Implementing the Waste Classification and Management Regulations and Associated Standards for the Assessment and Disposal of Waste to Landfill: An Industry Perspective

B. K. Thorpe. Interwaste (Pty) Ltd.. Durban. South Africa. bradleyt@interwaste.co.za

ABSTRACT
The promulgation of the Department of Environmental Affairs' *Waste Classification and Management Regulations* in August 2013 presented a notable paradigm shift away from the principles previously applied to the classification, management and disposal of waste contained in the Department of Water Affairs and Forestry's (DWAF) Minimum Requirements Series, 2nd Ed.; 1998. Significant regulatory reform of this nature (acknowledging that the DWAF Min. Requirements did not have the force of law) is bound to experience 'teething issues' in the short- to medium-term implementation thereof; as thorough and well thought out as the development thereof may have been. This paper presents the Author's own experiences and challenges in implementing the Regulations to date, as a technical professional in the South African waste management sector. This paper is not a legal review of the entire regulatory framework, but will rather highlight the more pertinent challenges, and un-intended consequences, experienced by the Author. The paper, furthermore, recommends remedial measures aimed at easing the implementation of the Regulations, as well as removing any regulatory uncertainty evident therein in their current form, without altering the purpose thereof.

1. INTRODUCTION

1.1 Background

In August of 2013 the National Department of Environmental Affairs (DEA) promulgated *Waste Classification and Management Regulations* (GN R 634 of 23 August 2013), in terms of the provisions of the *National Environmental Management: Waste Act*, 2008 (Act No. 59 of 2008)[NEM:WA]. These Regulations were supplemented by two National Standards specific to the assessment and disposal of waste to landfill (GN R 635 and 636 of 23 August 2013); hereinafter referred to as the 'Regulations' and 'Landfill Standards' respectively. This 'new' legislation represented a notable paradigm shift from the principles previously applied to the classification, management and disposal of waste contained in the Department of Water Affairs' (DWA) Minimum Requirements Guideline Series until that time.

The Regulations largely removed the preceding regime's linkage between a wastes classification and particular disposal/management requirements. Waste classification, in terms of SANS10234 [as required in terms of Regulation 4 (2) of the Regulations], does not require a waste to be managed in a particular manner, nor excludes any management option, but is primarily intended to inform appropriate storage, transport and handling from the point of generation to management. This being in order to protect human health and the environment. The requirements for the disposal of waste to landfill are to be determined through the assessment of a waste in terms of the *Standard for the Assessment of Waste for Landfill Disposal* (GN R 635 of 23 August 2013).

1.2 Introduction

The Regulations and Standards have been in force for approximately three (3) years now, since their promulgation by the Minister of Environmental Affairs on the 23rd of August 2013. Whilst in Regulatory terms, these Regulations would be regarded as being in their infancy; this paper seeks to take a retrospective view on some of the challenges associated with the implementation thereof during this preceding period. The paper does not present a critical or exhaustive review of the soundness of the Regulations and Standards themselves, but focuses rather on the Author's own perspectives in having been involved in the practical implementation thereof on a near daily basis to date.

Substantial changes of this nature to an existing regulatory regime would be anticipated to incur 'teething' problems, despite the Regulator's concerted attempts to ensure the ease of implementation- and understanding thereof by industry, as well as the likelihood of unintended consequences resulting from such. The degree of stakeholder engagement affected by the DEA during the development phase of the Regulations and Standards, combined with the regular inputs thereon by industry bodies and industry specialists throughout (through the establishment of Technical Reference Working Group), is testament to these efforts.

2. IMPLEMENTATION CHALLENGES AND EXPERIENCES TO DATE

2.1 General

The promulgation of the Regulations in 2013 was met with some degree of uncertainty and apprehension by waste generators. This was predominantly rooted in uncertainties around their ability to comply with the new regime, as well as around the costs associated with compliance and the potential financial burden thereof on their businesses. Some three years on and these fears are still regularly encountered amongst waste generators; although to a lesser extent than in 2013. What is also of concern is that some waste generators are either still not aware of their legal obligations under the Regulations, or do not fully comprehend the extent thereof, or consequences of non-compliance thereto.

It is the Author's personal experience, however, that the majority of large industrial and mining generators have either already met-, or have instituted appropriate projects towards meeting, their obligations under the Regulations. Reasons encountered for waste generators failing to meet these obligations to date range from i) ignorance, ii) failure to secure budget and associated management buy-in, iii) regulatory misinterpretation and iv) reliance on waste managers to fulfil the waste generator's legal obligations under the Regulations. It must be noted, with relevance to the latter, that the new Regulations placed a shifting obligation onto waste generators (from waste managers) to ensure legal compliance in respect of many of what can be considered as the 'administrative' aspects of managing the waste they generate.

2.2 Application of SANS10234 to the Classification of Waste

SANS10234, as adapted from United Nations' (UN) the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), covers the harmonised criteria for the classification of hazardous substances and mixtures, including waste, for their safe transport, use at the workplace or in the home according to their health, environmental and physical hazards. So while SANS10234 advocates the use thereof for the classification of waste, this is not without its challenges under certain circumstances, as described in the Sections to follow.

Wastes are typically, but not always, complex mixtures of inorganic and /or organic substances present at potentially variable concentrations in those mixtures, depending on the generating process(es). SANS10234 accordingly provides for the hazard identification and classification criteria for the classification of human health and environmental hazards for such mixtures; where unless defensible hazard data exists for the mixture itself, or for a comparable mixture, the classification criteria require that adequate knowledge on the chemical composition of the waste be derived through analytical testing and / or other defensible means.

2.3 Compound Occurrence / Speciation of Metal Ions

Analytical methods for the determination of metal ion concentrations in a mixture, such as XRF (x-ray fluorescence) and digestions with subsequent ICP-OES/AES (inductively coupled plasma), are readily available, cost 'effective' and reliable; assuming that sample preparation adequately caters to the potential short-falls of each such method. As stated, the output of such methods is however limited, in that it provides information on the metal ion concentrations in the mixture, but tell one nothing about how those metal ions potentially exist as compounds in the mixture. Knowledge of compound occurrence is essential if one considers that differing compound forms of the same metal ion can be associated with significantly different hazards and / or severity of hazard within the same hazard class under SANS10234 [e.g. Methyl mercury (CH_3Hg) Vs. Mercury oxide (HgO) Vs. Mercury fulminate (Hg(CNO)2) Vs. Elemental mercury (Hg) Vs. Mercury sulphate ($HgSO_4$)].

The above scenario is not anticipated to be as significant an issue for the manufacturers of hazardous chemical products, given that these producers would be inferred to have developed the chemical mixture with a specific compositional end-point in mind, and in having detailed knowledge of the chemical formulations and chemistry involved in developing their products(s). Also, the GHS was primarily developed for use by such parties in the first instance. This is not the case in practice in the South African waste management sector; with waste generators typically unable to provide a similar level of detailed insight into the anticipated chemical composition of their waste streams (with exceptions).

X-ray Diffraction (XRD) analysis can go some way to alleviating the above position for suitable mineralogical wastes, in determining metal ion compound concentrations in crystalline fractions of a sample, but again do not provide analytical insight into the compound occurrence of metal ions present in the mixture as part of the amorphous fraction thereof. To close the remaining gaps, one then becomes reliant on i) professional judgement, in combination with ii) knowledge of the waste generation process and industry, as well as iii)

whatever relevant information can be drawn from safety data sheets for contributing hazardous raw materials.

The challenge described above is not impossible to overcome, but does open the classification of waste to subjectivity (presumably supported by professional judgement) and requirements for appropriate expertise in undertaking such classification. Whether or not such judgement and other reasonable means are being applied in practice by parties classifying waste in South Africa remains to be seen, but will presumably be dealt with through future DEA compliance reviews and specialist auditing.

2.4 Wastes Containing 'Obscure' Organic Contaminants

Some industrial wastes encountered in practice can contain organic contaminants not readily analysed for by local- or international laboratories, and certainly not listed with corresponding LCT and TCT threshold values in the *Standard for the Assessment of Waste for Landfill Disposal* (GN R 635 of 23 August 2016). The presents a challenge toward defensibly classifying such wastes, particularly if one considers that there are hundreds of thousands of organic contaminants known to man, with new ones being developed daily. This can again be exacerbated where waste generators have limited knowledge or understanding around their waste streams to start with.

The challenges in classifying such wastes is to get to a point where the composition and concentration of relevant organic contaminants is the waste / mixture is understood to sufficiently that the SANS10234 hazard classification criteria can be appropriately applied. This challenge is, again, not a fatal flaw to effective classification of such wastes, but certainly requires one to implement a range of alternative measures, as described in the previous section, toward classifying such wastes from an informed stand-point.

A reliance on hazardous organic ingredient compositional data from contributing hazardous raw material SDS/MSDSs also requires a measure of professional judgement, in order to determine defensible carry-through concentrations in the actual waste stream. The classification of wastes described above typically comes at additional costs to the waste generator, and are typically on the conservative end of the scale so as to defensibly cater to the hazards associated with such wastes; particularly in cases of uncertainty as to what the anticipated concentrations of such organics are likely to be in the waste.

The above scenario is not a deficiency in SANS10234 itself, but rather points to increased complexities in applying the Standard to the classification of such wastes (as opposed to the chemical industry itself), and requirements for thorough compositional and hazard data review and data collection by experienced practitioners.

2.5 Pathogenic and Infectious Agents

There is a gap in the current regulatory regime as concerns the classification and management of potentially pathogenic or infectious wastes not falling within the definition of health care risk waste (HCRW) under the draft *Health Care Risk Waste Management Regulations* (GN R 452 of 1 June 2012), or other Provincial HCRW Regulations with the force of law. None of the definitions of 'HCRW' consulted by the Author caters to the management of *inter alia* sewage sludge or screenings, nor would they be expected to. As such, these waste types would, in terms of Regulation 4 (2) of GN R 634 of 2013 require SANS10234 waste classification and the development of a 16-point SANS10234 safety data sheet (SDS) should they meet the prescribed hazard classification criteria under SANS 10234.

The problem arises that SANS10234 is deficient in respect of classifying pathogenic and infectious hazard; again, due to the Standard's primary relevance being the classification of chemical substances and mixtures. Such sludge could thus theoretically, and likely in practice, not meet the hazard identification and classification criteria under SANS10234 for a hazardous waste, and accordingly not require a SDS, yet still poses a potentially significant hazard to holders and mangers thereof. This by virtue of the potential presence of pathogenic and / or infectious agents contained therein. The safety of the holder of such waste(s) is thus compromised by a lack of appropriate safety communication tools, as would have otherwise been derived through classification, and accompanying SDSs and label development.

2.6 Batch Processes

It is the Author's experience that waste generators who run multi-product batch processes have been left particularly frustrated by the Regulations, if they are to be applied to the letter of the law. This being either through significant financial outlay on classifying their multitude of wastes, and /or with the conservative output of other reasonable and defensible means taken by these parties to cater to their particular scenario.

These generators can develop dozens (hundreds in some instances) of 'different' waste streams from a particular facility. These may include floor sweepings, batch spillages and off-specification product wastes from different product runs. Each of these wastes will likely have differing physical and chemical properties from product to product, and would in theory each require some form of analysis, SANS10234 classification and / or SDS development (as relevant).

'Batch process' generators are typically 'forced' to take a highly conservative view toward the classification of their waste, as well as to assess such defensibly for landfill disposal (where landfill disposal is relevant). The approach adopted is to conservatively classify and assess (for landfill) their broad spectrum of wastes on the basis of the worst-case hazardous ingredient composition anticipated across the spectrum. Through knowledge gained of the 'most' hazardous raw materials used in the batching for specific products, coupled with targeted time-sequenced analysis of wastes generated, the generator is able to defensibly generate a SDS, or SDSs, that would cater to the potential hazards posed by any potential waste generated at the facility. The result is that the hazards of some wastes from such facilities will be overstated, and some waste streams may be directed to landfill sites with engineered barrier designs more conservative than is required (with associated cost implications in the long-term).

The above is not a fatal flaw to the application of SANS10234 for the classification of waste, but again requires a 'creative' approach and significant professional judgement toward ensuring that the generators' Regulatory obligations are met, and that costs associated with such remain 'manageable'. The implications of the conservative output of the approach have already been mentioned above.

3. PROBLEMATIC AND UNSCIENTIFIC LINKAGES BETWEEN WASTE CLASSIFICATION AND LANDFILL DISPOSAL

The classification of waste and the assessment thereof for disposal to landfill have been largely divorced under the current regulatory regime. There is one exception thereto, as pertains to wastes classified for human health or aquatic hazard as a result of a chemical substance not included under the GN 635 list of such substances. In such instances, *inter alia*, the waste is considered to be Type 1 waste for landfill disposal. This inclusion was presumably made by the DEA with the fact that the GN 635 listings are non-exhaustive in nature, but has some unintended consequences of significance in practise.

The Author has encountered a number of waste streams that contain classified skin irritants (in terms of SANS10234 criteria) as the single driver toward the hazard classification thereof, at concentrations that would result in the classification of such waste as 'hazardous' in terms of SANS10234 (Category 2 skin irritation), where the waste would otherwise be assessed as a Type 2/3 waste for landfill disposal in terms of GN R 635 of 2013.

The presence of a Category 2 skin irritant, as an ingredient in a waste, at a concentration as low as 1% would lead to the waste being classified as 'hazardous' in terms of SANS10234's criteria for the classification of skin corrosion/irritation hazard. Hypothetically then, if a waste was assessed for disposal to be a Type 3 Waste, thus allowing for Class C landfill disposal, but the waste contained 1.1% of a Category 2 skin irritant in isolation, it would be considered *de facto* Type 1 waste in terms of Section 7 (3) of the Landfill Assessment Standard; requiring Class A/H:H/H:h landfill disposal. All of this because the waste is potentially minor skin irritant, i.e. Category 3 skin irritant in terms of SANS 10234 (Table 1 to follow has reference).

To contextualize the potential for such conservative and presumably unintended consequences, a waste with up to 15.9% Zinc (Zn), i.e. 159 000mg/kg total concentration, could lawfully be disposed of to a Class B / GLB+ landfill (assuming all other parameters qualify as Type 2, 3 or 4). This is despite the GHS classification for Zinc Oxide, for example, indicating it to be hazardous in respect of Acute Aquatic Toxicity (Category 1) & Chronic Aquatic Toxicity (Category 1), i.e. pathways seemingly more relevant to managing the potential risks of landfill disposal thereof to the groundwater environment.

Table 1. Table 26 of SANS10234

SANS10234, Table 26 – Cut-off values/concentration limits of the ingredients of a mixture classified as skin category 1, 2 or 3 that trigger classification of the mixture as hazardous to skin			
Sum of ingredients classified as:	Cut-off values/concentration limits of the ingredients that trigger the classification of a mixture %		
	Skin corrosive	Skin irritation	
	Category 1	Category 2	Category 3
Skin category 1	≥ 5	≥ 1 but < 5	
Skin category 2		≥10	10 > C ≥ 1
Skin category 3			≥ 10
(10 X skin category 1) + skin category 2		≥ 10	10 > C ≥ 1
(10 X skin category 1) + skin category 2 + skin category 3			≥ 10

Similarly, Nickel (Ni) has a TCT1 of 1.06%; where Nickel Oxide for example is classified according to GHS for Skin Sensitization (Category 1), Carcinogenicity, Inhalation (Category 1A), Specific Target Organ Toxicity (STOT) - repeated exposure (Category 1) and Chronic Aquatic Toxicity (Category 4).

Based on these examples, it is doubtful whether the DEA had intended to include 'skin-/eye irritancy' under the broader grouping of 'health hazard characteristics' referred to under Section 7 (3) of GN R 635 of August 2013, or whether such health hazard characteristics for chemical substances (i.e. for those chemical substances not included on the list with corresponding LCT and TCT limits) need to rather be related to risk to groundwater posed by a landfill disposal scenario for it to be considered 'relevant' in this regard.

Alternatively put, whether a chemical substance contained in a waste stream is a skin irritant, or not, typically has no bearing on the potential risk to the groundwater environment of a landfill facility. This apparent un-intended consequence under Section 7 (3) of GN R 635 seemingly goes against the risk-based approach (i.e. risk of water resource degradation) on which GN R 635 itself is premised.

Several other such examples exist in practice, such as dry Type 3 waste containing inhalable crystalline silicates (SiO2) at >0.1%; where this waste would be classified as hazardous in terms of SANS10234 criteria, but where the subject health hazard characteristic of the waste (i.e. potential Carcinogenicity /STOT repeat exposure - lungs; inhalation) is irrelevant to the groundwater pathway once the waste is disposed of. Asbestos waste is also worth noting; where the assessment thereof for disposal to landfill would seemingly allow for Type 3 disposal, yet the physical form thereof (i.e. mineral fibres) and not necessarily its chemical composition, contribute to its classification as hazardous in terms of SANS10234 (i.e. STOT, repeat exposure - lungs; inhalation).

4. SCHEDULE 3 TO THE DEFINTION OF 'WASTE' AND SANS10234 CLASSIFICATION

The amendments to the definition of 'waste' that came into force under the National Environmental Management: Waste Amendment Act (Act 26 of 2 June 2014) created confusion within Industry in respect of the continued- and relative applicability of Regulation 4 (2) under the Regulations. The amended definition included a cross reference to 'Schedule 3' of the Act; which contained a seemingly arbitrary list of pre-classified 'hazardous'- and 'general' wastes associated with industry sector aggregations; with some industry sectors appearing in both Category A (i.e. hazardous wastes) and Category B (i.e. general wastes).

This broad-stroke inference of a waste's classification on the basis of the industry sector generating the subject waste is i) not scientifically justified or defensible, ii) contrary to the principles of the Waste Classification and Management Regulations (published only 9 months prior), and ii) creates an unnecessary burden on Industry and the Regulator alike around the compilation and review of exemption / exclusion

applications in this regard, respectively, to essentially 'over-rule' category listings under Schedule 3 through preferential scientific means (i.e. SANS10234 classification).

The DEA has seemingly acknowledged the issue above through their proposed further amendments to the definition of 'waste' in the latest Waste Act Amendment Bill. Resolution to the matter would only be finalised with the exclusion of Schedule 3 as proposed.

5. SAFETY DATA SHEET REQUIREMENTS FOR PRE-CLASSIFIED HAZARDOUS WASTES

There are challenges experienced in achieving absolute compliance around the implementation of Section 5 (2) of the Regulations, as relates to requirements for the preparation of SANS10234 SDSs for pre-classified hazardous wastes in terms of Annexure 1 to the Regulations. As a primary point of Departure, Regulation 4(1) of the Regulations expressly states that, "*Wastes listed in Annexure 1 of the Regulations do not require classification in terms of SANS10234*".

It is the Author's understanding from the Regulations that generators of waste that has been classified as hazardous (either formally in terms of SANS10234, or 'pre-classified' as hazardous in Annexure 1 of the Regulations) are required to ensure a Safety Data Sheet (SDS) for the waste is prepared in accordance with SANS10234, per Regulation 5 (1); with the exception of Health Care Risk Waste (HCRW). Regulation 5 (2) then directs the requirements for SDS preparation for these pre-classified hazardous waste streams, as follows: i) SDSs for hazardous wastes under Section 2 (b) i of Annexure 1 must be prepared in accordance with SANS10234 for the product the waste originates from; and ii) SDSs for hazardous wastes under Section 2 (b) ii of Annexure 1 must be prepared in accordance with SANS10234 reflecting the details of the specific hazardous waste(s) or hazardous chemical(s) in the waste.

It is thus clear that for pre-classified hazardous waste(s), that one becomes heavily reliant on the use of hazardous chemical / hazardous product (M)SDSs in order to comply with the above Regulatory provisions without indeed having to formally classify such waste. This is presenting a significant challenge; where there is seemingly no current legal obligation for hazardous chemical(s)/product(s) in South Africa (whether imported, or locally produced – excluding imports from the EU, for example) to be classified in terms of SANS10234 (GHS).

The issue arises then in many instances where the hazardous chemical/product of origin in the waste has not in fact been classified in terms of SANS10234 or the GHS to start with [albeit that there may be a 16-point (M)SDS for such]; making it difficult, and in some instances impossible, to then produce a SANS10234 compliant SDS for that pre-classified hazardous waste.

In summary, it is not in the Author's view scientifically- or legally defensible to, in practice, produce a SANS10234 SDS for a pre-classified hazardous waste (as required by the Regulations) based on a product or specific hazardous chemical/waste (M)SDS not derived from a SANS10234/GHS classification process itself.

6. CONCLUSION AND WAY FORWARD

This paper has presented some of the challenges experienced by the Author to date in implementing the Department of Environmental Affairs' (DEA) Waste Classification and Management Regulations and associated Standards for the Assessment and Disposal of Waste to Landfill (GN R 634, 635 and 636 of 23 August 2013). The timing of the paper ties in well with the close of significant transitional windows under Section 12 of the Regulations in respect of generators' obligations for, *inter alia*, SANS10234 waste classification and GN R 635 Assessment of Waste for Landfill Disposal (as relevant). It is anticipated that the full extent of generators' compliance therewith will become known with the close of the final 22 August 2016 transitional periods referenced above, and what is anticipated to be increased enforcement thereof by the Regulator.

It is the Author's opinion that although potentially significant in their own right, none of the challenges identified in this paper present a fatal flaw to achieving the stated purpose and continued functioning of the Regulations and Standards to date.

It is proposed that the Regulator give due consideration to appropriately amending the aforementioned Regulations and Standards (as relevant), toward stream-lining the implementation thereof and closing the gaps/deficiencies identified in this paper, as well as other such submissions with merit made by other third parties. It is acknowledged, however, that closing a gap in one instance may potentially yield unintended consequences in another, or for particular industry sectors.

REFERENCES

Department of Environmental Affairs, 23rd August 2013. *National Norms and Standard for the Assessment of Waste for Landfill Disposal*.

Department of Environmental Affairs, 23rd August 2013. *National Norms and Standard for Disposal of Waste to Landfill.*

Department of Environmental Affairs, 23rd August 2013. *Waste Classification and Management Regulations*.

Department of Water Affairs and Forestry, 1998. Waste Management Series. *Minimum Requirements for Waste Disposal to Landfill* Edition 2, 1998.

Department of Water Affairs and Forestry, 1998. Waste Management Series. *Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste*, Edition 2, 1998.