Eco-Design Principles, Benefits and Opportunities

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Chemistry Innovation
Our mission

To stimulate and support product and process innovation in the chemistry-using industries, thus enhancing bottom line performance, delivering additional GDP to the UK and ensuring sustainability.
Industry Partners

Knowledge Transfer Networks
A DTI business support solution
Delivered through the Technology Programme
Academic Partners

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Government Partners
Eco-Design

- Eco-Design
- Green Product Design
- Green Design
- Design for the Environment (DfE)
- Design for Sustainability (DfS)
- Environmental Design
- Sustainable Design
- Eco-Innovation
Eco-Design

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• Green Product Design
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• Design for the Environment (DfE)
• Design for Sustainability (DfS)
• Environmental Design
• Sustainable Design
• Eco-Innovation
Designing a product or service to reduce overall environmental impact whilst maintaining or improving, economic, technical and social performance
The purpose is to develop sustainable competitive advantage not to win eco-awards
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Reasons for failure

- 28% Solving the wrong problem
- 24% Me-too product
- 15% Product did not work
- 13% Competitors cut price
- 13% Too expensive
- 7% Just plain ignorance

75% of products launched without proper market research

“Why Innovation Fails”
Carl Franklin, 2003
Why?

- Pressure from resources
  - oil
  - minerals
  - water
  - carrying capacity
“If everyone enjoyed the lifestyle of North Americans, we would need the resources of three planet earths”

Source: UN Human Development Report
Resource constraints

• The world consumes 84 million barrels of oil a day.
• We consume two barrels of oil for every barrel discovered.
• It took us 125 years to use the first trillion barrels of oil.
• We’ll use the next trillion in 30.
• The world has been finding less oil than it’s been using for twenty years now.
• In 20 years the world will consume 40% more oil than it does today.
• The oil and gas we’ve been finding is coming from places that are tough to reach.

Source: Chevron
Copper usage

- US usage 170kg per person
  - 21kg per automobile
  - 200kg per house
- Current China usage 35 kg
- China usage 170kg per person
- Global need 1.7 billion tonnes
- Global resource 1.6 billion tonnes

Source: T E Graedel
Recycling copper

Source: Basel Action Network
Why?

- Pressure from resources
- Pressure from:
  - regulators/legislation
  - customers
  - public
  - shareholders/lenders
Why?

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Why?
Business benefits

- Compliance at lowest cost
- Lower production costs
- Increased product benefits
- Increased market share
- New market opportunities
- Improved customer relationships
- Potential for market leadership
- Better reputation
Different strategies

• Improve product
• Redesign product
• New ways to deliver function
• Redesign system
Different strategies

- Improve product  x 2
- Redesign product  x 5
- New ways to deliver function  x 10
- Redesign system  x 20

Reducing impact
Cost of substitution

Replacing one ingredient in an aircraft paint:

- 4 man years work on reformulation and testing for the aircraft coatings manufacturer;
- 1.2 man years on assessment and production for the aircraft component manufacturer;
- 2.5 man years on assessment and monitoring for the aircraft constructor;
- 1.2 man years on retraining for airlines in repainting.

Approximately 9 man years

Source: British Coatings Federation
Fire-prevention in electronics

**Substance**
- TBBA replaces PBB/PBDE
- Polymerized TBBA
- Phosphorus-based retardants
- Mineral-based retardants
- Change base material

**Material**
- Separate high & low voltage
- Reduce voltage

**Product**

Innovation Depth
UV-curable, one-component, low-VOC refinish primer

- Urethane acrylate oligomer
- >50% less VOC
- Cures with UV-A lamps or sunlight
- No bake ovens
- Cuts primer use by >60%
- Waste reduced from 20% to near zero
- Improved adhesion, corrosion and abrasion resistance
- Eliminates most PPE
Ford and Houghton

Metalworking fluids

- Hydraulic and metalworking oils from renewable vegetable sources
- Higher price per litre – *but:*
- Dagenham Engine Plant
  - 2 million litres less effluent each year
  - fewer grades and greater compatibility
  - superior metalworking performance
  - 20% cost reduction at Dagenham
  - 40% expected at Bridgend
  - …
It’s about business strategy

Integrate
Change mindset

Ask different questions
Overcoming barriers

- Environmental is not overhead
- Don’t *fix* the problem
- There is *no* waste
- Reduced impact *and* higher value
Opening up opportunities

• Think service *not* product
• Think lifecycle
• Look downstream
Open out your innovation space as wide as possible

Many different approaches
  – Lifecycle impact profile
  – Eco-innovation compass
Lifecycle impact profile

- Materials
- Manufacturing
- Distribution
- Use
- End of Life

Environmental Impact
Lifecycle impact profile

Opportunity

Tend to think about

Environmental Impact

Materials, Manufacturing, Distribution, Use, End of Life
Lifecycle impact profile

- Materials
  - Renewables
  - Low hazard
  - Recycled RM’s
  - Reduce mass intensity
  - Reduce RM impact

- Manufacturing
  - Reduces energy
  - Low hazard
  - Reduce waste
  - Closed loop
  - Safer process

- Distribution
  - Make on demand
  - Minimise packaging
  - Recycle packaging
  - Containment
  - Minimise loss

- Use
  - Efficiency
  - Safe to use
  - Improper use
  - Avoid waste
  - Safe emissions
  - Packaging

- End of Life
  - Disassembly
  - Disposal advice
  - Reuse, recycle
  - Benign materials
Eco-innovation compass

Eco-innovation compass – WBCSD and Dow
Compass scale

0 – decrease > 50%
1 – some decrease
2 – no change
3 – some increase
4 – increase x 2
5 – increase x 4
Service

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Durability

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Re-use and recycle

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Energy intensity
Health and environmental risk

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Resource conservation
Remember!

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