MARKS AND SPENCER POLICY

MARKS AND SPENCER POLICY P3 FOOD PACKAGING CHEMICALS

Aim: The aim of this document is to outline the Chemical Policy for Packaging Materials.

Scope: The scope of this document is for all Packaging Materials and Hardware across the Foods Business Unit.

General introduction

A number of chemicals that we use in packaging give rise to significant concerns about their potentially adverse impact on human health and/or the environment. The pressure groups and the media that influence our customers are articulating these concerns. We have an extremely good reputation for chemical management amongst these influencers that we wish to maintain.

The Packaging Chemical Policy outlines a leading standards approach in managing key chemicals that have or potentially will give rise to public concern on their health and the environment. The policy has been put in place:

- To ensure that legal requirements are answered.
- To ensure Marks & Spencer due diligence requirements are met.
- To address NGO and Customer facing concerns.

Thereby, providing benefit to our customers by ensuring the safety of product.

The M&S Packaging team have risk assessed each chemical against its implications to the M&S business. This process has determined that for each chemical, M&S has adopted an industry standard as a minimum position. Where a chemical was deemed as high risk, the packaging team has engaged relevant parties of the supply chain to adopt a leading standards approach.

Legislation concerning Materials and Articles intended to be brought into contact with food exists, and it is the direct supplier's responsibility to ensure that they are compliant with this legislation. The Foods Standards Agency has published an explanatory note that lists all relevant legislation. The Explanatory note is ENFCM1 and can be located through the FSA website: www.food.gov.uk

In addition, this policy covers chemicals that are a risk to the M&S brand, not always covered by legislation. It is the supplier's responsibility to ensure that the policy is complied with for these chemicals.

Policy statements

The M&S objective is for the following chemicals not to be present or used in our packaging:

Acrylamides
NOGE
PFOS & PFOAS
Phthalates
PVC and Derivatives (where a technological solution exists for the chemicals to be removed, without any impact on product safety)
Semicarbazides
4-methylbenzophenone

The M&S objective is for the following not to be found at residual levels in our packaging:

Isocyanates (in film packaging)

The M&S objective is for the following to meet legislative requirements in our packaging:

Antimony in PET
BADGE, BFDGE & Bisphenol-a
ESBO
Heavy metals in Packaging (as defined by Essential Requirements legislation)
Tin in canned goods
ITX (IsopropilThioXantone)
DIBP (Di-Iso Butyl Phalate)
4-hydroxybenzophenone
Benzophenone

The M&S objective is for the following to meet levels within M&S Code of Practice:

Azo-dyes	(refer to the M&S Environmental Code of Practice)
Heavy Metals in fabric lines	(refer to the M&S Environmental Code of Practice)
Methyl Bromide	(refer to the M&S Code of Practice on Natural Materials)
PCP	(refer to the M&S Environmental Code of Practice)

Printing inks and Varnishes

Food Suppliers are responsible for specifying inks and varnishes are suitable for Food Packaging and that low migration ink technology is used.

Testing

- Food Suppliers should select random products on an annual basis and test packaging for the presence and amounts of chemicals of concern.
- The number of products and which chemicals to be tested will vary depending on the suppliers volume of business with M&S and the packaging materials used.
- A risk based approach should be used to determine the amount of testing and suppliers can contact Mark Caul at M&S to agree a sensible approach.

- All results should be copied to M&S, from which further actions may be required and will be agreed on the submission of the results.

Key tables and appendices

The following tables give details of how these policies will be delivered and back ground information.

Table 1: Responsibilities of each part of the supply chain in maintaining our industry position

Appendix 1.0: Summary of priority chemicals and the Marks & Spencer current position against industry standards.

Appendix 2.0: Provides a more detailed technical background to each chemical.

Appendix 3.0: List of Chemical Abbreviations

Appendix 4.0: Sun Chemical Statement for 4-MethylBenzophenone

Table 1.0 Responsibilities

The customer benefits of this chemical policy are that M&S aim to set leading standards, where appropriate, on chemicals that are a concern to food safety and NGO concerns. To meet this objective, responsibilities of the supply chain are detailed:

*Please note that chemicals in bold have been highlighted in the national press.

CHEMICAL	PACKAGING SUPPLIER	FOOD SUPPLIER	M&S
Acrylamides	Printers and board mills must ensure that the chemical is not used.	To hold on file written confirmation from their suppliers that the chemical is not used in board. To report non-compliances to the M&S Packaging team	Packaging Team have confirmation on file, from printers, that the chemical is not used in board. Packaging Team to hold this information on file.
Antimony in PET	Packaging Suppliers must ensure that the legislative levels are complied with. Non compliances must be reported directly to the food supplier. Certificates of compliance must be forwarded to the Food Supplier.	Food Suppliers are responsible for yearly due diligence testing. Testing must be carried out on randomly selected products on an annual basis. Any non-compliance must be forwarded immediately to the M&S packaging team.	Food Technologists to review and action non-compliances from PPC audits A testing programme has been carried out by the Packaging Team and results are held on file
Azodicarbonimide	To ensure that the chemical is not used as a blowing agent, and to supply certificates of conformity to their customers. To ensure that semicarbazide is	Food Supplier are responsible for holding certificates of conformity from their suppliers on file. Food suppliers that are affected by the compound must maintain due diligence	Key Food Suppliers have confirmed that the use of the chemical is not present in our packaging.

	not formed during lid manufacture and to supply certificates of conformity to the food suppliers.	records. Testing must be carried out on randomly selected products on an annual basis. Results to be forwarded to M&S packaging team. Food suppliers must confirm with their packaging supplier that packaging is free from semicarbazide. Written statements to be held on file by the Food supplier.	Packaging Technologist to keep these confirmations on file.

CHEMICAL	**PACKAGING SUPPLIER**	**FOOD SUPPLIER**	**M&S**
Azo-dyes	To ensure that all fabric lines are compliant with M&S leading standard limits.	All Fabric hardware lines must be independently tested. Test certificates to be electronically forwarded to the Packaging Technologist at M&S, copying the M&S Category Food technologist.	The Food Technologist should ensure that the Food Supplier carries out independent testing on all fabric lines. The Packaging Technologist maintains an electronic filing system for testing certificates forwarded by the Food Supplier

BADGE, BFDGE & **Bisphenol-a**	M&S expect research programmes to be put in place, with the short term aim of reducing bisphenol-a from can lacquers and the long term aim of eliminating bisphenol-a from can lacquers. The can supplier must communicate progress to their customers and the M&S Packaging Team. The can supplier must carry out either in-house testing, or independent testing on can lacquers. In-house testing must be by recognised international test methods. Results of testing must be held on file for reference.	The direct food supplier is responsible for ensuring that legislative limits of the directive are adhered to. The direct food supplier is responsible for working with packaging suppliers to support chemical reduction and elimination programmes. The Food Suppliers are responsible for carrying out annual independent testing. Testing must be on a range of products and results reported to the M&S Food Group Packaging Team.	Food Technologists to review and action non-compliances from PPC audits where annual testing is not in place.

Benzophenone and its derivatives	Packaging supplier to use benzophenone, 4-methylBenzophenone and 4-hydroxybenzophenone free inks and varnishes. Refer to Appendix 4 for Sun Chemical Statement. Packaging Suppliers are responsible for specifying the use of low odour and migration inks and varnishes to ensure migration legislative limits on benzophenone and its derivatives are met.	The food supplier is responsible for specifying benzophenone, 4-methylBenzophenone and 4-hydroxybenzophenone free inks and varnishes in packaging. Low odour and migration inks must be specified to ensure legislative limits on benzophenone and its derivatives are met. In addition, they are responsible for a due diligence testing programme of random products on an annual basis and reporting results to the M&S.	Food Technologists to review and action non-compliances from PPC audits where annual testing is not in place. Packaging suppliers have confirmed that they are not using 4-methylbenzophenone containing inks. Packaging Team to ensure statements are kept on file.

CHEMICAL	**PACKAGING SUPPLIER**	**FOOD SUPPLIER**	**M&S**
DIBP (Di – Iso Butyl Phalate)	To ensure that the chemical is not used in virgin board packaging.	The food supplier is responsible for specifying DIPB free packaging. In addition, they are responsible for a due diligence testing programme of random products on an annual	Food Technologists to review and action non-compliances from PPC audits where annual testing is not in place.

		basis and reporting results to the M&S.	Packaging suppliers have confirmed that they are not using DIPB in virgin board packaging
ESBO	Packaging Suppliers are responsible for ensuring that legislation is met.	Food Suppliers are responsible for ensuring that legislative migration levels are met. Independent testing must be carried out on a annual basis.	Food Technologists to review and action non-compliances from PPC audits
Heavy Metals **Packaging**	To ensure that all dyes meet M&S limits, through supply of certificates of conformity, or independent testing as agreed with their customers.	Food Suppliers to ensure that certificates on conformity are provided from their suppliers.	Food Technologists to ensure that all certificates of conformity are registered as part of the product specification on FIND
Heavy Metals **Hardware**	Responsible for ensuring that all supplied fabrics conform with the M&S Environmental code of practice.	Hardware lines are risk assessed for child appeal (see M&S Child Policy and M&S Environmental Code of Practice), and where relevant, independently tested against EN71 part 3. Responsible for ensuring that the hardware suppliers are aware of the limits set out in the M&S Environmental Code of Practice.	Packaging technologist to maintain electronic database of all testing carried out by suppliers.
Isocyanates	To ensure that the legislative and industry guidelines on	Food suppliers are responsible for ensuring that legislative migration	Packaging Team have confirmation on

	curing procedures and guidelines are adhered to.	levels are met. This can be done through certificates of conformity.	file, from film suppliers, that the manufacturing process of the film ensures no residual chemical is present in the final product. Packaging Team to hold this information on file.

CHEMICAL	**PACKAGING SUPPLIER**	**FOOD SUPPLIER**	**M&S**
ITX	ITX not to be used as a photo initiator in printed inks.	To specify ITX free Packaging. To include the chemical in a due diligence annual testing programme on random products and to forward results to the M&S packaging team.	Packaging technologist to maintain electronic database of all testing carried out by suppliers.
Methyl Bromide	To ensure that fumigation takes place in accordance to M&S CoP on natural materials and hold certificates on file. . Packaging and Hardware suppliers are responsible for using alternative fumigants to Methyl	The direct supplier must keep a copy of the fumigation certificate on file, outlining which fumigation method has been used. Fumigation must occur at final destination (e.g. UK Port or designated European Food Supplier port).	

	Bromide according to import regulations.		
NOGE	To ensure that the chemical is not used as an additive and to supply certificates of conformity to food suppliers.	To hold on file certificates of conformity from their suppliers	
PCP	To ensure that all fabric lines are absent of the chemical above the limit of detection	To comply with M&S dyeing and finishing COP	Food Technologists to review and action non-compliances from PPC audits
PFOS & PFOAS	The board supplier and printer are responsible for ensuring that their products are PFOS/PFOA free. Any non conformances must be reported to the food supplier.	Food suppliers are responsible for informing the Packaging Team of any non conformances.	Food Technologists to review and action non-compliances from PPC audits
Phthalates	Refer to PVC section.	Refer to PVC section.	Refer to PVC section.
PVC and Derivatives	To ensure that where technologically possible, an alternative to PVC and its derivatives is available to their customers.	Food Suppliers are responsible for the continued non-use of PVC in M&S packaging materials. This includes the use of PVdC, or other derivatives.	Food Technologists to review and action non-compliances from PPC audits
Tin in canned goods	Tin suppliers are responsible for packaging that meets relevant legislation.	Refer to Food Chemical Policy	Refer to Food Chemical Policy

Appendix 1.0: Priority chemical list– Current position against Industry standards

*Please note that chemicals in bold have been highlighted in the national press.

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
Acrylamides			✓	➢ Acrylamides can be found in cartonboard packaging, as a result of the manufacturing process, in addition to product itself. ➢ FSA publicised a surveillance report, highlighting the presence of acrylamide across key brands/ own label packaging – M&S was not implicated. ➢ Confirmation received across print supply base of no presence in our packaging.
Antimony in PET		✓		➢ Antinomy is used as a catalyst in the manufacturing process of polyesters (PET). ➢ The key areas of the business using PET food packaging are Ready Meals and Desserts (CPET Duo-ovenable Trays), Produce (APET punnets) and Soft Drinks (PET Bottles) ➢ The 6th amendment to EC legislation on

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				Materials in Contact with Food (91/128) set a new residual level of antinomy at 20 ppb. ➢ Independent testing carried out by ITS show levels are within new legal limits.
Azodicarbonimide			✓	➢ Used as a blowing agent in gaskets on metal lids for glass jars (long life products). ➢ A by-product, semicarbazide, has been linked to carginogenic activity. ➢ Azodicarbonomide has been removed from all M&S cap compounds, in advance of the legislation due to come into force in Aug 2005. Supplier confirmations are held on file.
Azo-dyes			✓	➢ Several fabric dyes have been banned, that form carcinogenic amines during processing. ➢ All textiles used for gifting lines in Foods have independent testing to test for the presence of these chemicals. ➢ No instances of a banned substance have been recorded in the Food Group.

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
BADGE & BFDGE		✓		➢ Both BADGE and BFDGE are used in can lining compounds for long life products and have been linked to carginogenic activity. ➢ BFDGE is banned from use (affirmed by FSA on 30 Nov 2005) as from 1st January 2006. ➢ The migration limit for BADGE has been re-evaluated by the EU and set at 9 milligrams per kilogram of food stimulant, including its hydrolysed derivatives from 1st January 2006. ➢ M&S position is to ensure compliance with legislation through due diligence testing
Benzophenone, 4-methylbenzophenone, 4-hydroxybenzophenone			✓	➢ Used in UV cured Printing inks. ➢ There are no specific EU controls for migration from inks and their associated coatings, but there is a Group Tolerable Daily Intake (Group TDI) for benzophenone and 4-hydroxybenzophenone of 0.01 milligram/kilogram (mg/kg) bodyweight (bw).

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				➢ The TDI is the amount of substance that can be consumed every day for life without adverse toxicological effect. ➢ There is legislation for food contact plastics, Directive 2002/72/EC, in which there is a specific migration limit (SML) for benzophenone of 0.6 mg/kg ➢ SMLs are derived from TDIs using the assumption that the average European weighs 60 kg, and consumes 1kg of packaged food per day. ➢ EFSA are reviewing the chemical and are due to report in May 2009.
Bisphenol-a			✓	➢ Used in manufacture of some can linings and polycarbonates and linked by pressure groups to carginogenic activity. ➢ Product Testing carried out by Food suppliers confirming minimal levels in can lacquers. ➢ Programmes of reduction and phase out agreed with key can supplier.
DIPB (Di-Iso Butyl Phalate)		✓		➢ Di Iso phenyl Butadiene (DIPB) has been found in printed

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				paper packaging and packaging containing recycled pulp. E.g. Take away pizza boxes. It is thought that this is due to phalate containing glues used in non-food contact packaging entering the recycling waste steam. ➢ Italy has banned DIBP from packaging and Germany has set a guidance level of 50mg/kg. ➢ FSA, EFSA or FDA restrictions have not been set as of October 2008.
ESBO		✓		➢ ESBO is epoxidised Soya Bean Oil and has been found in certain food items packed in glass bottles, where migration has occurred from the gasket seal on specific types of metal lids. ➢ Foods at greatest risk include ketchup, pesto and sun-dried tomatoes in oil. ➢ There is no safety risk associated with this chemical, but a Swiss public health lab has tested products on the market to find levels are greater than the 60 mg/kg legal limit.

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				M&S were not implicated. ➢ We are currently working with key suppliers to ensure all lines are within the legal requirements.
Heavy metals *use of Hg, Cd, Pb*		✓	✓ ✓	**General Packaging** ➢ Essential Requirements legislation stipulates that no packaging contains mercury, cadmium or lead. ➢ This is verified by the supply base on a certificate of conformity basis, across all lines as part of the product specification in FIND. **Hardware** ➢ All hardware lines containing fabric (such as plush bears), are independently tested. ➢ Test certificates are held on file by the M&S packaging team **Textiles** ➢ Dyeing and Finishing CoP managed by M&S General Merchandising, sets M&S limits for Heavy Metal in textiles. ➢ M&S limits are lower than required by EU legislation. ➢ Foods comply with CoP, verified by independent testing

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				carried out on all dyed textiles used in gift hardware. Test certificates are kept on file.
Isocyanates		✓		➢ Isocyanates are used in adhesive layers between laminate films. ➢ Strict curing procedures and timings have been put in place by industry to ensure no residual cyanide compounds remain. ➢ Confirmation across our film supply base of agreement to adhere to this industry code of practise. Responses filed.
Methyl Bromide		✓		➢ UK Methyl Bromide stocks are predicted to run out at the end of 2005. ➢ Legislation allows for the use of existing stocks. ➢ Investigations have identified an alternative, sulfuryl flouride (otherwise known as Profume or Vikane), which has been trialled in industry. ➢ The phase out of methyl bromide (exception for wooden pallets) is not related to food safety, but to environmental

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				concerns).
NOGE		✓		➢ NOGE (novolac glycidyl ethers) was banned as an additive on 1 December 2002
PCP			✓	➢ Pentachlorophenols (PCPs) are used in the textile and wood industries as a preservative. ➢ Trace elements of the chemicals and their derivatives must not be allowed above the limit of detection (0.05ppm) ➢ The chemical is contaminated with dioxins that pose carcinogenic health risks. ➢ Banned in Dyeing and Finishing CoP, complied with by Foods.
Perfluorinated Chemicals: PFOS & PFOAS			✓	➢ Perfluorinated chemicals are known to be used in grease-resistant coatings on cartonboard packaging. ➢ The chemicals have been raised as having potential developmental toxicity by pressure groups. ➢ M&S foods have traceability of cartonboard sourcing and have obtained written statements that the mills do not

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				manufacture boards with PFOS or PFOA.
Phthalates			✓	➢ Phthalates are plasticizers used in PVC compounds and have been linked to oestrogenic activity in humans, particularly children. ➢ These have been banned for use in M&S foods packaging since 1992.
PVC			✓	➢ PVC and derivatives (PVdC) have been publicised by key pressure groups for the effect on human health and the environment. ➢ A corporate ban on PVC and PVdC was actioned, with a target date of Jan 2003 agreed. ➢ Marks and Spencer Foods are now 99.7% free of PVC and PVdC. Areas that still use PVC and PVdC have no technical alternatives at the current time (bottle caps, tin linings). ➢ An Ernst and Young independent audit in 2003 confirmed the quoted figures.
Tin in canned goods		✓		➢ Tin levels have been set by EU legislation on Materials in Contact with Food. ➢ The issue here is the

Chemical	Minimum Standard	Industry Standard	Leading Standard	Comments on current position
				affect of the product on the dissolution of the tin coating. ➢ Refer to Food Chemical Policy for details of IPT requirements.

Appendix 2.0: Background technical information for reference

The following details background to each of the chemicals listed in the Packaging Chemical Policy, for additional information. The information has been collated from website sources, for example the Foods Standards Agency Website (www.food.gov.uk), and scientific publications e.g PIRA International. The information is correct as of July 2005. Any reference to Daily Tollerable Intakes and Specific Migration Limits are correct as of July 2005. It is the supplier's responsibility to ensure that they remain up to date with any future changes in these limits.

2.1 Chemicals that affect plastics:

1. PVC

PVC is highlighted by NGOs as the top plastic on the "poisonous plastics pyramid". This issue is being driven by consumer concerns and media/NGO campaigning. The concerns are that:

- **Hazardous substances** are released during the production and disposal of PVC. These include vinyl chloride monomer, ethylene dichloride, hydrogen chloride, lead, cadmium, alkyltins, phthalates and dioxins. These substances are toxic, persistent, bioaccumulative or endocrine disruptors ('sex change' chemicals).
- The highest profile initiative to phase out the use of hazardous materials is the Ospar Agreement. Under this Agreement, fifteen European countries, including the UK, have committed to phasing out the use of 27 particularly hazardous chemicals, seven of which are associated with PVC. Dioxins are also included on the UN's Persistent Organic Pollutants (POPs) Convention, identifying the 12 highest profile pollutants that require phase out;
- **PVC is difficult to recycle.** Recycling rates for PVC are low (3%) and best estimates for 2010 are 9%. It is also contaminating other, less hazardous, plastic recycling streams, reducing their commercial viability. The EU and the UK Government are committed to making substantial improvements in recycling rates in the future to deal with a mounting plastic waste problem.
- PVC does not biodegrade in **landfill;**
- When **incinerated**, PVC may release highly toxic dioxins. Incineration is becoming an increasingly important waste disposal option.
- Because most uses of PVC are long life (30+ years) we are only now beginning to see significant quantities first installed in the 1960/70/80s sent for disposal. A very large quantity is coming to the end of its useful existence and will have to be dealt with, raising its profile significantly.
- Phthalates may be **ingested** by young children if they suck PVC products. The EU has introduced legislation to ban the use of certain phthalates because of concern about their potential impact on their complex endocrine systems

The use of **PVC packaging was banned in the business from 31st December 2002**

2. Phthalates

Phthalates leach from plastic products into the environment which over time results in widespread environmental contamination. Humans are therefore exposed to these compounds through ingestion, inhalation, and dermal exposure.

The results of a US study on the **public's exposure to phthalates**, report that children are exposed to higher levels than adults. The study measured phthalate metabolite levels in urine samples and showed that children have greatest exposure to **dibutyl phthalate (DBP), butyl benzyl phthalate (BBP), and diethyl hexyl phthalate (DEHP)**. Phthalates are known to be reproductive toxicants as well as potential endocrine disrupting chemicals.

As a result of the M&S PVC ban, Phthalates are automatically banned form use. Responsibilites are as above for PVC

3. Antinomy levels in PET

Antimony is a metal, just below arsenic in the periodic system, with which it shares several chemical and toxicological properties.

Following the introduction of the 6th amendment to EC legislation on Materials in Contact with Food (91/128), which set Antinomy levels at 20 ppb. M&S foods worked with the supply base to reduce levels in plastics. A series of independent tests were carried out to demonstrate compliance with the new legislation.

4. Ready Meals

Eight ready meal lines were sent to PIRA to assess the levels of Antinomy in the food content. These were found to range from 25 to <10 ppb. However, PIRA reported that the two test results that were above the set limit were not statistically significant as the measurement error was 8ppb.

Trading standard officers will not progress any investigation where the test results for materials in contact with food are less than twice the limit set out in legislation. Taking statistical variability into account, the above results are well within this remit.

CPET trays are formed by two key suppliers (Faerch and Hutamaki), who both buy the raw material resin from Eastmann. Eastmann have issued a certificate of conformity to current legislation.

2.2 Chemicals that affect board

1 Perfluorinated chemicals (PFOS, PFOA)

- PFOS is a **perfluoroalkyl sulphonate (PFAS)** used in treating textiles, leather, carpet and paper
- Grease resistant board is the only area in Foods Packaging that used Perfluoronated chemistry.
- A risk assessment of **perfluorooctane sulphonate (PFOS)** completed by the Organisation for Economic Co-operation and Development (OECD) has found the chemical to be **persistent, bioaccumulative and toxic to mammals**, and concludes that its properties 'give cause for concern'
- In the US, the environmental protection agency (EPA) proposed a prohibition of the manufacture or import of PFAS which took force in January 2003. The two UK manufacturers of PFOS, F2 Chemicals and Fluorochem, said they no longer manufacture or sell products containing PFOS.
- WWF have run a 'Detox Campaign' on the use of 'non-stick' chemicals in synthetic clothing, particularly children's clothing.

- These chemicals are referred to as perfluorinated chemicals, including PFOA and PFOS, and are used to provide 'non-iron' performance.
- Both PFOA and PFOS have been investigated by the US Environmental Protection Agency for environmental impact and for health risks to end consumers.
- The EPA concluded that there is no reason for consumers to stop using any consumer or industrial related products given current scientific uncertainty.
- The Metro ran an article on 2nd September entitled 'School Uniforms are toxic, say scientists', citing children being exposed to toxic and cancer-causing chemicals in their school uniforms.

- The article stated that uniforms containing perfluorinated chemicals are sold in a range of high street stores, including Marks & Spencer, and are often sold as 'non-iron' clothing.
- Perfluorinated chemicals are also used in food cartonboard packaging, to provide grease resistance. A fact that has not been picked up by the media to date, although is briefly mentioned in the WWF website.

Current Position:

- Marks & Spencer Foods moved away from using this technology over 3 years ago, when an issue was first identified.
- We have worked with the Central Technical Team in Clothing, agreeing with the

standards outlined in the 'Environmental Code of Practise for Dying and Finishing'. Part of the code specifies that neither PFOS nor PFOA are to be used in the manufacturing process of clothing.

- We have completed a full traceability audit of where all carton board is being sourced from. This confirmed that neither PFOS nor PFOA were being used in the manufacturing process of board, used in Marks & Spencer food packaging.
- However, it may be the case that other retailers use such chemicals in manufacturing their food packaging.
- In response to the Metro article, Central Technology in Clothing have issued the following statement to Stores and Retail Customer Services

  'The chemicals mentioned in the article causing concern are not present in our clothing. We go to great lengths to ensure our children's clothing is completely safe.'

2. Benzophenones

On Friday 20th February 2009, the BRC issued a statement that a specific type of Benzophenone (4-methylbenzophenone) had been detected in cardboard boxes (produced in the Netherlands) containing chocolate crunch muesli manufactured in Belgian. The amount of benzophenone detected was 798 ppb (or 0.798 ppm). This is over the **Plastics** Specific Migration Limit for Benzophenone (0.6 ppm) or 0.6mg/kg of food. **There is no legislation for inks or varnishes.** However, Good Manufacturing Practice (GMP) EU regulations states:

1. Printing inks applied to the non food-contact side of materials and articles shall be formulated and/or applied in such a manner that substances from the printed surface are not transferred to the food-contact side:

(a) through the substrate or;

(b) by set-off in the stack or the reel,

in concentrations that lead to levels of the substance in the food which are not in line with the requirements of Article 3 of Regulation (EC) No 1935/2004.

PIRAs view is that the Good Manufacturing Practice regulation can be applied, which means that the '0.6ppm plastics directive limit' could be used in the absence of any other legislation for inks and varnishes.

The Belgian authorities have taken a different stance to other EU members and have impounded goods based on a benzophenone level that exceeds the SML for plastics.

In 2006, the FSA conducted a study of 350 food samples in printed board packaging. Of these, Benzophenone was detected in 61 samples and 18 samples had levels in excess of 1ppm. The FSA calculated (base on an average bodyweight of 60Kg) that

the maximum level found (4.5 ppm SML) equated to a Daily Tolerable Intake of 0.0015 ppm bw (body weight). At that time, the FSA concluded that there was no adverse effect on human health.

A similar calculation of the result found by the Belgian Authorities in February 2009 means that the 0.798ppm SML equates to a TDI of 0.000266 ppm bw. Again, the conclusion would be that there is no adverse effect on human health.

Our Printers

Following the 2006 FSA study we contacted our key printers and requested confirmation that they did not use Benzophenone in printed packaging. Following this most recent event, we have contacted the printers again. Many of the Printers use a SunChemical statement as their response. The response from SunChemical refers to 4-Methylbenzophenone (being absent in their formulations). They recommend the use of low migration inks to ensure that benzophenone and derivatives cannot migrate into food.

We have statements on file that 4-MethylBenzophenone is not used in inks from key printers.

Benzophenone – what is it?

Benzophenone is a generic term used for a group of chemicals, including:

- 4, 4'-bis(dimethylamino)benzophenone (Michler's ketone (MK)
- 4,4'-bis(diethylamino)benzophenone (DEAB).
- 4-hydroxybenzophenone

They act as curing agents that harden the ink or varnish when it is exposed to ultra violet (UV) light during the litho printing process.

Risks

- The FSA carry out studies on the chemical and selected random products for testing, which potentially could lead to the chemical being detected in M&S products:
    - A FSA study in November 2006 found Benzophenone in 61 of 350 tested samples but did not detect 4-hydroxybenzophenone.
    - The FSA stated that the levels of benzophenone in the 61 samples of foods was below the maximum toxicological standard set by an European Commission scientific committee and **do not pose a health risk.**
    - The FSA did not detect 4-Methylbenzophenone in the 2006 study and we have made an assumption that the calculated TDI methodology for benzophenone is the same for 4-Methylbenzophenone.

- The highest risk of migration into food is not from the potential of chemicals across the packaging substrate (from printed side through the board to the pack interior), but between the printed and unprinted side of the packaging. This occurs when the substrate is stacked immediately after printing and prior to storage before use. The potential for migration to food occurs when the substrate is eventually made into packaging.
- Our biggest risk will be where we pack food directly in contact with Food.

Explanation of Legislation and Limits

- There are no specific EU controls for migration from inks and their associated coatings, but there is a Group Tolerable Daily Intake (Group TDI) for benzophenone and 4-hydroxybenzophenone of 0.01 milligram/kilogram (mg/kg) bodyweight (bw).
- The TDI is the amount of substance that can be consumed every day for life without adverse toxicological effect.
- There is specific legislation for food contact plastics, Directive 2002/72/EC, in which there is a specific migration limit (SML) for benzophenone of 0.6 mg/kg
- SMLs are derived from TDIs using the assumption that the average European weighs 60 kg, and consumes 1kg of packaged food per day. Consequently the SML for benzophenone is 0.6 mg/kg of food.
- Sun Chemicals have developed a range of photo initiators through design of molecular structures, where the relatively large molecular size means that the capacity for migration to occur is limited, thereby allowing legislative limits to be met. The range of inks is classed as 'M-Cure' and can be specified by printers. Alternatives form other ink suppliers will be available.

2.3 Chemicals that affect natural materials

1 Methyl Bromide

- Methyl bromide has been used to fumigate facilities and commodities. However, its use is being phased out under the Montreal Protocol (an international agreement ratified by more than 160 countries) due to concerns that it depletes the stratospheric ozone layer.

- Used in fumigation process, the substance is banned from 2005. Any stocks held at ports etc can be used up during 2005. Alternative has been identified: sulfuryl flouride (otherwise known as Profume or Vikane)

2.4 Other chemicals

1 Tin in canned foods

The issue with tin is the affect of product on the dissolution of the tin coating. It is therefore product specific.
Legislation currently states that it is prohibited to sell any food containing in excess of 200 mg/kg of tin (50 mg/kg for canned beverages, and 50 mg/kg for canned processed). This legislation has been in place since 1992 and M&S carried out due diligence testing at that time.

2 Semicarbazides

- Used as a blowing agent in jar gaskets, the substance has been found in some food substance up to levels of 20ppb.

- Semicarbazides have not been tested extensively for toxic affects. However, it belongs to a family of chemicals known to cause cancer in animals.
- Early genotoxicity results show that semicarbazide has weak mutagenic activity, but its relative potency needs to be compared with other known carcinogens.
- Crown Cork and Seal have developed new gaskets that are semicarbazide free. There may be potential drawbacks on opening torques.
- All Food suppliers provided position statements confirming non-use of the blowing agent, or timescales compliant with August 2005 ban.
- On 28 July 2003, EFSA issued preliminary advice on the possible occurrence of semicarbazide (SEM) in certain packaged foods.
- The foods concerned are those packaged in glass jars and bottles closed with metal lids sealed with plastic gaskets that are foamed using the chemical blowing agent, azodicarbonomide.
- Since this date EFSA has set up industry working groups to establish further information and report back to the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food on:

    - Whether the semicarbazide detected in foods was an artefact of the analytical method used to test foods.
    - Levels of semicarbazide in different types of food product and therefore the extent of exposure to the customer.
    - The actual toxicological risk associated with semicarbazide.

- The key supplier of metal lids to our grocery suppliers, Crown Cork and Seal, are part of the industry working party and we have been in constant contact with their technical expert group since July 2003.

- The EFSA met with relevant industry groups on 14 October 2003 published the following findings of the work carried out to date:

Current findings on Exposure and Toxicology

- The current information now indicates that semicarbazide detected in foods is not an artefact of the analytical method used to test foods.
- On the basis of the available evidence, it can be concluded that:

    - Free semicarbazide is formed as a consequence of the thermal treatment of azodicarbonomide.
    - It is present in gaskets foamed using azodicarbonomide.
    - It migrates from these gaskets into foods.

- Foods that have been reported to contain semicarbazide include baby foods, fruit juices, jams and conserves, honey, ketchups and mayonnaise, pickles and sauces.
- Levels of semicarbazide reported in these foods vary from non-detectable (less than 1 ppb) up to 25 ppb.
- Baby foods are reported to have the highest concentrations due to the pack size and therefore higher ratio of gasket to food mass.
- Industry groups are developing estimates of exposure.
- In the interim, a preliminary estimation of the potential exposure to semicarbazide from foods in glass jars and bottles has been made at 2.3 microgrammes/kg body weight/day. This estimate has focused on babies due to higher levels found in baby food and because their food consumption is higher, on a body weight basis, than that of other age groups.
- From the little data available, it appears that semicarbazide is only weakly genotoxic in some test systems in vitro and only a weak carcinogen.
- To date it has not been possible to determine whether semicarbazide may pose a carcinogenic risk to humans.
- However, there is no risk of immediate illness to adults, children or infants from consumption of foods containing semicarbazide. The concern relates to health in the long term because of the possibility that semicarbazides may cause cancer. The risk, if any, has been judged to be very small for both infants and adult consumers.
- Glass jars and bottle with secure seals offer very good protection against microbial risks and ensure a long shelf life, protecting the nutritional integrity of the product.
- Taking into account the information available to date, on the levels in food, intake and toxicology, the risk to consumers eating products containing semicarbazide is likely to be very small.
- Industry groups are working on means to reduce or eliminate semicarbazide in baby foods and ultimately in other foods.
- If alternative technologies are going to be used to reduce or eliminate semicarbazide from foods, it is crucial that the same microbiological standards are upheld.
- There is no reason for consumers, including infants, to change their diet because of the possible presence of semicarbazide in certain foods.

3 Bisphenol A, BFDGE, NOGE, BADGE

On the 8 August 2001 a Directive (2002/16 as amended 2004/13), was published on the migration limits for certain chemical additives used in materials entering into contact with foodstuffs. This would:

- limit migration to 1ppm for BADGE (2,2-bis(4-hydroxyphenyl)propane bis (2,3-epoxy-propyl)) and BFDGE (bis (-hydroxyphenyl) methane bis (2,3-epoxypropyl) ethers) until end 2004 for all applications,
- and ban the use of NOGE (novolac glycidyl ethers) as additives from 1 December 2002

The provisions of this Directive will apply to the following materials and articles:

- materials and articles made of any types of plastics,
- materials and articles covered by surface coatings,
- Adhesives manufactured or containing one or more BADGE, BFDGE or NOGE or their derivatives.

Since that date, the following has been carried out:

NOGE was banned in December 2002. Substance has been banned in M&S foods Packaging.

- BFDGE migration limit is 1ppm as of the end of 2004.
- BADGE migration limit is 1ppm as of the end of 2004.
- Bisphenol A is used in can lacquers. The specific migration limit is 0.6 milligrams per kilogram of food. The tolerable daily intake level is 0.01 milligrams per kilogram of food. Independent testing program for M&S foods was initiated and results demonstrate that the chemical is well within this limit. Results are held on file.
- In November 2005 a new directive was issued that banned BFDGE from 1st January 2006 and set the migration limit for BADGE at 0.15ppm.
- In February 2006, the foods standards agency published a guidance note that stated the following:

The European Regulation now permits the use of (BADGE) in food contact plastics, adhesives and coatings, providing any migration is within a specific migration limit of 9 milligrams per kilogram of food of food simulant, including its hydrolysed derivatives. This limit can be taken as 9 milligrams per six decimetres squared in certain cases.

This applies where articles are containers, or are comparable to containers, which can be filled with a capacity of less than 500 millilitres or more than 10 litres. It also applies to sheet film or other material, which cannot be filled, or for which it is impracticable to estimate the relationship between the surface area and the quantity of food with which the material is in contact. Where BADGE migration occurs with particular chlorohydrins the sum of their migration may not exceed 1 milligram per kilogram of food or food simulant or I milligram per six decimetres squared in the specific cases above. The EC

Regulation permits trade in the use of materials and articles containing BADGE throughout the EU from 1 January 2006 and re-affirms the ban on the use of BFDGE (Bis(4-hydroxyphenyl)methane bis(2,3-epoxypropyl)ethers) and NOGE (Novolac glycidyl ethers).

The EC Regulation also requires that, at the marketing stages but not the retail stage, materials and articles containing BADGE and its derivatives shall be accompanied by a written declaration in accordance with Regulation (EC) No. 1935/2004 (Article 16). Compliance must be documented and that documentation has to be made available to the competent authorities on demand.

4 ESBO

- ESBO is Epoxidised Soya Bean Oil. It is used as a stabilizer in PVC gasket seals for metal lids on glass jars. Its purpose is to prevent microbioloical and foreign body contamination in the food product.

- The issue is that ESBO can migrate from the gasket seal to the food product. Oil and Fatty foods are the highest risk products.

- However, toxicology work has shown that there are no mutagenic or geneotoxic effects in humans.
- The EFSA have stated there are no health risks associated with ESBO. However, it has been found at higher levels in food product than the limit of 60mg/kg through new testing methods. The EFSA recommend that industry should act to reduce these levels in line with legislative requirements.

Appendix 3.0 List of chemical abbreviations

BADGE:	2,2-bis(4-hydroxyphenyl)propane bis (2,3-epoxy-propyl)
BFDGE	((bis)-hydroxyphenyl) methane bis (2,3-epoxypropyl) ethers
DIBP	***Di Iso Butyl Phenol***
ESBO	Epoxidised Soya Bean Oil
NOGE	Novolac glycidyl ethers
PET:	Polyethylene terephthalate
PCP	Pentachlorophenols
PFOS	Perfluorooctane sulphonate
PVC:	Polyvinylchloride

Appendix 4.0 Sun Chemical Statement relating to 4-methylbenzophenone

4.1 Background

On 3rd February 2009 the RASFF (Rapid Alert System for Food and Feed of the European Commission) notified an incidence of migration of 4-methylbenzophenone from cartons produced in The Netherlands into cereals manufactured in Belgium. The package consisted of a carton board outer layer, printed and coated with UV curable product, with the packaged goods retained within a flow wrap. The level of migration was considered excessive when viewed against relevant EU Regulations[1]. Following this notification many users of UV curable products are seeking assurance that the UV curable inks and coatings being supplied for printing of their products for food packaging applications specifically do not contain 4-methylbenzophenone. In addition, information is being sought about benzophenone and substituted benzophenones.

4.2 What are benzophenone and substituted benzophenones?

Benzophenone has been used as a photoinitiator in UV inks and coatings for many years and is a very well categorised material. It is a permitted food additive with an EU flavourant number (FL No. 07.032), assigned specific migration limit (SML 0.6mg/kg food) and tolerable daily intake value (TDI 0.01mg/kg bodyweight). For benzophenone, therefore, the basis for risk assessment in use is available should the need arise. Products formulated with benzophenone are not usually recommended for primary food packaging applications. **Sun Chemical Europe has not used benzophenone in UV curable offset inks for more than 8 years.**

Benzophenone (CAS No. 119-61-9) and substituted forms, of which 4-methylbenzophenone (CAS No. 134-84-9) and 4-hydroxybenzophenone (CAS No. 1137-42-4) are examples, are frequently components in a complex mixture of photoinitiators that are used to initiate the curing of UV inks and coatings. These materials do not cure into the film, so under certain packaging scenarios are available to migrate.

Benzophenone can be replaced by low molecular weight substituted benzophenones in some formulations and products made this way are often referred to as 'benzophenone-free'. Note, these are not necessarily low migration products. Most substituted benzophenones have only limited toxicological data associated with them, which is insufficient to support migration above 10ppb (10µg/Kg of food) when the most relevant regulatory instruments are applied. On this basis, where migration above the statutory limit might occur, products containing low molecular weight substituted benzophenone are not recommended for primary food packaging applications and are only suitable for secondary packaging if tested in conditions of use and migration shown to be below the limit. Where doubt exists, low migration products should be used.

In low migration formulations supplied by Sun Chemical the photoinitiator components are polymeric and when correctly used[4] these initiators do not migrate.

4.3 Sun Chemical position

Sun Chemical Europe does not use 4-methylbenzophenone or 4-hydroxybenzophenone in products intended for food packaging

Sun Chemical is the industry leader in the development and supply of printing inks and coatings for all types of food packaging. For primary[2] food packaging and secondary packaging where there is no functional barrier[3] we strongly advise the use of low migration products. When correctly used[4], low migration products avoid migration of unwanted or undesirable ink and coating components into the foodstuff and comply with all current and expected future legislation.

Specifically for Energy Curing printing processes, Sun Chemical proposes **SunCure® ULM** and **FLM** UV offset inks, **Solarflex SFLM** UV Flexo inks and **SunBeam® ELM** EB curable inks, together with **SunCure® LM coatings**. SunCure® UV curing low migration products are based on low migration photoinitiator technology. **These ink series are formulated without the use of benzophenone or substituted benzophenone.**

Sun Chemical Europe 25 February 2009 Cray Avenue, St Mary Cray, Kent, BR5 3PP, UK Tel: +44 (0)1689 894000 Fax: +44 (0)1689 894020 www.sunchemical.com ENERGY CURING PRODUCTS **Inks & Coatings**

Where printing with conventional inks is a viable alternative, Sun Chemical propose Irocart LMQ inks, which are also based on patented materials and are specifically designed for low migration printing. Low migration SunCoat™ water-based coatings are available for use with both technologies.
Both our Energy Curing and Conventional low migration ink and coating solutions have been validated for food packaging by accredited expert third party institutes[5].

4.4 What is migration?

Migration is the transfer of substances from the packaging to the packaged goods. Migration is usually at trace levels and may not be detected in organoleptic (taint and odour) testing or when consumed, but may be found by sensitive chemical analysis. Migration can occur through a number of mechanisms and may be influenced by many factors including package design, choice of substrate, ink and coating coverage, nature of the packaged goods e.g. dry food, high fat or sugar content, liquid, how long the product is packaged and storage conditions, especially temperature.

Detailed information on migration and best practices for printing low migration packaging can be found in the Sun Chemical brochure "Print for Packaging – Low Migration Printing", available by contacting sheetfed@eu.sunchem.com.

4.5 Regulatory Issues

In Europe, packaging that is intended to come into contact with food must meet the requirements of EU regulation 1935/2004/EC. In general terms, this regulation outlines the guiding principles that food packaging should not transfer materials to the packaged goods in quantities that bring about a change in nature, substance or quality of the food and must not be injurious to health. EU Regulation 1935/2004/EC has legal status in all EU member states. Those responsible for supplying the packaged goods, the packaging manufacturer and the food manufacturer that distributes the product, are responsible for ensuring the requirements of the regulation are met. In addition, they are obliged to observe Good Manufacturing Practice (GMP) as defined in EU Regulation 2023/2006/EC. GMP not only refers to the control of the processes used in manufacture but also to the need to ensure appropriate selection of materials for the intended end use of the product. This includes the use of printing inks and coatings in the manufacture of food packaging[6].

1. Please refer to EU Regulation 1935/2004/EC and 2003/2006/EC
2. Primary food packaging is defined as packaging material that comes into direct contact with the packaged goods. Secondary packaging is the outer layer of packaging, frequently printed but not in direct food contact. For secondary packaging it is expected that the packaged food will be retained or restrained within some form of primary packaging, for example a tray or flow-wrap.

3. Where secondary packaging is in use, there remains a risk of migration from the printed material if the primary retaining layer is not a barrier to migration. For example, most polyethylene flow wraps are not effective barriers. Examples of effective barriers are metallised polyester film or laminated structures that contain a continuous layer of aluminium.
4. Correct use assumes the products are used and printed according to good working practice and all inks and coatings are effectively dried or cured.
5. Examples of certification available upon request. Sun Chemical will also help customers to validate product performance in conditions of use by co-operating under strict confidentiality and non-disclosure agreement with their chosen accredited expert third party analyst.
6. Selection of inks and coatings for printing of food packaging requires an understanding of the risk of migration of components from the printed package to the packaged goods. Depending on packaging construction, this can vary from little or no risk, to some risk and even high risk with some types of product and packaging. There are no clear definitions but review of the construction of the package and its interaction with the contents can provide some guidance. As a basic working principle where food packaging is concerned, it is always best to avoid direct contact between print and package contents.