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W. R. Grace & Co.

BPA-NI CAN COATINGS

AsiaCanTech 2013

The Technical Conference and Exhibition that brings together global suppliers, can makers and fillers from across Asia

Surabaya, Indonesia 11-13 Nov, 2013

BPA Regulatory Status

BPA Regulatory Status in EU

EU – BPA for food contact

- European Food Safety Authority (EFSA) reconfirmed BPA is safe to use in food contact materials.
  - Exposure assessment issued July 2013 for public comment
  - Final opinion due after 2014 public consult of risk assessment
- France, Sweden, Belgium have acted unilaterally to restrict use of BPA in infant food packaging [0-3yrs].
- France has gone further;
  - Effective ban for infant baby food packaging Jan 1st 2013,
  - **Ban for food packaging Jan 1st 2015.**
  - **BPA labelling to be implemented during 2014.**

European CHemicals Agency (ECHA)

- ECHA: Community Rolling Action Plan (CoRAP)
  - Assess concerns related to potential persistency, bioaccumulation and toxicity (PBT), endocrine disruption, or carcinogenicity, mutagenicity and toxicity to reproduction (CMR) of chemicals.
  - **BPA added to the 2012-2014 list for investigation as an endocrine disruptor**

All add to continuing uncertainty related to BPA

Further questions...

A seemingly never ending stream of questions related to the safety of BPA containing packaging.

Many scientific studies confirm safety in use of the material at the extremely low levels of exposure, but the 'hazard' steals the headlines.

Repeated scientific studies support continued use of BPA based materials for direct food contact but brand owners face a stream of questions related to BPA. Some major brands are now tired of seeing their valuable brand names linked to BPA.

Combination of French 'law' and brand owner pressure is forcing clients to act.

BPA Regulatory Status in North America – Federal Level

Canada

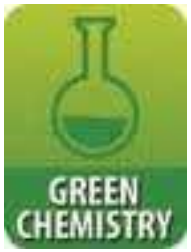
- Canadian government has confirmed the safety of BPA in all food contact applications as of October 2012

US Food and Drug Administration (FDA)

- Reconfirmed the safety of BPA in March 2013; however, effective July 12th 2013 the agency will not permit BPA based epoxy resins as coatings in packaging for infant formula.
- The FDA notice made clear that the decision is not related to BPA safety, but based solely on a determination that manufacturers are no longer using BPA-based epoxy resin coatings in infant formula packaging (**Abandonment principle**).
- This dual decision has been read as contradictory by the public opinion and has fueled the press and social media creating further uncertainty about the safety of BPA

Again in NA, uncertainty related to BPA in the minds of many

Green Chemistry Laws



Green Chemistry Laws in various states- a new initiative to put BPA under Chemicals of Concern category.

What is Green Chemistry and Green Chemistry Law

- The processes that reduce or eliminate the use or generation of hazardous substances
- Ultimate goal is hazardous chemical de-selection throughout the supply chain.

Chemicals of Concern

- Based on hazard categorization. Especially carcinogens, mutagens and reproductive. **More recently: focus on bio-persistence, endocrine, disruptors**

Priority Chemical Lists

- Lists of chemicals designated by states for immediate focus, requiring extra reporting and alternative assessments for covered products containing these chemicals

Goal of State Green Chemistry Laws

- Most state legislation focuses on children's products. But doesn't stop there- Nursing mothers, breast cancer patients, etc

Green Chemistry Laws- created in response to perceived failure of federal regulations to protect against exposures from consumer products

State Level BPA-Green Chemistry Legislative & Regulatory Activity*

**Based on public information last updated in June 2013*

State Bans Passed to date (since 2009)

- CT*, DC, DE, IL**, MA, MD*, ME, MN, NY, VT*, WA, WI (* Infant formula; **rescinded)

Current active BPA Ban States

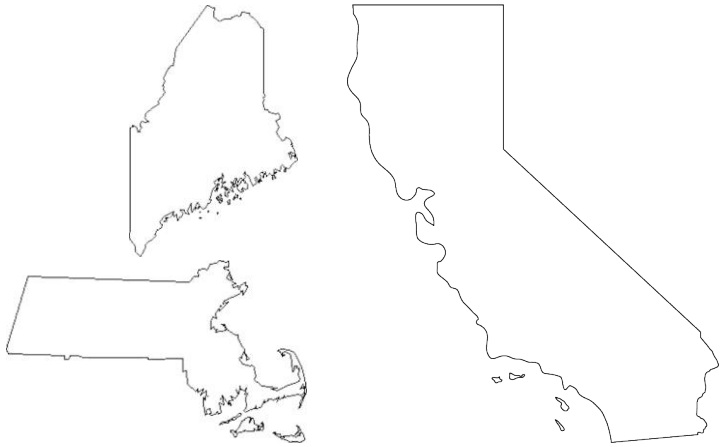
- DE, MA, ME, MN, NV, NY, PR, TN

Current active Green Chemistry/Chemical Reform States

- CA, DE, MA, ME, MN, NY

BPA Bans- Overview

- **BPA Bans: 50 pieces of legislation in 15 states**
- Green Chemistry/Chemical Reform: 38 pieces of legislation in 16 states
- Chemical Regulations: 5 states



NA 'Green Chemistry' legislative approach driving change, not based on scientific risk assessment principles

BPA-NI Can Coatings: Where are we today?

BPA NI: Current perspectives, where are we today?

Clients converting, adoption of BPA NI materials is increasing. Driven mainly by food sector brand owners, personal care sector following.

Brand Owners push

- Major International brand owners have already taken the decision to switch to BPA NI

BPA NI pack performance

- Products are fully commercial, volume increases year on year
- Generally good performance being seen, suitability for a wide ranges of food types proven **with some limitations**

Operational issues - use in can plants

- BPA NI products generally stable
- Incompatibility with 'universal' wash-up solvents
- Some materials tend to be more sensitive in use

Contamination

- BPA NI potential for cross – contamination must be recognized

BPA-NI – very early stages of commercialization. Experience to date generally good

BPA NI: Pack performance - perspectives

Trials continue in all regions, Grace BPA NI materials are commercial.

Between 2008 and 2012

- Most North American/EU customers initiated qualifications as far back as 2008. No shortcuts were taken – Qualifications have taken years.
- 100's of coating application trials – 'fine tuning' ongoing as part of the product development process
- 1000's of customer pack tests – learning about new systems, the suitability and limitations of the newer technologies

  Data gathered to date prove materials are commercially usable and are expected to support further conversions to BPA NI during 2013

2012 and onwards

- Rate of customer trials rapidly increased
- Coatings assessed for a wide range of food types/simulants including; fruits, vegetables, sauces, pet foods as well as protein containing foods such as meats, fish & sea foods
- Some pack limitations, difficult pack types managed by use of combinations of chemistries and multi-layer (2 & 3 coat) systems

Clients gathering experience, product development continues

BPA NI - Operational issues

Running BPA NI materials is generally straightforward, but users need to be aware of the particular issues relating to the use of these new chemistries

- **Product stability & characteristics**
  - In general, BPA NI products are stable and require no special handling.
  - Generally more sensitive, (e.g. heat), foaming tendencies, cratering and surface defects
- **Thinners and wash-up materials**
  - “Universal” wash-up and thinners are not compatible with several BPA NI systems,
  - Most of the resins used are simply insoluble in these types of ‘universal’ thinner
  - Users to carry a wider range of specific solvent types for cleaning and wash-up processes.
- **Segregation of Production**
  - Segregation of BPA NI production is advisable.
  - Use of a material containing BPA on any part of the package means the package contains BPA.
  - Cleanliness and careful control of coatings and coating/printing lines is required
  - Audit existing materials to verify BPA content.

Normal production processes – but careful management of plant & materials

BPA NI – Cross contamination

BPA NI materials and sheets coated with BPA NI materials can be easily contaminated, necessary precautions should be considered in a production environment.

Level of analytical detection

- BPA detection levels now at the “parts per billion” (ppb) level
  - Parts per million = detection at a level of 1 gram in 1 metric ton
  - Parts per billion = detection at a level of 1 gram in 1000 metric ton

Cross Contamination

- Potential for “cross contamination” with BPA containing materials is an issue requiring users to carefully consider in a production environment;
  - Dedicated stirrers
  - Dedicated lines (coater and oven)
  - Extremely low levels of contamination can and will be detected.

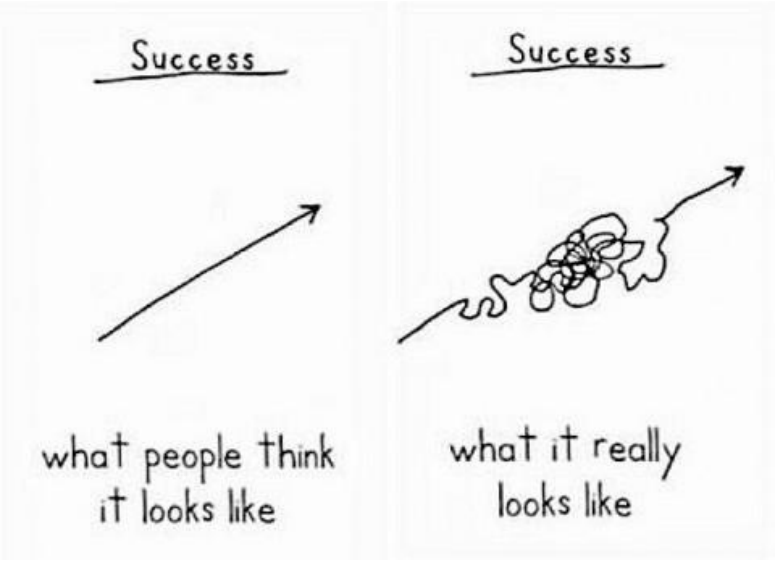
Steps must be taken to ensure materials segregated and equipment cleaned

BPA-NI Can Coatings: Our experience

BPA NI experience

Primary fully commercial products;

- Apperta 1883
  - Gold polyester top coat for FAEOE's system
  - Single coat for standard ends and bodies
- Apperta 1882
  - Gold polyester primer
- Apperta 1917
  - Aluminised organosol top coat
- Apperta 1918
  - Aluminised polyester primer
- Apperta 1884
  - Gold organosol top coat
- Darex SE1169-101
  - White external basecoat
- Darex PR1159
  - Clear print primer for UV and conventional printing
- Darex OV1820
  - Clear polyester overprint varnishes
- Darex PO1787-11/14
  - Aluminised organosol internal coat for DRD & ends



Newest product launches

- Apperta 2282*
  - White internal for 3pc body and ends
  - Basecoat for FAEOE's
- Apperta 2018*
  - High flex internal white
  - * Use with clear top coat Apperta 2040 or 2050
- Apperta XT 2014/2019
  - External gold/clear for FAEOE's

Volumes growing, product range widening, results good, gathering experience

DAREX Packaging Technologies – BPA NI system examples

Double-coat systems *Single-coat*

pH Scale

1 2 3 4 5 6 7 8 9 10

High acidity packs

Double-coat – PE/Org system - Gold
Apperta® 1882 7 to 9 gsm 190°C curing
Apperta® 1884 7 to 9 gsm 205 °C curing

High acidity packs - Highly sulfurous

Double-coat – PE/Org. system – Alum.
Apperta® 1918 7 to 9 gsm 200°C curing
Apperta® 1917 7 to 9 gsm 205 °C curing

Medium acidity packs

Double-coat – Polyester system – Gold
Apperta® 1882 7 to 9 gsm 200°C curing
Apperta® 1883 7 to 9 gsm 200 °C curing

Fishy, oily contents

Double-coat – Polyester system– Alum.
Apperta® 1918 7 to 9 gsm 200°C curing
Apperta® 1920 7 to 9 gsm 200 °C curing

Single coat - PE system
Apperta® 1883 Gold
8 to 9 gsm 205°C curing
Apperta® 1920 Aluminized

For aluminum/TFS substrates

Broad overview of food types and Apperta® BPA-NI Systems

BPA-NI Can Coatings: What's next?

BPA NI: Next Steps

Sharing experiences, building on learning:

- Today, 5 year packing and test history, further pack testing ongoing, some with 2-3 years commercial experience
- As 1st generation materials are being adopted, developments continue and improvements made. **Filling product portfolio gaps**.
- Better can manufacturing practices emerging, further improving overall BPA NI package performance

Demands for BPA NI materials continue:

- Regardless of legislation to meet brand owner demands
- As industry gains experience. As confidence in using BPA NI materials grows, the rate of adoption will quicken
- Despite BPA containing materials forming our industry performance benchmark.

Despite challenges, BPA NI adoption continues

Future products

Product developments continue:

Internal systems

- New materials to address limitations of BPA NI materials for high acid packs PL2025
- New internal white IW2282
- New internal clear PL2040

External systems

- New external/internal BPA NI clear PL2019 and gold PL2014 to provide BPA NI external solutions

Closure systems

- New crown closure adhesion lacquer AL2002 and varnish OV1961 systems

Future – a period of uncertainty & risk

Uncertainty

- Industry needs consistent legislative frameworks under which business and international trade can be conducted –
- European regulatory frameworks are being undermined by actions of member states.
- Hastily imposed legislation, limits of detection, test protocols, scope of law all unclear.
- Products evaluated over many years by countless bodies and considered ‘safe’, now being questioned. ‘Media’ and ‘politics’ overruling sound scientific evaluation.

Risk

- Moving away from known BPA based coating materials is a major technical challenge, it is not simple, answers to many technical challenges are still being sought.
- Timescale for change is short, full pack testing cannot be done in just 6-12 months.
- Who is to say newer materials are safe? By what criteria are they judged as safer than BPA based materials? (Toxicological evaluation of alternatives ongoing)
- Alternative chemistry coatings exist, applications need to be carefully evaluated prior to full scale commercialisation to ensure pack integrity and consumer safety.

Act early, test thoroughly, ensure continued integrity and safety of metal packaging

Thank you

謝謝

Terima Kasih

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Salamat

धन्यवाद

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