A GUIDELINE

for the

BEST PRACTICES TO CONTROL RELEASES to the ENVIRONMENT

from the

COMPOUNDING OF PLASTICS

in Canada

Developed in conjunction with the Canadian Plastics Industry Association

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Preface

Plastic resin manufacturers produce polymers to which additives are incorporated to render the polymer suitable for use in subsequent manufacturing operations. At the most basic level these would include antioxidants and process stabilizers, without which the polymer would not possess the necessary attributes to withstand normal processing into marketable goods. These additives are normally incorporated into the polymer by the resin manufacturer.

Additives used in the compounding process include finely divided particulate and liquids that have the potential to enter the environment through a variety of sources discussed in this guideline. Plastic compounding is the process of incorporating additives into a polymer matrix through physical mixing. The process disperses and encapsulates the additive into a base polymer.

The federal government's Chemical Management Plan (CMP) has identified a significant number of substances of potential concern that may be used by the plastics industry. Following such identification Environment Canada and Health Canada initiate the process of risk assessment. A risk assessment is a scientific evaluation of a chemical substance. This evaluation determines the potential harm or danger a chemical substance may cause to human health and/or the environment, and the ways in which humans or the environment can be exposed to the substance. If there is potential harm the substance could be declared "CEPA toxic" and control measures may be required. Such measures may include restrictions on production, use, import, sale and/or release of the material.

This Guideline addresses the handling methods for additives and additive packaging, minimizing the losses of additives during processing and other activities that create a potential for loss of additives. The practices described in the Guideline are intended to provide the compounding industry the resources to reduce the likelihood that additives used by these facilities will enter the environment.

The Guideline is not intended to address specific workplace health and safety issues, which are managed and regulated under other (e.g. provincial) jurisdictional authorities and legislation

The overall goal of this Guideline is to assist the plastics compounding industry in recognizing and controlling activities and processes that could lead to the release of harmful materials.

Introduction

A large range of polymer additives is available to tailor polymers, or resins, for specific end use applications. These additives include colorants, ultra violet stabilizers, flame retardants, impact modifiers, plasticizers, reinforcements, electrically conductive materials, anti-stats and many more. There are numerous products available within each of the functional additive groups.

Additives are used to impart functional or cosmetic properties to polymers. For example, film made from polyethylene resin would quickly breakdown on exposure to ultraviolet radiation. The addition of a functional ultraviolet stabilizer increases the resistance of the film to UV radiation, allowing for the use of the film in greenhouse cover applications. On the other hand, a colourant added to a polyethylene ice cream tub increases its cosmetic appeal but does not alter the functionality of the polymer.

Plastic compounding is carried out by three industry sectors; resin producers, plastic processors (e.g., injection/blow moulders and extruders), and independent compounders. The compounding process typically consists of blending additives with a suitable polymer, applying heat and mechanical shear to disperse the additive evenly in the polymer, cooling and pelletizing. The heating and shearing process (melt processing) may take place in a continuous device such as an extruder or continuous mixer, or in an intensive batch device such as a Banbury mixer or roll mill. The additives and polymer may be physically blended prior to melt processing, or may be separately metered into the process equipment.

Products of the compounding process may be compounds or additive concentrates. Compounds can be considered to be ready to use materials containing additives at the level required in the final product. Additive concentrates contain additives at a level substantially higher (typically 25 -50 times) than required in the final product and are intended to be reduced to the correct levels in the final fabrication process. Concentrates allow processors to use a wide range of additives in a base polymer without the need for specialized compounding equipment.

Compounds may contain a single additive, or a combination of materials to impart the desired properties. Colourants are a good example of additives used in combinations. A colour compound may contain several pigments or dyes to achieve a specific colour match and may be combined with other additives such as metallic stearates, mineral oil or plasticizers to aid in dispersion of the pigment in a carrier resin. Stages in the compounding process can include:

- Pre-blending of additives
- Blending of additive with polymer
- Melt compounding (extrusion or batch)
- Pelletizing

1.0 Applicability

This Guideline is applicable to all plastic compounding facilities using powder or liquid plastic additives in Canada.

2.0 Glossary of Terms and Key Definitions

Additive:	A material, not part of the chemical structure of a polymer, added to a polymer to impart specific properties or attributes to the polymer
Aqueous:	Of, or containing water
Bag House	A component of a dust collecting system that house the filter elements
CCOHS:	Canadian Centre for Occupational Health and Safety; a resource for information on workplace health and safety issues. http://www.ccohs.ca/
Colourant:	A pigment or dye intended to impart colour
Continuous Processor	A continuous processing development of the internal batch mixer; commonly referred to in the industry as an FCM or Farrel Continuous Mixer™ - a melt processor manufactured by the Farrel Corporation
Dedicated Process Equipment:	Equipment that is used exclusively for production of a single mixture of additives and polymers
Dike:	A raised area around a tank (or other container) to contain and prevent the contents of the tank (or other container) from escaping in an uncontrolled manner in the event of a leakage from the primary container
Dye:	A colourant, usually transparent and soluble in the polymer to be coloured
Environment:	Ambient air, water or land
EPIC:	Environment and Plastics Industry Council
Facility:	A manufacturing plant where the compounding process is performed
FIBC:	Flexible Intermediate Bulk Container – A fabricated woven polymer bag intended to hold semi bulk quantities of dry materials; e.g. 1000 kilograms
Fugitive Dust:	Small quantities of airborne particulates arising from activities within the compounding facility; may include additive powders in addition to dust from other sources, i.e. vehicular traffic, unsealed concrete floors, fibres from package handling; may exit a facility via open doors, on clothing, shoes and vehicles, etc.

HDPE:	High Density Polyethylene
HEPA Filter:	High Efficiency Particulate Air filter designed to remove at least 99.97% of airborne particles of 0.3 micrometers (μm), or greater, in diameter.
Intensive Batch Mixer	A batch style melt processor in which polymers and additives are subjected to high shear forces in a closed chamber; commonly referred to in the industry as a Banbury Mixer®, a style manufactured by the Farrel Corporation
LDPE:	Low Density Polyethylene
Melt Processor:	A machine that melts a polymer and incorporates additives into the base polymer carrier
MSDS:	Material Safety Data Sheet – a document describing hazardous properties of materials and prescribing measures required for the safe handling of those materials
Pigment:	A solid particle colourant, usually insoluble in the polymer to be coloured
Plastics Processor	In this guide, any operation that manufactures goods from plastic resins through a process that causes melting of the resin
Polymer:	A long chain organic compound; such as. polyethylene, polystyrene
PPE:	Personal Protective Equipment – devices to protect workers from exposure to hazards or to limit injury from hazards such as falls
Regulating Authority:	The local, Provincial, Territorial or Federal agency responsible for the oversight and enforcement of by-laws, laws and regulations.
Release to the Environment:	A discharge of material into the ambient air, land or water, whether intentional or accidental
Resin:	A polymer
Spill:	A spill is any accidental, abnormal or inadvertent release of a substance from or out of a man-made container
Tote:	A rigid portable container intended to contain semi bulk quantities of liquid; e.g. 1,000 litres; may also be called an Intermediate Bulk Containers (IBC))
WHMIS	Workplace Hazardous Material Information System. A system to provide information on the hazardous properties of workplace substances

2.1 Symbols

	Housekeeping activity
	Self assessment question – does your facility use this process or product?
	Maintenance activity
	Potential water contamination
	Waste reduction opportunity
	Waste disposal issue

3.0 Packaging

Additives are commercially available in a range of packaging.

Powders are typically packaged in flexible intermediate bulk containers (FIBC's) (~1,000 kgs), fibre or steel drums and pails (~ 5 – 100 kgs), plastic or paper bags (~25 kgs). Due to large differences in bulk density of additives the weights and dimensions for each packaging type can exhibit significant variation.

Liquids are typically packaged in semi-bulk totes (~1,000 litres), drums (205 litres) and small pails (20 litres or less). Totes and drums are generally reusable and may be returned to the supplier. Pails are normally one way containers and are disposed of by the compounder.

Both liquid and powders may be shipped in bulk trucks, eliminating the need for packaging. Packaged powders will represent the largest class of additives handled by the compounding industry.

The form of packaging will dictate the method of storage and subsequent dispensing into the compounding process.

4.0 Storage

4.1 Powders

Containers of powdered additives should be stored indoors, protected from moisture and mechanical damage. Consult the manufacturer's current MSDS to check for the potential of incompatibility with other stored materials and for specific storage requirements, i.e. temperature and humidity limitations, safe stacking height etc. Damage to packaging is most likely to occur through contact with material handling equipment. Good material handling practices should be observed to prevent accidental spills during transport and stacking of packaged materials. Accidental spills should be cleaned up immediately using methods that do not create airborne dust, such as vacuuming or sweeping with dust suppressing materials. Always refer to manufacturer's MSDS for specific instructions on cleanup and disposal of spilled materials as special PPE or cleaning techniques may be indicated. Cleaning supplies should be readily available to operating personnel. Spilled materials should be placed in sealable containers for disposal in an approved manner in accordance with section 6.9 of this guideline.

4.1.1 Bulk

Bulk shipments of powdered additives are likely to be restricted to high volume pigments; titanium dioxide and carbon black. Transfer lines and storage containers for these materials will generally be dedicated due to the high risk of cross contamination of materials. Care should be exercised when connecting and disconnecting transfer

lines from bulk transport vehicles to prevent spillage of residual materials. Lines should be securely capped to prevent contamination of the lines and to avoid spillage of residual materials. Controls and/or alarms should be installed to prevent overfilling of bulk storage silos. Air vented from silos during the material transfer process should be filtered to prevent escape of dust to the environment.

4.1.2 Flexible Intermediate Bulk Containers (FIBC's)

FIBC's are woven plastic bags with an impervious polymer liner and integral flexible lifting straps. The FIBC may be open topped or filling and discharge spouts may be provided.

When lifting FIBC's with a fork lift truck be sure the tines are correctly spaced. Lifting straps should be vertical to prevent lateral loads in the FIBC. Lifting straps should not be twisted. Forklift tines should have rounded edges or should be equipped with protective cover to prevent damage to the lifting straps. Loads should be raised and lowered smoothly. Care should be exercised to ensure the FIBC is not damaged by contact with the wheels of a fork lift truck while travelling.

4.1.3 Drums and pails

Drums and pails may be constructed of steel, fibre or plastic. They will typically have a removable lid and may have a flexible liner to protect the contents from moisture and contamination. Protect containers from physical damage during storage. A USA Department of Transportation study concluded that "a sizable proportion of all releases of hazardous materials from fibre, steel, and plastic drums occur when a drum is punctured, often by the blades of a forklift or by a protruding nail or screw."[1]

Refer to manufacturer's recommendations for maximum safe stacking heights of drums and pails. Avoid stacking full drums on top of partially filled drums when returning process materials to storage.

4.1.4 Bags

Additives may be packaged in paper or polyethylene bags. Typically the bags will contain either 25 kgs or 50 pounds of product although lesser and greater bag weights may be used for some material. Bags are normally stacked on pallets of 40 – 50 bags for shipment. Stretch wrapping of the palletized unit for stability and protection is a common practice. Care should be exercised when stacking pallets to ensure bags are not damaged by material handling equipment *Refer to manufacturer's recommendations for safe stacking heights of palletized loads.*

[1] Fiber Drum Packaging for Transporting Liquid Hazardous Materials**, National Research Council, Transportation Research Board**, March 1997**.**

4.2 Liquids

Containers of liquid additives should be stored away from sources of heat or flame. Products may be flammable and/or corrosive. Some additives, such as organic peroxides, can react violently if exposed to other materials. Consult the manufacturer's current MSDS to check for the potential of incompatibility with other stored materials and for specific storage requirements. Measures should be implemented to prevent accidental spillage. Drums and totes should be protected during storage, transport and use to prevent damage by mechanical devices or vehicles. Where a potential for release of liquid additives exists measures should be implemented to prevent a spill from entering the environment. Preventatives measures include the use of dikes, spill pallets and isolation (or closing) of floor drains. Emergency spill cleanup kits should be readily available and operating personnel should be trained in the use of the kits. A system for reporting spills should be implemented as part of a plan to monitor performance and improve liquid additive handling practices. Please see Section 8 for spill reporting requirements.

4.2.1 Bulk

Construction of bulk storage containers must always be of a material suitable for contact with the product to be stored. Check with the additive supplier for a list of compatible materials for each liquid additive.

Bulk containers may be located inside or outside the facility. Venting of the containers should comply with federal, provincial and local air emissions regulations. Venting of containers to the interior of the compounding facility should be in compliance with applicable limitations for workplace exposure to the additive.

All liquid bulk storage tanks should be placed inside a diked containment area constructed in accordance with applicable federal, provincial and local regulations.

4.2.2 Totes

Totes may be constructed of a compatible metal or may consist of a high density polyethylene (HDPE) container in a steel supporting frame. Totes should be stored away from heat or flame and protected from mechanical damage. Measures should be implemented to ensure accidental spills are not released to the ground or to floor drains.

4.2.3 Drums and Pails

Typical drum and pail materials are lined steel or HDPE. Storage should be away from heat or flame and containers should be protected from mechanical damage. Measures should be implemented to ensure accidental spills are not released to the ground or to floor drains.

5.0 Handling and Dispensing of Additives

Dispensing of additives from containers into the compounding process presents a number of potential points of accidental spills and releases of powdered and liquid additives. Measures should be implemented to prevent additive particles becoming airborne during dispensing and settling on equipment, stored materials and fixtures where subsequent housekeeping activities could result in release of hazardous materials to the environment.

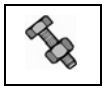
Throughout the process there are a number of activities that have the potential to result in a release of material to the environment. These activities and the equipment utilized in the compounding process will vary significantly from facility to facility. However, all facilities will have some or all of the materials and operations described in this Guide.

5.1 Loss of Material from Opening Containers and Dispensing Product

5.1.1 Flexible Intermediate Bulk Containers

FIBC's should be moved into process areas using the handling techniques described in section 4.1.2. A wide range of devices for suspending and discharging FIBC's is commercially available. Adequate ventilation should be provided to capture any airborne dust created during the dispensing operations. Ensure the contents of the FBIC are fully removed. If the full contents of the FIBC are not required for the process, securely reseal FIBC spouts and clean away residual materials before return the container to storage.

5.1.2 Drums and Pails



Ensure drums and pails containing liquid additives are placed on a secure level surface prior to opening to prevent splashing or spillage of the liquid. Drip pans should be provided to capture and contain spills from dispensing operations. Where dispensing of the liquid additive is made through hoses or drum pumps, ensure connections are secure and that hoses are in good working order. Inspect hoses, pumps and connecting devices regularly for signs of damage or leakage. Promptly repair or replace damaged equipment. Fully discharge the contents of drums and pails, or reseal with original lids and bungs before returning to storage.

5.1.3 Bags

Additives packaged in bags are normally removed from pallets manually and cut with a sharp bladed knife to release the contents. All bag breaking operations should be carried out in an area where dust and spills can be controlled and collected. Bag breaking stations are commercially available to assist the operator in controlling dust and disposing of empty bags.

Care should be exercised to ensure all the contents of the bags are discharged, unless a lesser quantity is required.

Additives can be easily trapped in an integral bag filling spout. In some cases, small quantities of additives may be dispensed for use in a batch process. Scoops of various constructions may be employed to transfer small quantities. These operations should be carried out in a controlled manner to avoid the creation of airborne dust or spills onto floors and other surfaces. Promptly clean up any spills, using methods that do not create dust, and place materials into sealable containers for safe disposal or reuse. In cases where only a portion of the bag contents are required, the bags should be tightly closed and taped before returning to storage. Secondary containment, such as placing the partial bag inside a sturdy plastic bag or drum should be considered.

5.2 Loss of Material from Material Transfer and Blending Operations

Material transfer operations include all of the movements of additives from the point of dispensing from the shipping containers into and out of blending or metering systems. Wherever possibly these transfers should take place within a sealed environment, however this is not always possible or practical. Where frequent product changes occur, the practicality of completely sealed systems is diminished as components must be readily accessible for cleaning.

Additives are typically added to a polymer to form a compound (the compound is formed in the melt processing stage) by one of two methods; batch blending of additives and polymers in a dry state, or metering of individual streams of additives and polymers directly into the melt processing equipment. Various combinations of the two methods may be employed; for example, metering of a liquid additive into a batch blend during the melt processing stage.

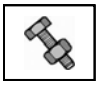
5.2.1 Batch Blending

Batch blending may take place in a high shear mixer (high intensity mixer) or a low shear mixer such as a ribbon or twin cone mixer. Additives and polymers are typically pre-weighed by the equipment operator and may be manually charged into the mixer. Each time that additives are tipped, or fall by gravity, into a batch mixer a potential for release of additives to the environment is created either by spillage or creation of airborne particles. Good operating practices should be developed and operator training implemented to minimize material losses from manual handling operations. Catchments should be provided to contain spills and adequate ventilation should be provided to capture airborne dust to a dust collector for subsequent recovery or disposal. During the batch mixing cycle losses of additives can occur through poorly fitted blender doors, valves and seals. Frequent checks of these devices should be made and any damaged or worn components should be promptly repaired. Typically the completed batch will be discharged directly to the melt processor or placed into an intermediate container for subsequent transfer to the melt processor. Adequate dust collection should be provided to capture airborne

particles released by the gravity discharge of the mixer and by the displacement of air from the receiving container. When discharging to intermediate containers care should be exercised to avoid overfilling the container. The common practice of shaking the container with a forklift truck to settle the contents increases the risk of airborne losses and damage to the intermediate container. Such activity should be avoided. Promptly clean up spills using methods that do not create airborne dust and place materials into a sealable container for subsequent recovery or disposal in accordance with section 6.9 of this guideline.

5.2.2 Additive Metering

Additive metering devices, by design, have a greater potential to provide a sealed environment for the containment of additive than batch blending processes. Typically a metering device will have an integral hopper that is filled with additive during the additive dispensing process. Filling of the hopper will displace air that must be filtered or collected to avoid the release of airborne additives to the plant environment. The metered materials are typically discharged directly to the melt processor. Poorly fitting hopper lids, loose or damaged flexible connectors and rotating shaft seals are potential points for loss of additives. Regular inspections of these components should be conducted. Damaged components should be promptly repaired or replaced. *Refer to the equipment manufacturer's instructions for inspection and maintenance procedures*.



5.3 Loss of Material from Melt Processing Equipment

5.3.1 Continuous processes

Additives and polymers will be transferred from metering or mixing devices into a surge hopper and fed directly (in the case of a single screw extruder) or through a metering device (in the case of a twin screw or continuous processor). Discharging materials from metering devices or mixing devices will cause displacement of air from the hopper. The velocity of air exiting the hopper may be sufficient to carry powdered additives. Air displaced by the actions of the melt processing equipment may also be discharged back through the feed throat of the extruder or processor. Filtering or collection of displaced air is necessary to prevent the release of additives to the plant environment. Wherever possible the filtered materials should be returned to the process to avoid disposal issues and loss of expensive additives. Hopper mounted filtered vents may be utilized or the displaced air may be ducted to a central dust collecting system. Returning collected materials to the process may be most practical in dedicated lines where cross contamination of additives is not an issue.

Extruders and continuous processors have rotating shafts that extend through the end of the feed throat to connect with the machine's gearbox.

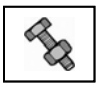
Seals are provided to reduce the leakage of dry powder materials around the rotating shaft. Leakage from the seals should be contained and collected for reuse or safe disposal in accordance with section 6.9 of this guideline.

Materials should not be allowed to build up around the seal area as entrapment of solid additive particles will accelerate seal wear. *Refer to the manufacturer's instructions for regular seal maintenance and replacement procedures*.

Metering pumps may be used to inject liquid additives into the extruder or processor. Liquid additive containers should be protected from mechanical damage and provision made for containment of spills, i.e. spill pallets. Regularly inspect pump seals, fittings and tubing for signs of damage or leakage. *Refer to pump maintenance manual for recommend maintenance procedures.*

5.3.2 Batch Processes

Intensive batch processors are charged with a batch of premixed additives and polymer, or may simply receive the components without premixing. In some cases additives may be packaged in bags made from a polymer compatible with the batch polymer. This eliminates additive spillage and bag disposal issues associated with bag breaking operations. Properly designed dust collection hoods should be employed to capture airborne powders during charging of the additives into the batch processor. Hopper mounted dust collectors may be used to capture the product for reuse in the batch process, or a central dust collector may be used to collect particulate material for subsequent disposal in accordance with section 6.9 of this guideline.



Batch processors rely on shaft seals to prevent escape of powdered additives from the mixer. Refer to the equipment manual for instructions for maintaining and replacing the shaft seals. Charging and discharge doors are also equipped with seals to minimize the escape of additives during batch processing. *Refer to the manufacturer's instructions for cleaning and maintaining door seals. Regularly inspect all seals and repair leaks promptly.*

6.0 Housekeeping

General housekeeping activities are not only essential to minimizing the risks from loss of additives, but the activities themselves may give rise to unintended releases of these additives to the environment.

Cleaning and general housekeeping activities should always be carried out in a manner that does not create dust. Personal protective equipment may be required to protect worker health during these activities; *refer to manufacturer's MSDS for specific spill clean-up, PPE and disposal requirements.*

Common cleaning methods for dry powdered additives may include vacuuming, brushing and wiping with rags etc. Vacuums must be equipped with appropriate filters (i.e. HEPA) to prevent the release of airborne particles from the exhaust of the vacuum device. Compressed air jets should never be considered as an appropriate method for general housekeeping activities.

Typically additives are not water soluble and cleaning with aqueous media is not practical. In the event that water based cleaning methods (such as high pressure or steam cleaning) are employed, wash water must be prevented from entering into the municipal sewer system, municipal storm water collection system, surface water course or subterranean aquifers.

Wherever possible additives lost from the process should be recovered in a manner that permits their reuse in the manufacturing processes. Prompt clean-up will minimize the risks of cross contamination and improve the opportunities for additive reuse. If additives can not be reused dispose in accordance with section 6.9 of this guideline.

6.1 Equipment

It is common in the custom compounding sector for compounding equipment to be used to process multiple additive and polymer combinations. Careful cleaning of the equipment in contact with process materials is required to ensure that no cross contamination from previous applications can occur.

Targets for cleaning may include: weigh scales, blenders, transfer bins, blenders, metering devices, and melt processor hoppers. Heavy accumulations of additives should be carefully removed from the subject equipment by vacuuming or manual removal. Wherever possible these materials should be retained in sealed containers for future reuse. Additives clinging to the surface of process equipment should be removed by scraping, brushing or wiping. Additives removed by these methods should be placed in sealable contains for future reuse or disposal in accordance with section 6.9 of this guideline. Wipers and rags used for cleaning should be similarly retained for proper disposal in accordance with section 6.9 of this guideline.

Accumulations of fugitive dust on the outer surfaces of process equipment should be removed. Equipment cleaning operations may also result in fugitive dust accumulations on floors and work surfaces. Fugitive dusts that may contain additive particulates should be placed in sealable containers for future reuse or disposal in accordance with section 6.9 of this guideline.

Dedicated process equipment typically does not require the removal of additives or significant quantities of materials on a routine basis. The activities described above for equipment cleaning should be followed when carrying out maintenance operations on the dedicated equipment.

Regular inspection and removal of fugitive dust from equipment surfaces should be a part of a comprehensive housekeeping plan. Fugitive dusts that may

contain additive particulates should be placed in sealable containers for future reuse or disposal in accordance with section 6.9 of this guideline.

6.2 Single Use Packaging

6.2.1 Drums and Pails

Single use drums and pails commonly are lined with a LDPE liner to prevent contamination of the contents. When the contents of the container have been consumed, the liner should be carefully removed and placed in a sealable container for future disposal in accordance with section 6.9 of this guideline. The primary container should be inspected for signs of residual additives before disposal. If residual additives are present the container should be isolated for disposal in accordance with local, provincial and federal regulations. Clean containers may be recycled or disposed with regular non hazardous materials. Consideration should be given to crushing or puncturing containers prior to disposal to prevent inappropriate reuse.

Note: it may be possible in some operations, such as intensive batch mixing, to incorporate the drum liner into a compatible polymer and additive batch.

6.2.2 Bags

Empty plastic or paper bags are likely to contain significant amounts of residual materials. Bags should be placed in a sealed container for disposal. Compactors or balers may be used to reduce the volume of bags to be sent for disposal. Dusts created during the compression cycle of these machines should be captured and retained in a sealable container for future disposal. Disposal of bags and dust should be in accordance with section 6.9 of this guideline.

Note: it may be possible in some operations, such as intensive batch mixing to incorporate a plastic bag into a compatible polymer and additive batch. Some additive suppliers can provide packaging specifically designed for incorporation into a compound.

6.3 Reusable Containers

Most suppliers offer reuse programs for semi bulk containers. Ensure contents are fully discharged before returning packaging to the vendor or designated package handler. Fold in all spouts on FIBC's to prevent loss of residual materials during shipping. Close valves, replace lids and caps on liquid totes and drums to prevent loss of residual product and eliminate the possibility of contamination of the tote.

Store empty reusable containers in a manner that protects the container from damage and contamination. Ensure that the previous contents of the packaging, e.g. TITANIUM DIOXIDE, are shown on all shipping documents.

6.4 Tools

Tools, such as scrapers, brushes and vacuum cleaner accessories used in housekeeping

functions may become laden with residual additives. Tools should be cleaned in a manner that captures residual additives for future disposal in accordance with section 6.9 of this guideline or should be stored in a dust tight cabinet for future use. Spent brushes should be placed in sealable containers for future disposal. Compressed air should never be used for cleaning of tools and vacuum hoses.

6.5 Personal Protective Equipment/Clothing

Spent PPE, such as gloves, dust masks, disposable coveralls, boot covers etc., that has been in contact with additives should be placed in sealable containers for future disposal. in accordance with section 6.9 of this guideline.

Suitable change facilities should be provided to isolate contaminated clothing from regular work wear to prevent additives from being released to the environment by normal human traffic. Work clothing should not be taken home for laundering as this may present a hazard to the environment and to the health of the worker and his/her family. Provincial health and safety standards may apply to the isolation and clean/dirty work areas.

Commercial uniform services provide reusable work clothing. These vendors should be made aware of the hazardous properties of the materials that the clothing has, or may have, come in contact with. Due diligence is required to ensure that vendors can:

collect and transport soiled clothing without releasing residual additives to the environment manage wash water in a manner that prevents the possibility of releases of an additive to the environment

Laundering services may extend to floor mats, gloves and mops, wipers, in which case the same precautions that apply to uniforms should be observed.

6.6 Vehicles

Vehicles are forklifts, pallet trucks and other material handling equipment, delivery trucks and rail cars. In-plant vehicular traffic can retain additive residuals on tires and other components. Good housekeeping practices will minimize the potential for fugitive dust accumulating on these surfaces. Movements of in-plant vehicles to outdoor surfaces should be restricted to prevent release of fugitive additives to exterior surfaces where they can be washed into sewers and watercourses. Where traffic between interior and exterior surfaces is unavoidable measures should be implemented to prevent track out of additives. Floors adjacent to egress points should be kept clear of dust and debris. A textured concrete scrub pad should be considered to aid in the removal of fugitive dust from tires.

Over the road vehicles should not be permitted into areas of a facility where additive bearing fugitive dusts may be present. Shipping and receiving areas should be kept free of dust and debris.

Delivery trucks and box cars may be a source of additive spills. Additives may be released into the vehicle from container damage during loading or unloading. Additive spills should be cleaned up immediately to prevent tracking of the additives on the tires of material handling equipment. Empty vehicles should be inspected for residual additives and all residues should be removed and stored in sealable containers for future disposal in accordance with section 6.9 of this guideline before releasing the vehicle

6.7 General Facility Housekeeping

General housekeeping includes all the activities included in keeping the general facility in good order. This may include removal of fugitive dust from floors, walls, ceilings, beams, pipes, light fixtures, stored inventory etc. Cleaning methods that do not create airborne dust should be employed for these cleaning activities. Where a possibility that fugitive dusts may contain additive particles, the dust should be captured and placed in a sealable container for future disposal in accordance with section 6.9 of this guideline. If water or other solutions are used in the cleaning process, care should be taken to ensure that water containing additive residues does not enter into the municipal sewer system, municipal storm water collection system, surface water course or subterranean aquifers.

6.8 Housekeeping Contractors

Outside contractors engaged in housekeeping activities such as comfort area cleaning should be made aware of potential hazards and procedures developed to prevent the release of additives to the environment through inappropriate cleaning technique and improper waste disposal.

6.9 Waste Containment and Storage

Waste additives accumulated during cleaning and housekeeping operations should be placed in a suitable container for safe storage and transport to an approved waste management facility. The container should be dust (or liquid) tight, readily opened and resealed and sturdy enough to protect the contents from accidental release resulting from damage to the container. In some cases the type of container may be specified by the supplier of waste disposal service. The quantity of waste stored on site and the duration of storage may governed by local, provincial or federal authorities. *Obtain advice from knowledgeable persons or seek legal advice on the requirements and limitations for on-site waste storage in your jurisdiction.*

7.0 Dust Collection

Dust collection systems are critical to the control of airborne additives, serving a major

role in protecting workers from exposure to hazardous materials and reducing the risk of releases of additives to the environment. There are several types of dust collectors and effectiveness of these systems depends upon correct collector selection and other factors. These include, capture hood and duct design, blower and filter media selection, capture air velocity etc. *Dust collection systems should be designed by professionals qualified in the field. Air discharges from dust collectors will be subject to the provisions of an Air Emissions Certificate of Approval (or equivalent) in most jurisdictions. Provincial regulations will govern these discharges.*

Dust collection systems should be maintained in accordance with the manufacturers' instructions in order to provide continuing effective capture of fugitive additives. A dust collector maintenance schedule may form part of the Air Emissions Certificate of Approval. Ductwork should be regularly inspected to ensure that there is no build up of material in the duct. Built up materials should be promptly removed in a manner that does not create dust and stored in a sealable container for future reuse or disposal in accordance with section 6.9 of this guideline. The underlying cause of the material build up should be determined and resolved.

The dust collector itself provides a significant potential for releases to the environment in the event of system failures. A broken or damaged filtration element can cause the sudden and rapid discharge of collected additives to the environment. The velocity of the discharge air will, typically, be sufficient to distribute the additives particles over a wide area making re-capture difficult or impossible. Bag break monitoring systems can be installed to detect the onset of material losses into the discharge air and alert operators or shut down processes. It may be necessary, or advantageous to discharge air through a secondary bag house to capture dust released as a result of a failure in the primary filtration system. **Bag or filter breaks should be repaired immediately to prevent the release of additives to the environment. In no situation must a dust collection system with a damaged or broken filter element be allowed to operate.**

Dust collecting systems maybe local or central. A local dust collecting system may be mounted on or near the source of particulates and may discharge the captured dust directly back into the process. Examples would be silo 'bin vents' and integral dust collectors on bag break stations. These are effective when use of the system is dedicated to a single product. Central systems draw particulates from a number of collection points. It would be typical for several materials to be collected simultaneously, precluding the recovery of the collected additives.

Additives will be removed from the conveying air stream in the dust collector and discharged for reuse or disposal in accordance with section 6.9 of this guideline.

The discharge may be continuous, through a rotary valve, or batch style into a steel drum or similar container attached to the dust collector. Rotary valves may

discharge into a designated container, or returned to the process. Rotary valves, flexible connectors and receiving containers should be regularly inspected for signs of leakage or damage. Defective or damaged components should be promptly repaired. *Refer to manufacturer's instructions for repair procedures*.

Additives removed from the dust collection system should be stored in sealed containers for subsequent reuse or disposal. Protect containers from physical damage during storage.

Local or provincial regulations may require that a Pre Start Health and Safety Review (PSR) be conducted on new dust collection systems. Modifications to a dust collection system may require a new PSR to be conducted. A professional engineer may be required to conduct the PSR if toxic materials are handled, or if a dust collector is collecting an easily ignitable (combustible) substance. *Obtain advice from knowledgeable persons or seek legal advice on the requirements for PSR's in your jurisdiction. Check local and provincial requirements and Fire Codes before installing or modifying dust collection systems.*

8.0 Spills

Spill prevention should be considered a priority in the handling of additives to protect the environment and avoid the loss of costly materials. In most jurisdictions the owner of the materials is financially responsible for clean up of spills that enter the ambient environment. Spills can result in fines and/or criminal prosecution. Some jurisdictions may require a spill prevention plan for prescribed industries. *Obtain advice from knowledgeable persons or seek legal advice on the requirements for spill reporting in your jurisdiction*.

In the event of a spill of additives from a punctured or upset container or as a result of an equipment failure prompt action is required to minimize the loss of material and prevent the release of additives to the environment. Advance planning to deal with such incidents, in the form of written procedures and worker training, should be a standard business practice for compounding facilities. Locations of shut off valves should be clearly marked. Emergency stop buttons for pumps, metering and conveying devices should be readily accessible to operators and their functions clearly identified.

Spill kits with materials to contain, clean-up and securely store spilled materials should be immediately available. Appropriate PPE should be part of the spill kit contents.

A system to record all spills and to document the cause of the spill, actions taken and steps to prevent a reoccurrence is a useful tool in reducing the risk of releases to the environment arising from spills and should be a component of the environmental management program for the facility.

In the event that a spill results in a release to the environment immediate action is required to mitigate the threat to human health and the environment. Spill reporting of pollutants, solid or liquid, is required in many areas. *Obtain advice from knowledgeable persons or seek legal advice on the requirements for spill reporting in your jurisdiction*

The contact numbers for spill reporting centres should readily available to those persons responsible for the operation of the facility.

9.0 Waste Disposal

9.1 Solid Additive Waste

Currently some solid additives may not be regarded as hazardous substances and therefore not subject to the hazardous waste handling regulations of most provinces. *Consult with additive suppliers and other knowledgeable persons may be required to determine the regulations in your jurisdiction for specific additives.*

It is common in custom compounding operations for non hazardous additives to be mixed with hazardous additives intentionally as part of a formulation, or incidentally in dust collectors and housekeeping operations. Non hazardous materials that have, or may have, come in contact with hazardous materials should not be disposed of in a municipal waste landfill site.

Hazardous solid wastes, including non re-useable packaging, spent dust filtration media, soiled rags, contaminated PPE etc, should be disposed of at a landfill or incinerator that is certified to handle the subject materials. *Refer to local regulations and consult with the receiving facility for packaging and transporting requirements.*

9.2 Liquid Additive Waste

Liquid waste will, in most jurisdictions, be regarded as hazardous waste. Disposal of all

liquid waste, including any aqueous solutions used for cleaning of additive laden surfaces, must be done through a facility that is certified to handle liquid and hazardous industrial waste. Refer to local regulations and consult with the receiving facility for packaging and transporting requirements.

Under no circumstances should any liquid additives or cleaning solutions, including additive bearing water, be disposed of into municipal sewer systems, municipal storm water collection systems or surface water course.

9.3 Hazardous Waste Protocol

Transportation and disposal of hazardous and liquid industrial waste is regulated by provincial authorities. Generators of these materials may be required to register both the designated waste and the generating facility with the appropriate regulating authority. It is the responsibility of the waste generator to ensure that the waste receiving facility and

transporters are properly licensed to manage the subject materials. Documentation, including waste manifests, may be required. Manifests should be submitted to the regulating authority and copies retained on site as required by the regulating authority. Waste storage requirements and limits on the quantity of liquid or hazardous wastes may apply to waste from compounding operations *Obtain advice from knowledgeable persons or seek legal advice on the requirements for hazardous waste disposal in your jurisdiction.*

10.0 Maintenance

Maintenance activities can give rise to the loss of additives from process and process equipment through cleaning and/or disassembly of equipment, transfer lines, dust collection systems that may contain, or have been in contact with additives. Personal should be aware of the environmental risks associated with uncontrolled escape of additives during maintenance functions. Maintenance procedures should deal with the control of additive losses, disposal of fugitive additives and proper handling PPE and tools that may have come into contact with additives.

10.1 Maintenance Contractors

Maintenance contractors should be made aware of the environmental risks associated with uncontrolled escape of additives during maintenance functions. Management of environmental risks should be included in contractor orientation programs.

Maintenance procedures should deal with the control of additive losses, disposal of

fugitive additives and proper handling PPE and tools that may have come into contact with additives. Appropriate containers for materials and contaminated PPE, rags etc should be provided. Contractors should be made aware of risks from track out of additives on clothing and vehicles.

Workers in charge of the contractor's activities should be trained to recognize and control potential additive losses.

11.0 Management System

Compounding facilities should have a set of policies, procedures and work instructions for the responsible handling of additives. These written policies will address the following:

- WHMIS and other health and safety training
- Corporate environmental policy
- Organization Chart
- Job descriptions clearly outlining responsibility for the environmental affairs
- Receiving, storage and handling of additives
- Maintenance schedules for pollution control equipment

- Spill prevention and containment; spill reporting procedures and contact information
- Incident reporting and investigation procedures
- Contractor orientation and work practices
- Vehicle policy
- Waste storage and disposal procedures
- Housekeeping policies and procedures
- Returnable packaging procedures
- Employee training on environmental policy and procedures

11.1 Purchasing Practices

Sound purchasing practices can assist in reducing the risk of releases of additives to the environment. Purchasing policies should:

- Encourage the use of returnable packaging
- Ensure suppliers provide detailed product handling and waste management information
- Encourage good environmental practice by vendors
- Require evidence of proper licensing of venders providing waste management services

12.0 Documentation

The following records should be retained at the compounding facility for a minimum period of two years or longer if required by provincial or federal regulations:

- Copy of Waste Manifest showing date of shipment, classification of waste, quantity of waste and name(s) of the waste transporter and receiver of liquid industrial waste
- Copy of Waste Manifest showing date of shipment, classification of waste, quantity of waste and name(s) of the waste transporter and receiver of solid hazardous waste
- Documentation related to spill notification required under applicable spill reporting regulations
- Spill investigation reports
- Maintenance records for all pollution abatement equipment

APPENDIX 1
POTENTIAL ADDITIVE LOSS POINTS AND CONTROLS

Activity		Risk		Controls
Additive Receiving and Storage	→	Mechanical damage to packaging	→	Provide protection, use best material handling practices
		Liquid spill	→	Provide spill containment
		Bulk storage overfill	→	Provide overfill alarm/shut off
Additive Dispensing	→	Airborne dust	→	Provide adequate dust collection
		Spills	→	Provide spill containment measures
		Residual additive in packaging	→	Use best available techniques for emptying packages
Additive Transfer and Blending	→	Airborne dust	→	Provide adequate dust collection
		Spills	→	Provide spill containment
		Leaking seals and doors	→	Inspect regularly, repair as required
		Damaged tubing/connectors	→	Inspect regularly
Melt Processing	→	Airborne dust	→	Provide adequate dust collection
		Leaking seals	→	Inspect regularly, repair as required
Housekeeping	→	Airborne dust	→	Use cleaning methods that do not create airborne dust
		Vehicle track out	→	Control traffic in additive storage and use areas
		Track out on clothing	→	Provide segregated clean/dirty change rooms
		Single use package disposal	→	Dispose in accordance with all applicable waste regulations
		Returnable packaging	→	Prevent re-use or misuse of additive packaging Follow supplier's requirements for returnable packaging
				Prevent loss of residual materials during storage and transport
		Contractor activities	→	Provide written additive control procedures for contractors
Dust Collection	→	Filter failure	→	Provide bag break alarms, provide secondary filtration i.e. back up bag house
		Loss of performance	→	Provide gauges/alarms to monitor performance
		Collected additives	→	Reuse or dispose in accordance with all waste regulations
		Spent filter media	→	Dispose in accordance with all applicable waste regulations
Spills	→	Release to the environment through uncontrolled spills of liquid or solid additives	→	Use spill containment devices where a risk of spill is identified
			→	Have spill containment equipment immediately available
			→	Provide spill containment/clean up training
			→	Investigate all spills and implement measure to prevent reoccurrence
			→	Protect drains to prevent entry of spilled materials
Waste Handling	→	Release to the environment through improper disposal	→	Ensure all hazardous materials are stored, transported and disposed in accordance with applicable regulations

APPENDIX 2

SELF ASSESSMENT QUESTIONNAIRE

The following checklist is intended to assist users in identifying processes and activities within the compounding facility that may be a source of releases of additives to the environment and activities to minimize the risks of such occurrences.

It is not intended to replace the need for compliance under local, provincial, territorial or federal regulations that apply to the facility and its operations. Users are encouraged to consult with knowledgeable persons or obtain legal advice to ensure their operations comply with all applicable laws and regulations.

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ Plant Site_____ Date_____			
1.0 ADDITIVE RECEIVING AND STORAGE			
		yes	**no**
1.1 Do you receive bulk shipments of solid additives (if 'no' go to section 1.2)			
a)	Do procedures exist for safe unloading of bulk vehicles?		
b)	Are lines capped to prevent contamination, loss of materials and unauthorized use?		
c)	Do alarms exist to prevent overfilling of bulk storage tanks (silos)?		
d)	Are storage tanks vented through proper filtering devices?		
e)	Do inspection and maintenance procedures exist for bin vents?		
f)	Does operator training cover best practices for solid bulk material handling		
1.2 Do you receive Flexible Intermediate Bulk Containers (FIBC's) shipment of solid additives? (if 'no' go to section 1.3)			
a)	Do procedures exist for safe lifting and transport of FIBC's		
b)	Do procedures exist for safe stacking and storage of FIBC's		
c)	Is designated storage area adequate to prevent mechanical damage to FIBC's		
d)	Can accidental spills from FIBC's be contained		
e)	Are emergency cleaning equipment and containers readily available		
f)	Do you have a return to vendor program for FIBC's		
g)	Do you have a waste disposal policy for non-returnable FIBC's		
h)	Does training cover safe lifting, transport, storage and spill cleanup procedures for FBIC's		
1.3 Do you receive drum or pail shipments of solid additives? (if 'no' go to section 1.4)			
a)	Do procedures exist for safe lifting and transport of drums and pails		
b)	Do procedures exist for safe stacking and storage of drums and pails		
c)	Is designated storage area adequate to prevent mechanical damage to drums and pails		
d)	Can accidental spills from drums and pails be contained		
e)	Are emergency cleaning equipment and containers readily available		
f)	Do you have a return to vendor program for reusable drums		
g)	Do you have a waste disposal policy for non-returnable drums and pails		
h)	Does training cover safe lifting, transport, storage and spill cleanup procedures for drums and pails		
1.4 Do you receive shipments of solid additives in bags? (if 'no' go to section 1.5)			
a)	Do procedures exist for safe lifting and transport of bags		
b)	Do procedures exist for safe stacking and storage of bags		

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ **Plant Site**_____ **Date**_____			
c)	Is designated storage area adequate to prevent mechanical damage to bags		
d)	Can accidental spills from bags be contained		
e)	Are emergency cleaning equipment and containers readily available		
f)	Do you have a waste disposal policy for empty bags		
g)	Does training cover safe lifting, transport, storage and spill cleanup procedures for bags		
1.5 Do you receive bulk shipments of solid additives (if 'no' go to section1. 6)			
a)	Do procedures exist for safe unloading of bulk vehicles?		
b)	Are lines capped to prevent contamination, loss of materials and unauthorized use?		
c)	Do alarms exist to prevent overfilling of bulk storage tanks?		
d)	Are storage tanks properly vented?		
e)	Are storage tanks located in a disked spill confinement area?		
f)	Can accidental spills from FIBC's be contained		
g)	Are emergency cleaning equipment and containers readily available		
h)	Do spill reporting policies and procedures exist		
i)	Does operator training cover best practices for liquid bulk material handling, spill containment, cleanup and reporting?		
Notes:			
1.0 ADDITIVE RECEIVING AND STORAGE			
		yes	**no**
1.6 Do you receive semi bulk (tote) shipments of liquid additives? (if 'no' go to section 1.7)			
a)	Do procedures exist for safe lifting and transport of totes		
b)	Do procedures exist for safe stacking and storage of totes		
c)	Is designated storage area adequate to prevent mechanical damage to totes		
d)	Are there spill containment measures in the designated storage area		
e)	Can accidental spills from totes be contained		
f)	Are emergency cleaning equipment and containers readily available		
g)	Do you have a return to vendor program for semi-bulk containers		
h)	Does operator training cover best practices for liquid bulk material handling, spill containment, cleanup and reporting?		
1.7 Do you receive drum or pail shipments of liquid additives? (if 'no' go to next section)			
a)	Do procedures exist for safe lifting and transport of drums and pails		
b)	Do procedures exist for safe stacking and storage of drums and pails		
c)	Is designated storage area adequate to prevent mechanical damage to drums and pails		
d)	Can accidental spills from drums and pails be contained		
e)	Are emergency cleaning equipment and containers readily available		
f)	Do you have a return to vendor program for reusable drums		
g)	Do you have a waste disposal policy for non-returnable drums and pails		
h)	Does operator training cover best practices for liquid bulk material handling, spill containment, cleanup and reporting?		
2.0 ADDITIVE HANDLING AND DISPENSING			
2.1 Do you dispense materials from FIBC's? (if 'no' go to section 3.1)			
a)	Do adequate dust seals or dust collection equipment exist?		
b)	Are FIBC's adequately protected from mechanical damage during discharge?		
c)	Are operators trained in best practices for fully discharging FIBC contents?		

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ **Plant Site**_____ **Date**_____			
2.2 Do you dispense additives from drums and pails? **(if 'no' go to section 3.2)**			
a)	Is adequate dust extraction available for powdered additives?		
b)	Are spill containment measures in place for liquid additives?		
c)	Are drums and pails adequately protected from mechanical damage during discharge?		
2.3 Do you dispense additives from bags (if 'no' go to section 3.1)			
a)	Is adequate dust extraction available?		
b)	Are operators trained in best practices for fully discharging bag contents?		
c)	Do procedures exist for the safe disposal of empty bags?		
3.0 ADDITIVE TRANSFER AND BLENDING			
3.1 Do you batch blend additives in your process? (if 'no' go to section 3.2)			
a)	Is adequate dust collection available for charging and discharging blenders?		
b)	Are mixer seals regularly inspected and the condition documented?		
c)	Do maintenance procedures for seal replacement exist?		
d)	Do blender cleaning procedures exist?		
e)	Are workers trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
3.0 ADDITIVE TRANSFER AND BLENDING			
		yes	**no**
3.2 Do you use additive metering devices in your process? (if 'no' go to next section)			
a)	Are flexible transitions and seals used to create a sealed environment?		
b)	Is adequate dust collection available where additives are not contained in sealed environment?		
c)	Are metering device seals regularly inspected and the condition documented?		
d)	Are pump seals and lines regularly inspected and the conditions noted		
e)	Do maintenance procedures for leak repairs exist		
f)	Do metering device cleaning procedures exist?		
g)	Are workers trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
4.0 MELT PROCESSING			
4.1 Do you use continuous melt processing equipment? if 'no' go to section 4.2)			
a)	Are material hoppers adequately vented to dust collection systems?		
b)	Are shaft seals regularly inspected for leakage?		
c)	Is shaft seal leakage adequately contained?		
d)	Are liquid injection ports regularly inspected for leakage?		
e)	Do maintenance procedures for seal replacement exist?		
f)	Do cleaning procedures for extruder hoppers exist?		
g)	Are workers trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
4.2 Do you use intensive batch melt processing equipment? if 'no' go to next section)			
a)	Are mixer charge stations adequately vented of dust collection systems?		
b)	Are shaft and door seals regularly inspected and the results documented?		

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ **Plant Site**_____ **Date**_____			
c)	Do maintenance procedures for seal replacement exist?		
d)	Do cleaning procedures for charging stations exist?		
e)	Are workers trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
5.0 HOUSEKEEPING			
5.1 General Housekeeping			
a)	Does a written housekeeping program exist?		
b)	Are housekeeping supplies readily available to workers?		
c)	Are workers trained in the use of cleaning techniques that do not create airborne dust?		
d)	Are vacuum systems equipped with HEPA filters?		
e)	Is compressed air ever used for cleaning operations?		
f)	Is water used for any cleaning operations?		
g)	Are floor drains protected to prevent the entry of additives?		
h)	Are workers trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
i)	Are contract cleaners in contact with additives?		
j)	Are contract cleaners trained in proper handling and disposal of residual materials and contaminated cleaning tools, PPE etc.?		
5.2 Single Use Packaging			
a)	Do safe disposable procedures exist for disposable drums and pails?		
b)	Do procedures exist to prevent the abuse or misuse of empty drums and pails?		
c)	Can poly bags and liners be incorporated into the compound?		
d)	Are workers trained in proper handling and disposal of single use packaging?		
		yes	**no**
5.3 Returnable Containers			
a)	Do written instructions exist for storage and shipping of returnable containers?		
b)	Are returnable containers protected from contamination during storage and shipping?		
c)	Are workers trained in proper storage and handling returnable packaging?		
d)	Are returnable container-handling practices at final destination on file?		
5.4 Tools			
a)	Does an ‘approved” list of cleaning tools exist?		
b)	Do procedures exist for the safe disposal of spent cleaning tools?		
c)	Are workers trained in proper tool cleaning methods and disposal of cleaning tools etc.?		
5.5 Personal Protective Equipment & Work Clothing			
a)	Are work clothes (uniforms) provided for workers?		
b)	Does formal system exist to advise laundering service of additive contamination and hazards?		
c)	Does laundering service have adequate environmental policies and controls?		
d)	Do procedures for storage and disposal of contaminated PPE exist?		
e)	Are workers prohibited from taking contaminated work clothes home?		
f)	Do segregated dirty and clean change facilities exist?		
g)	Do contractor safety procedures adequately address treatment of soiled clothing and PPE?		

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ **Plant Site**_____ **Date**_____			
	5.6 Vehicles		
5.6.1 In Plant Vehicles			
a)	Is the movement of in-plant vehicles to the outdoors prohibited? **(if yes go to section 5.6.2**)		
b)	Is the movement of in-plant vehicles restricted to essential activities?		
c)	Are in-plant vehicles regularly inspected and fugitive residues removed?		
d)	Does a tire scrub pad or similar tire cleaning device exits		
e)	Are exterior surfaces paved?		
f)	Are drains and catch basins protected to prevent the entry of additives?		
5.6.2 Over the Road Vehicles			
a)	Are over the road vehicles prohibited entry to the facility interior?		
b)	Are transport vehicles inspected and residual additives removed before leaving the facility?		
c)	Are workers trained in the proper cleaning of transport vehicles and disposal of additive residue		
d)	Are over the road vehicles, such as contractor service trucks, permitted into the facility?		
e)	Does a permit system for service truck entry exist?		
f)	Are contractor vehicles inspected and residual additives removed before the vehicle exits the facility?		
g)	Do contractor safety procedures adequately address the prevention of vehicle trackout?		
6.0 DUST COLLECTION SYSTEMS (includes bin vents)			
a)	Are Pre Start Safety reviews conducted on new or modified dust collector systems?		
b)	Are dust collection systems regularly inspected and the results documented?		
c)	Does adequate instrumentation exists to monitor duct collector performance?		
d)	Are dust collectors equipped with bag break detectors		
e)	Are dust collection systems maintained in accordance with a written schedule?		
f)	Do inspections include build up in ductwork?		
g)	Do written procedures exist for the handling and disposal of residual additives from dust collection systems?		
h)	Are workers trained in the proper disposal of residual additives and spent filter media?		
7.0 SPILLS			
		yes	**no**
a)	Does the facility have spill prevention, containment and spill reporting policies?		
b)	Are non reportable spills recorded and investigated?		
c)	Are emergency contacts and phone numbers posted in a conspicuous place?		
d)	Are spill containment and cleaning supplies readily available?		
e)	Are workers trained in proper spill cleanup and material handling procedures?		
	8.0 WASTE DISPOSAL		
a)	Are hazardous and liquid wastes storage in sealed containers?		
b)	Is a designated safe storage are available for hazardous and liquid waste?		

CONTROLLING LOSSES OF ADDITIVES TO THE ENVIRONMENT			
SELF ASSESSMENT WORKSHEET			
Company Name_____ **Plant Site**_____ **Date**_____			
c)	Are hazardous wastes registered in accordance with local regulations?		
d)	Are waste transporters properly licensed to transport hazardous and liquid waste?		
e)	Do waste receiving facilities have proper licenses?		
f)	Are waste manifests retained in accordance with governing regulations?		
9.0 MAINTENANCE			
a)	Do maintenance procedures include safe removal and handling of residual additives from process equipment?		
b)	Are maintenance workers trained to recognize and control environmental hazards?		
c)	Does maintenance contractor safety policy include provisions to manage environmental risks?		
10.0 MANAGEMENT SYSTEMS			
a)	Is environmental policy regularly reviewed and endorsed by senior management?		
b)	Are internal environmental policy compliance audits conducted		
c)	Do senior management regularly review environmental performance?		
d)	Are environmental responsibilities included in job descriptions?		
e)	Is environmental performance part of job evaluations?		
f)	Are environmental incidents investigated and measures implemented to prevent reoccurrence?		
g)	Is environmental performance considered in awarding business to vendors?		
h)	Do vendor audit procedures include environmental performance?		
I)	Do purchasing practices favour returnable or recyclable packaging?		
j)	Does the facility have an environmental management program?		
	ISO 14000		
	Responsible Care		
	EMP		
	VECAP		
	Other		
	Notes:		

Supplemental Information Appendix 3

These references are provided for illustration and example only. Inclusion of these links does not constitute an endorsement of the products or information by the Canadian Plastics Industry Association. Additional material may be available from various jurisdictions and industry sources. The user may wish to check for availability of such material where warranted.

1. **Common Sense Handling Guidelines for Flexible Intermediate Bulk Containers**; **Flexible Intermediate Bulk Container Association**
   http://www.fibca.com/Files_BrochuresAndVideos/File_FIBC%20_Handling_Brochure.pdf

2. **Best Available Technique for Emptying Bags Containing Brominated Flame Retardants** –VECAP; VECAP is a voluntary initiative of the European Brominated Flame Retardant Industry Panel (EBFRIP)
   http://www.vecap.info/uploads/BAT/vecap_techn%20empty%20bags%2003%2007.pdf

3. **Housekeeping Program Guide** – CCOHS Publication *http://www.ccohs.ca/oshanswers/hsprograms/house.html* Canadian Centre of Occupational Health and Safety (CCOHS), June 23, 2008. Reproduced with the permission of CCOHS, 2009

4. **Managing Emissions of Brominated Flame Retardants – courtesy VECAP Publications**
http://www.vecap.info/uploads/COGP%20VECAP%20DOCUMENTS/BSEF%20COGP_all%20BFR_EN.pdf

5. **Ontario Pre-Start Safety Review Guide**
   http://www.labour.gov.on.ca/english/hs/guidelines/prestart/index.html

6. **Guide to Creating a Spill Prevention and Control Plan**
http://www.ene.gov.on.ca/en/about/penalties/SpillPrevention.pdf

7. **Ontario Spill Reporting Guide**
   http://www.ene.gov.on.ca/en/about/penalties/SpillReportingGuide.pdf

8. **A typical guideline for containment dikes can be found at the Ontario Ministry of the Environment website**.

http://www.ene.gov.on.ca/envision/env_reg/er/documents/2005/PA05E0012.pdf