

Health Care without Harm – A Case for the Recovery and Recycling of PVC Waste from the Health Care Environment

Delanie Bezuidenhout, CEO: Southern African Vinyls Association. South Africa. delanie@savinyls.co.za

ABSTRACT

In the past two decades there has been a greater focus on ensuring that waste materials are managed properly in order to protect public health and the environment. Health care facilities have different waste requirements than other types of businesses and the question remains: “Can health care facilities also go green?”

The use of Polyvinyl Chloride (PVC) in medical devices has proved indispensable in reducing the risk of life-threatening and health care-acquired infections. As a result, today almost 30 percent of all plastic-based disposable medical devices are made from PVC which is highly recyclable.

A large number of case studies and research projects have been conducted regarding the separation of recyclables from general and health care risk waste with the purpose of reducing both waste management costs and the impact of the health care facility on the environment.

The Southern African Vinyls Association (SAVA) is in the process of establishing such a pilot project whereby PVC medical waste will be diverted from landfill contributing to the vision of “Zero Plastics to Landfill”.

DEFINITIONS

Definitions according to The National Health Act, 2003

- “health care general waste” means the non-hazardous components of waste generated by a generator and can include liquids, but excludes:
 - (a) Health care risk waste; and
 - (b) Health care waste generated from isolation wards.
- “health care risk waste” means waste capable of producing any disease and includes but is not limited to the following:
 - (a) Chemical waste;
 - (b) Cytotoxic waste;
 - (c) Genotoxic waste;
 - (d) Infectious waste;
 - (e) Isolation waste;
 - (f) Laboratory waste;
 - (g) Pathological waste;
 - (h) Pharmaceutical waste;
 - (i) Radioactive waste; and
 - (j) Sharps waste.
- “health care waste” means waste generated at a health establishment and includes both health care general waste and health care risk waste.

1. INTRODUCTION

In the past two decades there has been a greater focus on ensuring that waste materials are managed, reduced, reused, recycled, and disposed of properly in order to protect public health and the environment. Businesses, including health care facilities, are encouraged to help reduce waste by purchasing products that are durable, repairable, recycled, recyclable and/or have minimal packaging, and to find other uses for surplus goods instead of throwing them away. However, health care facilities have different waste requirements than other types of businesses and the question remains: “Can health care facilities also go green?”

An ageing population is expected to help drive global demand for medical polymers from 4 901 kilo tons in 2013 to 7 149 kilo tons in 2020, a compound annual growth rate of 5,6 percent. It is also expected that conventional materials such as glass and metal in medical devices will be continuously replaced by high performance polymers such as PVC and polypropylene (Plastics & Rubber Weekly, 2014).

2. LEGISLATIVE FRAMEWORK

Legislation in South Africa provides a framework for integrated health care waste management and requires the implementation of the waste management hierarchy as illustrated in Figure 1 below. In the first tier of the waste management hierarchy it is expected of waste generators to avoid or reduce waste. If this is not possible, practices to recover, re-use or recycle waste should be implemented. The treatment, disposal and remediation of waste are seen as last resort options.



Figure 1: The Waste Management Hierarchy
(Waste Act: 2008)

Recycling is a common method for reducing waste as it diverts waste from landfill, reduces waste disposal costs and in some instances generate revenue from the sale of recyclables. It also provides participants with an opportunity to be a good steward of the environment. Furthermore, the polluter pays principle holds the generator of health care waste responsible for the safe handling and sound management of this waste stream, from time of generation until time of final disposal in an environmentally sound and healthy way (Waste Act, 2008).

3. HISTORICAL WASTE MANAGEMENT PRACTICES IN THE HEALTH CARE ENVIRONMENT

Due to the fact that the HIV/AIDS epidemic was poorly understood in the mid 1980s, the most cautious approach for dealing with hospital waste was followed and all waste was treated as suspect. This practice continued to the mid 1990s when new efforts were made to redirect waste management behaviour and today we know that only a few items are actually suitable for disposal in health care risk waste containers, usually a red bag or bin.

Hospitals generate large quantities of health care risk waste which is commonly incinerated or sterilised and then landfilled. The cost of disposing of health care risk waste is high. A solution could be to minimise the amount of health care risk waste generated, or diverting a significant amount of general health care waste that is currently found in the health care risk waste stream away from incineration to recycling by introducing proper waste separation practices.

4. HEALTH CARE WASTE MANAGEMENT – A CHANGING LANDSCAPE

It's not just that hospitals, doctors' offices, clinics and other health facilities generate large quantities of garbage each year. Within the large quantities of garbage are untold numbers of unused disposable medical devices, as well as used but recyclable supplies and equipment, from excess syringes and gauze to surgical instruments.

This problem, fuelled by a shift towards the use of disposables that made it simple to keep treatment practices sterile, has been an open secret for years, but getting the health care industry to change its habits has not been easy. Only recently has the industry begun grappling with the amount of waste it generates, and one reason is that financially stressed hospitals are seeking ways to cut costs.

Over the past decade, a large number of case studies and research projects have been conducted in the national and international arena regarding the separation of recyclables from general and health care risk waste with the purpose of reducing both waste management costs and the impact of the health care facility on the environment. Conceptually, the South African health care industry is as advanced as its international counterparts, but the issue of separation at source and “practicing green health” has not yet been adopted by any of the major health care groups locally.

5. THE USE OF PVC IN THE HEALTH CARE ENVIRONMENT

PVC is a versatile plastic that has been used for medical applications for more than 50 years. It has passed many critical tests and gained acceptance by health regulators internationally and is now the most widely used polymer in pre-sterilised single use medical applications.

PVC is commonly used in a wide range of medical applications for screening, diagnosis, treatment and care, as well as in the creation of safe health care environments. PVC has made it possible for a patients and health care professionals to access a wide range of medical applications with optimal technical performance, safety and comfort in use. In addition to their versatile nature, PVC health care applications can easily be sterilised while keeping their key properties, such as resistance (to tears, scratches and kinks) and flexibility. The use of PVC in both single and multiple-use medical devices has proved indispensable in reducing the risk of life-threatening and health care-acquired infections. As a result, today almost 30 percent of all plastic-based disposable medical devices used in hospitals are made from PVC. PVC waste is highly recyclable and can be recovered as a valued raw material to make other secondary products, such as industrial and garden hoses, vinyl flooring and carpet backing.

PVC is used in various health care applications such as:

- IV and Blood Bags
- Surgical and examination gloves
- Inflatable splints
- Inhalation masks and tubing
- Blister packs for pills and tablets
- PVC coated mattress covers – hygienic and easy to clean
- Easily fabricated oxygen tents, relying on the welding characteristics of PVC combined with good transparency
- Water and drainage pipes
- Fire-resistant cabling in electrical and telecommunications equipment
- PVC flooring and wall cladding

Unlike most PVC applications, the majority of PVC medical devices are short term, “single-use” products.

Hospital waste management processes have been improved over the last decade to make incineration sustainable and efficient. In addition, recent experiences have shown that recycling of medical waste has the potential to be successfully implemented in health care settings like hospitals, thereby contributing to the efficient use of resources, while improving cost-efficiency.

Concerns have been raised about the potential emission of waste substances from PVC incineration. The production of waste substances depends on incineration conditions. In modern, well-run incinerators, these substances are appropriately managed on the basis of the strict procedures and standards.

6. THE RECOVERY OF PVC FROM HEALTH CARE WASTE

The economics of plastics recycling at hospitals are a function of the “avoided costs” associated with decreased disposal, the internal costs of setting up and operating a hospital recycling programme, the external costs to handle, transport and process the recyclables, and the revenues from the sale of the materials. These economics will differ for each player in the recycling loop – the hospital, the handler or processor and the reclaimer.

Recovering PVC can be a cost neutral situation for hospitals. The recovery of PVC is good in predictable work-flow situations. However, the motto: “If in doubt, leave it out!” always applies!

According to the Australian Vinyls Council, there are various challenges to any recovery operation and behaviour, storage space for waste bins and the logistics of moving waste is seen as the most prominent. However, through various pilot projects we have learned that these challenges can be overcome by good planning, ongoing education, and constant liaison with the waste management team and by having a project champion on site.

Due to the unique challenges within the waste management environment in health care facilities, any pilot project should take the following into consideration:

- Infection control
- Resistance to change
- Contamination by other materials ie rubber bands, metal pieces.

Implementing a successful PVC recovery programme at a health care facility could have various advantages for the facility, including:

- Improved environmental compliance
- Enhanced community relations by demonstrating a commitment to environmental protection
- Economic benefits resulting from pollution prevention products that reduce and recycle waste
- Avoidance of long-term liability
- Positive press coverage for the health care facility
- Increased employee morale resulting from a healthier work environment

7. PILOT STUDY SHOWS PATH TO SUCCESS

Australian health care consumes over 50 million IV fluid bags a year made from PVC as well as significant quantities of tubing and oxygen masks. That is equivalent to over 2 500 tons of material but represents only a fraction of all the plastics consumed in single use, disposable products in hospitals. Each ton of recycled PVC produced will replace about one ton of virgin PVC compound used in new products (McMillan, 2014).

A pilot PVC Recovery in Hospitals programme, launched by the Australian Vinyls Council at Western Health Victoria in 2009, demonstrated that specific PVC medical products can be separated relatively easily by hospital staff after use and recovered for recycling into new products such as industrial house and non-slip floor mats.

During the pilot project, it was estimated that plastics account for about one third of the hospital's general waste, most of which was sent to landfill. Of that plastic waste, PVC is estimated to represent about 25 percent. Therefore, the potential for plastics recycling in hospitals appears significant.

The trials showed that with clear guidance to help recognise recyclable waste streams, change current behaviours and set up appropriate systems, they were able to recover tons of PVC medical product waste from hospitals and divert it from landfill.

According to the Australian Vinyls Council CEO, Sophi MacMillan, the trials showed educating hospitals is vital if recycling is to be successful. The Australian Vinyls Council collaborated with hospital staff, recyclers, the New South Wales and Victorian governments and Sydney-based medical product manufacturer, Baxter Healthcare (Pty) Ltd, to create educational tool kits which includes a short video, training slides and step-by-step guides.

The programme now operates in six hospitals and medical centers, including a dialysis center. Another two hospitals are in the early stages of implementing the programme and four more registered interest online. Although only 15 000 kg of PVC waste has been recycled since 2009, the recycling rate is increasing significantly.

8. CONCLUSION

Plastics account for about one third of a hospital's general waste, most of which is sent to landfill. PVC is widely used in health care in IV fluid bags, tubing, oxygen masks and blood bags. The PVCMedAlliance is the PVC industry chain platform to raise awareness and to promote informed decisions about the use of PVC in health care delivery. PVC recycling programmes exist and as a member of the global PVCMedAlliance, the Southern African Vinyls Association (SAVA) is in the process of establishing a pilot project similar to that of the Australian Vinyl Council, whereby PVC medical waste will be diverted from landfill and used in the

production of new products such as industrial and garden hoses, vinyl flooring and carpet backing. The purpose of the pilot project will be to contribute to the vision of "Zero Plastics to Landfill".

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