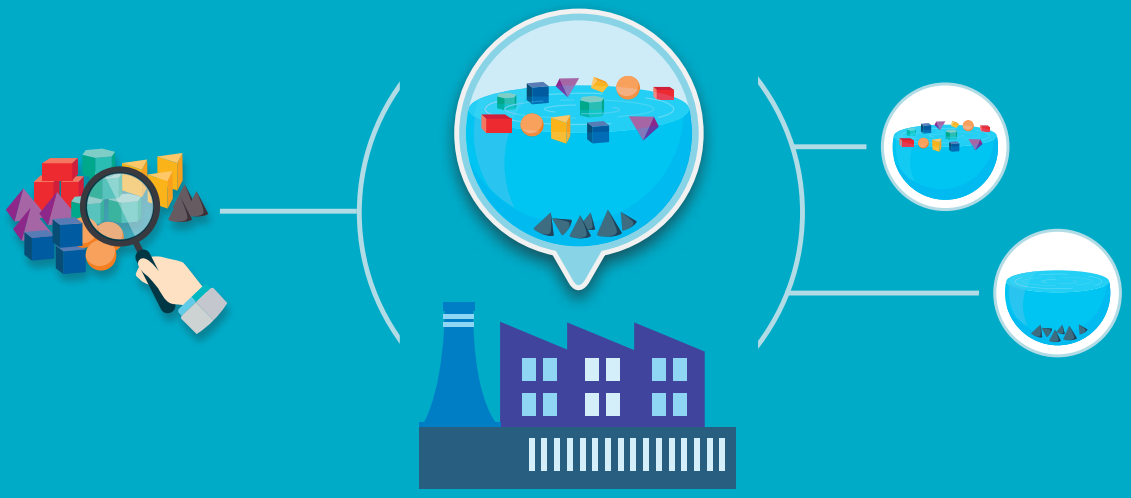
Responsible recycling of WEEE plastics containing Brominated Flame Retardants- BFR's.

This brochure describes how WEEE recyclers treat mixed plastics with Best Available Technology in compliance with WEEE and POP regulation.



WEEE PLASTICS

Each year some 3 million Metric Tons plastics are used in new Electric and Electronic Equipment (EEE) in Europe. In the separately collected Waste of Electric and Electronic Equipment (WEEE) there are many plastics.

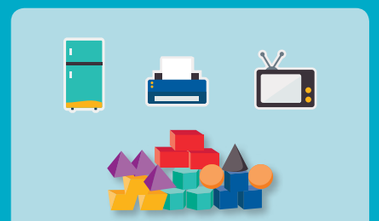
There are many types of plastics used in EEE products. The most common are HIPS, ABS, PP and PC-ABS.These plastics may contain Brominated Flame Retardants (BFR's) and some of the BFR's are restricted, because they contain substances of concern. The vast majority of WEEE plastics do not have BFR's in them.

Plastics with BFR's are typically used in appliances that generate heat such as CRT televisions and monitors, printed circuit boards in IT equipment, printers and cables and connectors.

Treatment of WEEE plastics containing Brominated Flame Retardants (BFR's)

POP's regulation applies

WEEE PLASTICS



TO CHECK OR NOT TO CHECK THAT IS THE QUESTION

WEEE plastics are deemed to have restricted BFR's if no check is made showing that the WEEE plastics contain > 2.000 ppm Bromine (Br). In that case all WEEE plastics need to be delivered to specialized WEEE plastics recycling plants capable of separating BFR containing plastics.

If WEEE plastics are checked (described in the EN 50625-1 General treatment and depollution standard) and the check shows that the plastics contain less than 2.000 ppm Br, they are free of restricted BFR's.

< 2000 PPM BROMINE

> 2000 PPM BROMINE
or not tested

POLYMER SEPARATION

The plastic mix that does not contain restricted BFR's above the threshold values can thus be used in advanced recycling processes. The first step is the separation of the individual polymers.
The processes also have non-recyclable fractions.

SPECIALIZED RECYCLING FACILITY FOR WEEE PLASTICS

The plastic mix may contain restricted BFR's in which case the mix must be treated by specialized recyclers that separate the plastics containing BFR's from other plastics.
Only 8% of this fraction contains restricted BFR's. After separation 92% of the plastics can undergo further sorting and treatment.

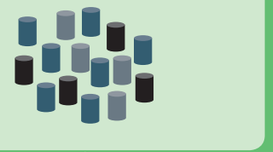
NON-RECYCLABLE FRACTIONS

PLASTICS FREE OF BFR'S

92%

08%

PLASTICS WITH RESTRICTED BFR'S



PLASTIC EXTRUSION & COMPOUNDING

The separated polymers from WEEE will then be extruded and if needed compounded. These plastic pellets are checked on conformity with POP legislation. For EEE products this is RoHs and for all other products this is REACH. Product legislation has clearly defined limit values for the presence of any legacy substances such as BFR's.

Plastics recycling saves large amounts of CO_2 emissions and energy compared to virgin plastics.

ELIMINATION OF PLASTICS

WEEE plastics containing restricted BFR's must be incinerated.
Non-recyclable plastics are also incinerated.
Although these substances have not been used in EEE since long, they can still be present in WEEE as legacy substances.

Facts & figures:

TOTAL AMOUNTS:

In Europe the total quantity of plastics used for the production of electric and electronic products amounts to some 3 Mio MT's per year. 1,2 million MT mixed WEEE plastics arise from the separated collection of WEEE in Europe. About 300.000 tonnes of these plastics are delivered to specialized recycling facilities in Europe and recycled as Post-Consumer Recycled – PCR plastics. 75% of the WEEE plastics are exported from Europe and it is unknown how much is recycled as PCR plastics.

PERCENTAGE BFR'S:

In the average mix of WEEE plastics only 5 – 10 % consist of plastics with Brominated Flame Retardants.

BFR'S:

The majority (> 92 %) of the applied Brominated Flame Retardants in EEE are not restricted.
The restricted BFR's, according to POP regulation are: Octa BDE, Penta BDE, and HBCD. Deca BDE has been added to these POP's, but no thresholds has been defined yet. Since the introduction of the RoHS directive in 2003 these restricted BFR's are not allowed into new electronic equipment.

THRESHOLDS:

The following thresholds for POP BFR's for restricted BFR's in plastics are:

- Penta BDE – 1000 ppm
- Octa BDE – 1000 ppm
- HBCD – 1000 ppm for waste and 100 ppm (under discussion*) for application in products.
- Deca BDE – not yet determined*.

** Decision in 2019 by Stockholm Convention*

EN STANDARD 50625-1 ON COLLECTION, LOGISTICS & TREATMENT REQUIREMENTS FOR WEEE - PART 1:

General treatment requirements takes a threshold value for total elemental Bromine - Br of 2.000 ppm for the check if there are BFR's in plastics. Many product categories do not contain any BFR's or only traces of these BFR's. The check for mixed plastics from product categories that can contain BFR is done by determining the Br content e.g. all Bromine molecules in all BFR's. For electronic products there is substantial evidence that if Br < 2000 ppm no restricted BFR's above the legal thresholds can be found. So if Br > 2000 ppm it is assumed that restricted BFR's are present and further separation by specialised plastic recycling facilities is required. In these processes the restricted BFR plastic fraction is concentrated and this fraction must be incinerated. By doing so, the restricted BFR are removed from the material cycle.

CLIMATE CHANGE:

If all plastics from WEEE in Europe would be recycled compliant to the EN 50615-1, the estimated CO_2 emission reduction is about 2.5 million MT of CO_2 per year.

COLOFON:

Production:

EERA
European Electronics Recyclers Association

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