

Brominated Flame Retardants Recycling E-Waste Chart



The International
Bromine Council

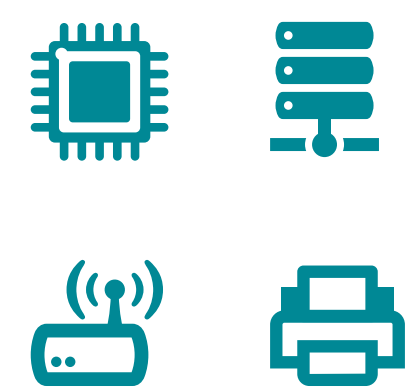
www.bsef.org

FLAME RETARDANT SUBSTANCES:

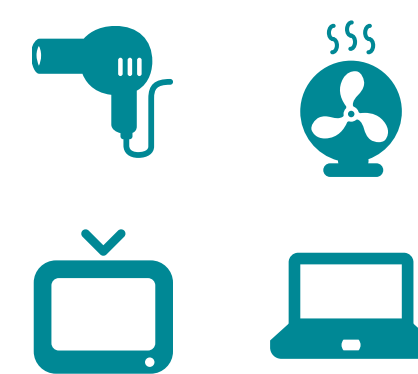
	HBCD	DecaBDE	PentaBDE	OctaBDE	TBBPA	EBP	ATO	Brominated PS
Cas #	3194-55-6	1163-19-5	32534-81-9	32536-52-0	79-94-7	84852-53-9	1309-64-4	88497-56-7
Name	Hexabromocyclododecane	Decabromodiphenyl ether	Pentabromodiphenyl ether	Octabromodiphenyl ether	Tetrabromobisphenol-A	Ethane,1,2 bis(pentabromophenyl)	Antimony trioxide	Brominated polystyrene
Remarks	No longer manufactured by BSEF members	No longer manufactured by BSEF members	No longer manufactured by BSEF members	No longer manufactured by BSEF members			Synergist used in combination with some brominated flame retardants	

1 PRODUCTS

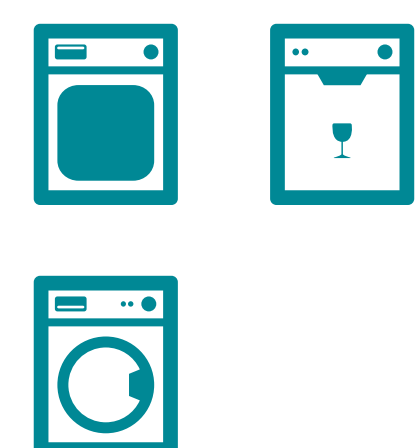
IT electronics
(microprocessors, computer servers, modems, printers, copy machines...)



Consumer electronics¹
(hairdryers, heaters, TV sets, laptops...)

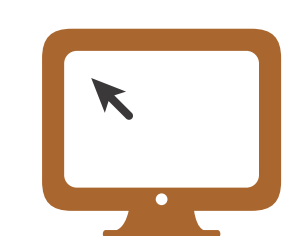


White goods
(tumble dryers, dishwashers, washing machine...)

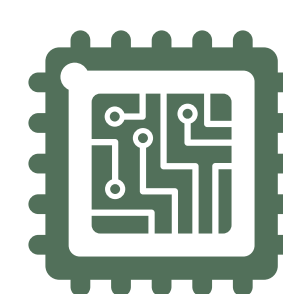


2 PLASTIC PARTS

Housing



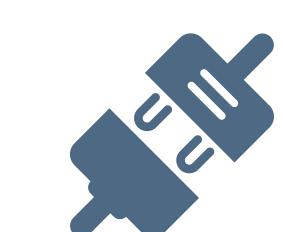
Printed circuit boards



Cables



Connectors

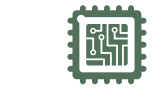


3 TYPICALLY USED FRs²

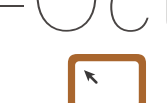
HBCD³



c-PentaBDE



c-OctaBDE



DecaBDE



TBBPA (reactive)



EBP



ATO



Brominated PS



4 REGULATIONS⁴

Authorisation under REACH⁵ (Annex XIV)

POP under Stockholm⁶

Restriction under RoHS⁷

Restriction under REACH⁷ (Annex XVII)

No restriction

5 WASTE TREATMENT OPTIONS

Mechanical recycling

Chemical recycling (solvolysis)

Thermal processing/depolymerisation/gasification

Incineration

Landfilling

6 RELEVANT EoL & WASTE REGULATIONS

Occupational health and safety measures exist for workers at recycling facilities

Dust filters are installed at shredders

Emission limits of the IED

Advanced solid waste incineration allowed under Basel Convention

Provisions of the EU landfilling directive

7 END PRODUCT

Recycled plastic with FR

Energy recovery

Urban mining

RECYCLABILITY DEPENDS ON:

- Material composition
- Cleanliness of waste streams
- Available technology
- Economic considerations
- Regulations

POP listing and REACH restriction proposals

— preferred option
— least preferred option

¹ Depending on the device the fire safety requirements and the plastics used for the housing might be different (e.g. hairdryers need to be V0 with ABS as a typical polymer, while TVs only need to be V1 and polymer alloys are more common)

² This gives just an initial, non-comprehensive overview. There are more flame retardants with no restrictions

³ Use of HBCD in E&E is minimal, therefore rarely detected