Role of the TRI and Green Chemistry in DuPont's Sustainability Journey

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E. I. du Pont de Nemours and Company

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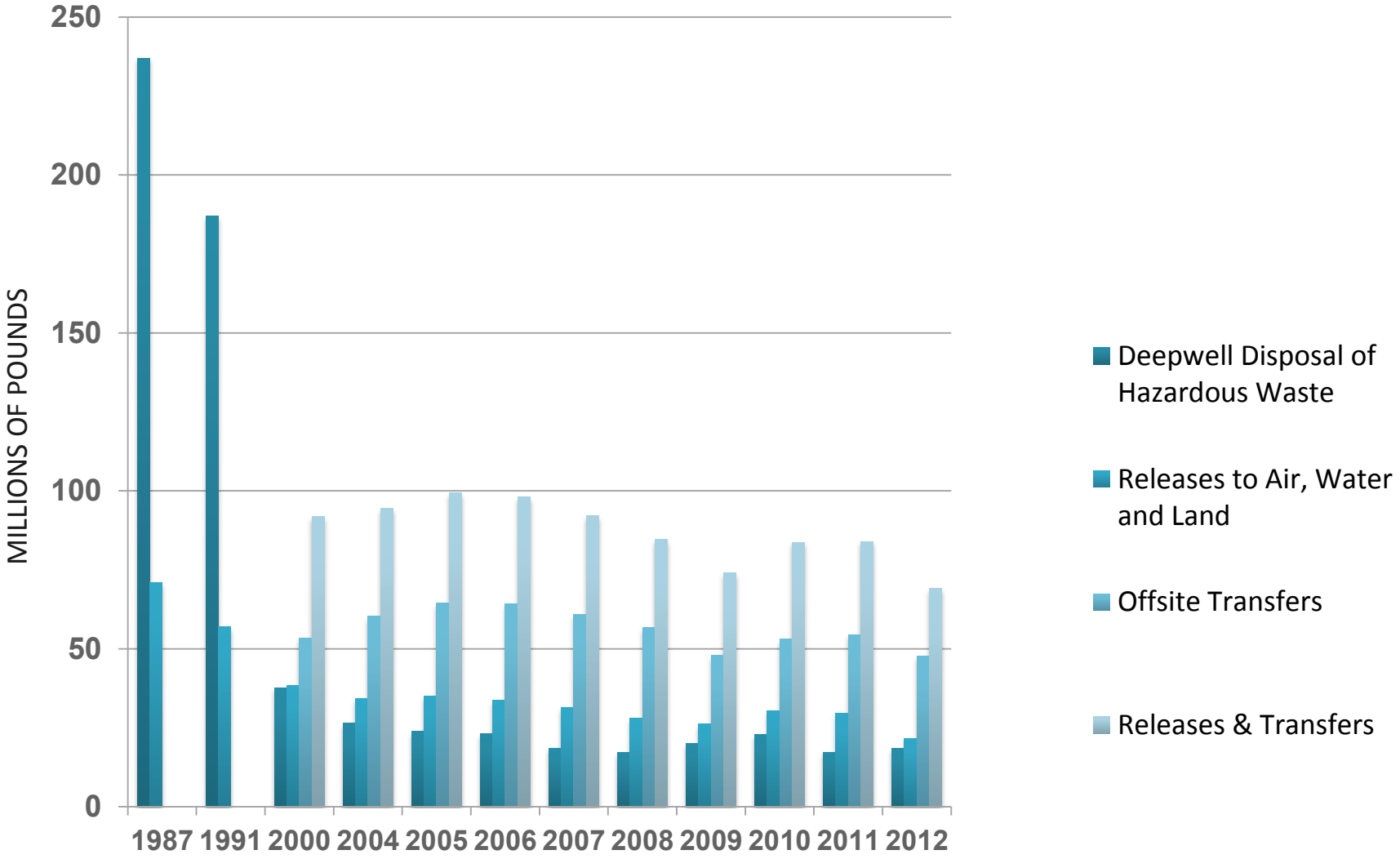
DuPont Today

Founded in 1802, DuPont is a global research and technology-based science company, creating sustainable solutions to help make better, safer and healthier lives for people everywhere. Together, we can feed the world, decrease dependence on fossil fuels, and protect what matters most.

- **Headquarters**: Wilmington, DE
- **Revenues**: $35.7B*
- **Global**: Operating in 90 countries
- **Business Segments**: Agriculture, Electronics & Communications, Industrial Biosciences, Nutrition & Health, Performance Chemicals, Performance Materials, and Safety & Protection
- **Core values**: Safety and Health, Environmental Stewardship, Highest Ethical Behavior, and Respect for People

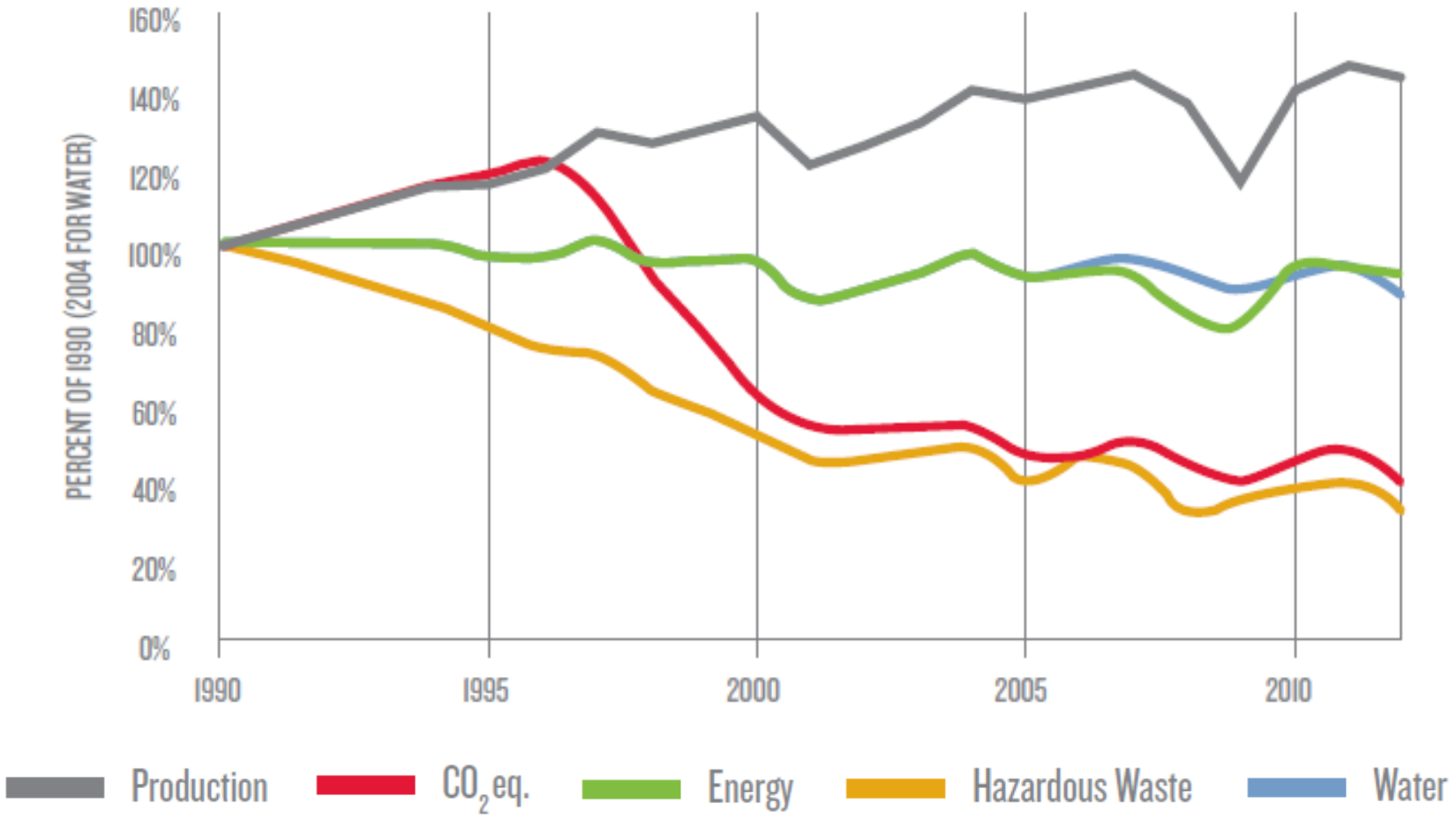
* Net sales in 2013

U.S. Toxics Release Inventory (TRI) Data



DuPont data as reported to EPA. 2004 data reflects Invista separation. 2011 data reflects Danisco acquisition. 2012 data reflects divestiture of DuPont Performance Coatings.

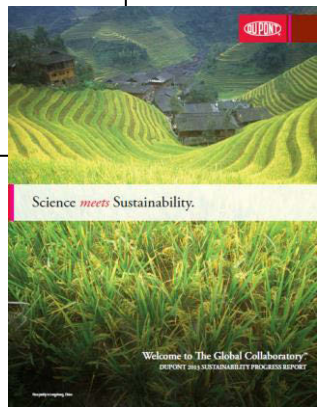
Environmental Footprint Reduction



DuPont global absolute footprint values relative to baseline

TRI Trends

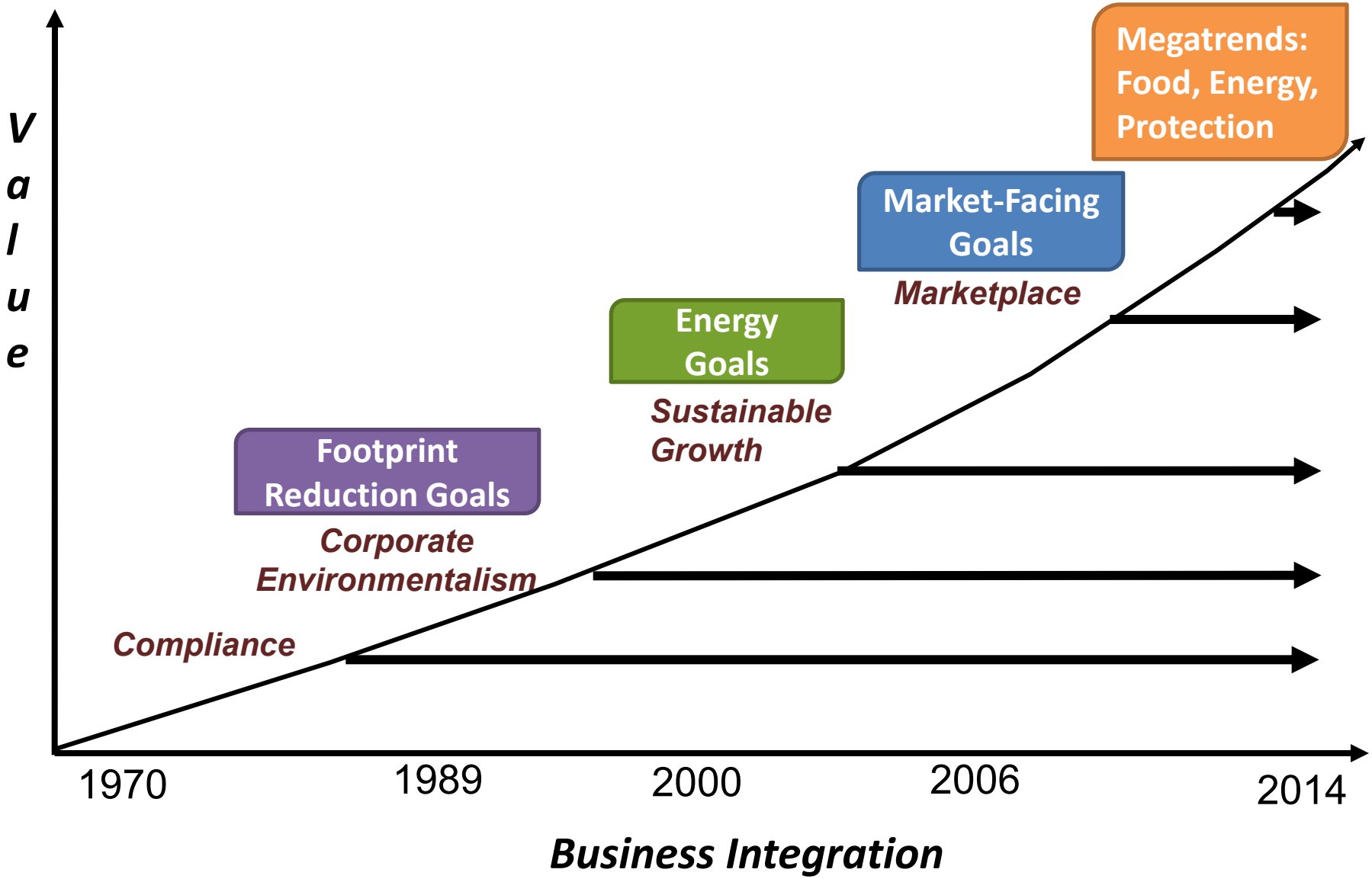
- Total DuPont TRI environmental releases
  - First reported in 1987
  - Reduced by >69%
- Total DuPont TRI waste as generated
  - First reported in 1991
  - Reduced by 66%
- Context
  - TRI list, 1987 - 2012: ~330 → ~680 chemicals*
  - Production, 1990-2012: increased by 45%



http://www2.dupont.com/inclusive-innovations/en-us/gss/sustainability/performance-reporting/sustainability-reports.html

* Chemicals and chemical categories

Our Sustainability Journey



Corporate Environmentalism: 2000 Goals*

- ✓ Reduce toxic air emissions from U.S. sites by 60% from 1987 to 1993, and at other sites by 10% per year from 1990 to 1993.
- ✓ Reduce Carcinogenic Air Emissions by 90% from 1987 to 2000 at U.S. sites and by 90% from 1990 to 2000 at other sites.
- ✓ Reduce emissions of 33/50 Chemicals, 17 large-volume chemicals identified by EPA, by 50% in aggregate from 1988 to 1995.
- ✓ Reduce Hazardous Waste Generated from the manufacture of chemicals worldwide by 35% from 1990 to 2000.

* Announced May 1989

DuPont Corporate Environmentalism 1993 Progress Report

Corporate Environmental Plan

- Ensure alignment of business-unit goals & corporate goals
- Promote business-specific environmental planning
- Predict resource needs (e.g., people, capital)
- Integrate environmental goals into business plans
- Enable prioritization of environmental initiatives
- Track progress on meeting current sustainability goals
- Monitor performance on prior goals to guard against backsliding
- Facilitate corporate-level external reporting (GRI, etc)

TRI Pollution Prevention via Green Chemistry

Driver: Comply with newly applicable state air regulations*

Upgrade: Increase selectivity to cut byproduct formation through development of new replacement catalyst for chemical synthesis.

Green Chemistry principle: Catalysis (9)

TRI chemical source reduction: >90%

Need identified to project complete: 4 years

Approx. capital investment: <$1 million

Recognition: ACS Heroes of Chemistry

* Negotiations gave time for catalyst R&D in lieu of end-of-pipe controls

TRI Pollution Prevention via Green Chemistry

Driver: Environmental Stewardship

Upgrade: Modify reactor system to eliminate generation of inadvertent reaction byproduct.

Green Chemistry principle: Prevention (1)

TRI chemical source reduction: >95%

Need identified to project complete: 7 years

Approx. capital investment: $25 million

Recognition: EPA NPEP* Achievement Award

* National Partnership for Environmental Priorities (originally called Resource Conservation Challenge)

TRI Pollution Prevention via Green Chemistry

Driver: Cost

Upgrade: Convert high-temperature free-radical synthesis to low-temperature catalytic ionic reaction to improve process yield.

Green Chemistry principle: Catalysis (9); Energy (6)

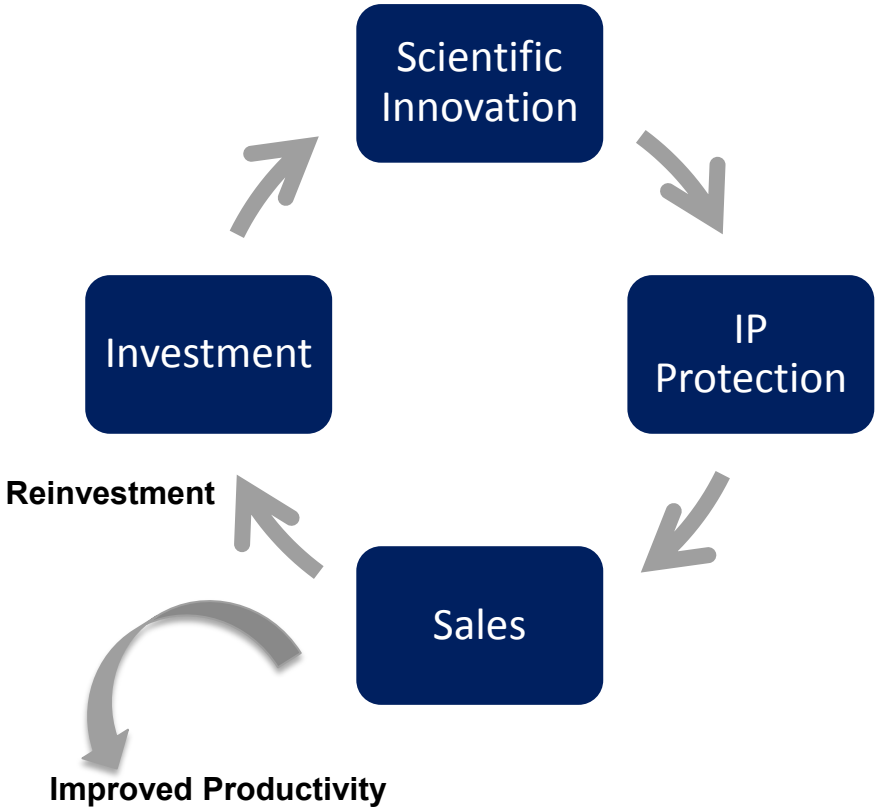
TRI chemical source reduction: >40%

Need identified to project complete: 8 years

Approx. capital investment: $10 million

Recognition: EPA Region Waste Minimization Award

CBI protection is required to sustain innovation



- The ability to preserve legitimate CBI and prevent piracy of intellectual property is critical to competitiveness and innovation.
- There is active industrial espionage seeking to steal trade secrets that needs to be recognized – if we simply give innovation away, there is little reason to innovate.

Ref.: Statement of Linda J. Fisher, DuPont, Before the Senate Committee on Environment and Public Works, March 9, 2010, Business Perspectives on Reforming U.S. Chemical Safety Laws

Our Approach to Reducing Operational Footprint

1. Look at our operations.
2. Publicly set aggressive goals.
3. Drive toward zero waste generation at the source and drive toward zero emissions.
4. Excel in the efficient use of fossil fuels and feedstocks, land, water, minerals and other natural resources and transition toward the greater use of renewable energy and feedstocks.
5. Measure performance.
6. Continuously improve.

DuPont 2015 Sustainability Goals*

Reducing Environmental Footprint

- Greenhouse Gas Emissions
- Water Conservation
- Fleet Fuel Efficiency
- Air Carcinogens
- Independent Verification of Site Programs

Serving the Marketplace

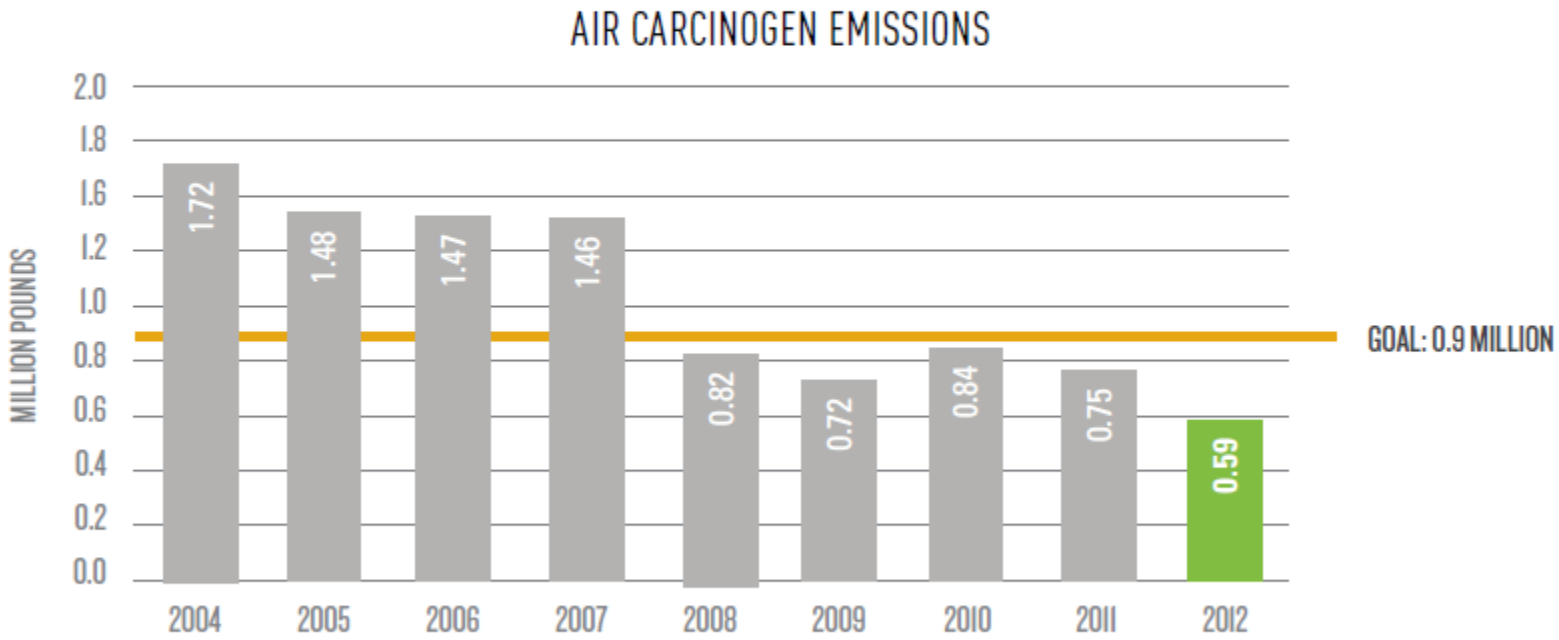
- Environmentally Smart Market Opportunities from R&D Efforts
- Products that Reduce Greenhouse Gas Emissions
- Revenues from Non-Depletable Resources
- Products that Protect People

* 2015 Sustainability Goals were announced in October 2006.

Air Carcinogens Emissions Goal

Air Carcinogen Emissions Goal

GOAL: Since 1990, DuPont has reduced global air carcinogen emissions by 92 percent. Further reduce by at least 50 percent from a base year of 2004.



PROGRESS: Reduced emissions 65.6 percent since 2004.

To reduce reporting burden, EPA can:

- Revise TRI software to enable facility data download to common spreadsheet format (e.g., Microsoft® Excel (.xls)) upon submission via TRI-MEWeb
- Revise guidance to provide default emission factors for reporting PAC & Creosote releases from Creosote-treated railroad ties
- Revise TRI software to enable facility data upload to TRI-MEWeb via direct transfer from common spreadsheet format (e.g., Microsoft® Excel (.xls))

To promote pollution prevention (P2), EPA can:

- Collaborate with industrial innovators, e.g., in
  - Review of TRI University Challenge P2 feedback
  - Development of holistic sustainability indicators that consider TRI with other key factors such as water, GHGs
- Bolster protection of legitimate CBI
- Foster balanced, fact-based public discourse on chemicals that considers societal benefit
- Sponsor voluntary P2 challenge programs for manufacturing facilities and recognize success

The Value of Continuous Improvement

"I fear some times that we are a little dismissive of incremental change. And actually you can win a baseball game with a lot of singles, right? If all you're doing is waiting for the grand slam, you might not get that. So, I think we should look for leadership where we find it. And I think we should grasp onto every incremental change we can because it may be the quickest path to sustainability."

The Regeneration Roadmap

Linda Fisher (DuPont CSO), http://theregenerationroadmap.com/videos.html#/video-15.htm

Acknowledgements

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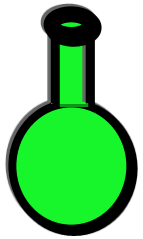
Back-Up Slides

Principles of Green Chemistry[1]



1. **Prevention**
2. **Atom Economy**
3. **Less Hazardous Chemical Syntheses**
4. **Designing Safer Chemicals**
5. **Safer Solvents and Auxiliaries**
6. **Design for Energy Efficiency**
7. **Use of Renewable Feedstocks**
8. **Reduce Derivatives**
9. **Catalysis**
10. **Design for Degradation**
11. **Real-time Analysis for Pollution Prevention**
12. **Inherently Safer Chemistry for Accident Prevention**

[1] Anastas, P. T. and Warner, J. C. *Green Chemistry: Theory and Practice*. Oxford University Press: New York, 1998.