



SABITA

REPORT: AIR QUALITY ACT
AND THE ASPHALT
PRODUCTION INDUSTRY

February 2011



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TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1. PURPOSE OF THIS REPORT.....	5
2. SCOPE OF WORK.....	6
3. OBJECTIVES OF THE REPORT	6
4. METHODOLOGY.....	6
5. BACKGROUND TO THE HISTORY OF ASPHALT PRODUCTION AND INSIGHT INTO PAST AND PRESENT ASPHALT PRODUCTION PROCESSES IN SOUTH AFRICA	7
5.1 WHAT IS ASPHALT?	7
<i>Tar product</i>	8
<i>Bitumen product</i>	8
5.2 HEALTH IMPACTS.....	9
<i>Effects of Chronic Exposure</i>	10
5.3 ENVIRONMENTAL IMPACTS	11
<i>Coal tar versus Bitumen</i>	11
6. TECHNOLOGY AND METHODOLOGY	12
6.1 WHAT IS AN ASPHALT PLANT?.....	12
6.2 OPERATIONAL PROCESS OF AN ASPHALT PLANT.....	13
6.3 DIFFERENT TYPES OF ASPHALT PLANTS	14
6.3.1 <i>Permanent or static asphalt plant</i>	14
6.3.2 <i>Mobile asphalt plant</i>	15
7. LEGISLATION REGULATING ASPHALT PLANTS	15
7.1 AIR QUALITY ACT (39 OF 2004).....	16
7.2 <i>Atmospheric Pollution Prevention Act, 45 of 1965 (APPA)</i>	24
7.3 <i>Constitution of the Republic of South Africa Act, 108 of 1996</i>	25
7.4 <i>National Environment Management Act, 107 of 1998 (NEMA)</i>	25
7.5 <i>NEMA Regulations, 2010</i>	26
7.6 <i>NEMA Regulations, 2006</i>	27
7.7 <i>Environmental Conservation Act, 73 of 1989</i>	27
7.8 <i>Occupational Health and Safety Act, 85 of 1993</i>	28
7.9 <i>Others</i>	28
8. ENVIRONMENTAL AUTHORITIES	29

9. ENVIRONMENTAL STUDIES FOR ASPHALT PLANTS.....	30
9.1 BASIC ASSESSMENT	30
9.2 SCOPING/ENVIRONMENTAL IMPACT ASSESSMENT	31
10. BIOPHYSICAL ENVIRONMENTAL CONSIDERATIONS RELATED TO ASPHALT	32
10.1 CLIMATE	32
10.2 GEOLOGY	33
10.3 SOIL.....	33
10.4 ECOLOGY	33
11. MONITORING	34
12. MAINTENANCE AND ENVIRONMENTAL COMPLIANCE.....	34
13.EMISSION STANDARDS.....	35
INTERNATIONAL EMISSION STANDARDS - GERMANY	35
LOCAL (SOUTH AFRICAN) AMBIENT AIR QUALITY STANDARDS	35
<i>Subcategory 5.7: Macadam preparation.....</i>	<i>36</i>
14. EMISSION MONITORING	37
FINALISATION ON THE EMISSION MONITORING OF ASPHALT PLANTS MUST STILL BE ACHIEVED AND DISCUSSIONS BETWEEN THE INDUSTRY AND THE AUTHORITIES IS STILL IN PROGRESS.	37
15. APPENDICES	38
<i>NATIONAL ENVIRONMENT MANAGEMENT AIR QUALITY ACT, 39 of 2004</i>	<i>38</i>
<i>Guidline to general protocol.....</i>	<i>38</i>

EXECUTIVE SUMMARY

SABITA is committed in ensuring that all SABITA members and Associate members adhere to and comply with environmental legislation pertaining to the production of asphalt products at static and mobile asphalt plants distributed throughout South Africa.

Asphalt production and pollution was and still is very close related terms as viewed by the general public. This negative public opinion can be altered very easily and without too much effort. The asphalt industry and all its associates must accept the responsibility for a relatively new term – Sustainable Development. In short this means that development must happen, in a responsible manner though, for us mortals to survive in our beautiful country. As we gladly deposit profits into our bank accounts, we must, in a similar spirit, ensure that we improve and upgrade our asphalt production plants and processes with existing technology and methodology to ensure more effective and environmentally friendly operations for both employees and the world out there.

Your responsibility does not stop once you have obtained environmental authority to erect and operate your asphalt plant. Ongoing maintenance and upgrading of these facilities will ensure that you stay in line with changing legislation.

The newly promulgated Air Quality Act (39 of 2004) came into effect on 1 April 2010 and derived from the Air Prevention Pollution Act (1946) and similar legislative processes and procedures currently being implemented in Europe. It is of utmost importance that the legislative authorities keep up with changes in the industry and amend legislation to facilitate and encourage the incorporation of new, environmental friendly technology.

1. PURPOSE OF THIS REPORT

The Report was compiled to serve as a guideline for use by the asphalt production industry in obtaining environmental authorization as well as to enlighten the environmental authorities on the history and operational cycles of the asphalt production industry in South Africa.

2. SCOPE OF WORK

Giving environmental authorities insight into the asphalt production industry to ensure that new legislation affecting the industry is based on current methodology, technology and production processes and not that of the past. The asphalt industry was involved by sending out a questionnaire to be completed. Transition from the APPA (Atmospheric Pollution Prevention Act) to AQA (Air Quality Act) was discussed and a guideline on AQA certification was compiled.

Matters addressed are:

- a. Establish an industry wide accepted definition of a static asphalt plant.
- b. Establish an industry wide accepted definition of a mobile asphalt plant.
- c. Compile a prioritised list of suggestions as to what should be included/excluded when asphalt plant emissions are tested (ie. SO₂, particulates and VOC's).
- d. Provide statistical data of emission results forthcoming from a mobile asphalt plant (2 Sets – Old and new plants). The plant must therefore operate within the boundaries of these norms irrespective of where the plant will be stationed (i.e. 200mg/m³/ph).
- e. Suggestions on how existing legislation can be amended as to shorten the timeframe pertaining to AQA authorisation.
- f. Provide statistical data pertaining to DAE with existing plant emission levels for static plants (2 x Sets - old and new plants).

3. OBJECTIVES OF THE REPORT

The objectives of the report are the following:

- Provide the authorities with a transparent insight into the asphalt production industry by disclosing issues pertaining to the environmental, socio economic, commercial, regulatory and industrial disciplines;
- Provide the authorities with suggested emission levels as a norm for mobile asphalt plants.
- Provide the authorities with a clear definition of a mobile asphalt plant.
- Provide statistical emission levels for old and new asphalt plants as to establish standardized emission levels .eg. 200mg/m³/ph

4. METHODOLOGY

The following process was followed.

- a) A list of asphalt producers as well as members of SABITA relevant to the asphalt production industry was obtained from SABITA.
- b) A questionnaire (information document) on asphalt production issues as well as issues pertaining to legislation regulating the industry was compiled and sent out to the relevant members.
- c) Information forthcoming from the questionnaire was gathered and issues prioritized.
- d) Various asphalt production sites were visited.
- e) International standards (German TA-Luft 202 – Technical instructions on Air Quality Control) pertaining to asphalt plant emission levels were obtained.
- f) Emission samples from new and existing static and mobile asphalt production plants (SO₂, particles and VOC's (odours) were obtained.
- g) A draft report was compiled and referred to SABITA for commentary.

Issues to be finalised

- 1) Discuss the report with representatives of the asphalt industry.
- 2) Finalise the report and submit to the authorities.

5. BACKGROUND TO THE HISTORY OF ASPHALT PRODUCTION AND INSIGHT INTO PAST AND PRESENT ASPHALT PRODUCTION PROCESSES IN SOUTH AFRICA

5.1 *What is asphalt?*

Asphalt is a compound formed by mixing mainly bitumen and aggregates (crushed rock) through a heated process. The final product is primarily used for surfacing roads. In general conversation we often hear the term “tarred road” due to the similarity in colour and texture of the old coal tar compound and the new bitumen compound (Neveling, 2007: 10).

Tar product

Coal tar, usually viscous liquid or semi-solid, blackish, with a naphthalene-like odour, is a condensation by-product obtained from the pyrolysis of coal. More than 400 compounds have been identified in coal tars, and as many as 10 000 are actually present, including complex combinations of hydro-carbons, phenols and heterocyclic oxygen, sulphur and nitrogen (Asphalt Institute Information Series, 1991: 2).

Coal tars also contain Polycyclic Aromatic Hydrocarbons (PAHs). The concentration of carcinogenic PAHs found in both low and high-temperature coal tar products is orders of magnitude higher than in bitumen. The carcinogenic potential of coal tar is well recognised and widely accepted since 1985 by the International Agency for Research on Cancer (IARC). A significant environmental hazard is that while coal tars are soluble in a wide range of solvents, they are also slightly soluble in water. (Siemiatycki *et al*, 1987: 493 – 504).

Bitumen product

Bitumen, on the other hand, is derived from the distillation of crude petroleum, and are complex mixtures containing a large number of chemical components of relatively high molecular weight, typically 82-85% combined carbon, 12-15% hydrogen, 2-8% sulphur, 0-3% nitrogen and 0-2% oxygen.

Bitumen also contains polycyclic aromatic hydrocarbons (PAHs), although in significantly lesser quantities due to the process used to manufacture bitumens, such as vacuum distillation, which removes the majority of components with low molecular weights and boiling points, including PAHs with three to seven fused rings.

In addition, the high aromaticity of PAHs found in coal tar pitch fumes, together with its higher content, may give rise to significantly higher concentrations of fume during spraying operations with coal tar (SABITA, 2006: 3)

Pro bitumen activists have made statements like “Bitumen is not toxic or polluting” and “Bitumen is not a health hazard, nor does it damage the environment”. Bitumen is not made from coal tar, and while both materials are black, the similarity ends there. Bitumen is a petroleum product. In the refining of crude oil by fractional distillation, lighter fractions of the crude are drawn from the distillation tower at different levels (temperatures) leaving a residue at the bottom which is a complex mixture of high molecular weight hydrocarbons. This residue is further distilled at low pressure to produce the bitumen feedstock. Bitumen is mixed with mineral aggregate to produce asphalt. Since the high molecular weight hydrocarbons in bitumen are not very reactive, the mixture is inert and it does not harm the environment.

The tar or pitch used as a road surface in the past is an entirely different substance made from coal. It is the coal tar products - not materials obtained from petroleum - that contain polycyclic aromatic hydrocarbons known to cause cancer. Thus, bitumen under stable conditions, is not an environmental or health hazard.

To avoid any possible confusion, tar is NOT used in the production of asphalt.

5.2 Health Impacts

In the South African context, bitumen is mainly used for road surfacing purposes. South Africa has a moderate climate and it is therefore seldom that the bitumen compound is exposed to extreme climatic conditions. Bitumen, under stable conditions, can therefore be classified as safe for the general public.

According to Neveling, (2007: 21) bitumen becomes a dangerous and hazardous substance under extreme conditions i.e. abnormal high temperatures as in an asphalt drum mixer with the following apparent health hazards: -

SKIN: Hot bitumen and bitumen fumes may cause moderate to severe irritation and burns. Cold bitumen may cause moderate irritation. Bitumen dust may cause irritation characterized by redness and occasional drying and peeling.

INGESTION: Irritation of gastrointestinal tract and vomiting. Aspiration can develop into potentially fatal chemical pneumonitis.

INHALATION: Bitumen fumes, due to heating bitumen to extreme temperatures, may cause moderate to severe irritation of the nose, throat and respiratory tract. Exposure to bitumen fumes over lengthy periods may also cause headache, nausea, sore throat, nasal congestion, dizziness and nervousness. Confined spaces may accumulate hydrogen sulphide gas. Hydrogen sulphide may cause respiratory tract irritation, nausea, headache, dizziness, pulmonary oedema, loss of consciousness, brain damage and death.

Effects of Chronic Exposure

EYES: Effects not reported.

SKIN: Repeated exposure to hot bitumen or bitumen fumes may cause inflammation of the skin, acne like lesions, development of horny growths on the skin, darkening of the skin and sensitization of the skin to light. Bitumen may cause hair loss, dryness, scaling, and dermatitis. May aggravate existing skin conditions. Bitumen contains chemicals that may have a carcinogenic potential.

INGESTION: Effects not reported.

INHALATION: Prolonged exposure to bitumen fumes may cause inflammation of the lungs and mucous membranes of the nose and throat. May cause chronic bronchitis, pulmonary congestion, laryngitis, hoarseness, coughing, fatigue and atrophy and/or death of the epithelium. May aggravate existing respiratory conditions.

5.3 *Environmental Impacts*

Coal tar versus Bitumen

The leaching qualities of coal tar products is higher than that of bitumen, posing a higher threat to surface and ground water supplies, and aquatic life. This threat is heightened by the fact that coal tars contain compounds of substantially lower molecular weight than bitumen, including phenols and other aromatic compounds, many of which are liquid at ambient temperatures.

“The prohibition of coal tar products by some road authorities/agencies has resulted in changed work practices and seen the development of alternative, more user-friendly products. It is hoped that these best practices, which are being incorporated into project specifications, can be included with time when TRH 1 manual on ‘Primes coats and bituminous curing membranes’ is eventually updated. However, this is only one big step on the road towards making the roads industry a safer and friendlier environment in which to operate,” Sabita’s executive director Piet Myburgh said.

“The continued use of coal tar products flies in the face of global best practice and may constitute an infringement of the laws of the country, laying it open to legal

action. Since cost-effective alternative products exist to replace coal tar in road construction processes, irrespective of aggregate type and surfacing procedures, road owners should consider using these alternative products as an obligation to society” (SABITA, 2006: 3).

6. TECHNOLOGY AND METHODOLOGY

6.1 *What is an asphalt plant?*

In layman’s terminology an asphalt plant is mechanized system where the various ingredients of the asphalt compound is brought unto unity. From a more technical/scientific perspective Neveling (2007: 25) describes the asphalt operation as follows:

Hot mix asphalt (HMA) paving materials are a mixture of size-graded, high quality aggregate (which can include reclaimed asphalt pavement [RAP]), and liquid asphalt cement, which is heated and mixed in measured quantities to produce HMA. Aggregate and RAP (if used) constitute over 92 percent by weight of the total mixture. Aside from the amount and grade of asphalt cement used, mix characteristics are determined by the relative amounts and types of aggregate and RAP used. A certain percentage of fine aggregate (less than 74 micrometers [μm] in physical diameter) is required for the production of good quality HMA.

Hot mix asphalt paving materials can be manufactured by: (1) batch mix plants, (2) continuous mix (mix outside dryer drum) plants, (3) parallel flow drum-mix plants, and (4) counter flow drum-mix plants. This order of listing generally reflects the chronological order of development and use within the HMA Industry.

Emissions forthcoming from the production process are released into the atmosphere via a stack. There are currently three emission reduction systems used to minimise stack emissions (particles, dust and gasses) namely bag house systems, wet scrubber systems and cyclone systems.

6.2 Operational Process of an Asphalt Plant

The asphalt production process is as follows:

- Fuel oil is burned within the rotating mixing drum at the desired temperature;
- Stockpiled rock is fed into the rotating mixing drum through dedicated loading bins;
- The rock's temperature is raised to the desired temperature inside the rotating mixing drum;
- All liberated dust, steam and un-combustible gasses are passed through the bag house filter before it is released through the stack tower;
- Pre-heated bitumen is sprayed onto the pre-heated rock;
- The rotating mixing drum ensures that the rock has a homogeneous covering of pre-heated bitumen;
 - The heated and bitumen covered rock combination is now called asphalt;
- The mixed asphalt is moved via a conveyer system to a storage bin;
- Trucks park underneath the storage bin where the asphalt is loaded into the trucks;
- Asphalt is taken to the construction site where it is paved onto the already prepared surface.

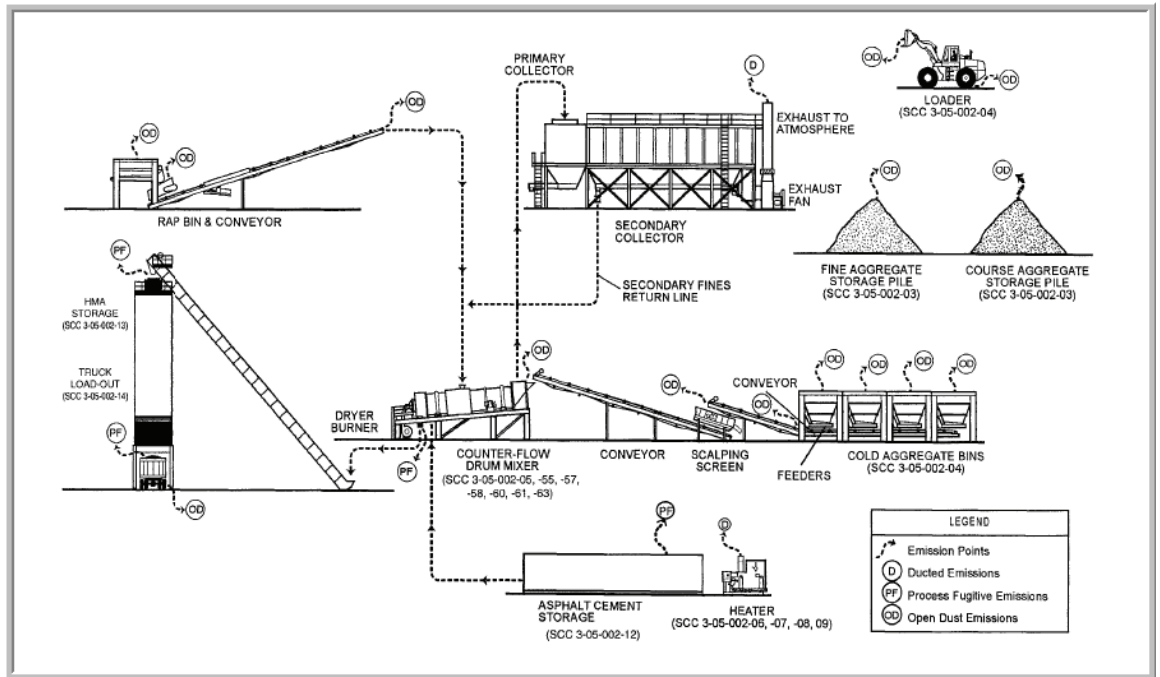


Diagram 1: Diagram of an asphalt operation (Neveling, U., 2007: Ambient Air Quality Impact Study For A Proposed Asphalt Plant Near Vanderbijlpark. Roadmac Surfacing. Report 0507-P003-ENV.)

6.3 Different Types of Asphalt Plants

6.3.1 Permanent or static asphalt plant

Permanent asphalt plants differ from the mobile plants only in size and mobility. These plants are stationary and will produce asphalt over longer periods in a permanent capacity. Permanent asphalt plants are usually situated in close proximity to industrial, commercial and residential developing areas as they supply the material for road and various hard surface areas to the industrial and commercial markets.

Industry derived definition:

A static or permanent asphalt plant is a high production capacity asphalt plant operating from an authorized industrial zoned site and erected on a

permanent foundation infrastructure serving multiple customers simultaneously.

6.3.2 Mobile asphalt plant

The mobile asphalt plant is a very small operation and is designed to conveniently fit on the back of an articulated truck. Its design incorporates easy on- and off loading. The asphalt plant can be off-loaded and put into operation and trail production within two working days. The design is compact and the rotating drum, loading bins, storage skip, bag house filter/wet scrubber filter and piping all fit onto the same truck. The environmental impacts associated with the operation of the asphalt plant is also considerate short term and not significant. These mobile asphalt plants are used for road construction and rehabilitation in remote areas and are very efficient as it uses minimal water and can operate independently. Generators deliver power and are diesel or petrol driven.

Industry derived definitions:

A mobile asphalt plant is a medium to low capacity asphalt plant consisting of mobile units to ensure mobility and be commissioned and de-commissioned within 48 hours respectively for projects in rural areas exclusively and not in close proximity to an authorized operational static asphalt plant.

7. LEGISLATION REGULATING ASPHALT PLANTS

An asphalt plant is affected by environmental legislation because the process of preparing a bitumen and aggregate mix causes harmful emissions. This process is called the Macadam Preparation Process and defined as:

That is to say, processes in which crushed stone is heated or dried, with or without the addition of tar or bituminous binders, for the purpose of preparing road surfacing or paving material.

Any facility involved with the abovementioned process must therefore apply for an Atmospheric Emission Licence and the temporary licence be granted before the production process may commence.

The activity triggered by the production of road surfacing material is Activity 26 of NGR 545 stipulating: **Commencing of an activity, which requires an atmospheric emission license in terms of Section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004) except where Activity 28 in Notice No R544 of 2010 applies.**

GNR 544 lists all activities that requires environmental authorisation through the Scoping/EIR process. In the past a directive was issued by DEAT allowing the shorter BAR (Basic Assessment Proses) to be followed for obtaining environmental authorisation pertaining to asphalt plants. When the 2010 regulations came into effect this directive accommodating the asphalt industry became something of the past.

The 2010 regulations does however make provision for the applicant to apply for the downscaling from a Scoping/EIR to a BAR should the applicant, on the recommendation of the EAP, suspect that the BAR would provide the competent authorities with sufficient information to be able to make an informed decision.

7.1 Air Quality Act (39 of 2004)

As mentioned previously, the Air Quality Act has been in existence since 2004 but was only promulgated and came into effect on 1April 2010. It is always good practice to have a copy of the Act available to ensure compliance.

A few excerpts from the Act affecting the asphalt industry are:

- **Section 14. Appointment of Air Quality Officers**

- 1) The Minister must designate an officer in the Department as the national air quality officer to be responsible for co-ordinating matters pertaining to air quality management in the national government.
- (2) The MEC must designate an officer in the provincial administration as the provincial air quality officer to be responsible for co-ordinating matters pertaining to air quality management in the province.
- (3) Each municipality must designate an air quality officer from its administration to be responsible for co-ordinating matters pertaining to air quality management in the municipality.
- (4) (a) An air quality officer must perform the duties or exercise the powers assigned or delegated to that officer in terms of this Act.

(b) An air quality officer may delegate a power or assign a duty to an official in the service of that officer's administration, subject to such limitations or conditions as may be prescribed by the Minister.
- (5) Air quality officers must co-ordinate their activities in such a manner as may be set out in the national framework or prescribed by the Minister.

- **Section 21.2.2 Applicability of the Notice**

- (1) Minimum emission standards as contained in this Notice shall apply to both permanently operated plants and for experimental (pilot) plants with a design capacity equivalent to the one of a listed activity.
- (2) Minimum emission standards are applicable under normal working conditions.
- (3) Should normal start-up, maintenance, upset and shut-down conditions exceed a period of 48 hours, Section 30 of the National Environmental Management, 1998 (Act No. 107 of 1998), as amended, shall apply unless otherwise specified by the licensing Authority.

- **Section 21.2.3 Averaging Period**

Unless where specified, minimum emission standards are expressed on a daily average basis, under normal conditions of 273 K, 101.3 kPa, specific oxygen percentage and dry gas.

- **Section 21.2.4. Emission measurement**

- (1) The manner in which measurements of minimum emissions standards, as required by Section 21(3)(a)(ii) of the Act, shall be carried out must be in accordance with the standard sampling and analysis methods listed in Schedule A of the Notice
- (2) Methods other than those contained in Schedule A may be used with the written consent of the National Air Quality Officer.
- (3) In seeking the written consent referred to in 4(2), an applicant must provide the National Air Quality Officer with any information that supports the equivalence of the method other than that contained in Schedule A to a method contained in Schedule A.

- **Section 21.2.5. Compliance time frames**

- (1) New plant must comply with the new plant minimum emission standards as contained in Part 3 on the date of publication of this Notice.
- (2) Existing plant must comply with minimum emission standards for existing plant as contained in Part 3 within 5 years of the date of publication of this Notice.

- (3) Existing plant must comply with minimum emission standards for new plant as contained in Part 3 within 10 years of the date of publication of this Notice.

- **Section 21.2.6. Postponement of compliance time frames**

- (1) As contemplated in Section 5.4.3.5 of the 2007 National Framework for Air Quality Management in the Republic of South Africa (2007) published in terms of Section 7 of the Act, an application may be made to the National Air Quality Officer for the postponement of the compliance time frames in Section 5 for an existing plant.
- (2) The application contemplated in 6(1) must include -
 - (a) An Atmospheric Impact Report in terms of Section 30 of the Act, compiled 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; and
 - (c) A certified copy of the announcement of the intention to seek postponement in, at least, one newspaper distributed in the area affected by the specific plant.
- (3) The National Air Quality Officer, with the concurrence of the Licensing Authority as contemplated in Section 36 of the Act, may grant a postponement of the compliance time frames in 5 for an existing plant for a period, not exceeding 5 years.
- (4) The National Air Quality Officer, with the concurrence of the Licensing Authority, may
 - (a) from time to time review any postponement granted in terms of 6(3) should ambient air quality conditions in the affected area of the plant not conform to ambient air quality standards; and

- (b) on good grounds, withdraw any postponement following-
 - (i) representations from the affected plant; and
 - (ii) representations from the affected communities.

- **Section 21.2.7. Compliance monitoring**

- (1) Where continuous emission monitoring is required for a listed activity in terms of the minimum emission standards as contained in Part 3 –
 - (a) The averaging period for the purposes of compliance monitoring shall be one calendar month or as prescribed in the Atmospheric Emission License as contemplated in Section 22 of the Act.
 - (b) The emission monitoring system must be maintained to yield a minimum of 80% valid hourly average values during the reporting period.
 - (c) 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.
 - (d) Continuous emission monitoring systems must be audited by an SANAS accredited laboratory at least once every two (2) years.
- (2) Where periodic emission monitoring is required for a listed activity in terms of the minimum emission standards as contained in Part 3-
 - (a) Emission measurement will be conducted in accordance with Section 4.
 - (b) Measurements shall take place on, at least, an annual basis unless otherwise prescribed in the Atmospheric Emission License as contemplated in Section 22 of the Act.

- (c) Sampling will take place using the permitted feed-stock or raw material and under operating conditions that are representative of operating conditions in the reporting period.
- (d) All tests will be conducted by SANAS accredited laboratories or laboratories accredited by similar foreign authorities.

- **Section 21.2.8. Reporting Requirements**

- (1) Notwithstanding the compliance time frames established in terms of Section 5, the Atmospheric Emission License holder shall submit an emission report in the form specified by the National Air Quality Officer to the Licensing Authority -
 - (a) within one (1) year of the date of publication of this Notice; and
 - (b) annually thereafter unless otherwise prescribed in the Atmospheric Emission License as contemplated in Section 22 of the Act.

- (2) The report contemplated in 8(1) shall include-
 - (a) The name, description and license reference number of the plant as reflected in the Atmospheric Emission License.
 - (b) Where periodic emission monitoring is required for a listed activity in terms of the minimum emission standards as contained in Part 3 -
 - (i) The name and address of the accredited measurement service-provider that carried out or verified the emission test, including the test report produced by the accredited measurement service-provider;
 - (ii) The date and time on which the emission test was carried out;
 - (iii) A declaration by the Atmospheric Emission License holder to the effect that normal operating conditions were maintained during the emission tests;

- (iv) The total volumetric flow of gas, expressed in normal cubic meters (Nm³) per unit time and mass flow (kg per unit time) being emitted by the listed activity or activities measured during the emission test, as the average of at least two (2) measurements;
 - (v) The concentration or mass of pollutant for which emissions standards have been set in this Notice emitted by listed activity or activities as the average of at least two (2) measurements; each measured over a minimum sample period of 60 minutes and a maximum of 8 hours to obtain a representative sample, and
 - (vi) The method or combination of methods used for determining the flow rate and concentration as contemplated in Section 4.
- (c) Where continuous emission monitoring is required for a listed activity in terms of the minimum emission standards as contained in Part 3:
- (i) Results of the spot measurements or correlation tests carried out to verify the accuracy of the continuous emission measurements;
 - (ii) The most recent correlation tests; and
 - (iii) The availability of the system as contemplated in 7(1)(b) in terms of the number of full hours per annum that valid results were obtained.
- (d) Following the compliance time frames established in terms of Section 5, an explanation of all instances where minimum emission standards were exceeded and remediation measures and associated implementation plans aimed at preventative measures.

- (e) Any other relevant information as required by the National Air Quality Officer from time to time.

- (3) Within three (3) years of the date of publication of this Notice, the National Air Quality Officer will establish an internet-based National Atmospheric Emission Inventory as a component of the South African Air Quality Information System (SAAQIS). Once established, the reports contemplated in 8(1) must be made in the format required for the internet-based National Atmospheric Emission Inventory.

- **Section 51. Offences**

- 1. **NB** :Being unable to provide a certificate or license
- 2. If licensed but does not comply with emission standards

- **Section 52. Penalties**

- 1. Fine calculated according to the severity of the offence but not exceeding maximum fine for criminal offences as per legislation
- 2. Imprisonment (Max – 10 years)

- **Section 61. Transitional Licensing Arrangements**

From APPA to AQA

- Provisional APPA certificate valid for 2 years from 1 April 2010 (as if a provisional license – AQA)
- Should a provisional license be issued (AQA) within that 2 years the provisional certificate (APPA) expires on that date
- Permanent APPA certification stays valid for a period of 4 (four) years after 1 April 2010.
- Application for an atmospheric emission license must be made within the first three years of the four years. If not, the APPA certificate lapses at the end of the three years and you become an illegal activity.

- **Schedule 2. Ambient air quality standards**
(Pertaining to particulate matter)

Ambient concentrations of particulate matter with a particle size of less than 10 microns (μ) in size (PM_{10}) may not exceed -

- (a) a 24-hour average of 180 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and the 24-hour limit may not be exceeded more than three times in one year; or
- (b) an annual average of 60 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

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

Although the National Environmental Management Act, 39 of 2004 repealed APPA and replaced APPA with the Air Quality Act, 39 of 2004 the majority of asphalt plants are still certified under APPA and is in the process of being licensed under AQA. No asphalt plant can therefore legally operate without APPA or AQA certification. The exclusive use of source-based controls (e.g. emission limits) as an air quality management tool has been found to have important short-comings Under APPA, an asphalt plant is classified as a scheduled process – Process 58: Macadam preparation process: processes in which crushed stone is heated or dried, with or without the addition of tar or bitumen binders, for the purpose of preparing road surfacing or paving material.

Emission limits do not take the unique characteristics of the receiving environment into account, such as the dispersion potential, existence of other sources, existing ambient pollutant concentrations, and the sensitivity of the receiving environment. Such limits therefore provide no insurance that ambient air quality objectives will be achieved and that there will be no adverse effects on human health and welfare (Neveling, 2007: 11).

7.3 Constitution of the Republic of South Africa Act, 108 of 1996

Referring to the environment, article 24 of the constitution stipulates that:

Everyone has the right –

- (a) to an environment that is not harmful to their health or well-being; and
- (b) to have the environment protected, for the benefit of the present and future generations, through reasonable legislative and other measures that –
 - (1) prevent pollution and biological degradation;
 - (2) promote conservation; and
 - (3) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development (Barnard *et al*, 2003: 68).

The Constitution influences the asphalt production process by forcing the asphalt industry to consider and respect human activity in close proximity to the asphalt plant operation.

The primary objective of the World Health Organisation's Guidelines for Air Quality is to help countries derive their own national standards, to help protect human health from air pollution.

The guidelines are technologically feasible and consider socio-economic and cultural constraints. It provides a basis for protecting public health from the adverse effects of air pollution and for eliminating or reducing to a minimum, air pollutants likely to be hazardous to human health (Neveling, 2007: 22).

7.4 National Environment Management Act, 107 of 1998 (NEMA)

The National Environment Management Act, 107 of 1998 and the Environmental Conservation Act of 1989, impacted on the asphalt industry by recognizing the asphalt industry as a possible polluter of the

environment and our natural sources. Very little attention was given to these laws in the past as the enforcement of the legislation was lacking. During 2005 the authorities brought out a general amnesty declaration giving all non compliant asphalt operators (and all other listed activity offenders) the opportunity to become compliant with the legislation. All offenders were given six months within which they had to apply for amnesty and therefore avoid prosecution. To qualify for the indemnity asphalt producers had to apply via a Section 24 G of NEMA implying their guilt. Section 24G of NEMA pertains to the voluntary rectification of an illegal operation.

The small operators and many of the bigger operators ignored the amnesty offered by the authorities. They were liable for prosecution implicating fines of up to R5 million or a jail term of up to 10 years or both. The irony of the exercise was that the responsible operators who did apply for amnesty under Section 24G are still awaiting the outcome of their applications. The amnesty period ended in September 2005 (Barnard *et al*, 2003: 68).

7.5 NEMA Regulations, 2010

The new regulations have been promulgated and became effective on 2 August 2010. The asphalt industry will not be adversely affected by the new regulation and legislation will remain very much the same.

Asphalt production is still viewed as a listed activity due to the emissions produced during production.

An asphalt production plant is classified as a listed activity by the NEMA Regulations 2010. R545 Activity 5 "The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management

activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the Act will apply.”

A full scoping and environmental impact report (S&EIR) process therefore needs to be conducted to obtain environmental authority from the competent authority.

Where in the past a directive was issued to follow the Basic Assessment process, the NEMA Regulations, 2010 No R.543 (Article 20 (4) make provision for the Applicant to apply for permission to apply the Basic Assessment process, in stead of the S&EIR, should the Applicant on the advice of the EAP managing the process is of the view that the competent authority will be able to reach a decision on the basis of the information provided in a Basic Assessment Report.

7.6 NEMA Regulations, 2006

The National Environmental Management Act Regulations were promulgated in 2006 and has since been repealed and replaced by a brand new set of regulations that became effective on 2 August 2010.

All applications for environmental authorisation submitted before 2 August 2010 will be dealt with as if the 2006 regulations were still effective.

7.7 Environmental Conservation Act, 73 of 1989

ECA was the beginning of the regulating processes and procedures impacting on the environment and pollution of our very limited natural resources base. Asphalt plants were classified as listed activities by ECA due to the fact that noxious emissions were forthcoming from the heated tar and aggregate mix. Although asphalt plants were listed, very little compliance monitoring was done and the lack of fixed emission standards and procedures caused the industry ignoring the legislation. Listed activities authorized under ECA are still allowed to operate but must work strictly according to an elaborate Environmental Management Plan. ECA was replaced by a better structured but still far from perfect NEMA in 1998(Barnard *et al*, 2003: 37).

7.8 Occupational Health and Safety Act, 85 of 1993

The Occupational Health and Safety Act also influence the asphalt production industry by enforcing set safety standard and a healthy working environment for all employees. Issues addressed are the compulsory provision and use of protective clothing and equipment, erection of safety signage near dangerous areas and storage facilities harboring hazardous substances. The act also provides for emergency medical care and equipment (Barnard *et al*, 2003: 37).

7.9 Others

Key national and provincial environmental legislation that could influence the operation of asphalt plants, are included in the following list. The list is intended to serve as a guideline only for the asphalt producers and is not exhaustive:

- Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983).
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947).
- Forest Act, 1984 (Act No 122 of 1984).

- Hazardous Substances Act, 1973 (Act No 15 of 1973).
- Lake Areas Development Act, 1975 (Act No 34 of 1975).
- Land Survey Act, 1921 (Act No 9 of 1921).
- National Forests Act, 1998 (No. 84 of 1998).
- National Heritage Resources Act, 1999 (Act No 25 of 1999).
- National Veld and Forest Fire Act, 1998 (Act No 101 of 1998).
- National Water Act, 1998 (Act No 36 of 1998).
- Occupational Health and Safety Act, 1993 (Act No 85 of 1993).
- Provincial and Local Government Ordinances and Bylaws.
- World Heritage Convention Act, 1999 (Act No 49 of 1999)

8. ENVIRONMENTAL AUTHORITIES

National, Provincial and Local authorities

The current administrative, regulatory, compliance monitoring and technical advisory role that the authorities are suppose to fulfill are ineffective and causes confusion and frustration to the asphalt producing industry as well as Independent Environmental Practitioners who are stationed in the centre of the confusion. Inexperienced officials are expected to monitor and regulate the industry and must take action against “non-compliances”. Unisa is currently presenting academic/practical courses for environmental compliance inspectors and should bear fruit in the near future.

Asphalt plants are regulated by the authorities due to its classification as a listed activity. The new legislation will also include local authorities as an active role player, joining forces with provincial and national authorities in regulating the industry. This will ease the pressure on current regulatory and monitoring processes as many asphalt plants are situated in remote areas and environmental compliance officers must travel long distances to reach these activities.

Inter-departmental communication between competent authorities concerned with the regulation of the asphalt industry must improve drastically. To be able to regulate an industry, the authorities must be given insight into the operation of such an industry. Training in these aspects is essential. Currently the regulators do not seem to understand that an asphalt plant is a commercial activity dependent on national, provincial and municipal contracts for its existence. Current time frames attached to the various stages of the EIA process are only workable when long term planning can be done for specific projects

The purpose of mobile asphalt plants is to be able to be in full production on a short notice. Regularly road rehabilitation needs to be undertaken urgently and no long term planning is possible. The legal system does not make provision for such emergencies and the average application for environmental authority takes 5 months for a BAR and 12months for a full Scoping /EIR application.. The authorities must surely accommodate these situations in some way.

9. Environmental Studies for Asphalt Plants

9.1 Basic Assessment

Due to the nature of asphalt plant operations and the relatively small size of the plant as well as production capacity, the National Environmental Authorities issued a directive in August 2006 that, in respect of existing asphalt plants relocated to a new site the Basic Assessment procedure as prescribed in the Act should be conducted. This process entails that a Basic Assessment Report has to be completed in addition to a comprehensive Environmental Management Plan for each proposed asphalt site. This is considered a very effective way to address the

application process and by following this process, it was possible that road rehabilitation projects could be completed within the time frames indicated. In order to accommodate the asphalt production industry, the Department of Environmental Affairs and Tourism forwarded a directive to all the provincial departments suggesting that listed activity 25 of Regulation R.386 should be the relevant listed activity with regard to asphalt facilities. Activity 25 facilitates the expansion or changes to existing facilities and did not facilitate new activities. When the 2010 regulations came into effect though this directive became redundant. Provision was made for the applicant to apply to the competent authority to do a BAR rather than a Scoping/EIR.

A thorough Basic Assessment Report would include specialist studies or professional opinions from Environmental Specialists where relevant.

9.2 *Scoping/Environmental Impact Assessment*

Listing 2 of the GNR 545 Activity 26 is the appropriate activity dealing with industries emitting noxious substances. The application procedure for following the Scoping/EIR process is an extensive, timeous process involving various specialist studies and reports with various stages requiring acceptance from the relevant authorities before proceeding to the next stage. Experience has shown that a full Scoping/EIA process can take up to 18 months depending on the nature of the application and the status of the competent authority. The 2010 regulations prescribes that in the case of a brand new asphalt plant operating for the first time the full scoping/EIA process needs to be followed. Should this materialize, the effectiveness of new mobile asphalts plant will be curbed.

The only workable solution for environmentally friendly asphalt plants and asphalt production is for the authorities to produce executable legislation

within a commercial/industrial environment. This will ensure the buy in of the asphalt producers and will secure commitment from all parties for an environmentally friendly industry.

10. Biophysical environmental considerations related to asphalt

The biophysical settings of the areas where the asphalt plant are/were (in the case of the mobile plants) encompasses all aspects relating to the natural environment such as climate, geology, topography, water resources, ecology and biodiversity.

10.1 Climate

Climate does play a significant role in the asphalt production process. Asphalt production forms an integral part of the road construction discipline that in turn is totally dependent on stable weather patterns for the timeous completion of projects.

Rain negatively affects asphalt producers as wet aggregate adversely affects the mix quality. The asphalt mix should also reach the site at a specific temperature when compacted onto the road surface as to ensure a quality product. The asphalt is usually transported to the construction site on open trucks where adverse weather conditions could affect the mix i.e. water in the form of rain, hail, snow or dust contaminating the mix via a wind storm or extreme hot or cold temperatures.

10.2 Geology

The geology of areas where the permanent asphalt sites are situated does not affect asphalt production as much. In urban areas the asphalt producers can only erect their asphalt plant on ready designated areas within an industrial zoned area. Usually the geology in these areas is stable. Mobile plants are erected where the project dictates and is short term of nature.

10.3 Soil

Soil types do play an important role in the establishment of an asphalt plant. Hazardous substances are stored on asphalt sites and should a spillage occur and control measures are not in place major damage can be inflicted depending on the soil types and the porosity of the soil. Great emphasis is therefore put on soil protection and spillage prevention in the Environmental Management Plan. Soil quality and type will also dictate to the site and construction personnel where to erect the plant and what type of foundations to use to ensure stability of the fixed concrete platforms (Kriech, 1990: 201).

10.4 Ecology

Asphalt plants could have an adverse effect on the ecology in a specific area due to emitting noxious gasses into the atmosphere, polluting ground water should a spillage of a hazardous substance occur, creating noise in a usually quiet area (mobile plants), causing excessive dust formation should stock piles and un-surfaced roads not be treated. These are the worst case scenario of things going wrong. Should an asphalt plant operate according to specifications and equipped with the prescribed stack filters and bunding

facilities the impacts on the environment would be nominal (Neveling, 2007: 16).

Thorough environmental studies, especially for the mobile plant projects in rural areas, are done when deciding on an appropriate site to operate from. Usually already ecologically disturbed sites are chosen to limit further pressure on the environment. Should any signs of ecologically sensitive areas (fauna, flora and natural water sources) be noticed during these studies, alternative sites would be considered.

11. Monitoring

Monitoring of set standards is also a major problem in the South African context regarding asphalt plants. The national and local authorities do not have the manpower to execute the monitoring function properly. Asphalt plants in general can be found all over the country. The permanent asphalt plants are situated in the proximity of the larger town and cities where the asphalt is in demand for use in the infrastructure development of these towns and cities. The majority of roads within the municipal boundaries are surfaced with an asphalt compound. Asphalt is also used for the surfacing of parking areas around shopping malls, surfacing of runways and tarmacs (loading zones) at airports as well as private paving material.

12. Maintenance and environmental compliance

A noticeable difference between the quality of the asphalt plants and maintenance levels on asphalt plants operating in the urban areas and

those from rural areas were visible. Urban based asphalt plants were new generation technology while the majority of asphalt plants stationed in rural areas were old technology asphalt plants. Although some of these sites were in dire need of environmental rehabilitation the positive side shows that the asphalt industry in general are accepting responsibility towards the environment and a culture of becoming and remaining environmentally compliant is developing.

An increase in “Green Scorpion” activity (Environmental Compliance and Law enforcement Officials) is positively contributing to improve environmental compliance levels in the asphalt production industry.

13.EMISSION STANDARDS

The new ambient air quality standards for the South African industry compares favorably with international standards.

New generation asphalt plants come with a manufacturers guarantee that stack emissions, under normal operational conditions, will not exceed the minimum ambient air quality standard.

International emission standards - Germany

Substance	Chemical Symbol	Mg/m³ under normal conditions (273K and 101.3 kPa)
Sulphur oxides	SO _x (SO ₂)	350
Nitrogen oxides	NO _x (NO ₂)	350
Particle matter		N/A
Carbon monoxides		50

Local (South African) ambient air quality standards

Substance	Chemical Symbol	Mg/m³ under normal
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		conditions (273K and 101.3 kPa)
Sulphur oxides	SO _x (SO ₂)	350
Nitrogen oxides	NO _x (NO ₂)	200
Particle matter		120
Carbon monoxides	CO	30

An asphalt production plant is classified as a listed activity due to the fact that an atmospheric emission license needs to be obtained before the plant can become operational.

An asphalt plant is listed under the Air Quality Act as it qualifies under the Macadam Preparation Process.

Subcategory 5.7: Macadam preparation

Description: The production mixtures of aggregate and tar or bitumen to produce road surfacing in permanent facilities and mobile plants

Application: All plants

Substance or mixture of substances		Plant status	mg/Nm³ under standard conditions of 11% O₂, 273 Kelvin and 101.3 kPa.
Common name	Chemical symbol		
Particulate matter	PM	New	50
		Existing	120
Sulphur dioxide	SO ₂	New	1000
		Existing	1000
Total organic compounds from vapour recovery /destruction units (Thermal treatment)	N/A	New	150
		Existing	150

Although the data depicted in the above table form part of the Act it is still under discussion as to accommodate the asphalt production industry.

Mobile plants operating from a specific site for short periods must be accommodated.

14.Emission Monitoring

Finalisation on the emission monitoring of asphalt plants must still be achieved and discussions between the industry and the authorities is still in progress.

15. APPENDICES

Appendix A

NATIONAL ENVIRONMENT MANAGEMENT AIR QUALITY ACT, 39 of 2004

Guidline to general protocol

- Ensure the listed status of your activity. The listed activity schedules have been updated and new activities was added while some other activities have been de-listed.
- Should your activity be listed ensure that your certification/license is valid.
- Should you currently operate a listed activity without environmental authorization or current APPA certification or AEL (Atmospheric Emission License) you are in contravention of the Act. The Act provides for such occurrences in the form of a Section 24G application. Therefore applying for the voluntary rectification of an illegal activity. Should your Section 24G application be granted, a penalty will be calculated that needs to be paid and you will get the opportunity to rectify the situation become legally environmentally compliant.
- In case of a new activity:
 - Should your activity be a listed activity under AQA it will automatically be a listed activity under NEMA and environmental authority must be obtained.
 - Environmental authority is a prerequisite for the granting of an atmospheric emission license.
 - Ensure that the proposed site your proposed activity is to be operated from qualifies to facilitate your activity according to the municipal town planning scheme.(In the case of an static asphalt plant)
- Evaluate what Air Quality monitoring and measurements have been carried out in the past.
- If no Air Quality monitoring and measurements or audits have been carried out you are in contravention of the Act and the services of a registered air quality specialist must be obtained to do the required test and monitoring.

Sampling should include dust, odours, fumes, heat and noise levels. Records of emission sampling and audits must be kept on site.

- Evaluate what Environmental Risk, Occupational Health and Legal Compliance Audits have been carried out.
- Occupational health audits must be conducted by a registered and approved inspection authority. Records of audits and monitoring must be kept on site.
- New and existing activities must apply for Atmospheric Emission licensing through the competent authority responsible for your region. District municipalities have been added to the list of competent authorities and have the authority to issue AEL's.
- The AEL application form is fairly complex as it requires extensive operational data to be provided. Some of the information can be obtained from your existing emission sampling records. New sampling data could be required by some authorities.
- A Provisional Atmospheric Emission License would be issued should the authorities be convinced that your activity complies or is in the process of becoming compliant.
- Should you feel that your activity is compliant according to the regulating standards you can apply for a Atmospheric Emission License. Should the authorities find your activity to be compliant, an AEL would be issued. The AEL will be issued for a set period after which it will expire and the license be renewed. This measure will ensure that listed activities be properly managed and maintained according to environmental legislation. This license will also be subject to specific restrictions and / or conditions imposed by the licensing authority.