

New Flame Retardants and Synergists saving lives

By Tim Cooper
Chemfit Speciality Chemicals

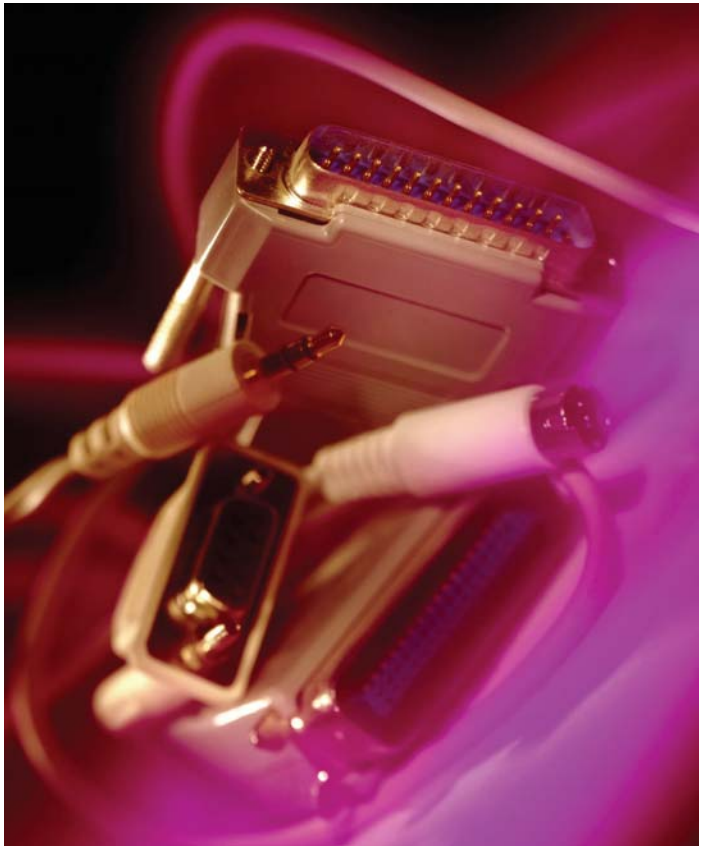
Introduction

In this day and age there is a global increase in demand for ever safer products. One growing requirement is for plastic materials which resist burning, emit lower levels of smoke and toxic gases in a fire, and are considered environmentally friendly. The global average for deaths from fire annually is around 10-20 per million persons. Chemfit markets a broad offering of products which act as fire retardants and smoke suppressants, and reduce the emission of toxic by-products in a fire, thereby contributing to a safer environment, and striving to reduce this fatality figure locally.

Fire retardants work in different ways, including flame poisoning to replace oxygen at the source, intumescent (char forming) to prevent oxygen and flame impinging on the surface, dripping to remove the burning material from the flaming area, and cooling or dilution due to decomposition to form carbon dioxide or water vapour. Most deaths occur not due to the fire itself, but because the victims are overcome by toxic gases and smoke. All polymers emit toxic gases during burning, mainly carbon monoxide and dioxide, but depending on the plastic, also gases like hydrogen cyanide and hydrogen chloride. Thus when using fire retarding materials, we need to consider not only the flammability but also the emission of toxic gases and smoke as well. The following are just a few examples of new developments available from Great Lakes through Chemfit Speciality Chemicals.

Developments for high temperature polyamide applications

Brominated flame retardants together with antimony trioxide are typically used as flame retardants in polyamides. A requirement exists for flame retardants that can be used at higher operating temperatures, for example in electronic connectors. Firemaster® CP44HF is a copolymer of di- and tri-bromostyrene with glycidyl methacrylate, which has superior blister resistance and can withstand application at higher temperature than traditional products. This property



Firemaster CP44HF from Great Lakes, supplied in SA by Chemfit, offers superior blister resistance and is being used increasingly in the electrical and electronics area

is especially important as the requirement for non-lead solder systems increases. **Table 1** shows the improved blister resistance of 30% glass filled flame retarded nylon containing Firemaster CP44HF.

In addition, compounds containing Firemaster CP44HF show superior flow properties, and V-0 ratings can be achieved with lower levels of antimony trioxide synergists.

A new intumescent for polypropylene

Some applications require or specify flame retardants which are halogen free. Reogard® 2000 is an intumescent flame retardant for polypropylene, used in applications such as electrical appliances and extruded (continued over)

New flame retardants website

Great Lakes Chemical Corporation has launched a new flame retardants website (www.fr.greatlakes.com) designed exclusively for plastics producers. The site provides in-depth information regarding flame retardant selection, technical and safety data, and regulatory requirements. "With the array of flame retardant products and technologies to choose from, making the right choice of additive can prove difficult for even the most experienced polymer manufacturer," said Angelo Brisimitzakis of Great Lakes. "Our selection charts make choosing a flame retardant quicker, easier, and more effective than ever." □

Table 1 — Improved blister resistance of CP44HF 30% glassfibre-reinforced, high-temperature nylon, UL94 V-0

Test	Standard product	CP44HF
Impact strength	469	554
Un-notched J/m		
Tensile strength	19,5	19,7
Blister resistance	255°C	270°C

New Flame Retardants and Synergists save lives

From page 26

building products. Also, it is partly melt blendable, resulting in higher impact strength and heat distortion temperature, and V-0 ratings are achieved with much lower additions than traditional products. The benefits of using Reogard 2000 in polypropylene can be seen in **Table 2**.

Low smoke-low halogen PVC compounds

In the field of PVC cable, a growing requirement was for heavy metal free, and low smoke, low halogen (LSLH) compounds. The target was to achieve an oxygen index >30%, heat stability >50 minutes as measured by VDE 0472, and HCl emission below 10%. The results in **Table 3** show how, by using a proprietary mix of non-toxic stabilizers, flame retardants and smoke suppressants, this target was exceeded by some margin. Such formulations can be extended to other PVC applications.

An efficient smoke suppressant for PVC

When PVC compounds burn in a fire, they also emit copious amounts of smoke. In today's world there is a demand for PVC formulations with very low smoke emission. This demand can be met by Ongard[®] 2, a magnesium/zinc complex synergist which has minimal effect on heat stability, gives superior flame retardance at lower dose compared to traditional synergists, and dramatically reduces smoke in PVC compounds, as shown in **Figure 4**. It can be used in both rigid and flexible applications, including wire and cable, sheet, pipe and profile, and coated fabrics.

Environmental product forms for flame retardants

Many flame retardants have in the past been supplied in powder form, including brominated organic compounds and antimony trioxide. Once incorporated into the polymer article this powder form is inconsequential.

However, during processing, workers are exposed to potentially harmful dusts. Chemfit is able to supply Great Lakes flame retardants in the form of one-pack granules, called Fyrebloc[®], an extension of Great Lakes patented Non Dust Blend (NDB) concept.

Conclusion

Chemfit Speciality Chemicals is able to provide a wide range of possible solutions to a burning issue (pun intended). The foregoing represents just a few of the many new innovations and improvements in the field of flame retardancy. Talk to us, and let's solve problems together. Ph 011

Table 2 — Benefits of Reogard 2000 over traditional intumescent additive in injection moulded PP

Test	Traditional product	Reogard 2000
Impact strength Un-notched J/m	330	453
Tensile strength MPa	28	31
Level to achieve UL94 V-O	28%	20%
Heat distortion temp	94°C	109°C

Table 3 — Comparison of PVC compounds based on standard and heavy metal free additives

Test	Standard compound #	HMF / LSLH *
Heat stability mins @ 200°C	75	68
Oxygen index %	29,5	31,5
HCl emission %	20,2	7,0
Smoke density D _{max}	377	198

lead stabilised, antimony oxide synergist
* Heavy metal free, low smoke-low halogen

Table 4 — Comparison of smoke suppression in tin-stabilized rigid PVC

Test	Timonox ATO		Ongard 2	
	1phr	2phr	1phr	2phr
Oxygen index %	44,0	47,5	48,5	52,0
Smoke density D _{max} corr	425	345	210	280
Total smoke m ² /m ²	7331	7561	5332	5380

918 1900 or write to tim@chemfit.co.za or doug@chemfit.co.za.

References

- 1) Joe Andrews and Larry Timberlake, FR Solutions in Critical Applications to meet Emerging Needs
- 2) Reogard 2000, Great Lakes application bulletin, visit www.fr.greatlakes.com
- 3) Ken Mulliner et al, Heavy Metal-free PVC Compounds for Cables
- 4) Ongard 2, Great Lakes info sheet, www.fr.greatlakes.com. □

Entries invited for DuPont's Packaging Awards

DuPont is inviting converters, moulders and consumer goods producers worldwide to submit their latest innovations for the DuPont packaging awards programme. The competition has attracted hundreds of entries from more than 30 countries since its inception in 1986.

Entries, in which plastics are an essential component, can be submitted for either the food or non-food

packaging categories. There is a particular calling for companies in the cosmetics and healthcare sectors to challenge the food and beverage industry's recent dominance of the awards. Projects can come from any point in the supply chain, including design, technology or machinery.

The closing date for all entries is April 30, 2005, with judging to take place in May. The awards ceremony

will be held in August 2005 in Philadelphia, Pennsylvania, USA.

To be eligible, projects must have been first marketed, test marketed or put into commercial use between January 1 2003 and December 31 2004. Entries can be submitted by individuals or teams. Joint projects involving several companies are encouraged. See www.dupont.com/packaging/awards. □