

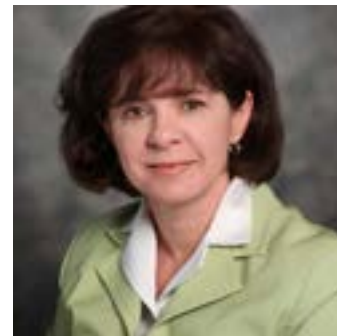


Mainstreaming Green Chemistry Webinar Series

March 26, 2014

Perceptions and Experiences of Green Chemistry Practitioners

With Lynn Leger
ALCERECO





What is the GC3?

A cross sectoral, B-2-B network of more than 70 companies and other organizations formed in 2005 with a mission to promote green chemistry and design for environment (DfE), nationally and internationally



GC3 Approach

Develop and promote tools, policies and business practices to drive green chemistry throughout supply chains

Foster collaboration among businesses, government, non-governmental organizations, and academic researchers

Identify and leverage enablers of green chemistry adoption



GC3 Project Groups

- 1. Advancing Green Chemistry Education**
- 2. Engaging Retailers in the adoption of Safer Products**
- 3. Facilitating Chemical Data Flow Along Supply Chains**
- 4. Promoting Green Chemistry Education**
- 5. Mainstreaming Green Chemistry**



Ground Rules

- Due to the number of participants on the Webinar, all lines will be muted.
- We want to encourage questions and comments **THROUGHOUT** the webinar. Please type in the Q&A box located in the drop down control panel at the top of your screen.

GC3 Mainstreaming Green Chemistry – Perceptions and Experiences of Practitioners

Lynn Leger
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By definition, Green Chemistry must have an impact in society beyond the R&D lab. The route to this impact usually means successful commercialization.

How do we
accelerate the
commercialization of
Green Chemistry?

What are the
perceptions of
Green Chemistry
practitioners?



Perception Drives Decisions

Perception Marketing



Perception
Specialist

HELPING BUSINESSES THRIVE

Bandwagon Marketing: How Leading
Brands Turn Perception Into Reality

“... marketing is essentially the manipulation of perception.”

Perception vs Reality

*All our knowledge has its origins
in our perceptions.*

Leonardo Da Vinci

Perception vs Reality



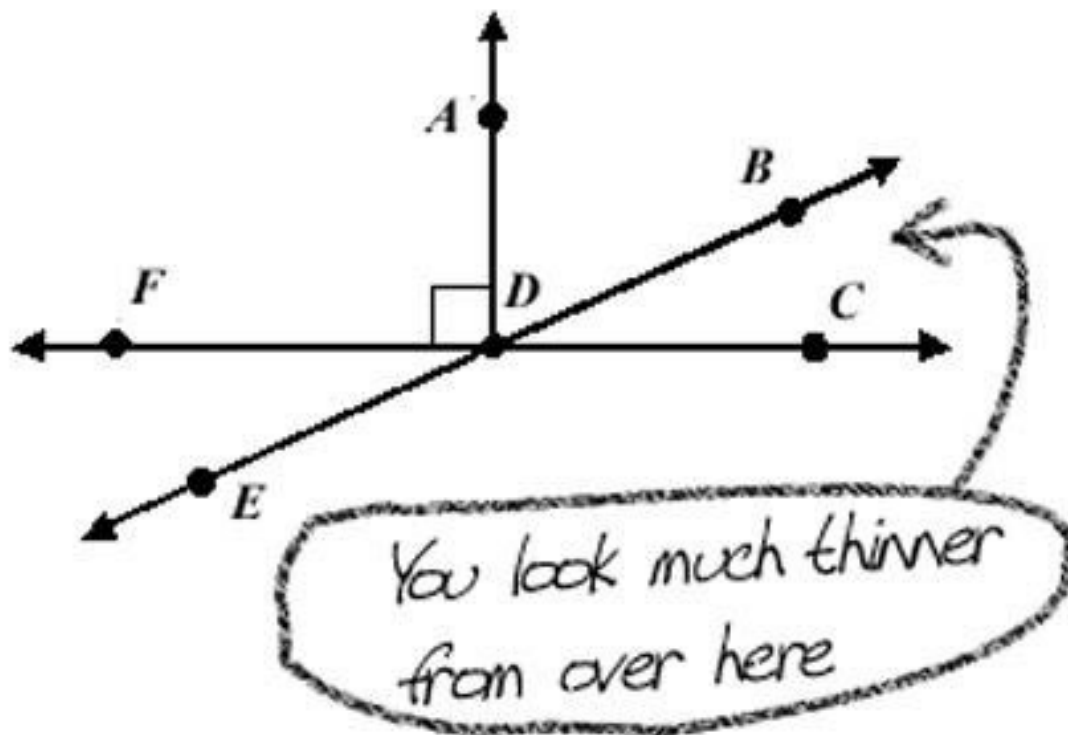
Vincent van Gogh's perception versus current reality.
John Brody Photography



To change centimeters to meters
you ____.

take out centi

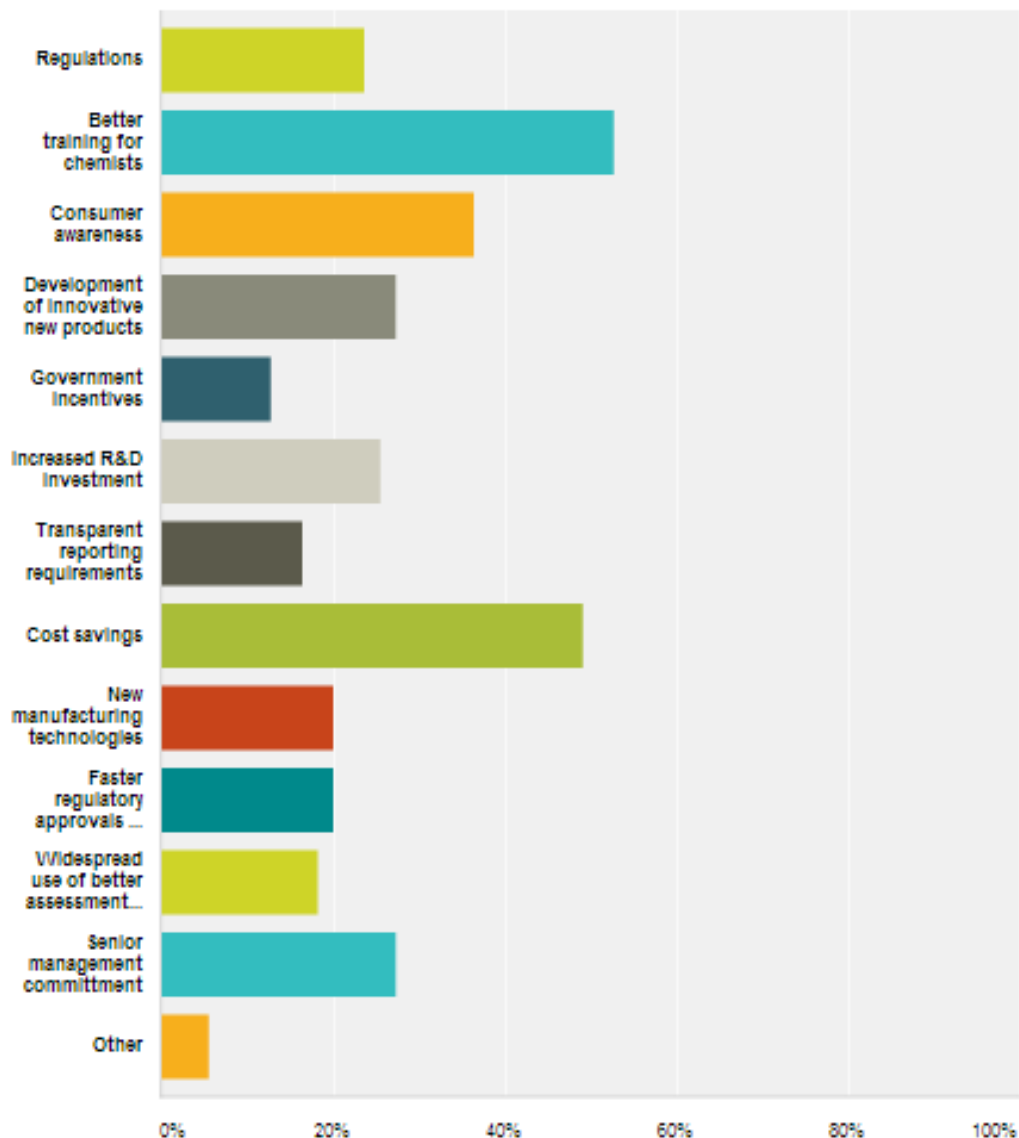
3. Name an angle complimentary to BDC:



- In 2013 members of the American Chemical Society were surveyed about some of their opinions relative to Green Chemistry. Respondents included government, academic and industrial participants with industrial representing the largest share of responses.

What factors do you believe are the most important drivers for the adoption of Green Chemistry in the next 10 years?(choose a maximum of 3 responses)

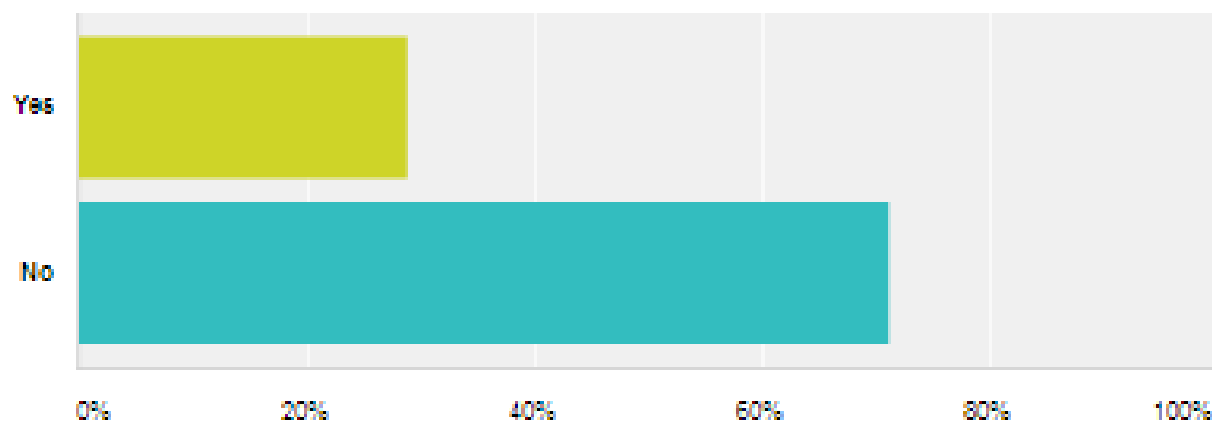
Answered: 55 Skipped: 0



There is a lot of diversity in the responses to this question. You can assume that the person sitting next to you has a different view – a different set of perceptions – about the best ways to advance Green Chemistry.

Does the introduction of Green Chemistry generally lead to a higher price for the customer?

Answered: 52 Skipped: 3



Regulations

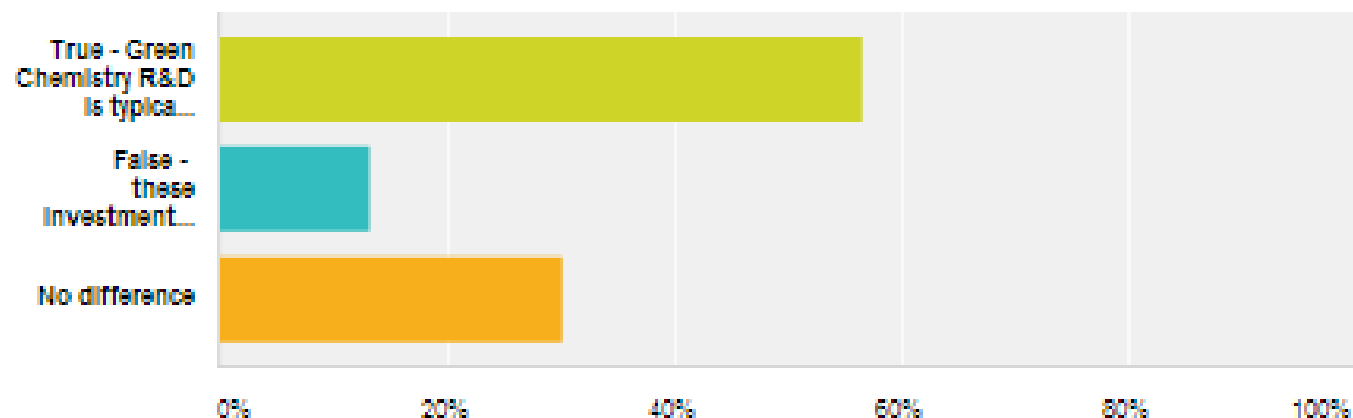
	Strong Negative Impact	Somewhat Negative Impact	No Impact	Somewhat Positive Impact	Strong Positive Impact
Expedited Approvals based on Life Cycle Analysis	0% 0	5.66% 3	11.32% 6	66.04% 35	16.98% 9
Transparent Reporting Requirements for Industry	3.92% 2	9.80% 5	11.76% 6	47.06% 24	27.45% 14
Penalties/Taxes on Non-Sustainable technologies	7.69% 4	15.38% 8	21.15% 11	30.77% 16	25% 13
Regulations and standards that require significant innovation over a longer time frame	0% 0	11.32% 6	18.87% 10	52.83% 28	16.98% 9
Regulations and standards that require more incremental improvements over a short time frame	3.85% 2	15.38% 8	25% 13	46.15% 24	9.62% 5
Regulations should only set a minimum standard	2% 1	30% 15	36% 18	24% 12	8% 4

Overall most positive Impact

Even division on aggressive vs incremental approaches

R&D Investments in Green Chemistry have greater Return on Investment (ROI) than standard investments.

Answered: 53 Skipped: 2



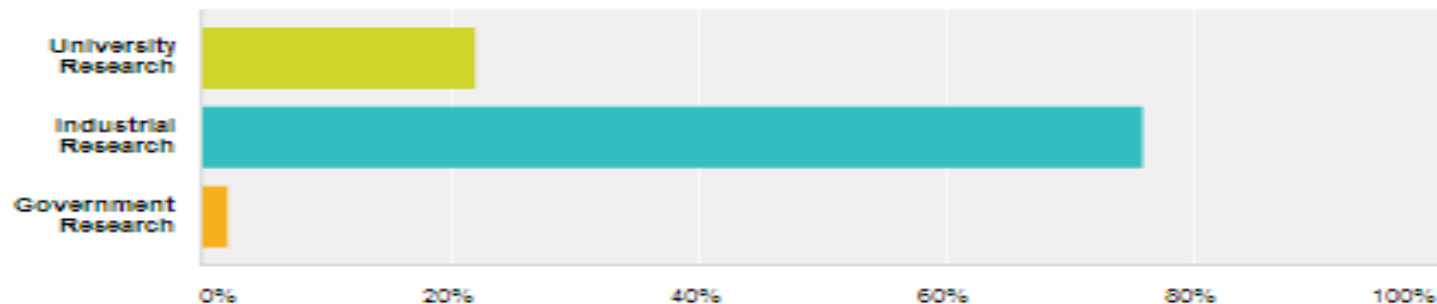
Which of the following Green Chemistry approaches has the greatest potential impact?

Answered: 50 Skipped: 5

Answer Choices	Responses	
Using Green Chemistry approaches to make current processes more sustainable	64%	32
Using Green Chemistry to develop new products	36%	18
Total		50

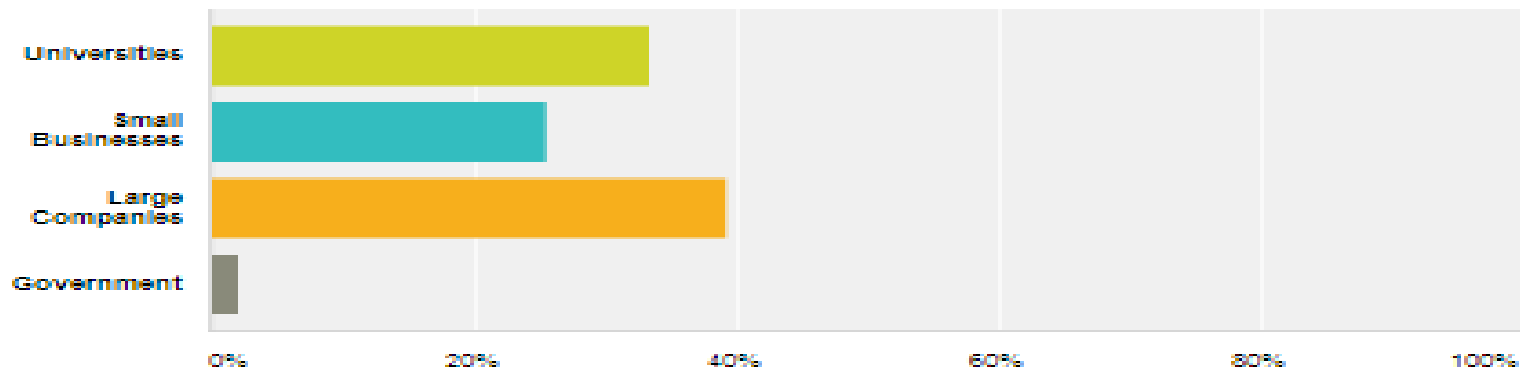
Which of the following types of R&D investment has the greatest impact in accelerating the adoption of Green Chemistry?

Answered: 50 Skipped: 5



Where is the majority of Green Chemistry R&D currently taking place?

Answered: 51 Skipped: 4



The Green Chemistry Entrepreneurs/Intrapreneurs of the future will come from:

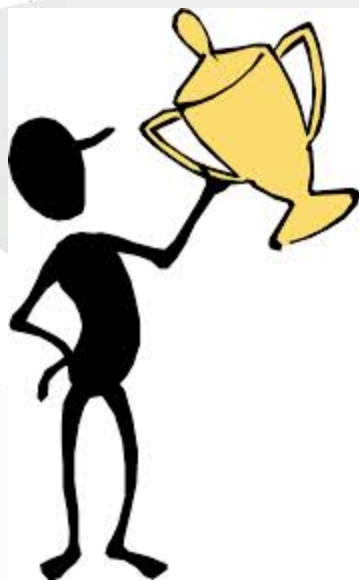
Answered: 50 Skipped: 5

Answer Choices	Responses	
Teaching sustainability concepts to future business leaders	20%	10
Training and encouraging Green Chemists to understand business opportunities	16%	8
Encouraging more cross-disciplinary training in business/green chemistry/engineering	64%	32
Total	50	

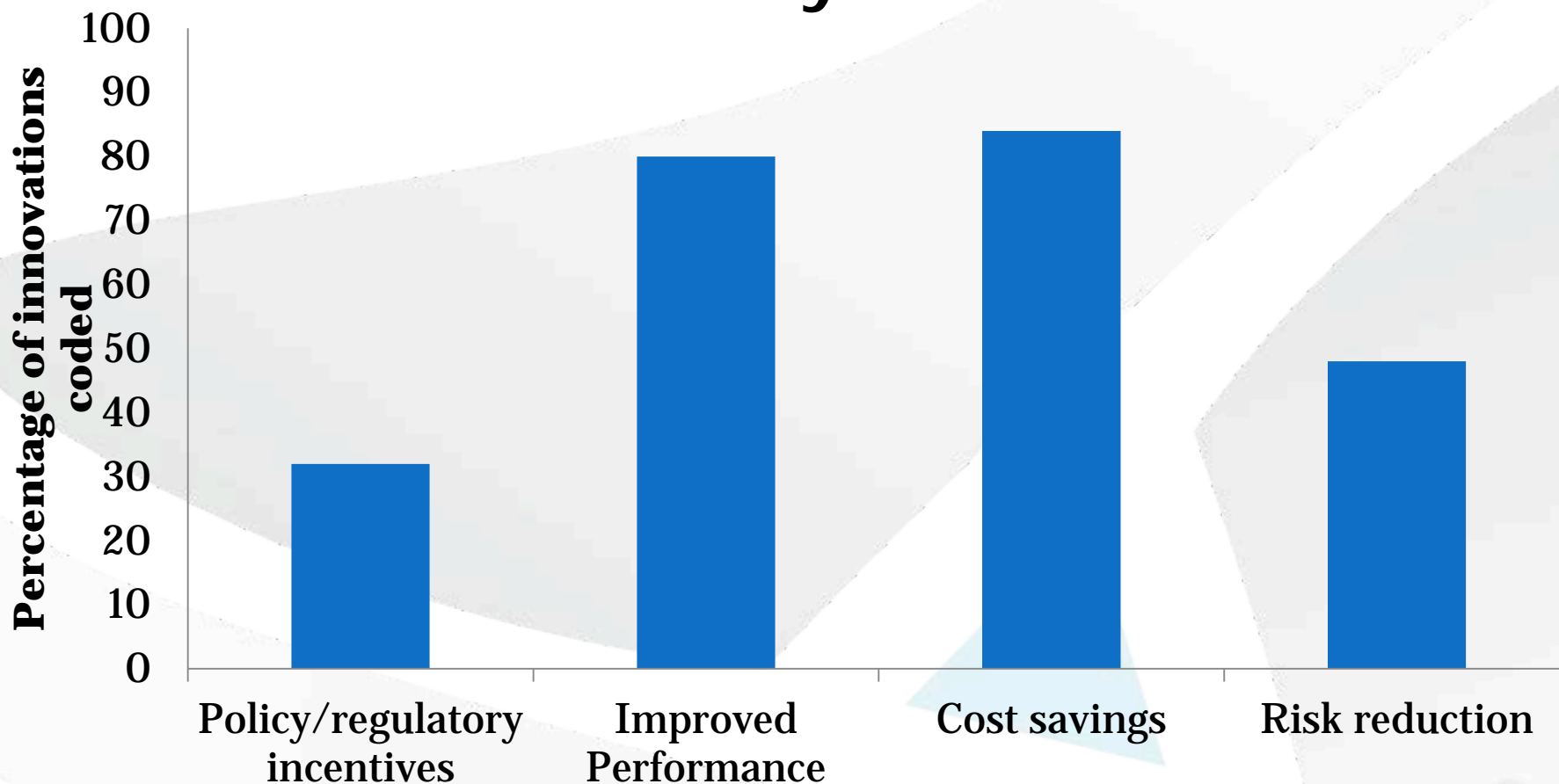
**What are the most important types of
Research that need to be taking place now
to support a future based on Green
Chemistry principles?**

*All types of research need to consider the negative impacts of the research itself. That's not to say that all research has to be applied green chemistry, but when doing any research, scientists need to be thinking about the impacts of their choices.....solar fuels
Biofuels...Alternative fuels"...Energy is the key..... Explore and quantify long-term savings (especially for revisions/alternatives to current processes), as well as market potentials (especially for new products).....Multidisciplinary thinking.....INTERDISCIPLINARY
Research in the Science-Technology-Environment-Society-Economy-Policy (STESEP)
interfaces.....reduction of required resources in current standard manufacturing systems -
Replacement of hazardous chemicals (general consensus required) by safer and lower
impact alternatives - Move away from oil based chemistry....biomimicry....
new enzymes, green industrial processes.... catalysts, safer solvents, non-covalent
technologies..... education in sustainable molecular design.....cost competitiveness
.....More accurate tools to evaluate the environmental impact of a process or material.
Efforts to generate toxicology data and other safety hazard parameters for many chemicals
through predictive tools. This will be a major driver for green chemistry research.....Water
based industrial processes, and recycling in every possible step.....CO₂ as
feedstock.....GC and competitiveness. Improvement of the life cycle analysis. improvement
in testing and screening methods to decipher predictive binding affinities vis a vis observed
ones.*

Examples of Successful Sustainable Innovation – What correlates to success in the market?



What have been the business impacts of Green Chemistry Innovations?



n= 60 innovations, winners from years 2001-2010 – Courtesy McGill Desautels School of Business

Removable Antimicrobial Coatings

- Developed by DuPont and commercialized by Ecolab for Food Processing market
- 7X less active ingredient needed to achieve better results for customer
- Innovation driven by desire for better performance for customer, sustainability goals in corporate culture



PROJECT RENEWABLES

Revitalize Ecolab's Hard Surface Cleaners

▲ Customer Driver

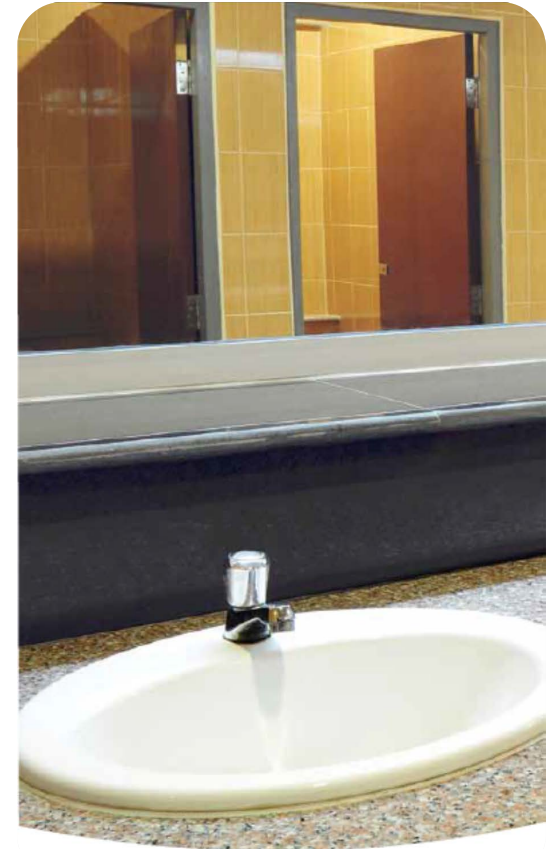
- Perception that cleaning products are harsh and un-safe; desire “green” chemistry, but do not want to sacrifice efficacy.

▲ Unique solution

- Products designed to maximize performance, while meeting broad sustainability guidelines.

▲ Opportunity

- Growth in Facility Care segments (where third party certifications heavily influence decision)
- Retain core business (stay well ahead of “defending” environmental and/or human health impact)



PRODUCT PERFORMANCE

Sustainability Chemistry with Enhanced Performance



MORE EFFECTIVE CLEANING THAN THE LEADING COMPETITOR



Recent lab tests show Ecolab Acid Bathroom Cleaner cleans the toughest soils better than the leading competitor

VALUE CAPTURE

Sustainable Business Value = Environmental Performance
+ Economic Payback (TCO)

SUSTAINABILITY



OPERATIONAL EFFICIENCY



eROI

Delivering Environmental
and Economic Improvement



WATER



ENERGY



WASTE



AIR



PRODUCTIVITY



ASSETS



SAFETY

Ecolab partners with you to help optimize your performance
with proactive service, solutions and expertise.

Process Excellence: Operations Initiatives and Programs

- Continual improvement teams examining process time reductions in our facilities:

- Ex: Reduction in cycle time by 40% for #1 volume (gallons) product
 - Reduced energy per unit
- THIS IS LEAN!



- Solvent Use Reduction:

- Reduced cleaning solvents 90%.
- Solvent reuse reduces needs, limits emissions



Process Excellence:

Product Development Initiatives

- Exploration and/or emphasis of new technology platforms
 - Water Catalyzed Urethanes:
 - Reduced needs for amines or organometallic complexes (ex: tins)
 - NOTE: 10 years old!
 - Hybrid Sealant Technologies:
 - Silane-terminated urethanes w/ potential for renewable based polyol backbones
 - Nearing performance life of silicone
 - Less energy in LC stages 1-3
 - Cost less
 - NOTE: 15 years old!
 - Aliphatic Urethanes:
 - Ideal tomorrow step... isocyanate free
 - NOTE: 10+ years!

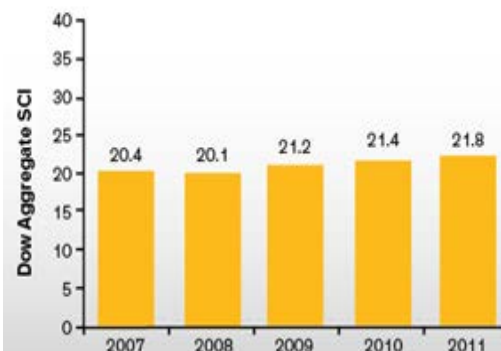
Sustainable Chemistry

Increase the percentage of sales to 10% for products that are highly advantaged by sustainable chemistry.

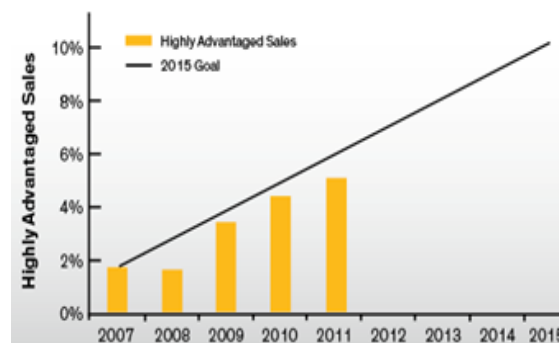
We will publicly report on our progress by:

- Reporting our overall annual assessment of our sustainable chemistry index, and performance against our % of sales having sustainable chemistry advantages
- Presenting and/or publishing life cycle assessments that are validated independently by an external stakeholder, on existing or planned Dow products.
- Providing ongoing updates on promising areas of research and investments and collaborations that spur sustainable chemistry innovation.
- Promoting sustainable chemistry internationally through student prizes and Dow employee awards under The Dow Sustainability Innovation Challenge Award program.

Dow Aggregate SCI



Highly Advantaged Sales



Example 2: Concentrating Solar Power

Description

- DOWTHERM™ A heat transfer fluids collect, transport, and store solar heat energy to power electricity-generating turbines.



Sustainability Profile

- Dow supplies enough fluid globally to generate more than 700 MW of electricity from the sun
- Projects in Spain use more than 20,000 metric tons of DOWTHERM™ A heat transfer fluids
- Energy produced by 12 plants is enough to power 400,000 homes
- These plants prevent about nearly 1.5 million tons of carbon dioxide from releasing into the atmosphere, vs. traditional fuels



Clorox Green Works



- ▶ Clorox identified elements that consumers desire in the product/brand experience:
 - Dramatically reduce the use of harsh chemicals
 - No compromise on functional performance
 - No compromise on convenience or ease of use
 - Be priced right
 - Be readily available
 - Assure it comes from a credible/trustworthy source
- ▶ Initial success (\$53M in 2008) followed by decline after recession (\$32M in 2012)
 - Decrease of price premium in 2013



Lysol Power & Free Line of Hydrogen Peroxide Cleaners

► Targets

- Safety Labeling
 - Recognized safe, effective active ingredient
 - No residue – Water and oxygen as breakdown products
- Lower carbon footprint
- Maintain brand standards in cleaning and germ kill

2020 *Our Net Revenue Goal*

By 2020, 1/3 of our net revenue will come from products that are significantly more sustainable than their predecessors and continue to deliver excellent product performance.

Our Better Design targets

1. 100% of product innovations assessed by our Sustainable Innovation Calculator
2. 100% compliance with RB's Global Ingredient Guidelines
3. 100% responsibly sourced natural raw materials



My Perceptions from Success Stories

- Culture supported by management commitment, metrics, and processes can have a significant impact on advancing Green Chemistry in an organization
- Many ways to be greener – not just about toxicity reduction or carbon emissions
- Think process, not just product
- Customers must have better value – no successes from equal performance at higher price
- Green Chemistry can drive more innovation in an organization
- Businesses look at broader concept of sustainability including profitability

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Upcoming Events:

<http://www.greenchemistryandcommerce.org/>

Green Chemistry in Education Webinar Series: *12 Principles of Green Chemistry: Sustainability at the Molecular Level*, April 17, 2PM Eastern/11AM Pacific





THANK YOU!

