



## Global **Passivate** Requirements and Trends

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## Presentation overview

- **Legislation**
  - Why are these changes being made?
  - Implications for the metal finishing industry
- **EH&S issues**
  - What (if anything) should we do ?
- **Global trends**
  - What is everyone else doing?
- **Performance comparison**
  - How does trivalent compare to hex?

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## Directive's Background

- Three Major Directives from European Union
  - Restriction of Hazardous Substance (RoHS)
  - Waste Electrical & Electronic Equipment (WEEE)
  - End of Life Vehicle (ELV)

Restriction of Hazardous Substance (RoHS), Waste Electric and Electronics Equipment (WEEE), and End-of Life Vehicle (ELV) Directives will be implemented in 27 Member Nation States by 2007. Potential market of **490 million people**

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## Directive timeline overview

- **RoHS**
  - Effective Date - 1 July, 2006
  - Six hazardous substances are covered - lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls) and PBDE (polybrominated diphenyl ether)
- **WEEE**
  - Effective date - 31 December 2006
  - Electrical & Electronic Equipment (EEE) means equipment which is dependent on electric currents or electro-magnetic fields
  - Categories covered - small and large household appliances, IT and telecommunication, consumer equipment, tools, toys, leisure and sport equipment, medical devices, monitoring and controlling instruments, etc.
- **WELV**
  - Effective Date - 1 January, 2007
  - Purpose is the prevention of wastes from vehicles and the reuse, recycling and other form of recovery to reduce waste
  - Annex II is periodically revised - 6/02, 1/05, 6/05, and 9/05 based on new technology and available alternatives

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## Facts about environmental compliance

- Many people mistakenly think this restriction of hazardous substances from all new automotive, electrical or electronic equipment only affects European Union countries.
- In fact, at least 23 states in the U.S. are considering legislation of this type. California may have a law in place by 2007. Canada, China, Japan and Taiwan are also expected to have RoHS regulations.
- In addition, environmentally conscious companies, not bound by legislation, are actively transitioning away from trivalent chrome. These include Harley Davidson, Caterpillar and others

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## Chrome Chemistry

- **Hexavalent Chrome (Cr<sup>+6</sup>)**
  - Toxic, carcinogen, targeted for elimination
- **Trivalent Chrome (Cr<sup>+3</sup>)**
  - Far less toxic, essential for good health
  - Best available technology without Cr<sup>+6</sup>
- **Chrome Metal (Cr<sup>0</sup>)**
  - Not part of the discussion



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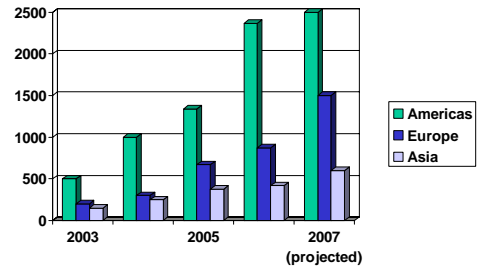
### Health hazards associated with hex chrome

- NIOSH considers all Cr(VI) compounds to be potential occupational **carcinogens**.
- An increased risk of **lung cancer** has been demonstrated in workers exposed to Cr(VI) compounds.
- Other adverse health effects associated with Cr(VI) exposure include:
  - Dermal irritation, skin ulceration, allergic contact dermatitis, occupational asthma, nasal irritation and ulceration, perforated nasal septa, rhinitis, nosebleed, respiratory irritation, nasal cancer, sinus cancer, eye irritation and damage, perforated eardrums, kidney damage, liver damage, pulmonary congestion and edema, epigastric pain, and erosion and discoloration of the teeth.

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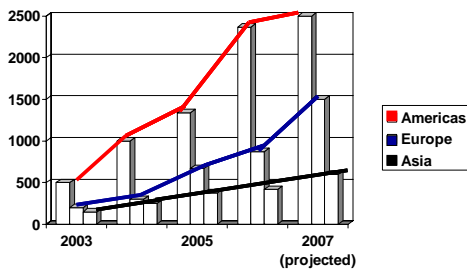
### Global trivalent passivate sales (US Gallons x 1000)



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### Growth trends



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### Global trends: Overview

- North America was the quickest to adopt change
- European transition was slower, but ramping up
- South America, following the lead of Europe, is just beginning the transition
- Asia has been slow, but steady. Primarily as a result of work transitioning to low cost countries as directed by NA and European OEM's

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### Global trends: What is changing?

- **Zinc plating**
  - Trivalent conversion coatings for corrosion protection
- **Mechanical plating and galvanizing**
  - Trivalent conversion coatings for corrosion protection
- **Zinc alloy plating (Cd replacement)**
  - Trivalent conversion coatings for corrosion protection
  - Non chrome conversion coatings prior to paint

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### Global trends: continued


- **Aluminum and it's alloys**
  - Trivalent and non chrome conversion coatings for corrosion protection and pre-paint applications.
- **Magnesium**
  - Non chrome conversion coatings prior to paint
- **Zinc based diecastings**
  - Trivalent conversion coatings for corrosion protection
  - Non chrome conversion coatings prior to paint

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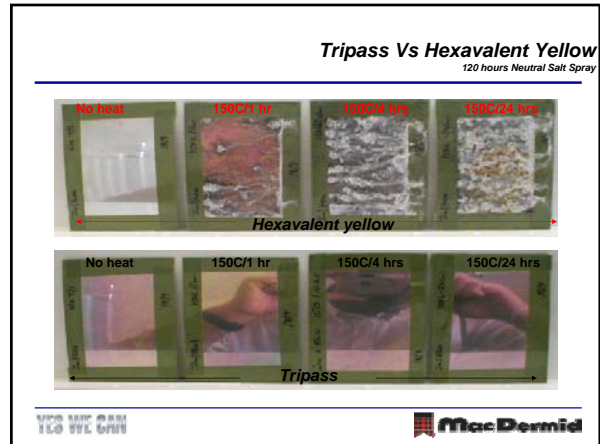
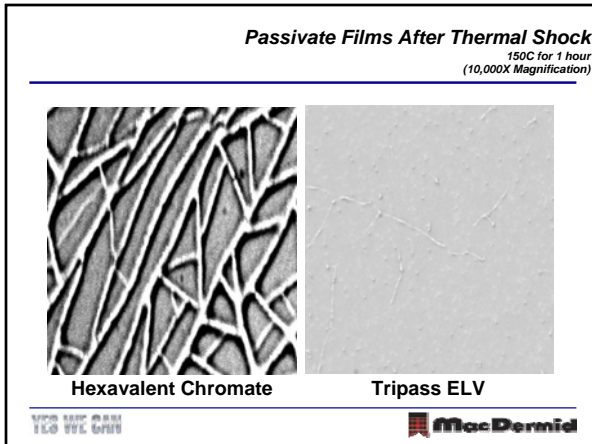
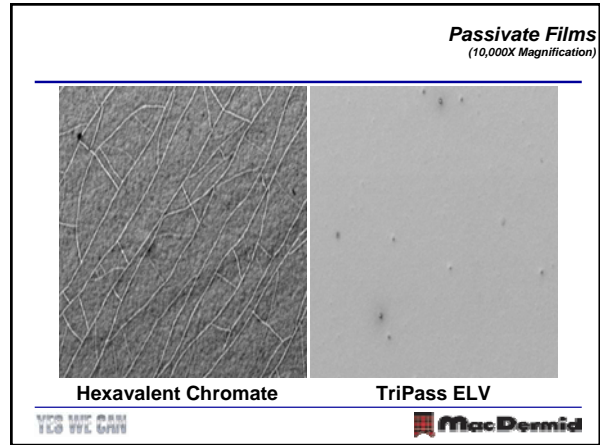
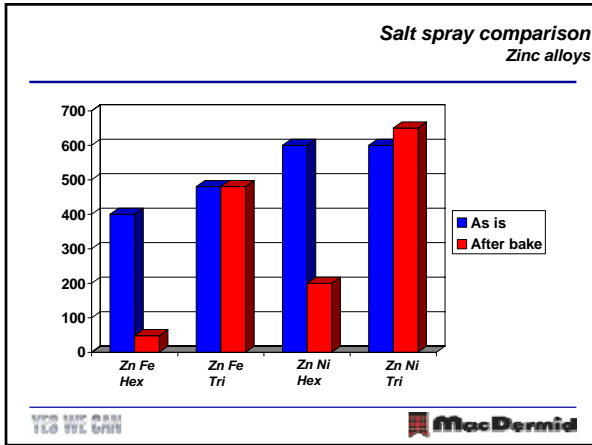
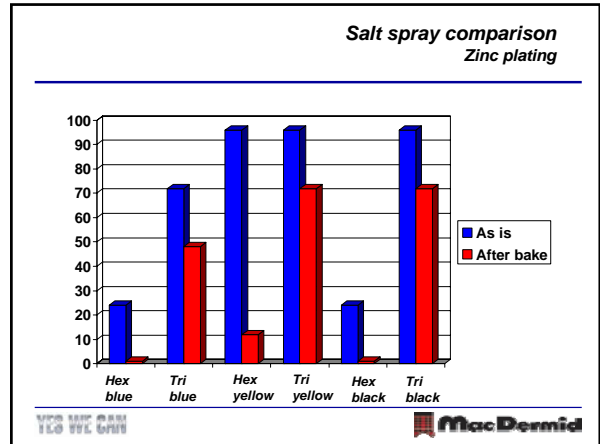


### Trivalent passivates: how are they different

- Appearance
- Build thicker films
- Outstanding corrosion protection
- Good absorbance characteristics
- Thermal shock resistance



YPO 100% Q&H  
TLO 99% Q&H

*In review....*

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- Health hazards of hexavalent chrome are well documented
  - Legislation was put in place banning the use of hexavalent chrome in many consumer goods.
  - Environmentally conscious companies are actively transitioning away from hexavalent chrome, even if not mandated to do so.
  - Environmentally compliant technologies are currently available that can meet or exceed the performance of hexavalent systems.

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*Thank You for Your Attention*

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