatibility of waste materials during handling, transport and storage. Liquid streams shall be stored separately to solid wastes. Flammable liquids shall be stored separately to substances with a high oxidizing potential. Non-compatible waste streams are to be stored separately.
    - Storage vessels or containers shall be designed in accordance with specifications in regulations or adopted standards, and must be clearly marked as per relevant standards.
    - Procedures governing the loading, offloading and transportation of hazardous waste, including the relevant national standards and codes.
    - Any appointment of a waste transport contractor shall be subject to (i) the contractor complying with the all requirements and relevant national standards for the transportation of dangerous goods / hazardous substances, (ii) all emergency response equipment as stipulated in the national standards are carried on vehicles, (iii) all drivers carry a Professional Driver's Permit and are trained in HAZMAT response, (iv) all documentation relevant to loads is accurate and complete, (v) adequate emergency response facilities has been contracted along the route from the waste generator to the plant, (vi) all placarding and emergency information relevant to the load is correctly displayed.
    - Establishing suitable and safe transfer systems from transportation to storage areas to avoid health, safety and environmental risks from spillage, such as fugitive emissions or vapour displacement. Suitable vapour filtration and capture equipment must be in place to minimize impact to the reception point and surrounding areas from unloading activities.

- Assuring that storage facilities fit their purpose. Appropriate storage for liquids must meet relevant safety and design codes and standards for storage, pressures and temperatures, and adequate bunding is required to ensure the containment of spills.
- Adequate dust control systems for solid materials handling systems.
- Storage design must be appropriate to maintain the quality of the materials, e.g. for solids, preventing build-up of old, solid materials, and mixing or agitation for liquids to prevent settlement.
- Transfer and storage areas must be adequately designed to manage and contain accidental spills into rainwater or firewater, which may be contaminated by the materials. This requires appropriate design for isolation, containment and treatment. Storage for liquids must have adequate secondary containment.
- Written procedures and instructions for the unloading, handling, and storage of solid and liquid waste treated or co-processed on site.
- Identification of designated routes for vehicles carrying specified waste or AFR materials within the site.
- Appropriate signs per relevant national standard indicating the nature of materials at storage, stockpiling, and tank locations.
- Storage halls must be fitted with suitable fire fighting systems and be vented to control the accumulation of solvent vapours.
- Tanks containing low flashpoint material must be fitted with an explosion safety device. Additional devices may be required such as atmosphere control (e.g. ‘nitrogen blankets’) and temperature control (e.g. shell cooling). The relevant national codes and standards for storage of hazardous liquids must be consulted.
- Equipment must be grounded and appropriate anti-static devices and adequate electrical devices selected (e.g. motors, instruments, etc.) where relevant.
- All material must be stored in fit for purpose facilities in accordance with their characteristics in such a way that environmental pollution or degradation is prevented. In particular, transfer of wastes from the transporter must occur within an enclosed or bunded area.
- Emergency Response Plans must cater for any accidents and incidents, and spill kits must be maintained on-site.
- Storage areas for hazardous waste must be as close to the point of application to the plant as possible, but far enough away to prevent being heated by the radiant heat of the treatment plant, and to allow truck delivery access.
- Pumps and piping systems for liquid and sludge transfers must be able to tolerate varying viscosities and solid particles (or filters should be installed to remove such).

Adequate maintenance of these pumping systems has to be performed to prevent pipe bursts.

- Transfer of dry materials (e.g. paper, sewage pellets and plastic) must be enclosed to prevent wind-blown waste material, dust / waste particles and litter.

3. Adequate storage capacity must be provided for contaminated storm water run-off from the site, or for contaminated water arising from spillage or fire-fighting operations, to ensure that such effluents can be tested and treated before discharge where necessary.
4. Detailed records must at all times be kept of all waste or AFR accepted and treated / co-processed at the site, as well as any residue disposed following treatment. These records must include:
   - Source / origin (company, locality and process that generated the waste);
   - Volume and mass of waste / AFR treated or co-processed, and any residue disposed off;
   - Chemical composition and physical characteristics of waste / AFR and residues;
   - Waste classification;
   - Risks associated with hazardous waste in terms of its Material Safety Data Sheet (MSDS) and the management thereof;
   - Specific raw material or energy replacement value and characteristic/s (if applicable);
   - Waste storage method and time of storage prior to treatment;
   - Specific transport and handling requirements;
   - Details of any pre-processing, preparation or blending of waste / AFR prior to treatment;
   - Compatibility tests (if relevant);
   - Records of treatment / co-processing of individual waste streams / AFRs or in combination with other wastes / AFR;
   - Volume, mass and percentage feed;
   - Feed point;
   - Time of treatment / co-processing and period required for treating the total volume of waste / AFR;
   - Waste manifests;
   - If POPs containing waste have been treated, the Certificate of Destruction.
5. Detailed records must be kept of waste not accepted and turned away from the site, as well as reasons for non-acceptance.
6. Any residues or waste resulting from the receipt, temporary storage, handling and treatment of waste must be minimised in quantity and hazard.

6. MONITORING AND REPORTING

Internal Quarterly Audits and an Independent Annual Audit must be conducted on the functioning and monitoring of the plant. The audits must give a detailed account of the general running of the overall waste treatment process and the emissions into air compared with the set air emission standards, and must cover all operations and supporting paperwork of the sourcing, sampling and analysis, acceptance, transportation, storage and preparation of waste on site, as well as operation, monitoring, reporting, staff training, emergency preparedness and response procedures and processes. The audit reports must, where relevant, present information in such a way so that a clear view of the waste treatment process and its influence on air emissions and operations are obtained. The audits must include, but not be limited to, the following:

1. Detailed assessment and evaluation of compliance, or progress in achieving compliance, with the conditions of the Environmental Authorisation;
2. Detailed discussions on any non-compliances and the significance thereof, how these were addressed, and the recurrence thereof prevented;
3. Summarised information and results required as conditions of the Environmental Authorisation;
4. Incorporation of air emission and operational monitoring results from Quarterly Emission Monitoring Reports;
5. Records of the waste types and volumes treated during the reporting period;
6. Reporting on each waste stream's feed volume over time, reported on line graphs that correspond in time and scale with emission and operational monitoring results;
7. Description and evaluation of all infrastructure development (e.g. waste storage areas) and process modifications (e.g. feed mechanisms) during the period of reporting;
8. Review of the site Operational and Environmental Management Plan in terms of its adequacy to ensure compliance with the conditions of this and other approvals, specifically air emission standards, and the prevention of significant impacts on the environment;
9. Summary of findings of any audits of the company's Environmental Management System (e.g. ISO14001);
10. The Annual Audit must include independent verification of the data, results and conclusions contained in the Quarterly Emission Monitoring Reports and the Internal Quarterly Audits.