

Status of Flame Retardants

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(NAFRA)

Agenda

- ✓ NAFRA background
- ✓ Uses of FRs in Aircraft
- ✓ Status of DecaBDE
- ✓ Alternative products



North American Flame Retardant Alliance (NAFRA)

- Aims to be the voice of the flame retardant industry in North America
 - all FR technologies - - organic chemicals based on bromine, phosphorus, nitrogen and inorganic compounds
 - seeks to educate manufacturers, consumers, legislators and regulators on the safe use of FRs
 - addresses state and federal legislative and regulatory challenges
 - develop the scientific record evaluating flame retardant efficacy and safety
 - new tools – Science Advisory Council, standards tracking and advocacy, communications

NAFRA Membership



- Current NAFRA members produce all major types of FR solutions - phosphorus, nitrogen, bromine and inorganic compounds
- Members constantly innovating to achieve better performance while improving environmental footprint

FR Use in Aircraft

- Wide variety of unique uses in commercial aircraft applications
 - Wiring and cable
 - Electrical/electronic equipment
 - Textile backing
 - Reinforced plastics
- Lengthy qualification & certification process



- US EPA phase-out initiative announced in 2009
 - 2012 for most applications
 - 2013 for transportation and military applications
- Limited imports in 2013



DecaBDE Regulatory Status

- International
 - Review under the Stockholm Convention
- Europe
 - Registered under REACH in 2010
 - Listed as candidate SVHC in 2012
 - Restriction proposal intention filed in 2013
- US
 - Significant new use restriction (SNUR) proposed in April 2012



EPA SNUR Proposal

- Would apply to -
 - Any use after December 31, 2013
 - Articles containing DecaBDE
- Would require -
 - 90-day notification
 - Significant testing requirements
- Timing is uncertain
 - Transportation applications
 - Replacement parts



EPA Design for the Environment

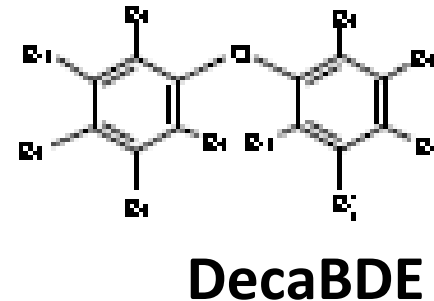
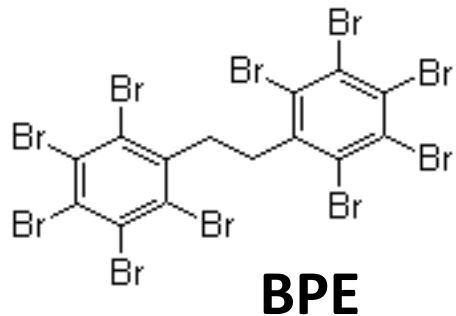
- DecaBDE alternatives assessment
 - Released in Jan 2014
- Looks at 29 potential alternatives in 5 classes
 - Halogenated
 - Polymeric brominated
 - Phosphorus & nitrogen
 - Polymeric P & N
 - Inorganic



DfE Summary – DecaBDE Alternatives

Work Plan	CAS No.	Health Effects											Aquatic Toxicity		Env Fate	
		Acute	Carc	Genotox	Repro	Develop	Neuro	Rep Dose	Skin Sens	Eye Irrit	Dermal	Acute	Chronic	Persist	Bioaccum	
Halogenated																
	DecaBDE	1163-19-5	L	M	M	M	H	L	M	L	L	L	L	L	VH	H
	Bis(hexachlorocyclopentadieno) cyclooc	13560-89-9	L	M	M	VL	VL	L	M	L	VL	L	L	L	VH	H
	Brominated poly(phenylether)	--	L	L	L	VL	M	L	L	L	L	VL	L	L	VH	H
X	Decabromodiphenyl ethane (DBDPE)	84852-53-9	L	M	L	L	H	L	L	L	VL	VL	L	L	VH	H
	Ethylene bis-tetrabromophthalimide	32588-76-4	L	M	L	L	M	L	L	L	VL	VL	L	L	VH	H
	TBBPA bis (2,3-dibromopropyl) ether	21850-44-2	L	M	M	M	M	L	L	L	L	L	L	L	VH	H
	Tris(tribromoneopentyl) phosphate	19186-97-1	M	M	L	M	M	H	L	L	L	L	L	L	H	M
X	Tris(tribromophenoxy) triazine	25713-60-4	L	L	L	L	L	L	L	L	L	VL	L	L	VH	H
Polymeric Halogenated																
	Brominated epoxy polymers	68928-70-1	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
	Brominated epoxy polymers	--	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
	Brominated epoxy resin/tribromopheno	135229-48-0	L	L	L	L	L	L	L	L	L	VL	L	L	VH	L
	Brominated polyacrylate	59447-57-3	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
	Brominated polystyrene	88497-56-7	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
PFR & NFR																
	Substituted amine phosphate	--	H	M	M	M	M	L	M	L	M	VL	M	L	H	L
	TPP	115-86-6	L	M	L	L	L	L	H	L	L	VL	VH	VH	L	M
Polymeric PFR & NFR																
	BAPP	181028-79-5	L	M	L	L	L	L	L	L	L	L	L	L	H	H
	Melamine cyanurate	37640-57-6	L	M	M	M	L	H	L	L	L	L	L	L	VH	L
	Melamine polyphosphate	15541-60-3	L	M	M	L	L	M	L	L	VL	L	L	L	H	L
	N-alkoxy hindered amine	191680-81-6	L	M	L	H	L	H	L	L	VL	H	H	H	H	H
	Phosphonate oligomer	68664-06-2	L	M	L	L	L	M	L	L	M	M	L	H	VH	H
	Polyphosphonate	68664-06-2	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
	BPBP	003300-73-9	L	M	L	L	L	L	L	L	VL	VL	H	H	H	M
	Poly[phosphonate-co-carbonate]	77226-90-5	L	L	L	L	L	L	L	L	L	L	L	L	VH	L
	RDP	125997-21-9	L	M	L	L	M	M	M	L	L	VL	VH	VH	M	H
Inorganic																
	Aluminum diethylphosphinate	225789-38-8	L	L	L	VL	M	M	M	L	L	VL	M	M	H	L
	Aluminum hydroxide	21645-51-2	L	L	L	L	L	M	M	L	VL	VL	M	M	H	L
	Ammonium polyphosphate	68333-79-9	L	L	L	L	L	L	L	L	VL	L	L	L	VH	L
	ATO	1309-64-4	L	M	M	M	L	L	H	L	L	M	H	M	H	L
	Magnesium hydroxide	1309-42-8	L	L	L	L	L	L	L	L	M	L	L	L	H	L
	Red phosphorus	7723-14-0	L	L	M	L	L	L	L	L	M	M	L	L	H	L
	Zinc borate	1332-07-6	L	L	H	M	M	H	L	L	L	L	H	H	H	L

Decabromodiphenyl Ethane (DBDPE or BPE)



- Similar structure to DecaBDE
 - Similar applicability
 - Basis for much of environmental fate concern
- Environmental fate analysis planned
 - Under ECHA CoRAP process

Polymeric FRs

- Large-sized molecules
 - lowers the potential for biological activity
 - may increase stability of material
- Polymers generally exempt from EPA pre-manufacture (PMN) review
 - Halogenated polymers are subject to PMN

Additional Information

- www.albemarle.com – Albemarle Corporation
- www.greatlakes.com - Great Lakes Solutions
- <http://icl-ip.com> - ICL Industrial Products
- <http://flameretardants.americanchemistry.com/>
- <http://www.frfacts.com/>

Questions?

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