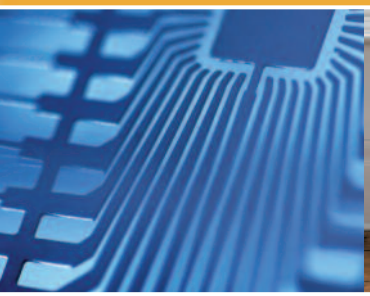
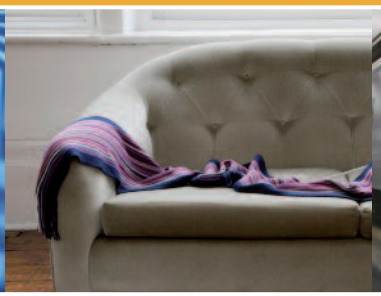
VECAP

MANAGING EMISSIONS OF POLYMER ADDITIVES

Through the proactive implementation of Good Practice

A Code of Good Practice for the use of polymer additives: controlling emissions, protecting the environment and promoting continuous improvement

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INTRODUCTION

The Voluntary Emissions Control Action Programme, VECAP™, is a proactive and dynamic industry programme established to identify, control and reduce the potential for emissions of polymer additives[1] into the environment.

VECAP was developed to address the environmental and human health concerns of the public, regulators, non-government organisations, industry and stakeholders throughout the polymer additives supply chain.

The programme provides a simple, economical and effective means of evaluating the potential for environmental emissions and gives practical advice to address concerns that may arise with the handling and transport of polymer additives. Detailed information on the programme can be found on **www.vecap.info**

VECAP's hallmark is the Code of Good Practice, which summarises the key aspects of the programme; controlling environmental emissions while handling polymer additives.

This Code of Good Practice is applicable to all companies using polymer additives, as well as manufacturers, distributors and importers of these products. It is intended to cover all applications where solid and liquid polymer additives are used. While there is no regulatory obligation to adopt this code, in doing so companies demonstrate their commitment to go beyond compliance of current legislation, as well as to continuous improvement. Applications of the Code of Good Practice may also reduce operational costs.

The origins of this Code of Good Practice lie in a document developed jointly in 2004 by the British Textile Finishers Association (TFA) and the Bromine Science and Environmental Forum (BSEF). BSEF is the international organisation of the bromine chemical industry which commissions' science on brominated chemicals and keeps stakeholders informed on the results of this science. VECAP is run by members of the North American Flame Retardant Alliance (NAFRA) and the European Flame Retardant Association (EFRA).

[1] *In this document polymer additives can have a reactive as well as an additive character.*

BACKGROUND

Specialty chemicals are added to plastics and other mixtures to meet targeted physical and chemical property requirements. These additives are commonly grouped together under the name "polymer additives".

Polymer additives perform a wide variety of functions when added to base resins or formulations. For instance, they can be used to modify the properties of plastic to increase UV stability or to provide flame retardancy.

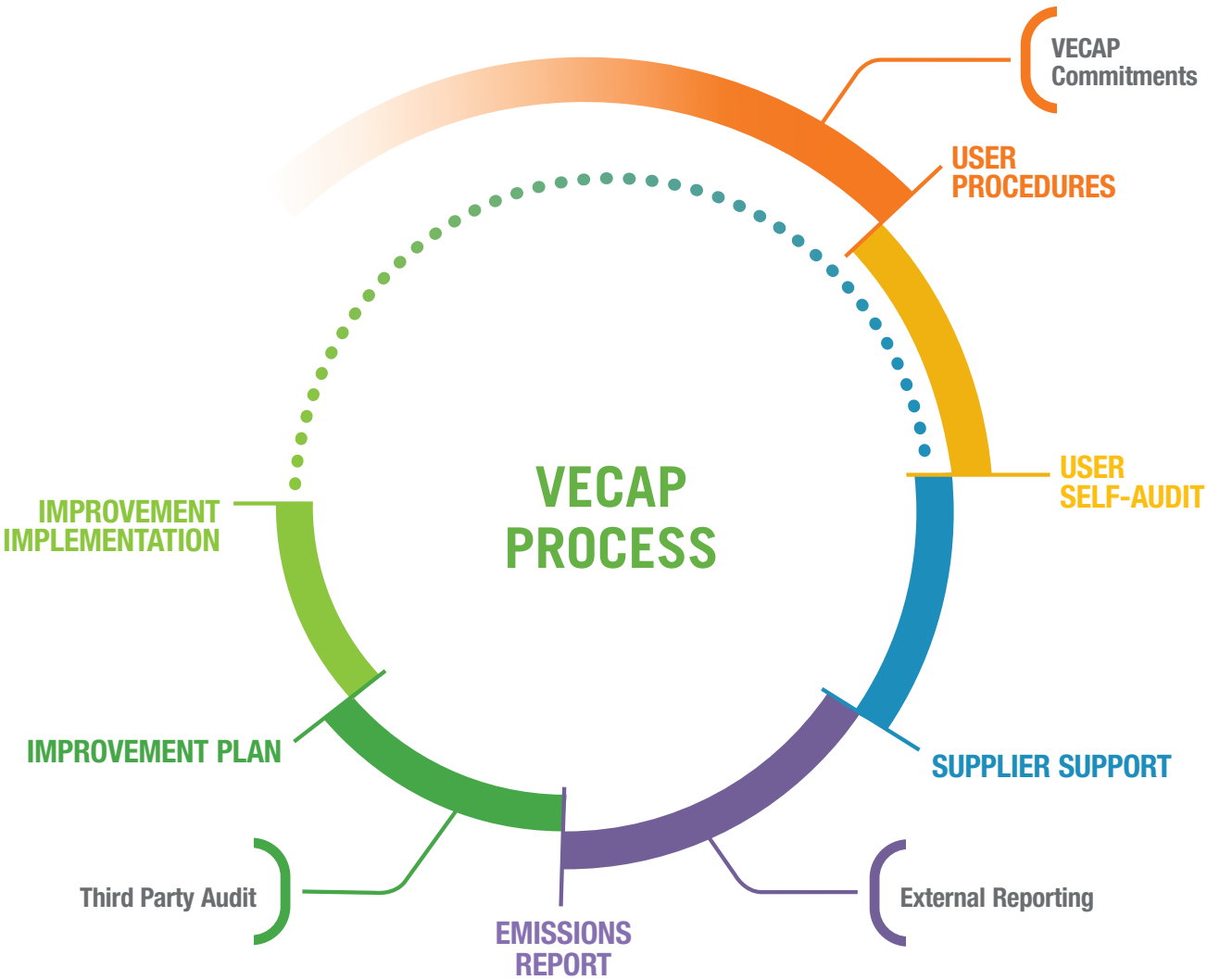
Polymer additives are often used in products that are designed to last for years or even decades such as cars, televisions, houses and furniture. Due to this, they are typically designed to be stable so that their performance within the end-product is maintained throughout their service life. Their stability, however, can be a source of concern when these materials are found in the environment. The industry recognises that these concerns exist and is actively taking steps to address them; one such example is the setting up of VECAP.

This Code of Good Practice has been developed to provide users of polymer additives with relevant guidance for managing and reducing potential emissions to the environment.

Companies that follow the Code of Good Practice achieve the following benefits:

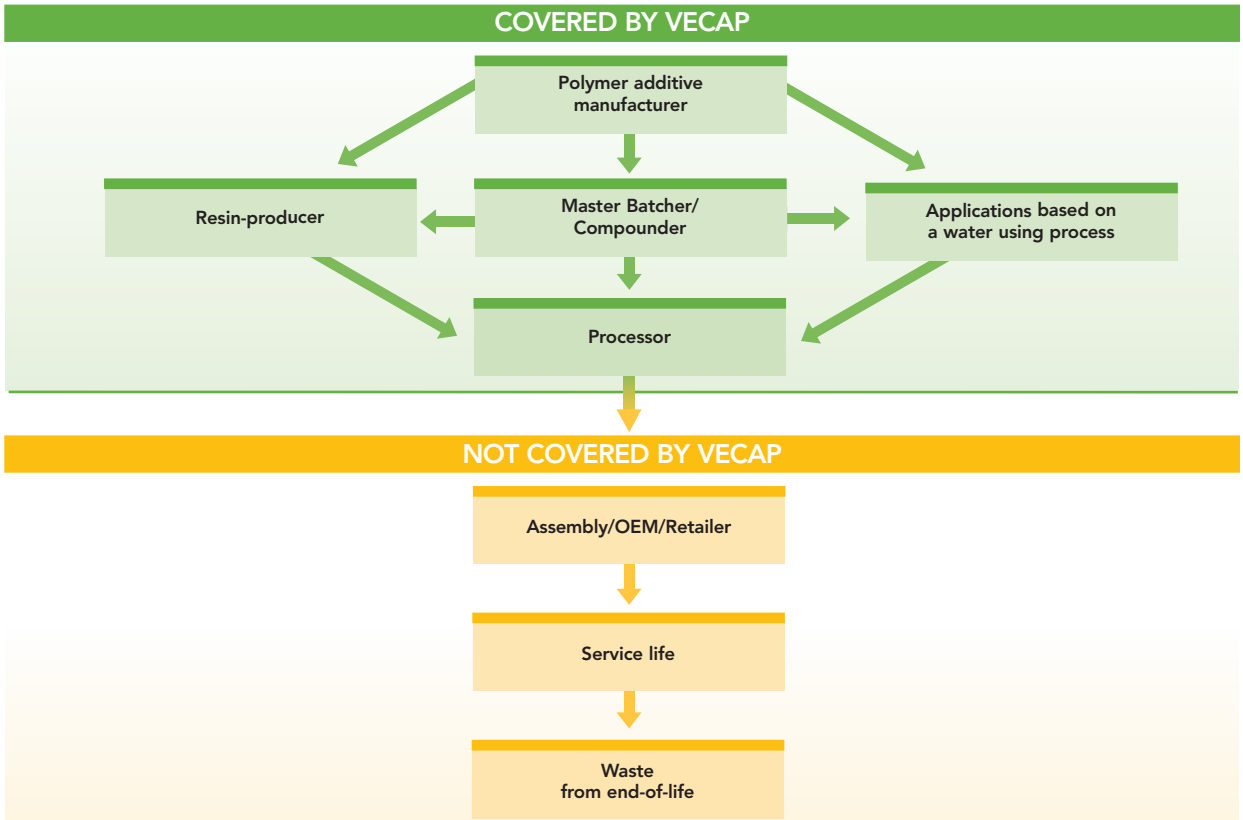
- Demonstrate a commitment to reducing the potential emissions.
- Provide regulators with reassurance that precautions are being taken by industry in order to manage the concerns associated with the product.

THE VECAP PROCESS DIAGRAM



CODE OF GOOD PRACTICE FOR MANUFACTURERS, DISTRIBUTORS, TOLLING AND PROCESSORS OF POLYMER ADDITIVES

POLYMER ADDITIVES FLOWCHART



VECAP addresses all steps in the value chain where polymer additives are handled as a powder, liquid or aqueous dispersion regardless of the application.

Subject to compliance with applicable competition and anti-trust laws, the EFRA and NAFRA member companies supporting VECAP™ have agreed to conduct business consistent with the Responsible Care® Product Stewardship Programme, which emphasises health, safety and the protection of the environment as integral elements in the design, production, marketing, usage and disposal of polymer additives.

As part of their commitment to product stewardship, these companies have agreed to provide guidance to their customers regarding the correct handling and processing of polymer additives through the following means:

INFORMATION

Further to legal requirements such as safety data sheets, brochures and posters on Best Available Techniques and Best Practices for emptying bags and handling waste will be provided.

EXPLANATION

Producers commit to organising regular meetings with individual customers in order to provide guidance on product stewardship based on this *Code of Good Practice*.

CHECKING AND MONITORING

The users committing to VECAP will be asked to implement the principles of this Code of Good Practice in their daily operations. The producers will assist the users in identifying potential emissions in their manufacturing process. Additionally, on request of the user, recognised third parties can provide independent certification on VECAP compliance.

MANAGEMENT INFORMATION ON A CODE OF GOOD PRACTICE FOR THE USE OF POLYMER ADDITIVES

POLYMER ADDITIVE USAGE

Polymer additives can be unintentionally released to the air, water and land if effective steps are not taken to identify and minimise the likelihood of such emissions.

During manufacturing, multiple transfers or blending operations may occur before final processing. When processed, base resins encapsulate the polymer additive or, in some cases, react with the additive to form the desired plastic. The same applies for water based processes with emphasis on emissions to water.

Powdered polymer additives tend to adhere to packaging equipment and the packaging itself, to processing equipment and to create airborne dust during transfers.

Liquid polymer additives are sometimes very viscous, resulting in significant residues in packaging and on transfer and processing equipments. They can also be more difficult to clean up and harder to contain in spill situations.

In previous years, the VECAP methodology has demonstrated that major potential emissions are primarily generated through used packaging and filter residues. Furthermore, in water based production processes, emissions to water represent a major potential emission source.

Once mixed into the polymer, additives are encapsulated in the plastic and pose little risk of being released into the environment.

In the case of textile formulations, a second processing step is taken before being cured into the latex binder. The formulation and the processing steps of textile additives are part of VECAP.

HANDLING OF POLYMER ADDITIVES

Safety Data Sheets

Polymer additive producers are required by law to keep their Safety Data Sheets (SDS's) updated. They are also required to send updates to their customers.

SDS's can be downloaded or requested via the producers' websites:

http://www.albemarle.com
http://www.iclfr.com
http://www.chemtura.com

Storage of Polymer Additives

Polymer additive products, as well as their used packaging awaiting disposal, should be stored in a designated closed building or container to avoid entering the environment via wind or rain.

Good Housekeeping

Employees should be trained on the benefits of timely, regular and thorough cleaning of work areas. Cleaning practices should be rigorously controlled and monitored.

- Packaging that contains polymer additives waste should be clearly marked and kept in designated closed containers. This is also applicable for spills, unusable samples, off spec material and collected dust.
- Protective clothing, as specified in the SDS, should be made available for employees handling the product. They should be advised on appropriate methods of disposal for contaminated clothing. Professional cleaning of contaminated clothing, in an environmentally sound manner, is advised in order to avoid emissions into the environment.
- Guidelines for good housekeeping (storage of polymer additives) should be made available to all personnel. Regular training should be scheduled to ensure responsible handling of raw materials.

Packaging Waste Disposal

Packaging waste with polymer additive residues, unless re-used internally, should be disposed of as polymer additive waste and sent to a chemically secure landfill[2] or to an approved chemical waste incinerator. Written confirmation should also be obtained from the authorised waste company on the route of disposal.

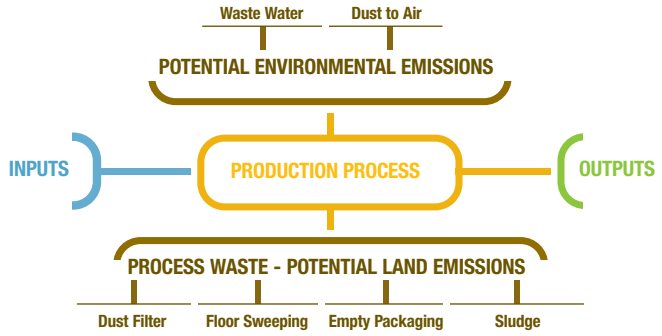
IMPROVE PROCESS EFFICIENCY AND REDUCE WASTE AND EMISSIONS

Users of polymer additives are encouraged to track operational efficiency using emissions and waste production (and rates) as key performance indicators. Neither emissions nor waste add value to a company's operations and, in fact, represent hidden costs.

Reducing plant or facility emissions often starts with having a good understanding of all production processes and then looking for opportunities. Estimated, measured and recorded data may serve to demonstrate the opportunities for process optimisation resulting in the reduction of waste and excess emissions, and hence lead to higher production rates at lower costs.

However, further measurement and recording of data, as well as a review of existing assumptions, calculations and estimates, may reveal further opportunities to optimise processes and product flows and, thereby, minimise waste and reduce emissions.

PRODUCTION PROCESS FLOWCHART



Land emissions are a result of potential process losses. Depending on the final destination of these process losses, they may result in the following emissions:

Destination of process losses and packaging waste	Impact
Recycle or reuse of the additive in own process	No emissions
To chemically secure landfill	No emissions
Non chemically secure landfill	Emissions
Packaging waste going to recycling	Potential emissions depending on the recycling process
Unknown	Emissions (worst case considered)

POTENTIAL EMISSIONS

Potential Land Emissions

Land emissions might result from operational use of polymer additives.

The following potential emissions have to be considered:

- Residual products in the empty packaging
- Spills and floor sweepings
- Contaminated / off specification products
- Test specimen / quality control
- Dust filters
- Sludge resulting from waste water treatment (WWT)
- Emissions potentially resulting from the selling of discharged big bags or internal bulk containers (IBC's), without knowing the treatment to remove the residual products by the end user. Residual products can also end up into the environment when packaging is cleaned, for instance, during preparation for reuse or recycle.

Depending on each particular process, one or more of the above sources have to be checked for potential land emissions.

Potential land emissions, resulting from residual products in empty packaging, represent the major part of overall potential emissions. Land emissions are a result of potential process losses. Depending on the final destination of these process losses, they may result in the following emissions:

AIR EMISSIONS

In places where powder materials are handled, such as packaging lines or systems for loading reactor vessels, use of a local exhaust ventilation system when emptying polymer additives packaging is strongly recommended in order to minimise dust emissions. By equipping ventilation systems with adequate filters, some facilities have reduced air emissions by as much as 99%.

Windows and doors near ventilation systems should be closed in order to avoid interference with the exhaust system.

Where local exhaust ventilation is used, air should be cleaned by passing through an appropriately designed filter system such as a bag house or dust collector, before discharge to the environment. If the system is designed to re-circulate exhaust air back into occupied areas, all safety systems and back-up devices must be properly maintained to prevent accidental recirculation of contaminated air.

- Filters should be maintained and cleaned according to guidelines from the filter producer.
- Filter dust should be processed in a manner that ensures full recyclability within the plant or disposal as described in the above table.
- Used filters should be disposed of in the same way as the filter dust.

WATER EMISSIONS

Users of water-based dispersions of polymer additives should take special care in their process to prevent releases to the environment.

Water used during processing and cleaning should be completely separated from rainwater (prevent dilution) and treated in an appropriate waste water treatment plant (either internally or externally).

Compounders and Masterbatchers using a vacuum system with a liquid ring pump at the extruder should also treat the resulting waste water appropriately. It is advised to install a filter in a closed water loop, as these can remove up to 99% of the polymer additives.

Sludge resulting from waste water treatment should be disposed of as chemical waste in accordance with the above recommended practices.

Potential emissions from cleaning operations of re-usable/sellable packaging should be avoided by giving instructions to the potential buyers of this packaging. Potential washings could end up with untreated water streams.

ADDITIONAL EMISSIONS REDUCTION OPPORTUNITIES

Non re-usable samples/off-specification material should be collected, stored (if possible), and disposed of as chemical waste, once testing is complete.

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[2] *A secure landfill site for the disposal of waste selected and designed to minimise the chance of release of substances into the environment*

SUMMARY DOCUMENT ON GOOD PRACTICES

PRIORITY

- Empty packaging should be disposed of using either incineration or a chemically secure landfil.
- A dust capture system should be used with a filter to prevent polymer additive emissions to the air when emptying a bag/ drum. The filter system should be properly maintained.
- Dust from the filter should be disposed of by incineration, chemically secure landfill or recycled in the process.
- Water streams discharged from the plant should be treated to remove the polymer additive.
- The resulting sludge should be disposed of through incineration or by using a chemically secure landfill.

IMPORTANT

- Collect polymer additives spills immediately and store them in the designated container as chemical waste.
- Collect all quality control samples and store them in a designated clearly labelled container or re-use in the process.
- Store polymer additive waste (empty packaging, filter dust, filters, spills, etc) in closed containers only.
- Contaminated water (floor/ equipment washings, cooling water, etc) should be sent to a proper waste water treatment facility and not directly to rainwater drainage, sewage where it is not treated.
- Used personal protection equipment should be disposed of as chemical waste.

COMPANY COMMITMENT TO A CODE OF GOOD PRACTICE FOR THE USE OF POLYMER ADDITIVES

[Company name] recognises its obligations to carry out its business in as environmentally sound manner, as feasible, in order to meet its responsibility to customers, shareholders, employees, neighbours and the environment. We are committed to promoting and maintaining an environmental policy to ensure that the impact of our operations on the environment is reduced to a level as low as practically and economically possible.

We recognise and respect public concerns with respect to chemical emissions to the environment and, accordingly, are committed to implementing all relevant portions of this “Managing Emissions of polymer additives by proactive implementation of Good Practice,” with a view to continuously improve our environmental performance.

Sincerely,

Plant Manager or
HSE Responsible Person
(Company name)

VECAP is a voluntary initiative of member companies of the European Flame Retardants Association (EFRA) together with the industry's global organisation, the Bromine Science and Environmental Forum (BSEF).

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