RoHS, REACH and Reason

Potential impact of European regulations on the Surface Finishing industry

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We should get rid of all these chemicals!!

YES!!

Let’s start with the big ones!

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Growth in ESOH regulations

- EU regulations include
  - ELV (End of Life Vehicles)
  - WEEE (Waste Electrical and Electronic Equipment)
    - RoHS (Reduction of Hazardous Substances)
  - REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals)
- Note: The names are getting loooonger!

- What matters is not just number of regs, but scope
Regulations have different purposes in US and Europe

**US REGULATIONS**
- Tend to regulate processes to control emissions or protect workers
  - Clean Air Act reduction in Cr\(^{6+}\) emissions from plating and finishing
  - OSHA Cr\(^{6+}\) PEL for worker exposure
- Except CA RoHS

**EUROPEAN REGULATIONS**
- Tend to regulate materials to reduce landfill, groundwater contamination
  - ELV, WEEE, RoHS
- To regulate chemicals in consumer products
  - REACH
- China RoHS
The Precautionary Principle –
the basis for EU environmental regulations

US
- Science-based and risk-based
- Requires pathways to ingestion or into the environment
- Remedies must be cost-effective
  - Benefit must be commensurate with cost

EUROPE
- Precautionary Principle
  - Not defined in legislation
  - “If an action or policy might cause severe or irreversible harm to the public, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action”

Various other formulations of the PP, but all similar
Or – Whoever screams loudest wins

- Note that the PP considers only negatives, not positives. There is little consideration of cost-benefit
  - Discourages political or engineering compromises
- A single perceived problem with a technology or material overrides any number of advantages or benefits.
  - Discourages better products – nothing can ever be perfect
- Since science is never certain, fact and reason become irrelevant, which in practice leads to the Legg version of the Precautionary Principle:
  - “Screaming trumps science”

“We cannot consider GMOs harmless until harmful effects are fully proven.”  (Greenpeace, 1999)
Huh?
RoHS – Reduction of Hazardous Substances

<table>
<thead>
<tr>
<th>Substance</th>
<th>Max conc (wt.%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>0.1%</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.1%</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.01%</td>
</tr>
<tr>
<td>Hexavalent chromium</td>
<td>0.1%</td>
</tr>
<tr>
<td>PBB(^1) <strong>flame retardant</strong></td>
<td>0.1%</td>
</tr>
<tr>
<td><strong>PBDE(^2) flame retardant</strong></td>
<td>0.1%</td>
</tr>
</tbody>
</table>

1 PBB: polybrominated biphenyl
2 PBDE: polybrominated diphenyl ether

Max concentration in any Homogeneous Material, i.e. in any coating layer (not in the whole item)
RoHS

- Strictly covers electrical systems and vehicles, but these days that is almost everything

- RoHS (and its companions WEEE and ELV) have led to elimination of Cd and Cr\(^{6+}\) from cars

- Forcing consideration of alternatives to Cd and Cr\(^{6+}\) for everything else (including aircraft)
  - Initially Cr\(^{6+}\) alternatives not very good
  - Now many Cr\(^{3+}\) and non-Cr finishes are as good as chromate, but more sensitive to produce
RoHS and Pb-free solder

- Eliminating Pb from solder is most far-reaching effect of RoHS
  - Changes all electronics manufacturing across the globe
  - Aerospace, defense and some other uses are “exempt”, but exemption is largely irrelevant as leaded solder becomes less and less available
- Major issues with Sn whiskers and concern over long term fatigue
  - Many failures are very long term and unknown
  - Reliability of critical electronics worldwide at risk

How many people have died from Pb solder? How many will die from eliminating it?
REACH – basic principles

- Information tracking
  - Keep track of how much of every substance you import or make in the EU
  - How much of anything is in everything

- Reporting up and down the chain
  - Provide chemical and toxicological info up and down the sales and use chain (in some cases to public)

- Registration (>1 tonne/yr)
  - Register both for chemical and use – no registration no use
  - Develop toxicological data (cost, data shared between registrants)

- Pre-registration
  - Make sure all substances you use are pre-registered with the ECHA by Nov 30, 2008

- Authorization (no weight minimum)
  - Certain substances of Very High Concern (SVHCs) cannot be used unless Authorized
REACH is European – why should we care?
Because the reach of REACH is global

- In a global market European control over materials used in manufacturing or on products subjects everyone to the Precautionary Principle
- This means that the costs of products we purchase will increase to pay for REACH compliance
  - Because it raises the cost of global products, everyone who buys products effectively pays a “tax” to the EU to satisfy the REACH requirements and maintain the REACH infrastructure
- Everyone will be denied the benefits of the better products that REACH makes unaffordable
Surface finishing chemicals sold into Europe

- These are “Preparations” and are subject to all the reporting and registration rules
- Register any substance > 1 tonne/yr
  - Pre-register before Nov 30, 2008
- No Annex XIV material can be used without authorization
  - Almost certain to include Cr$^{6+}$, Cd
  - Also eventually Be alloys
  - Will discuss Annex XIV later
Does REACH affect Surface Finishers?

- But for surface finishers, isn’t there an “Article Exemption”?
  - Unless the substance is intended to be released you do not even have to notify ECHA* unless
    - You import > 1 tonne/yr of the substance AND
    - It is > 0.1 wt% of the article
    - And, by the way, is that 0.1% of a screw of 0.1% or a ship? Different countries disagree
  - What surface finish weighs > 1 tonne/yr?
  - How often is a coating or finish > 0.1 wt% of the whole part?
    - Paints on planes, perhaps?

- So we’re off the hook, right?
  - Well, no actually......what about the dreaded Annex XVII and Annex XIV substances?

* ECHA – European Chemical Agency, Helsinki, Finland

See, it does have to do with Finishing!
Annex XVII

RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, PREPARATIONS AND ARTICLES

- Annex XVII is an ever-expanding list of all the “nasty stuff” whose use is restricted in some way
  - CMRs (Carcinogenic, Mutagenic or toxic for Reproduction) are SVHCs (Substances of Very High Concern)
  - Aim is to restrict their use and ultimately replace (ban) them
  - Cd plating is an Annex XVII substance, not permitted on vehicles but still allowed on aircraft and some electronics (para 23)
  - All substances in Directive 67/548/EEC (Classification, packaging and labelling of dangerous substances) classed as
    - Carcinogenic, Mutagenic or Reprotoxic, Category 1 or 2
    - Cr\(^{6+}\) materials
    - Ni and Ni compounds when in contact with skin
      - Even if overcoated, if Ni can still release
Why are the Ni rules such a concern?

- Dangerous Substances Directive (88/379/EEC) is built directly off (67/548/EEC)
- Any substance that ends up in it will end up being restricted under REACH, with the ultimate aim of banning it if possible
- Hence the concern over Ni and Ni compounds
  - Not just a labeling issue
LIST OF SUBSTANCES SUBJECT TO AUTHORIZATION

- Nothing in this Annex can be used unless EU authorizes it.

A manufacturer, importer or downstream user shall not place a substance on the market for a use or use it himself if that substance is included in Annex XIV, unless:

(a) the use(s) of that substance on its own or in a preparation or the incorporation of the substance into an article for which the substance is placed on the market or for which he uses the substance himself has been authorised (Article 56)

No limits, no percentages, no ifs, ands or buts.
How do you get a substance authorized?

1. Show that the risk from using the substance can be adequately controlled throughout its life cycle
   a) can only claim this if there exists a safe level
2. Show that
   a) the socioeconomic benefits of using the substance outweigh the risk, AND
   b) there are no suitable alternatives that are economically and technically viable.

- That is a tough row to hoe
- And authorizations are not permanent
  - Expect to lose authorization once they believe there is an alternative.
What is in Annex XIV?

- **NOTHING!!**
- When will there be anything in it?
  - Originally June 09, may be as early as fall 08 or late as Dec 09
- What will be in it?
  - Nobody is sure yet:
  - A lot of organics nobody can pronounce
  - Cr\(^{6+}\) possibly in first group
  - Cd very likely in near term
  - Be likely a bit later
  - Pb likely a bit later
  - Ni?? First against the wall when the revolution comes?
    - Like Sirius Cybernetics Corp

"I’m so depressed” Hitchhikers Guide
Creeping paralysis

Legg Corrosion Principle:
“Any material active enough for corrosion control will be a health and environmental hazard”
The silver lining

- (Ag is not restricted – even for linings)
- Excessive rules could force manufacturing and repair out of EU
  - Too difficult
  - Too expensive
  - Too uncertain
- US industry can step in to take some of that business
  - Will this open up western Russia as a manufacturing area?
  - Greenland will work well as a manufacturing center once the ice melts!
    - Back to good old Lief Ericksson’s day!

More info: www.hazmat-alternatives.com

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