



## DuPont Cleaning Products Division

Stuart Heggie, business manager of DuPont's Household and Institutional Cleaning Division, sat in his Mississauga, Ontario, office in June 2006 pondering the future strategic direction of the division in light of the growing concern over the environmental and social implications associated with the chemical ingredients of cleaning products. Embedded in this broader strategic dilemma was the decision to partner with leading retailers to tap into the growing end-consumer market concerned with the environmental implications of their cleaning practices. DuPont was examining the possibility of partnering with Canadian retailers, such as Loblaw Companies Limited, which might possess the marketing capabilities required to execute such an endeavor.

The chemical industry has undergone radical shifts in its value proposition to the market and is consistently having to adapt to myriad external forces that change almost daily. Latest among these forces is the green chemistry movement, which has become a hot topic in the industry and has gained considerable traction in the cleaning products sector. Stakeholders in the external environment have been responsible for legitimizing a movement towards green cleaning products. Political bodies, environmental activists, medical researchers, and even consumers have been voicing their concerns for some time over the detrimental impacts of cleaning products to the environment and human health.

In the last decade, the DuPont cleaning division has demonstrated a substantial commitment to green chemistry. Drawing from DuPont Canada's overall culture and vision, the cleaning division does not source any raw materials or formulations that are deemed environmentally unsafe. Furthermore, it has been able to remove harmful toxins, such as nonylphenol ethoxylates (NPEs) and volatile organic compounds (VOCs), without a decrease in product quality levels. As a niche player in providing green cleaning products, Mr. Heggie wondered how the division should position itself

---

This case was prepared by Michael Valente at the Schulich School of Business at York University. It is intended to serve as a basis for class discussion rather than to illustrate the effective or ineffective handling of an administrative situation. No part of this publication may be reproduced, stored in a retrieval system, used in a spreadsheet, or transmitted in any form by any means without permission by the ACS Green Chemistry Institute®. These materials were developed through a cooperative effort of the American Chemical Society's Green Chemistry Institute and the U.S. Environmental Protection Agency (EPA) Office of Pollution Prevention and Toxics' Design for the Environment Program. Partial funding was provided by the EPA through Cooperative Agreement #X8-83077701-0. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the EPA. Any mention of trade names does not imply endorsement by the EPA.

going forward in light of DuPont's internal competencies, external market opportunities, and overall culture and strategic vision.

## The History of DuPont

Eleuthère Irénée du Pont (E.I.) founded DuPont in 1802 from studying advanced explosives production techniques with the famous chemist Antoine Lavoisier. He used this knowledge and intense interest in scientific exploration to continually enhance product quality and manufacturing sophistication and efficiency. The company began life as a partnership in gunpowder and explosives, becoming the nation's largest gunpowder manufacturer by 1811. By 1905, the company became one of the largest corporations in the United States, holding 75 percent of the U.S. gunpowder market. DuPont was also responsible for 56 percent of the national production of explosives.<sup>1,2</sup>

In the early part of the 20<sup>th</sup> century, DuPont gradually diversified into other areas of business besides explosives. The company moved into the textile industry through a product known as guncotton, an early form of nitroglycerine. The end of World War I initiated further movement away from explosives, and in the 1920s, DuPont acquired the rights to make cellophane. During this decade they even bought General Motors and entered into a 50-50 joint venture with Standard Oil (now known as ExxonMobil) to produce and market the lead additive in petrol. Economically, the company's most important discovery was nylon, followed by a number of synthetic products such as Lucite (a clear tough plastic resin), Teflon (a resin used in non-stick cookware), Butacite PVB interlayer (a plastic used in automotive safety glass), and CFCs.<sup>3</sup>

The Second World War brought back profitability in military explosives for DuPont.<sup>4</sup> From 1941 to 1945, DuPont contributed to the top secret Manhattan Project, which was to produce the bombs that devastated Hiroshima and Nagasaki.<sup>5</sup> The post-war years brought further discoveries for DuPont, including Mylar (a strong plastic film), Dacron polyester, Orlon (a bulky acrylic fiber), and Lycra. DuPont's strong dependence on fibers led to trouble when the demand for fibers plummeted in the mid-1970s, and DuPont became one of the worst-hit chemical companies in the 1980 recession. In the

---

<sup>1</sup> The company was so dominant that in 1907 the U.S. government initiated antitrust proceedings. In 1912, the company was deemed a gunpowder monopoly and was ordered to divest itself of a substantial portion of its business. Despite having been streamlined, DuPont still managed to supply 40 percent of all explosives shot by the Allied forces during World War, I billion to 1.5 billion pounds.

<sup>2</sup> DuPont Home Page, Heritage. <http://heritage.dupont.com/> (accessed May 10, 2006).

<sup>3</sup> *Ibid.*

<sup>4</sup> The company also was heavily involved in weapons research, making major contributions to the development of plastic and other forms of explosives, gun and rocket propellants, and chemical warfare.

<sup>5</sup> The company also was the principal mass producer of plutonium in the United States, having designed, built, and operated the world's first plutonium plant—the Hanford plant in Washington—at the request of the federal government.

1980s, the company was deemed one of the worst air polluters in the United States in light of the fact that it was completely reliant on petrochemicals and had purchased the petroleum company Conoco.<sup>6</sup>

The 1980s also saw DuPont branch out into the life sciences. The company began to delve into the development and production of biomedical products and agricultural chemicals. But it wasn't until the late 1990s—after two decades of rampant jockeying in multiple and unrelated fields—that the company attempted to demonstrate its commitment to marrying its economic and profit goals with the social and environmental needs of the planet. At this time, DuPont saw the bio-industrial, pharmaceutical, feed, and food industries as potential areas for the increasing integration of chemistry and biotechnology.<sup>7</sup> In 1999, the company shed its Conoco subsidiary, using the money to invest in its growing biotech business by assuming 100 percent ownership of Pioneer.<sup>8</sup>

According to industry experts,<sup>9</sup> DuPont, as a company, has a number of strengths. First and foremost is its focus on science and technology. DuPont has tremendous breadth of expertise in a range of areas, from biology and traditional materials science to electronics and related applications. Second, the company is a leader in product stewardship in safety and in regulatory compliance. Some competitors call on DuPont for advice and assistance when disasters occur, and according to DuPont's Web site,<sup>10</sup> the company's record on environmental issues makes them a leader in the green movement.<sup>11</sup> Third, DuPont has tremendous strength in the sourcing of raw materials and logistics more generally.

## DuPont Canada

DuPont Canada is a diversified science company that dates back to 1877. It evolved in a similar fashion as its parent company by starting off in explosives and dynamite, which

---

<sup>6</sup> Doyle, J. DuPont's Disgraceful Deeds. *The Multinational Monitor*, October 1991, Vol. 12, Number 10. <http://www.multinationalmonitor.org/hyper/issues/1991/10/doyle.html> (accessed February 25, 2009).

<sup>7</sup> In 1997, DuPont acquired an interest in Pioneer Hi-Bred International, the world's largest seed company. The company also acquired Protein Technologies International, a leading supplier of soya proteins.

<sup>8</sup> DuPont Home Page. Heritage. <http://heritage.dupont.com/> (accessed February 25, 2009).

<sup>9</sup> ICIS Chemical Business Americas. <http://www.icis.com/v2/companies/9145202/dupont/structure.html> (accessed February 25, 2009).

<sup>10</sup> DuPont Home Page. DuPont's Role. [http://www2.dupont.com/Sustainability/en\\_US/DuPont/index.html](http://www2.dupont.com/Sustainability/en_US/DuPont/index.html) (accessed February 25, 2009).

<sup>11</sup> According to DuPont, commercial customers of the DuPont Flooring System are assured that the carpet that is removed from the building will never see a landfill. Regardless of whether the removed carpet was manufactured using DuPont fiber, customers are provided with a certificate that eliminates the customer from future EPA liabilities over the removed products. To the extent possible, the carpet is to be recycled and remanufactured into other products, including Ford Motor Company automotive parts.

helped to clear a path for the emerging nation's network of railways. Headquartered in Mississauga, Dupont Canada serves customers across Canada and in more than 40 other countries. The company offers a wide range of products and services to markets, including agriculture, nutrition, electronics, communications, safety, and protection. According to its Web site, DuPont Canada is committed to becoming a market-driven, customer-oriented organization of diverse, self-managed people that is dedicated to quality, innovation, and continuous improvement, as measured by its relative competitive position.<sup>12</sup>

DuPont's culture revolves around safety, business ethics, and respect for people. It facilitates the development and retention of managerial depth through the entire enterprise. According to employees, the company has an extraordinary core belief in the ethical conduct of business. According to its Web site,<sup>13</sup> the company believes in fairness in the marketplace, managerial discipline to look for ways to win that do not necessarily require others to lose, and a real strength that comes from a singular focus on the consumer and its aligned partners as customers. DuPont claims that this culture permeates throughout the company and is indeed a fundamental source of its success.

In February 2002, E.I. du Pont de Nemours and DuPont global aligned its business units into five market- and technology-focused growth platforms while creating a new subsidiary to be called INVISTA (formerly DuPont Textiles and Interiors).<sup>14</sup> The five business units include: 1) DuPont Electronic & Communication Technologies; 2) DuPont Performance Materials; 3) DuPont Coatings and Color Technologies; 4) DuPont Safety & Protection; and 5) DuPont Agriculture and Nutrition.

Included in the DuPont Safety and Protection unit is the DuPont Chemical Solutions Enterprise, which offers a wide range of environmentally sensitive industrial and institutional cleaning products. These products are specifically designed to meet the needs of the industrial and institutional cleaning market (See Appendix A for a listing of these products).<sup>15</sup>

---

<sup>12</sup> DuPont Home Page. [http://www2.dupont.com/DuPont\\_Home/en\\_CA/](http://www2.dupont.com/DuPont_Home/en_CA/) (accessed August 10, 2006).

<sup>13</sup> DuPont Home Page. Business Conduct. [http://www2.dupont.com/Social\\_Commitment/en\\_CA/conductguide/index.html](http://www2.dupont.com/Social_Commitment/en_CA/conductguide/index.html) (accessed February 25, 2009).

<sup>14</sup> The intent was to separate INVISTA by mid-2004 and to consider an initial public offering (IPO) of shares, or sale to a third party, among other strategic options.

<sup>15</sup> In May 2002, Dave Colcleugh, chairman, president, and CEO of DuPont Canada Inc., announced that he would hand the president and CEO roles to Doug Muzyka, who was, at the time, president and general manager of DuPont Mexico. Mr. Colcleugh remained chairman of the board. In March 2003, E.I. du Pont de Nemours and Company purchased all of DuPont Canada's common shares not owned by it. The buyout of DuPont Canada's minority shares was designed to help facilitate the separation of INVISTA, which had been announced in February of that year. The new Canadian entity would be called E.I. du Pont Canada Company but still commonly known as DuPont Canada.

# External Environment

## Traditional Cleaning Products

Quite naturally, consumers purchase commercial cleaning products to clean. They use a wide array of scents, soaps, detergents, bleaching agents, softeners, scourers, polishes, and specialized cleaners for bathrooms, glass, drains, and ovens to keep their homes sparkling clean. While the chemicals in these cleaners are effective at making dishes, bathtubs, and countertops free of germs, many also contribute to indoor air pollution, are poisonous if ingested, and can be harmful if inhaled or touched. In fact, some cleaners are among the most toxic products found in the home. In 2000, cleaning products were responsible for nearly 10 percent of all toxic exposures reported. Of these, 120,434 exposures involved children under six, who can swallow or spill cleaners stored or left open inside the home.<sup>16</sup>

Traditional cleaning products present a variety of human health and environmental concerns and can contain chemicals associated with cancer, reproductive disorders, respiratory ailments, eye or skin irritation, and other human health issues.<sup>17</sup> Cleaning ingredients vary in the type of health hazard they pose. Some cause acute or immediate hazards, such as skin or respiratory irritation, watery eyes or chemical burns, while others are associated with chronic or long-term effects, such as cancer. The most acutely dangerous cleaning products are corrosive drain cleaners, oven cleaners, and acidic toilet bowl cleaners, according to Philip Dickey of the Washington Toxics Coalition.<sup>18</sup> “Corrosive chemicals can cause severe burns on the eyes, skin, and, if ingested, throat and esophagus. Ingredients with high acute toxicity include chlorine bleach and ammonia, which produce fumes that are highly irritating to eyes, nose, throat, and lungs and should not be used by people with asthma or lung or heart problems. These two chemicals pose an added threat in that they can react with each other or other chemicals to form lung-damaging gases.”<sup>19</sup>

Chemicals that are so-called “hormone disruptors” can interfere with the body’s natural chemical messages, either by blocking or mimicking the actions of hormones. Possible health effects include decreased sperm counts, increased rates of male birth defects such as cryptorchidism (undescended testicles) and hypospadias (where the urethra is

---

<sup>16</sup> The Green Guide. <http://www.thegreenguide.com/green-cleaning-products/> (accessed November 1, 2007).

<sup>17</sup> Office of the Federal Environmental Executive. <http://www.ofee.gov/gp/greencleancriteria.asp> (accessed February 25, 2009).

<sup>18</sup> Dickey, P. Washington Toxics Coalition, Issue 001. Safer Cleaning Products. *Green Home Living* magazine. <http://www.greenhome.com/info/magazine/001/safercleaning.html> (accessed August 10, 2006).

<sup>19</sup> Organic Consumers Organization. How Toxic Are Your Household Cleaning Supplies? [http://www.organicconsumers.org/articles/article\\_279.cfm](http://www.organicconsumers.org/articles/article_279.cfm) (accessed August 12, 2006).

on the underside of the penis), and increased rates of some kinds of cancers. The alkylphenol ethoxylates (APEs) used in some detergents and cleaners have been shown to mimic the hormone estrogen; one, APE, *p*-nonylphenol, has caused estrogen-sensitive breast cancer cells to multiply in a test-tube study.<sup>20</sup>

Floor care products—which are some of the most powerful chemicals used in the industry—have been known to cause many of these complications. Not only are they potentially harmful to building occupants and the environment, but they are especially harmful to workers. In fact, “six out of every 100 cleaning workers are injured on the job, and from 1993 through 1997, more than 12 percent of these work-related injuries involved floor care products.”<sup>21</sup>

Fragrances added to many cleaners, most notably laundry detergents and fabric softeners, may cause acute effects such as respiratory irritation, headache, sneezing, and watery eyes in sensitive individuals or allergy and asthma sufferers. In the United States, the National Institute of Occupational Safety and Health has found that one-third of the substances used in the fragrance industry are toxic, but because the chemical formulas of fragrances are considered trade secrets, companies are not required to list their ingredients but merely to label them as containing “fragrance.”

The environmental implications of traditional cleaners are equally shocking. Although some ingredients in chemical cleaners break down into harmless substances through wastewater municipal treatment plants before they are discharged into nearby waterways, others do not. The result of the latter is a substantial threat to water quality or fish and other wildlife. In a 2002-published study of contaminants in stream water samples across the country, the U.S. Geological Survey found persistent detergent metabolites in 69 percent of streams tested. Sixty-six percent contained disinfectants.<sup>22</sup>

“In Halifax schools, the use of cleaning products with an endocrine disruptor as the main ingredient put an estimated three tons of pure endocrine disruptors into the waters off Halifax in the past five years.”<sup>23</sup> Endocrine disruptors are known to mimic, displace, or interfere with normal body hormones and have been linked to cancer and reproductive abnormalities that in some cases affect fetuses.

---

<sup>20</sup> The Green Guide. <http://www.thegreenguide.com/green-cleaning-products> (accessed November 1, 2007).

<sup>21</sup> Kravitz, R. Environmental Design + Construction. Green Cleaning: Effective and Environmental Floor Care Products. October 1, 2005. <http://www.edcmag.com/Articles/Column/bac385e92e697010VgnVCM100000f932a8c0> (accessed February 25, 2009).

<sup>22</sup> U.S. Geological Survey (USGS) Fact Sheet. Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams. <http://toxics.usgs.gov/pubs/FS-027-02/> (accessed February 25, 2009).

<sup>23</sup> Environmental Health Association of Nova Scotia. <http://www.environmentalhealth.ca/politicalagenda.htm> (accessed August 10, 2006).

Another water pollutant found in laundry detergents and other cleaners is phosphates. When phosphates enter waterways, they act as a fertilizer and spawn overgrowth of algae. This overabundance of aquatic plant life eventually depletes the water's oxygen supply, killing off fish and other organisms.

## Political Factors

Political bodies around the world have played and still are playing a very influential role in driving change through the green chemistry movement.<sup>24</sup> For example, in the United States, all companies bidding for particular jobs must guarantee and provide evidence that green chemistry attributes are considered. For some companies, greater regulatory barriers to old-style chemistry can cause some major headaches. In Europe, the Commission proposed a new EU regulatory framework for the Registration, Evaluation, and Authorization of Chemicals (REACH). The aim is to improve the protection of human health and the environment through the better and earlier identification of the properties of chemical substances. Similarly, in November 1986, California voters approved an initiative to address growing concern about exposures to toxic chemicals.<sup>25</sup> These regulatory influences show no signs of letting up. In fact, their pressures are growing exponentially, and corporations are facing immense pressures to remain afloat through constant innovation and adaptation.

A number of organizations in Canada and the United States promote green cleaning products. Canada's Environmental Choice Program and its sister organization in the United States, Green Seal, have begun certifying floor care chemicals. Although the definition of "green" is widely debated and remains ambiguous, "certification that a floor care product is 'green' verifies that it is made safer because of the type of ingredients used and/or the use of lesser amounts of certain ingredients."<sup>26</sup> In the United States, green purchasing, also known as Environmentally Preferable Purchasing (EPP), means buying products that have a reduced environmental impact while maintaining the same quality and performance.

---

<sup>24</sup> Green chemistry, quite generally, is the use of chemistry for pollution prevention. It is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.

<sup>25</sup> This initiative became the Safe Drinking Water and Toxic Enforcement Act of 1986, better known as Proposition 65. The proposition requires the governor to publish a list of chemicals that are known to the state of California to cause cancer, birth defects, or other reproductive harm.

<sup>26</sup> Kravitz, R. Environmental Design + Construction. Green Cleaning: Effective and Environmental Floor Care Products. October 1, 2005. <http://www.edcmag.com/Articles/Column/bac385e92e697010VgnVCM100000f932a8c0> (accessed February 25, 2009).

## Green Cleaning Products

In Canada, manufacturers of household cleaners are not required to display ingredients (i.e. bleach, ammonia, phosphates, or strong abrasives) on their labels. Yet there are many manufacturers of eco-friendly cleaning products on the market that voluntarily list all ingredients on their labels (many also list what they don't contain). Unfortunately, the definition of green cleaning products and the standards for green cleaning labels are ambiguous, not to mention that many end-consumers lack the education required to distinguish harmless from harmful ingredients.

Government institutions and environmental activists claim that switching from traditional cleaning products to biodegradable, low toxicity—or otherwise less harmful—products can drastically improve the environmental profile of routine cleaning activities without sacrificing cleaning effectiveness. In fact, many businesses have discovered that using green cleaners also can reduce costs, improve employee productivity, and enhance customer loyalty. Although these assertions exist, hard evidence indicating so is not readily available.

Green cleaning products use earth-friendly ingredients such as hydrogen peroxide, a natural bleaching agent that degrades into oxygen and water. It replaces the environmentally toxic chlorine bleach commonly found in cleaning products. The concept of “green,” especially in regards to cleaning, is an overall philosophy, mindset, or objective: to move away from “toxic” and “hazardous” petrochemical products (any product derived from crude oil or a petroleum distillate) and towards natural, bio-based ones<sup>27</sup> that provide healthy and safe indoor environments and enhance air quality.

Green cleaning products already have proven their worth economically. After switching to greener cleaning products, the city of Santa Monica, California, for example, documented a 5 percent price saving when compared to the traditional products it previously purchased.<sup>28</sup> Other institutional purchasers in Massachusetts, Minnesota, and Vermont report<sup>29</sup> that green cleaners are very cost competitive with traditional products and that any additional costs are offset by factors such as increased worker safety, superior performance, higher worker morale and productivity, reduced absenteeism, reduced medical and insurance costs, and improved indoor air quality.

Similarly, Canadian hospitals have saved substantial amounts of money by switching from toxic cleaning products to borax and water, and school boards reaped similar

---

<sup>27</sup> Bio-based means a product that is derived from renewable sources such as extracts or oils from fruits, vegetables, plant matter, seeds, or nuts.

<sup>28</sup> U.S. Environmental Protection Agency (EPA), The City of Santa Monica's Environmental Purchasing: A Case Study. <http://www.epa.gov/epp/pubs/case/santa.pdf> (accessed August 8, 2006).

<sup>29</sup> Commission for Environmental Cooperation, Environmentally Preferable Cleaning Chemicals: A Buyer's Guide. [http://www.cec.org/files/pdf/ECONOMY/NAGPI-Green%20Cleaners-FS\\_en.pdf](http://www.cec.org/files/pdf/ECONOMY/NAGPI-Green%20Cleaners-FS_en.pdf) (accessed November 17, 2008).



benefits by using less toxic cleaning materials.<sup>30</sup> Activists claim that although healthier products cost more in the short term, the costs may well decrease with time, as the demand for less toxic materials increases and healthier practices become more routine. Similarly, they claim that if the full costs of all decisions—including hidden costs like health, productivity, and behavior problems in children—are considered, integrating environmental health in all decision-making around cleaning products clearly reduces costs to society.

In Canada and the United States, the environmental effects of cleaning products rose on the agenda in the last decade because of concern about consumer exposure to household cleansers and indoor air pollution. In the United States, President Bill Clinton's Executive Order 12873, "Federal Acquisition, Recycling, and Waste Prevention," led to changes in federal purchasing, and more substantial changes were reported at state and local levels.<sup>31</sup> The Canadian government has a department called Sustainable Development Information System (SDInfo, [http://www.sdinfo.gc.ca/s1\\_e.cfm](http://www.sdinfo.gc.ca/s1_e.cfm)) that provides information for business consumers of green cleaning products.

### **Societal Trends around Green Cleaning Products**

Canadian demand for natural, nontoxic products in Canada has steadily increased as more people become aware of the benefits of green cleaning. Emmanuel Rey, founder of LiveLife, a lifestyle enhancement service for people in Toronto, Canada, warns his listeners:

*Most commercial and household products contain toxic and volatile chemicals that are harsh on the environment and our bodies. Consider that children are playing on carpets and that pets are licking up crumbs from the floor. If traditional chemicals are used to clean, your children and pets are being unnecessarily exposed to harmful chemicals.*<sup>32</sup>

This sentiment is echoed across a number of customer and environmental activities worldwide. Hundreds of Web sites<sup>33</sup> warn consumers about the dangers of traditional cleaning products and educate them about alternatives. The Canadian Centre for

---

<sup>30</sup> Environmental Health Association of Nova Scotia.  
<http://www.environmentalhealth.ca/politicalagenda.htm> (accessed August 10, 2006).

<sup>31</sup> Like Massachusetts's Toxics Use Reduction Act and Santa Monica's (California) Sustainable Cities program.

<sup>32</sup> Jackson, K. Microsoft Home Magazine, Think green when you spring clean.  
<http://www.microsoft.com/canada/home/productivity-and-planning/articles/think-green-when-you-spring-clean.aspx> (accessed August 19th, 2006).

<sup>33</sup> For example, see <http://www.mamashealth.com/doc/cleanprod.asp>;  
<http://www.healthycleaning.com/whycleanhealthy.html>; <http://www.emaxhealth.com/34/281.html> (all accessed February 25, 2009).

Occupational Health and Safety provides access to MSDS databases.<sup>34</sup> Thousands of homemade recipes are available online that are especially devised for green cleaning.

## **Marketing Green Cleaning Products**

Customers of green cleaning products range from commercial cleaning contractors to end-consumers. Regardless of the customer, the bottom line is that the “green” product in question must brighten and deodorize quickly and perform as well as or better than leading national brands of conventional products. They explain that the product should provide mild or fragrance-free day cleaning near sensitive populations and should not be harsh, contain damaging chemicals that etch or dull floor finishes, or leave residues, streaks, or unpleasant odors.

### *Commercial Cleaning Contractors*

Commercial cleaning contractors are increasingly looking for green cleaning products because they are starting to recognize the long-term cost benefits associated with the use of these materials. Occupational injuries and asthma related to cleaning are increasing at an alarming rate. In Canada, every year, cleaning products injure 6 percent of cleaning professionals,<sup>35</sup> and chemicals cause 20 percent of eye and skin burns<sup>36</sup>. Many people also experience headaches, nausea, or dizziness when they come into contact with harmful gases produced by the chemicals contained in conventional cleaning products. Green cleaning products are expected to safeguard employees by providing the highest international and domestic standards for health and safety.

These commercial customers also are requesting information on raw materials used in these cleaning products to determine the level of hazard to health and safety. They expect cleaning products to be based on sound science, independently tested, and third-party certified to comply with the strictest environmental, health, and safety standards.<sup>37</sup> They are looking for green cleaning products that contain no carcinogens, no alkyl-, octyl-, or nonylphenol ethoxylates (APEs, OPEs, NPEs), low or no VOCs or phosphates, no zinc, and no dibutyl phthalate.

Most of all, customers want products that are competitively priced yet perform just as well or better than leading national brands. Activists in the green cleaning movement

---

<sup>34</sup> Canadian Centre for Occupational Health and Safety Home Page. <http://www.ccohs.ca/> (accessed February 25, 2009).

<sup>35</sup> Green California, Building Maintenance – Cleaning Products. <http://www.green.ca.gov/EPP/building/cleaning.htm> (accessed July 7, 2006).

<sup>36</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

<sup>37</sup> *ibid.*

explain that there are opportunities for green cleaning product manufacturers to help their customers reduce their costs. For instance, they explain that many use in excess of 20 different cleaning chemicals when superior results can be obtained with a program that includes only three or four products. They explain that this reduction would simplify building operations and inventory, eliminate dangerous chemical stockpiles, reduce the cost of cleaning suppliers, and lower water consumption, cleaning times, waste removal, and disposal costs.<sup>38</sup>

Dilution control is supposedly another mechanism for cost savings. The traditional method of cleaning is the “pour into the bucket” approach. This method uses manual measurements, rendering the cleaning solutions inaccurate. In most cases, through no fault of their own, workers have a misconception that pouring more will result in increased effectiveness. Too much chemical can leave streaks and insufficient water could cause damage to surfaces. It also results in product waste. This manual method is just that—manual. Using a dilution-control system is meant to prevent chemical contact with worker skin. Moreover, accurate dilutions ensure that the cleaning solution performs at its optimal level. Furthermore, such a system would reduce set-up and mixing time, and fewer products would be wasted.<sup>39</sup>

### *End-Consumer Market*

Green cleaning products are found in local health-food stores and in the health-food aisle of grocery stores. Many Web sites also sell eco-safe cleaning products and deliver them directly to the end-consumer. For instance, Gaiam, a lifestyle company located in the United States, has an entire range of natural-living products, from cleaning products to allergy-relief bedding.<sup>40</sup> Real Goods has everything from the outdoors to the indoors—from garden composters and solar fountain kits to green cleaning products and laundry fragrance.<sup>41</sup> The Canadian company Nature Cleaning Living makes household cleaners and laundry products, from dishwasher liquid to fruit and veggie spray.<sup>42</sup>

## **DuPont’s Cleaning Products Division**

DuPont’s Cleaning Products Division (formally called Formulated Products) falls under the “Clean and Disinfect” department, which is part of the larger Chemical Solutions Group. DuPont offers a range of product categories in the cleaning division for the

---

<sup>38</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

<sup>39</sup> Perks Publications, [Green Cleaning for a Clean Bill of Health](http://www.sanitationcanada.com/sanitation/3.html), <http://www.sanitationcanada.com/sanitation/3.html> (accessed February 25, 2009).

<sup>40</sup> GAIAM Home Page. <http://www.gaiam.com/> (accessed February 25, 2009).

<sup>41</sup> Real Goods Home Page. <http://www.realgoods.com/> (accessed February 25, 2009).

<sup>42</sup> Nature Clean Home Page. <http://www.naturecleanliving.com/> (accessed February 25, 2009).

household and institutional cleaning market, including carpet care, floor care, laundry products, pool and spa care, specialty cleaners, toilet bowl cleaners, upholstery protection, and wood cleaner. Their cleaning products are free of phosphates, hydrochloric acid, phosphoric acid, chlorine, quats, NPE, and butyl.<sup>43</sup>

DuPont's traditional value proposition to the customer has always been the provision of raw material ingredients for cleaning chemical solutions. In 2000, however, DuPont Canada launched a pilot project to assess the feasibility of moving down the value chain to sell packaged-level products rather than just the bulk raw materials that DuPont was more accustomed to providing. In the first two years of this initiative, the division worked to develop and acquire a line of products that would meet the needs of the mainstream cleaning market. Unfortunately, this approach was fraught with financial troubles as the division had little direction and struggled to differentiate itself from competitors.

In 2002, Mr. Heggie shifted the focus to product formulations<sup>44</sup> that specifically leveraged DuPont's raw materials and their associated sensitivities to the environment. Mr. Heggie recognized that a strategy targeting the mainstream market with traditional cleaning products would not be in DuPont's best interests. DuPont's high costs of production would force it to command premium prices in a very competitive and mature industry. Consequently, Mr. Heggie suggested that DuPont leverage its existing core competencies as a means of differentiation. When assessing this possibility, the division identified two strengths it could draw upon: DuPont's expertise at supplying raw materials for chemical solutions and the attractive environmental profiles of many of DuPont's ingredients. The division subsequently evaluated which of its existing cleaning products indeed possessed both of these characteristics. Those that did not were dropped immediately from the division's product line. Mr. Heggie describes this process:

*As a division we asked what was special about these cleaning products. We realized that some of them are made with DuPont's raw materials. Although this was important, the fact that we make the ingredients wasn't much of a value proposition to the customer. So we probed further and we realized that some of the main ingredients have an attractive environmental profile. So we then used these two criteria to test whether our existing cleaning products were unique. Some of them missed by miles, so it became quickly evident that we'd need to become more of a boutique player. In other words, these are cool products, very interesting, but they're not going to represent a one-stop shop for someone that wants to clean an average building.<sup>45</sup>*

This policy was applied recently when one of DuPont's customers requested a rust remover formulation. Most rust removers contain hydrofluoric acid, and while this

---

<sup>43</sup> DuPont, Cleaning & Disinfection Products.

[http://www2.dupont.com/Directories/en\\_US/Products\\_Services\\_Index/Food\\_Pharmaceutical\\_Quality\\_Assurance\\_Products/Cleaning\\_Disinfection\\_Products.html](http://www2.dupont.com/Directories/en_US/Products_Services_Index/Food_Pharmaceutical_Quality_Assurance_Products/Cleaning_Disinfection_Products.html) (accessed July 4, 2006).

<sup>44</sup> Formulations refer to the mixture of ingredients and chemicals that make up a cleaning product.

<sup>45</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

substance is effective at removing rust, it is tremendously dangerous. DuPont refused to formulate this product despite customer requests. Consequently, DuPont, in their contract with customers, regularly informs them that they will not provide certain products that compromise their environmental principles.

Although strategically the expansion downstream sounded lucrative, Mr. Heggie recognized that any attempt by DuPont to do so would be stifled because it lacked infrastructure and marketing expertise to end-consumers. He explained:

*We don't have any way of affordably producing products for sale. The worst thing that could happen to us is that we produce more products and lose more money because the more we'd produce the more we'd lose.*<sup>46</sup>

Mr. Heggie subsequently looked at partnerships to help DuPont grow downstream at a rapid scale. In 2002, the cleaning division forged a relationship with ServiceMaster, a family of brands that provides outsourcing services for U.S. residential and commercial customers through a network of more than 5,500 company-owned locations and franchise licenses.<sup>47</sup> In the early negotiation stages, DuPont's cleaning division asked ServiceMaster if it would like to purchase DuPont's raw materials for its cleaning products OR work more closely with DuPont to develop the green cleaning products itself and, thus, join DuPont's quest to reduce the environmental footprint of these products. ServiceMaster already had a strong environmental policy in place and indeed wanted to partner with an environmentally oriented formulation partner, so it accepted the latter option with enthusiasm.

ServiceMaster already had the infrastructure that DuPont required to make its formulations while DuPont had the intellectual capital to produce a number of green cleaning formulations for which ServiceMaster was searching. The partnership was a natural fit of complementary capabilities.

DuPont and ServiceMaster chemists worked together, with DuPont's product stewardship team, to ensure that their products met performance standards while meeting or surpassing regulatory requirements. For example, DuPont removed all nonylphenol and its ethoxylates (NPEs) from its cleaning products line for acceptance in the UK, where NPEs were in the process of being banned. NPEs are primarily used as

---

<sup>46</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006

<sup>47</sup> ServiceMaster owns leading home service brands like TrueGreen, ChemLawn, Terminix, ServiceMaster Clean, Merry Maids, American Home Shield, Rescue Rooter, Furniture Medic, American Residential Services, and AmeriSpec. The company also partners with Sears to help homeowners manage their home service needs. The core services of the company include lawn care and landscape maintenance, termite and pest control, home warranties, disaster response and reconstruction, cleaning and disaster restoration, house cleaning, furniture repair, home inspection, and plumbing, heating, and air conditioning. See <http://corporate.servicemaster.com/index.asp> for more information (accessed November 1, 2007).

surfactants in industrial and domestic detergents.<sup>48</sup> The bulk of NPEs used were released through the sewage system; an estimated 37 percent reached the wider aquatic environment, 46 percent entered the soil via sludge spread on agricultural land, and 17 percent was degraded or destroyed.<sup>49,50</sup>

DuPont also has successfully removed volatile organic compounds (VOCs) from products that would not be sellable in California.<sup>51</sup> VOCs are highly evaporative, carbon-based chemical substances that produce noxious fumes; they are found in many paints, caulks, stains, and adhesives. VOCs are some of the most toxic ingredients in air pollution. A single tube of caulking may contain more than 500 grams of VOCs per liter. These compounds affect indoor air quality and occupant health, the health of workers producing and using the materials, and the overall health of the environment. VOC emissions from cleaning products occur when propellant and organic solvents evaporate. Released chemicals remain in the air all day. In the Chicago area, for example, 20 tons of VOCs are released into the air from the use of cleaning products each day. All-purpose cleaners—as well as specialty products such as metal polishes and glass, tile, and tub cleaners—pollute indoor air quality and may cause respiratory and eye irritation, particularly for janitorial and other cleaning staffs. According to some sources, for every 100 janitors who switch to greener cleaning products, VOC emissions could drop by one ton per year. Studies also have shown that the use of cleaner products reduces the incidents of health problems among janitorial staffs. And in many cases, cleaner products cost less.<sup>52</sup>

DuPont has worked closely with ServiceMaster to improve the safety instructions on labels in an effort to boost usage efficiency and minimize excessive and unnecessary exposure to particular chemicals. According to DuPont's Web site,<sup>53</sup> an important aspect of protecting human health and the environment from potentially toxic chemicals is to develop national systems that ensure that chemicals are properly classified and

---

<sup>48</sup> A surfactant is defined as a material that can greatly reduce the surface tension of water when used in very low concentrations.

<sup>49</sup> Concerns have focused on the potential for NPE to cause feminization in wildlife (such as fish exposed to NPE contaminated effluents), reproductive organ disorders, and decreasing sperm counts in men. Whereas NPE is reasonably readily degradable, its breakdown product NP is more persistent. NPEs have been detected in New Jersey drinking water.

<sup>50</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

<sup>51</sup> California was the first state to enact laws limiting VOC content. Traditionally, California's environmental rules have set precedents for federal regulations, as well as those of other states. The U.S. EPA is negotiating to develop a national VOC regulation that will be effective throughout the United States. Canada is following suit.

<sup>52</sup> Clean Air Counts. <http://www.cleanaircounts.org/lowvoccleaningprodcuts.aspx> (accessed February 25, 2009).

<sup>53</sup> DuPont, Creating Societal Value. [http://www2.dupont.com/Social\\_Commitment/en\\_CA/SHE/index.html](http://www2.dupont.com/Social_Commitment/en_CA/SHE/index.html) (accessed November 2, 2007).

labeled to provide users with clear and explicit instructions on usage quantities, mixes, and requirements. These communication tools provide workers, consumers, and the public with important information about the hazards of chemicals and, thus, help to trigger precautionary behavior. The chemical industry and labor unions around the world have embraced and supported better chemical hazard communication.

According to sources close to DuPont,<sup>54</sup> the cleaning products division has become incredibly proficient at achieving regulatory compliance and product stewardship of its products. The division has developed the expertise to ensure that a particular product is, in fact, made correctly and all the regulatory rules involved are obeyed. The division's team of product stewards is based in Wilmington, North Carolina, and constantly gives advice on product development and product introductions.

The culture of the cleaning products division very much reflects the culture of DuPont Canada. That is, it revolves around safety, business ethics, and respect for people. Within the chemicals business, however, there is a heightened concern for environmental stewardship. With the strategy of moving downstream to formulated cleaning products, the division realized rather quickly that these products would be in the hands of end-users that are not scientifically literate (and in some cases not literate at all). This meant that DuPont would need to incorporate a degree of care in the formulation and packaging process to ensure that these products are safe to use by all users. Mr. Heggie describes this importance:

*As you get closer to the final user and as you go more and more into the chemicals world, the due diligence and obligations go way up. So it's always about product and environmental stewardship and product safety.*

## Opportunities and Challenges

### The Canadian Retailer Market

One of the most promising yet challenging opportunities for the DuPont cleaning division is the idea of integrating downstream to the end-consumer market. The cleaning division is known as an industrial and commercial products supplier, but it does not possess the expertise required to penetrate this burgeoning market. Mr. Heggie has been pondering the idea of partnering with major retailers across Canada to gain the capabilities necessary to market these products. Loblaw Companies Limited ("Loblaw") was one such retailer.

Loblaw is Canada's largest food distributor<sup>55</sup> and a leading provider of general merchandise products and services. Through its various operating banners, Loblaw is committed to providing Canadians with a one-stop destination for their food and

---

<sup>54</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

<sup>55</sup> Access My Library. [http://www.accessmylibrary.com/coms2/summary\\_0286-25175060\\_ITM](http://www.accessmylibrary.com/coms2/summary_0286-25175060_ITM) (accessed November 11, 2007).

everyday household needs. Loblaw is known for the quality, innovation, and value of its food offerings.

While food remains at the heart of its business, Loblaw has changed Canadians' perceptions of what a supermarket can be by providing a wide, growing, and successful range of general merchandise products and services, including kitchenware (e.g. pots and pans, cutlery, utensils, etc.) and cleaning products. In fact, Loblaw typically dedicates a full aisle to these houseware items.

### *Loblaw and Green*

Loblaw has made a conscious effort in the last decade to demonstrate its commitment to health, safety, and the environment. The President's Choice Blue Menu is a menu of healthier products that contain responsible packaging and helpful nutrition information to help consumers and health professionals lead healthier lives. With more than 200 products with comprehensive nutritional and product labeling information, Loblaw is beginning to carve a niche in the healthy eating market. Similarly, Loblaw has created PC Organics and PC Green lines to complement this initiative.

Loblaw's image of responsibility and respect for environmental principles piques the interest of Mr. Heggie and DuPont. To partner with a progressive organization such as Loblaw, with its tremendous market capability and reach, sounded like a great opportunity for DuPont. But the question of whether the end-consumer market would indeed purchase green cleaning products was still unanswered. Is this a worthwhile endeavor? If so, what is the hook for the consumer? How would they persuade consumers to pay more for this? And most importantly, what should this partnership look like?

### **Challenges for the Cleaning Products Division**

One of the fundamental challenges within the cleaning products division is the need to develop environmentally friendly products without reducing cleaning effectiveness and quality and/or increasing price levels. Mr. Heggie explained this challenge:

*When you are leading an environmental business, you find that the majority of customers won't pay more for improved environmental performance but they will choose those environmental products over traditional ones if the prices are identical. There is also somewhat of a negative perception among "green" products that they are not as effective as the less green, traditional ones.<sup>56</sup>*

Despite these challenges, Mr. Heggie expresses some optimism:

*Lately, however, due to regulatory forces, customers are beginning to pay more for these products. Also, the perception that "green" products don't work is beginning to*

---

<sup>56</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.



*fade as people are seeing more and more evidence that “green” can perform as well if not better than traditional products.*

Another challenge for DuPont’s cleaning division is knowing where to draw the line when deciding whether or not to provide a formulation product. This dilemma was recently evident in a decision to source a skin product. DuPont initially chose not to provide a very powerful skin sanitizer to customers because it did not fit within the company’s environmental principles. Yet, DuPont recognized that industrial customers are very knowledgeable about how to use these products; they are trained to wear gloves and eye protection and take other safety precautions. In this case, rather than disbanding the chemical immediately, DuPont chose to phase out the chemical over a two-year period. These types of situations represent gray areas for DuPont, and the company had no guiding principles in place to help it deal with these circumstances.

Another interesting challenge for DuPont is the constant wrestling match between those customers and potential customers who do not take the green chemistry movement seriously. Many customers are rather withdrawn from, and disinterested in, the green chemistry movement and typically have no intention of fully considering the commitment or consequences involved. These attitudes have substantial and potentially negative implications for DuPont because the misuse of these chemicals breaches DuPont’s principles and could compromise their value proposition to the market. Consequently, DuPont is particularly focused on working with customers that are progressive in their policies toward green chemistry. As Mr. Heggie explains:

*So we spend a lot of time looking for those companies in particular that are aligned with our environmental approach. We’ve learned that there are customers out there that nod and smile at these environmental principles with no serious commitment. We now put our foot down and are much more explicit that these principles are non-negotiable.<sup>57</sup>*

Another potential obstacle facing the cleaning products division as it attempts to integrate downstream is DuPont’s historical identity as a provider of raw materials. Mr. Heggie has experienced substantial pushback for proposing that DuPont put its label on cleaning products used by customers and end-consumers. Unlike 3M, which is in the business of providing finished products for the consumer, DuPont is known for providing raw materials and has thus been overshadowed by this image for some time. Mr. Heggie struggled to shift this mindset to achieve the buy-in required to integrate downstream. The ServiceMaster relationship—as Stuart Heggie explains—was meant to start cracking that nut.

DuPont also wondered where they stood relative to competitors in the industry. 3M, Spartan, Ecolab, Johnson Diversity, and Rochester Midland are all operating in the downstream end of the value chain, and Mr. Heggie wondered how his cleaning division could best differentiate itself from these competitors.

---

<sup>57</sup> Interview with Stuart Heggie, Middle Manager, DuPont Canada, May 15, 2006.

## The Future

Mr. Heggie certainly had a lot to think about moving forward. He contemplated the different alternatives available to the cleaning products division at DuPont. His division certainly had an opportunity to ride the wave of the green movement and indeed become a leader in the industry. But how was he to do this when he really could only establish a boutique of products that conformed to the company's environmental principles? Was it even smart to deviate from DuPont's core business of raw materials? Would the company want to increase this portfolio to compete with bigger brands like 3M? If so, how would it do this?

Mr. Heggie also wondered how the division should move forward from a partnership perspective. ServiceMaster has been instrumental in developing the infrastructure required around downstream products. Who should DuPont turn to next? Should it pursue a partnership with a Canadian retailer such as Loblaw? Should DuPont target other downstream retailers? Was this option even viable?

Finally, Mr. Heggie thought about the long-term future of the division. He considered expanding the division into a systemic solution center where chemicals would only be one of the solutions provided to a customer. He also considered other services like consulting expertise, microbial protection equipment, and non-woven fibers, wipes, and clothes, among others. He wondered if this was something that should be pursued. Would there be a market for this? How would competitors react? Was this in line with DuPont's value proposition more generally?

All these and other questions occupied Mr. Heggie's mind as he gazed out his office window at workers cleaning windows of nearby commercial buildings.

## Case Discussion Questions

(these are meant to act as a guide only)

- 1) How would you characterize the competitive landscape of the cleaning product industry? Is the competitive landscape any different in the *green* cleaning product industry? What other external factors should DuPont consider?
- 2) How successful has the cleaning division been to date? What factors account for the division's success?
- 3) What are the cleaning division's strengths and weaknesses? What competencies and capabilities does the division have that its rivals don't have?
- 4) What is DuPont's organizational paradigm? What does the company stand for? Is this different from the cleaning division?
- 5) How should DuPont position itself in the cleaning products industry? What internal capabilities should it leverage in this positioning strategy?
- 6) If you were asked by Mr. Heggie to recommend specific strategies for DuPont's cleaning division for the next five years, what strategic options would you consider and what options would you recommend? Why?
- 7) How do you suggest DuPont implement these recommendations?

# Appendix A

## DuPont Canada's Performance Cleaning Chemicals<sup>58</sup>

### Performance chemicals

- **DuPont™ Zonyl® Fluorosurfactants** for coatings, textiles, carpet, and specialty applications. Please visit [www.dupont.com/zonyl](http://www.dupont.com/zonyl).
- **DuPont™ Zonyl® Fluorochemicals**, which include intermediates, oil and water repellents for carpet, textiles and paper, surfactants, highly stable polymeric lubricants and release agents, and additives for paints, coatings, and stone and masonry treatments. Please visit [www.dupont.com/zonyl](http://www.dupont.com/zonyl).
- **DuPont™ Zonyl® Fluoroadditives**, free-flowing Teflon PTFE powders designed for use as additives in other materials or systems. Depending on the application, they may provide nonstick properties, improved lubricity, better wear resistance, and reinforcing properties. For more information, please visit [www.dupont.com/zonyl](http://www.dupont.com/zonyl).
- **DuPont™ Krytox®** performance line of oil and grease products can exceed your most challenging needs; from the aggressive world of chemical processing, to the high temperatures in state-of-the-art automotive, paper corrugating, foundry, and textile applications, to the critical tolerances of aerospace military specifications and food grade (H-1) requirements. Krytox oils and greases offer a unique combination of properties that extend the life of components, allowing manufacturers to extend warranties and manufacturing plants to reduce costly maintenance and downtime due to component failure. Krytox performance lubricants have been developed to provide the best protection for bearings and other components in high-temperature service, up to 343°C (650°F). Krytox performance lubricants are cost-effective across a wide range of applications because of their long, useful life relative to traditional hydrocarbons. For more information, please visit [http://www2.dupont.com/Lubricants/en\\_US/index.html](http://www2.dupont.com/Lubricants/en_US/index.html).
- **DuPont™ DryFilm** dispersion products are formulations of ultra-low molecular weight PTFE particles manufactured as dispersions in various solvents, including water. DryFilm dispersions exhibit outstanding lubricity, an extremely low coefficient of friction and provide durable antistick properties when applied to a variety of surface types. Unlike most silicone coatings, DryFilm dispersions are non-migrating, staying where they are applied rather than spreading into surrounding areas. For more information, please visit [http://www2.dupont.com/Lubricants/en\\_US/products/dryfilm/dryfilm.html](http://www2.dupont.com/Lubricants/en_US/products/dryfilm/dryfilm.html).
- **DuPont™ TraSys®** mold coatings release agents and anti-friction coatings that supply the plastic rotational molding industry with the best in water-based mold release coatings. Free of alcohol and solvents, these coatings meet all existing and anticipated environmental regulations. DuPont coatings yield consistent, controlled release for maximum performance. Rotational molders use TraSys® coating and release systems because their long life reduces the need for frequent operator spraying and they are safe, easy to use, and work with LLDPE, LDPE, MDPE, HDPE, LXPE, PP, plastisol, and nylon. They produce consistent parts without warpage or sticking, allowing your production to run smoothly. For more information, please visit [http://www2.dupont.com/Lubricants/en\\_US/products/trasys/trasys.html](http://www2.dupont.com/Lubricants/en_US/products/trasys/trasys.html).
- **DuPont™ Tyzor®** DuPont was the industry pioneer and is today's global leader in supplying organic titanates and zirconates for a variety of industrial applications. Today's Tyzor organic titanates and zirconates perform four important functions:
  - Catalyst for esterification, transesterification, and polyesterification processes.
  - Cross-linking agent to improve solution properties.
  - Surface modifier to improve surface properties.
  - Adhesion promoter to increase coatings performance.For more information, please visit [www.dupont.com/tyzor](http://www.dupont.com/tyzor).

<sup>58</sup> List acquired from Stuart Heggie, Middle Manager, DuPont Canada.

- **DuPont™ Fluoroguard®** is a range of colorless, odorless, chemically inert polymer additives based on a fluorinated synthetic oil. Designed for a variety of uses, Fluoroguard is nonflammable and internally lubricates to reduce wear and abrasion and to improve polymer throughput and flow properties. Fluoroguard is used in a variety of thermoplastic and thermosetting polymers to improve mechanical performance, including wear, flex fatigue, coefficient of friction, chemical resistance of the products, and processing characteristics (e.g., melt flow, mold release, die buildup). Please visit [http://www2.dupont.com/Lubricants/en\\_US/products/fluoro/fluoroguard.html](http://www2.dupont.com/Lubricants/en_US/products/fluoro/fluoroguard.html).
- **DuPont™ Zelec®** electroconductive powders used as coatings and plastic additives.
- **DuPont™ Microfree®** antimicrobial powders for coatings and polymers.
- **DuPont™ Vazo® free radical initiators** that decompose to liberate free radicals for polymerization. For solvent-based systems, Vazo initiators come in liquid and solid white noodles grades. For aqueous systems, Vazo initiators come in white powder grades. Please visit [www.dupont.com/vazo](http://www.dupont.com/vazo).
- **DuPont™ glycolic acid** for a broad spectrum of consumer, beauty, and industrial applications. A clear, pale yellow, aqueous solution containing 70 to 72 percent total acid. It is readily biodegradable and is non-flammable. Glycolic acid is made synthetically, although it does occur naturally. It is the first member of the alpha hydroxy carboxylic acids (AHAs). Please see [www.dupont.com/glycolicacid](http://www.dupont.com/glycolicacid) for more information.
- **DuPont™ Glyclean®** an aqueous solution based on an organic acid with strong chelating properties.
- Specialty aramids, which serve as additives that provide chemical resistance, thermal stability, and corrosion protection for resins and textiles in many consumer, industrial, and automotive applications. For more information, please visit [www.dupont.com/specintermediates](http://www.dupont.com/specintermediates).
- **DuPont™ Oxone® monopersulfate compound**, a nonchlorine oxidizer used in a variety of cleaning applications that acts as an oxidizing additive for applications ranging from denture cleansers and pool and spa use to pulp and paper industry needs. Please see [http://www2.dupont.com/Oxone/en\\_US/](http://www2.dupont.com/Oxone/en_US/).
- **Teflon® Advanced carpet protector**