MANAGING EMISSIONS OF BROMINATED FLAME RETARDANTS

a Proactive Industry Commitment to Good Practice

PLASTICS SECTOR

> A Code of Good Practice for the use of Brominated Flame Retardants in the Plastics sector

BSEF Bromine Science and Environmental Forum

EBFRIP European Brominated Flame Retardant Industry Panel

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Introduction

This voluntary Code of Good Practice is applicable to all companies using brominated flame retardants in the plastics sector, as well as to manufacturers and importers of brominated flame retardants supplying this market. While there is no statutory obligation to adopt this Code, in doing so companies demonstrate their commitment to go beyond compliance with current legislation, as well as to continuous improvement. By following the advice in the Code, a company can make significant improvements in its environmental performance whilst reducing operating costs.

This Code has been developed jointly by the British Plastics Federation (BPF) and the Bromine Science and Environmental Forum (BSEF).

The UK Environment Agency and the UK Department of Environment Food and Rural Affairs (DEFRA) were consulted in the production of this Code. However, this document should not be read as a representation of their views.

Background

Brominated flame retardants (BFRs) are high production volume (HPV) chemicals which, under the EU Existing Substances Regulation (793/93/EC), are subject to a comprehensive European Risk Assessment. The same is true for a number of phosphorous and chlorine based flame retardant (FR) systems and antimony trioxide.

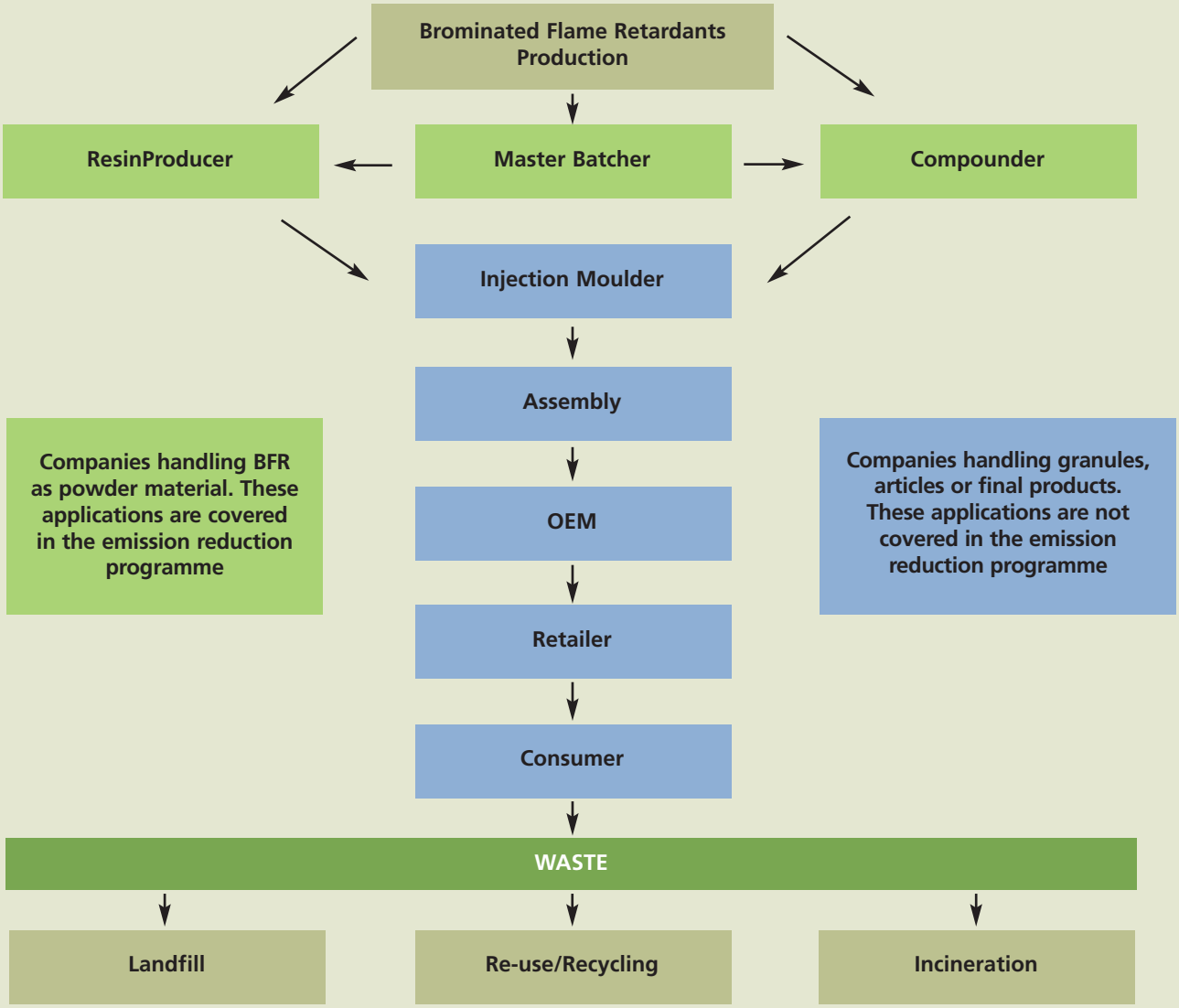
Further information can be found in the Safety Data Sheets (SDS) of the respective brominated flame retardants. Although many studies indicate that brominated flame retardants present an acceptably low risk, there are residual concerns.

As such, the need has been perceived for continued monitoring and minimising of further emissions to the environment from industry. Hence, this Code has been compiled in order to provide industry with appropriate guidance for managing and reducing emissions.

Signatories to this Code are accorded the following benefits:

- Providing regulators with the reassurance that precautions are being taken by industry in order to manage the residual concerns associated with the product.
- Providing an opportunity for brominated flame retardant users to achieve cost savings as a result of greater process efficiency, lower wastage and reduced emissions.

Brominated Flame Retardants Flowchart



Section I

Code of Good Practice for Producers and Importers of Brominated Flame Retardants

Subject to compliance with applicable competition and anti-trust law and in line with the OECD Voluntary Industry Commitment (VIC), the signatory companies to the OECD VIC commit to:

- using the best available techniques (not entailing excessive costs) in production
- using brominated flame retardants with high product purity, and fulfilling the agreements under the Responsible Care Product Stewardship Code. The purpose of this Code is to make health and safety aspects and the protection of the environment integral parts of designing, production, marketing, use, recycling and disposing of chemical products. As a result of this Code, different product stewardship programmes have been and are being implemented.

Importers and producers of brominated flame retardants will provide guidance to their customers in the EU on the correct handling and processing of brominated flame retardants through the following means:

1. INFORM

Subject to compliance with applicable competition and anti-trust law, the producers' SDS for brominated flame retardants will be harmonized with the EU SDS requirements, and regularly updated.
Appropriate user manuals will be developed, following a life-cycle approach to the product's use from reception, storage and handling down to waste management and will include brominated flame retardants hazard and risk profiles, their regulatory status and this Code of Good Practice.

2. EXPLAIN

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

3. CHECK

Producers will request confirmation from customers that the Code of Good Practice is being followed and in addition, on request of the customer, external audits can be implemented for verification.
Subject to compliance with applicable competition and anti-trust law, individual producers may consider not supplying a customer who does not provide the above written confirmation, or does not comply with the provisions of the Code.

4. ENVIRONMENTAL MONITORING

Producers agree to carry out environmental monitoring in line with this Code of Good Practice. The above commitment is subject to compliance with applicable competition and anti-trust law.

Section II-1

Management Information on a Code of Good Practice for the use of Brominated Flame Retardants in the Plastics sector

1. BROMINATED FLAME RETARDANT USAGE

Brominated flame retardants are mostly supplied as additive powders and are globally the products of choice for use in a very wide range of materials and applications. An exception is TBBPA, which is mainly used in reactive applications.

In the plastics sector, brominated flame retardants are normally stored in hoppers, which feed extruder lines. In the extruder the product is homogeneously mixed in with the melted plastic resin. The plastic strands emerging from the extruder are cooled in water or air and chopped mechanically into granules.

Technically there is no significant difference in the operations producing FR-resin, FR-masterbatches or FR-compounds. Typically, masterbatch producers supply to resin producers and compounders, whereas the latter two supply to injection moulders. In the plastics sector, additives once mixed in with the resin are not available for significant emissions to the environment. Therefore injection moulding and downstream applications are not included in the scope of this Code.

At the plastics compounding stage, reduction of emissions to the environment is feasible through responsible powder handling, and via the implementation of good housekeeping. These aspects are therefore the focus of this Code.

2. SAFETY DATA SHEETS

Brominated flame retardants producers are legally obliged to keep their SDS updated. They are also obliged to send updates to their customers.

SDS can also be downloaded or requested via the producers websites:
http://www.albemarle.com
http://www.iclfr.com
http://www.chemtura.com

3. STORAGE OF BROMINATED FLAME RETARDANTS

The product should be stored in a designated dry, cool, well-ventilated area and stock levels should be recorded.

4. HANDLING OF BROMINATED FLAME RETARDANTS

The detailed guidelines stipulated in the SDS as regards safe handling should be followed. Packaging should be tightly closed and appropriate Personal Protective Equipment (PPE) should be worn.

5. PRODUCT PURITY

Using brominated flame retardants with high purity is part of good practice. For example, it has been recognised by the OECD Voluntary Industry Commitment[1] that Deca-BDE needs to contain "an average purity of 97% or greater" in order to avoid proliferation of lower BDEs.

[1] Voluntary Industry Commitment by the US and European Producers of Selected Brominated Flame Retardants covered under OECD's Risk Reduction Programme, 30 June 1995.

6. GOOD HOUSEKEEPING

Good housekeeping contributes to the reduction of emissions to the environment.

Designated covered storage facilities should be made available. Stock levels should be kept up to date and recorded.

All waste contaminated with BFR's should be designated, clearly labeled and kept in closed areas. These waste streams, unless reused internally, should be disposed of as chemical waste and preferably sent to incineration. If the waste goes to incineration, the waste company should be requested to provide written confirmation that the waste will be incinerated. Waste stock levels should be updated on a regular basis and documentary evidence should be available of disposal by authorized waste companies.

Protective clothing as specified in the safety data sheet should be made available for handling the product as well as for possible emergencies. Clean protective clothing should be available to personnel in a known designated location. Employees should be advised as to appropriate routes of disposal for contaminated clothing. Professional cleaning of contaminated clothing in an environmentally sound manner should be used.

Guidelines for good housekeeping (Section II -2 of this Code) should be made available to all personnel, and training should be implemented on a regular basis, to ensure responsible handling of raw materials and waste in the workplace.

Staff should be instructed to maintain high standards of housekeeping on a frequent and regular basis. This practice should be rigorously enforced and kept up to date.

7. MEASURE, RECORD AND MANAGE, TO IMPROVE PROCESS EFFICIENCY AND TO REDUCE WASTE AND EMISSIONS

Companies are encouraged to track process efficiency using emissions and waste as key performance indicators. Neither emissions nor waste add value to the operations and in fact represent hidden costs. Indeed, to indicate possible savings by reducing waste, Envirowise (formerly the UK Environmental Technology Best Practice Programme) states that 1% of a company's turnover can be saved by implementing a systematic approach to waste minimisation, as waste costs typically are 10-20 times higher than disposal costs[2].

A good understanding of your process(es) should start with an attempt to close the mass balance using the process flow sheet. Product and waste flows, emissions to water and air, energy and water consumption and process parameters should be measured and recorded.

Measured and recorded data will serve to demonstrate the opportunities for process and product flow optimisation. Optimisation of process efficiency, and the reduction of waste and excess emissions, will lead to higher production at lower costs.

Additional information is available from Envirowise and can be downloaded free of charge from 'www.envirowise.gov.uk' . Examples include Envirowise EN 030 "Finding Hidden Profit - 200 Tips for Reducing Waste", and Envirowise GG 109, which describes case studies on cost-effective pollution control.

This Code of Good Practice on the use of brominated flame retardants is intended to support (production) management in finding ways to minimise emissions, as well as to offer guidance on how to handle waste flows where appropriate.

[2] Envirowise GG277, Finding and reducing waste in plastic processing.

8. EMISSIONS TO AIR

In places where powders are handled, such as loading brominated flame retardants into hoppers, reactors or extruders, some dust might be formed. It is recommended during filling to keep windows and doors closed and to regularly vacuum clean the work floor to remove dust. Only run the ventilation system during emptying of the packaging, and stop the ventilation once filling is complete. Empty packaging needs to be collected and stored in a closed area.

There are several other practices which would contribute to reduced emissions to air at the workplace. These are outlined in the Section II–2 on Good Housekeeping.

9. OTHER WASTES CONTAINING BROMINATED FLAME RETARDANTS

There is scope for further emission reduction from sources such as:

- floor sweepings
- off spec material
- dust filter contents
- filter cake
- empty product packaging

etc.

Users should secure environmentally sound disposal, preferably incineration, of all waste streams contaminated with BFR's and maintain documented evidence of correct disposal. It is recommended that empty packaging which contained brominated flame retardants is not re-used or recycled, to avoid traces of product entering the environment during cleaning of the packaging.

Where waste flows cannot be reprocessed internally, or cannot be sold as low grade material, it is recommended that those containing brominated flame retardants are disposed of as chemical waste and delivered to authorised waste companies for proper treatment.

An additional source of emissions arises from samples for the quality control lab. It is recommended to collect these samples (plastic granules, films, test specimens etc.) afterwards and store them. When samples are no longer required for quality control they should be disposed of as chemical waste.

Note: All studies and data mentioned in this brochure have been executed with the improved minimum average 97% purity commercial Deca-BDE as produced by BSEF member companies since 1995 and the conclusions are therefore by definition not valid for the commercial grades from other suppliers. All studies referred to in this paper are available at the BSEF secretariat or can be downloaded from www.bsef.org

Section II-2

Guidance Document on Good Housekeeping when handling Chemicals during Plastics processing

	Do make sure that it is clear which protective clothing is needed for handling the product in both everyday use and in case of emergency
	Do ask your shift manager for advice and training in case something is unclear
	Do keep containers tightly closed
	Do thoroughly empty packaging and containers
	Do inform your shift manager if you notice any product or cooling water leakage
	Do collect material spills immediately and store them in designated clearly labeled containers
	Do collect all quality control samples and store them in the designated container as chemical waste
	Do keep your workplace clean
	Do wash your hands before eating, drinking or smoking
	Do take a shower before going home

Don't overlook the details; guard against mishaps that can harm personnel and/or the environment

Don't wear incomplete or improper clothing but report it to your shift manager directly

Don't store open containers outside

Don't open windows or doors if you handle powder material, to avoid dust spreading

Don't treat tested quality control samples differently from other chemical waste

Don't wash any spills into the floor or rainwater drainage

Don't eat, drink or smoke at your actual work place

Don't wear working clothes going home

Section III

Company commitment to a Code of Good Practice for the Use of Brominated Flame Retardants in the Plastics sector

[Company name] recognises its obligations to comply with the law and to carry out its business in the most environmentally sound manner possible, in order to meet its responsibility to customers, shareholders, employees, neighbours and the natural 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 the lowest level practically and economically possible.

We recognize and respect Regulators' concerns with respect to brominated flame retardants and accordingly, are committed to implementing all relevant portions of this "Code of Good Practice for the use of Brominated Flame Retardants in the Plastics sector", with a view to continuously improving our environmental performance.

Signature

Managing Director
Company name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