

# GTA Advanced Manufacturing Case Studies

Final Report



*Discover How Design Adds Value*



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Greater Toronto Marketing Alliance in collaboration with the Design Industry Advisory Committee

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# Contents

- I. Executive Summary, 4
- II. Design in Advanced Manufacturing, 7
  - a. Introduction, 7
  - b. What is Advanced Manufacturing, 7
  - c. Design's Role in Location Strategy, 8
  - d. Case Selection and Findings Emerging, 9
  - e. Seven Best Practices, 10
- III. GTA Design Value Proposition, 12
- IV. Case Studies, 16
  - a. Umbra, 16
  - b. GE Water & Process Technologies – Zenon Membrane Solutions, 27
  - c. D&V Electronics, 35
- V. End Notes, 40

# Executive Summary

What does a maker of plastic housewares have in common with an automotive testing equipment provider and the developer of the world's most advanced ultra-filtration membranes? These companies are all advanced manufacturers. They are based in the Greater Toronto Area (GTA). They have won global recognition for product excellence. And they connect design to their business strategy.

The three companies are Umbra, D&V Electronics, and Zenon Membrane Solutions, now part of GE Water & Process Technologies. They are the first companies to be researched in a new case study project commissioned by The Greater Toronto Marketing Alliance (GTMA) in collaboration with Ontario's Design Industry Advisory Committee (DIAC). The objective of this ongoing research is to explore how leading advanced manufacturers, in various industry sectors, are working with Canadian designers to establish competitive advantage.

## **Design-Rich Region**

The study defines advanced manufacturing as: thinking smarter at the fuzzy front end of the manufacturing process. This approach puts more emphasis on high value jobs in research, development and design. The GTA is a premier North American centre for advanced manufacturing. It is also a premier centre for design. The GTMA research study demonstrates the Design Value Proposition for the GTA by linking its manufacturing and design capabilities. The research references other jurisdictions that have leveraged this connection. The talent of the design workforce in the United Kingdom has attracted in-bound investment from international companies including Samsung, Nissan and Orange. As part of its spectacular business transformation, South Korean manufacturer Samsung has mobilized local design talent in its major markets to capture and reflect cultural and customer trends in its value-added high design products. In this context, harnessing the GTA's design talent to add value to its well-established manufacturing capability makes very good sense.

The GTA has world-leading design education infrastructure. As for its design workforce, the GTA has the third highest concentration of designers in the labour force of any North American city (after New York and Boston). This gives international companies one more good reason to locate in the Greater Toronto Area. The findings could also help Canadian manufacturers, who are struggling to find new ways of competing against the low price, high volume strategies of their formidable offshore competitors.

A number of significant insights emerged from the study. The research identified Umbra, D&V Electronics, and GE Water & Process Technologies - Zenon Membrane Solutions as design-led manufacturers because each of these companies has used design to improve its products and to promote its brands internationally.

## The Case Studies

Umbr is an internationally renowned manufacturer of house-ware. Its products are sold through 25,000 retailers in more than 75 countries. The company has established a winning formula to compete in a highly competitive industry sector: a red-hot design team based at its Scarborough, Ontario head office combined with a rigorous methodology for integrating smart design with advanced manufacturing processes. Its creative team is continually experimenting with colour, new materials, forms and finishes to produce well-designed, affordable products to fit post-modern consumer tastes.

Zenon Membrane Solutions, now part of GE Water and Process Technologies, is a research and innovation-driven company with a world-leading track record in advanced membrane technology. The company also maintains a strong branding and design vision. The head office facility houses a full-scale science exhibit demonstrating generations of technology breakthroughs, and its ZeeWeed family of products has been branded with memorable names that blend science fact with science fiction. The product development team has worked with a local industrial designer to improve the packaged water treatment plant called the Z-Box. Design improvements have made the Z-Box faster to install and simpler to operate and reduced costs by nearly half.

D&V Electronics is North America's leading manufacturer of custom automotive testing equipment for rotating electrical systems. Its competitive advantage is based on a commitment to continuous innovation, supported by a significant investment in R&D and design. The computerized assessment tools developed by the company are based on user-centred design principles. Its design know-how is also demonstrated through a state-of-the-art interactive web site that extends the company brand internationally and delivers high-level remote access services to an international client base.

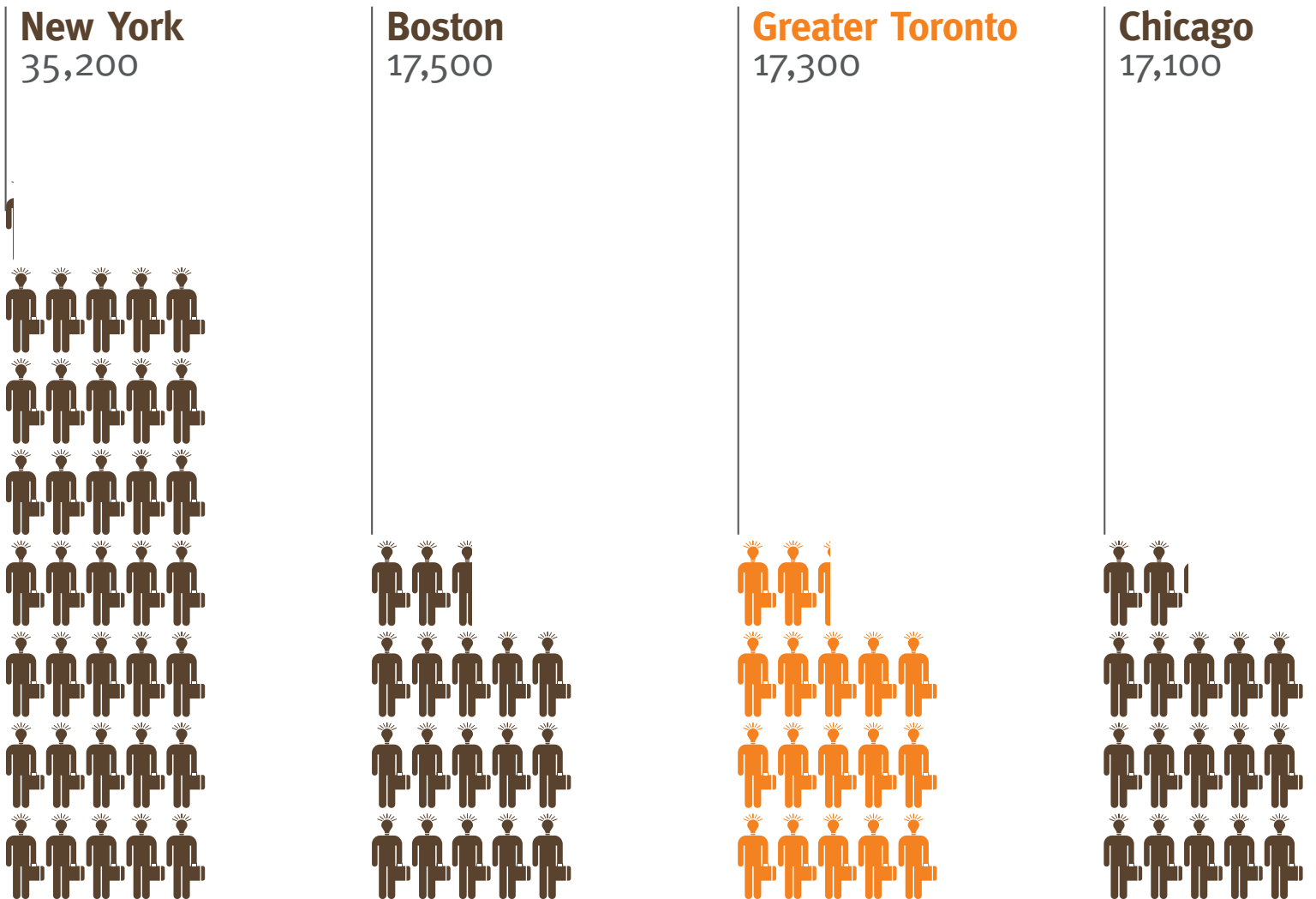
## Seven Best Practices

In integrating design with competitive business strategy, these companies demonstrate seven best practices:

1. Entrepreneurial Leadership.
2. R&D Linked to New Product Design.
3. Adding Value Through User-Centred Design.
4. Long Term Relationships with Designers.
5. Investment in Brand and Communications Design.
6. Reflecting a Culture of Innovation in the Workplace.
7. Research Relationships with the Local University and College Network.

# North America's Top Design Centres

Designers in the workforce



# Design in Advanced Manufacturing

## Introduction

The Greater Toronto Area is a premier North American centre for advanced manufacturing. It is also a premier centre for design. This research outlines a Design Value Proposition for the region, and explores how three global manufacturers, based in the Greater Toronto Area (GTA), have integrated design with their business strategy and benefited from the use of local design talent.

In the complex global business environment of the 21st Century, design has become the ultimate differentiator for innovative companies all over the world. Design has a special role to play in manufacturing, and particularly in advanced manufacturing companies. Design helps manufacturers not only to develop and brand more compelling products, but also to:

- improve production processes
- develop advanced materials
- manage their supply chain
- take cost out of their production process
- enhance quality and performance
- reduce environmental impacts

In fact, design is helping advanced manufacturers who are at the cutting-edge of their industries to transform every aspect of their business in order to establish international market leadership.

## What is Advanced Manufacturing?

There are various definitions of Advanced Manufacturing. However, an Industry Study Group Paper on Advanced Manufacturing titled “Getting Agile & Fast”, published in the United States by the Industrial College of the Armed Forces National Defense University, describes the marketplace for Advanced Manufacturing as:

“...a highly competitive environment that favors brains over brawn. Manufacturing has become a sprint to identify customer requirements, and in turn, produce products that meet them faster than the competition. In this environment, competitive prices, precise operations, and quality products are entry criteria. What differentiates certain companies is a unique ability to create a competitive advantage in this environment – these manufacturers think and do faster – and by definition these advantages make them advanced.”<sup>1</sup>

Certainly, if western companies are going to compete with the cost and time-to-market advantages of Asian manufacturers, thinking smarter at the front end of the manufacturing process has to be part of the solution. This strategy also puts more emphasis on high value jobs in research and development which Canada is well positioned to grow.

This kind of thinking has become closely linked to innovation and, in this decade, to design. When designers are involved early on in R&D, they are able to combine their analytical thinking with the ability to prototype, to sketch and to model ideas so that they can then be evaluated, adapted and improved even before they reach the design stage. This kind of conceptualizing in concrete form has revolutionized the R&D process and helped innovative companies all over the world to cut costs in design and production, to streamline their processes and to launch new products with a better rate of success.

Designers also bring a different approach to research that involves deep knowledge of human behaviours and close observation of cultural customs and the patterns of daily life. Design research can inspire and inform new products not yet imagined or conceived of in market research. For example, consumers had no idea that they wanted to walk around while listening to music before Sony launched the Walkman. There is a straight line in breakthrough design innovation from that product to Apple's launch of the iPod.

### **Design's Role in Location Strategy**

In the 21st Century, companies and entire countries have identified design as a driver for economic advantage. When South Korean manufacturing giant Samsung ran into problems with its low end brand in the mid 1990s, its CEO Jong-Yong Yun decided to use design to move the company up market and leveraged the resources of local design hubs to drive the repositioning.

The details of this transformation are compellingly recounted in Adrian Slywotsky's book, *The Upside: the Seven Strategies for Turning Big Threats into Growth Breakthroughs*. As Slywotsky explains:

"Samsung moved to change the balance of power between engineers and designers in favour of the designers. With the help of the Art Centre College of Design in Pasadena, California, the firm opened an in-house design school, where Samsung designers, marketers, and engineers began taking six-day-a-week classes in cutting-edge design techniques. It created design centers in every major market, the better to capture local customer trends. For example, Samsung opened studios to design cell phones in Seoul, San Francisco, London, Tokyo, Los Angeles and China." <sup>2</sup>

One of the ways that strategic regions can benefit from design is by using their design talent pool to attract foreign investment. Writing in the RSA Journal in August 2006, Clive Grinyer, former Director of Design and Usability Innovation at Orange Group, UK, and now Director of Design at Orange France Telecom, articulated the relationship between the UK's shrinking manufacturing base and its rising design sector.

He commented:

"There are many examples where UK design talent has itself attracted in-bound investment: 10 years ago I founded Samsung's European design team when it moved from Frankfurt



to London. We now have a thriving office where we design physical products and user interfaces for Samsung's global product range. More recently, Nissan set up in Paddington, London, and I have my own design team at Orange.

These companies are attracted to the UK by its many design advantages. It has a plentiful and high-quality pool of design graduates from its excellent design education system. London attracts both companies and designers from around the world, thanks to its status as a cultural and design centre within the context of the UK's liberal economy, mid-Atlantic point of view and, though often forgotten or denied, European presence and perspective.“<sup>3</sup>

The Greater Toronto Area is one of those international strategic design hubs offering a strong economic climate, cultural diversity and an abundance of creative and technological resources. It is the ideal location for the next wave of manufacturers focused on design-led business transformation for market success. In this context, harnessing the GTA's world leading design talent to add value to its well established manufacturing capabilities makes very good sense.

The GTA region is the epi-centre and central manufacturing hub for what urban geography guru, Richard Florida, calls the Tor-Buff-Chester (Toronto Buffalo Rochester) mega-region.<sup>4</sup> The GTA has a first-class design education infrastructure and the third largest professional design workforce in North America.<sup>5</sup> The local design community has one further advantage: its ability to translate and to interpret the European design sensibility for customers in North American markets. This has been a success factor for a number of GTA manufacturers who are leaders in the North American market.

## **Case Selection and Findings Emerging**

In this research, three case studies, from different manufacturing sectors, have been developed to explore how companies are benefiting from the local design talent pool and connecting design to R&D, product development, brand management and marketing activities. The companies researched are Umbra, D&V Electronics and Zenon Membrane Solutions, now part of GE Water & Process Technologies. Each of these advanced manufacturing companies, based in the GTA, is an international market leader in its industry sector.

These cases are stories of entrepreneurs with vision. All of these businesses started small and grew quickly. Two of the companies were started by university professors with a vision for commercializing cutting-edge technologies. They have used design thinking to bring their ideas out of the lab and into the marketplace. The founders of these companies have a strong appreciation for user-centred design and its ability to facilitate knowledge transfer in advanced manufacturing industries. They have developed groundbreaking research and transferred next generation technology into innovative products and services supported by strategic brand management. All three of these

companies draw on the local talent pool, in design, engineering and computer science. These companies have benefited from the R&D Tax Credit program in Ontario. They employ co-op students and have developed research relationships with faculty in the exceptionally strong university and college network in the region.

### **Isolating the Design Advantage**

Though these manufacturers operate in very different industries, they all understand the symbiotic relationship between management, marketing, engineering and design in a way that many less successful manufacturers do not.

These companies have worked with designers to improve the functionality and performance of their products, to take cost out of their manufacturing process, and to create a concrete look and feel that has transformed new product prototypes into the “show stoppers” at trade shows around the world.

In the technology-driven businesses of water filtration and automotive testing, GE Water & Process Technologies - Zenon Membrane Solutions and D&V Electronics have worked closely with designers to achieve specific business goals. Their well-designed products reflect the performance values of complex technologies in their outer form. GTA designers have helped to refine and to add value to these products, to reduce costs in production, and to raise the bar on standards of excellence in product development.

In the case of global housewares manufacturer Umbra, the translucent hues and sinuous curves of its plastic containers and furniture (a fusion of savvy design and rigorous manufacturing technique) have become synonymous with its brand. Umbra has even been clever enough to patent some of those signature curves as intellectual property.

### **Seven Best Practices**

In integrating design with competitive business strategy, these companies demonstrate seven best practices:

- 1. Entrepreneurial Leadership.** The history of innovation at these companies has been directed by dynamic, entrepreneurial leaders with a strong vision of how to make products better by design.
- 2. Focus on R&D Linked to Design Thinking.** These companies have world-leading track records in the rapid commercialization of innovation in their industries. They have taken advantage of the Ontario R&D tax credit to conduct cutting-edge research that integrates advanced technologies with new materials and design thinking.
- 3. Adding Value Through User-Centred Design.** The companies have worked with local designers to reduce costs in production and to enhance the performance, quality, adaptability, accessibility, value, and aesthetic look of their products to

maintain a competitive advantage in the global marketplace and to pass this advantage on to their customers.

4. **Long-Term Relationships with Designers.** The companies have worked in long-term relationships with design consultants. One company, Umbra, also maintains a large, multi-disciplinary in-house design team comprised of industrial and graphic designers and one engineer.
5. **Investment in Brand and Communications Design.** The companies have invested in state-of-the-art communications design to build global awareness for their brands. This investment is reflected in the consistency of their corporate identities and product branding, the quality of their product literature, and the highly sophisticated design of their web sites. These same values are evident in the way these companies present their products at international trade shows.
6. **Reflecting a Culture of Innovation in the Workplace.** Each of these companies has used design to celebrate and reflect a culture of creativity and innovation in the workplace. At their head offices, they have used architecture, landscape architecture and interior design to reinforce company values and to celebrate the essence of their brands with employees, clients, suppliers and other visitors. The workplace design elements explored in these case studies include: the design-centric headquarters of Umbra; the ZeeWeed Museum at GE Water & Process Technologies' Zenon head office; and the interior design ambience at D&V Electronics.
7. **Research Relationships with Local University and College Network.** All of these companies employ co-op students and have built research and advisory relationships with faculty and students in the strong university and college network in the region.

# GTA

## Design Value Proposition

The Greater Toronto Area has an immediate opportunity to optimize the capabilities of its design talent pool by marketing the area as a design-rich region. This potential is based on a number of factors outlined in the following Design Value Proposition.

**1. GTA is Canada's Design Hub**

The GTA is Canada's leading centre for design talent with the highest concentration of expertly trained designers in the labour force of any Central Metropolitan Area (CMA) in the country. There are 25,645 designers working in the region. <sup>6</sup>

**2. GTA Design Workforce Ranks #3 in North America**

The Toronto region is the third largest centre for design in North America, after New York and Boston.

**3. The Design Workforce is Growing**

The region's design capacity is growing. Between 1991 and 2001, the 4.7% <sup>5</sup> annual growth rate for the design workforce significantly outstripped growth in the overall labour force (which grew by 1.4%). <sup>7</sup>

**4. Highly Educated and Skilled Design Workforce**

Approximately 85% of the Ontario design workforce has university or college level education. Two thirds of these designers work in the GTA.

**5. Access to a Broad Range of Design Skills**

The design workforce in the GTA is broadly-based with strong representation from the six design disciplines: industrial, visual communication, interior and fashion design, architecture, and landscape architecture.

**6. High Creativity and Problem Solving Skills**

Industrial Designers in the GTA demonstrate their creative talent and ability to integrate new materials and advanced technologies into innovative new product concepts for industry sectors including contract furniture and medical devices.

**7. Design Education Infrastructure**

The GTA has a strong design education infrastructure with the region's four universities and six colleges of technology and advanced learning offering three and four year degrees in design. The University of Toronto offers graduate programs in architecture and landscape architecture and York University recently launched Canada's first Master of Design program in Visual Communication Design. York University, Ryerson University and George Brown College offer postgraduate courses in Design Management. York University and Sheridan College Institute offer a unique, joint Bachelor of Design Program in visual communication design.

**8. Centre for Design Research**

The university and college network in the GTA provides specialized courses and research opportunities on a range of design themes including Designing for Sustainability, Design for an Aging Population and Game Design. The region affords opportunities for collaborative design research connecting design faculty and students with researchers in engineering, business, the social sciences and other disciplines.

**9. High Level Expertise in Industrial Design**

Two of Ontario's three internationally-recognized, post secondary institutions offering industrial design degree programs are situated within the GTA. Humber College offers a four-year degree program in industrial design and has recently become the first institution in Canada to offer a specialization in automotive design within this degree program. The Ontario College of Art & Design (OCAD) offers an industrial design program with specialty courses in materials & technology, design research methodologies and interaction design.

**10. GTA is a Centre for Graphic Design**

Approximately half the designers in the workforce are visual communication designers with high level expertise in branding, corporate communications, packaging, web site and interactive design, information design and signage systems. Graphic designers work in almost every sector of the economy in the GTA.

**11. State-of-the-Art Facilities Design**

Architects, landscape architects and interior designers working in the GTA have a strong track record in designing and building state-of-the-art manufacturing facilities for advanced manufacturing industries. Partnering with designers, manufacturers have been able to introduce innovations to enhance production efficiencies, to improve indoor air quality and to reduce the environmental impacts of building materials, production processes, water and waste disposal.

**12. User-centred Design**

Designers in the GTA collaborate with research institutions and corporate clients on ethnographic research exploring user behaviours to inform the design and production of products in health care, automotive, transportation, electronic communications and other industry sectors.

**13. Universal Design and Human Factors**

Designers in the GTA are well trained in the principles of universal design. They integrate strategies to enhance accessibility and usability and to reduce human error into the design of technical equipment and consumer products.

**14. Multi-cultural Awareness**

The multi-cultural environment in the GTA has heightened the sensitivity of the local design workforce to cultural

issues. GTA designers are highly skilled in customizing the design of products and services for export to other cultures around the world.

**15. Professionalism of the Design Workforce**

Designers in the GTA are accustomed to meeting the needs of clients in a dynamic, fast-paced business environment. They display a high level of professionalism in the delivery of services on time and on budget and often exceed client expectations.

**16. World-renowned Project Management Skills**

Designers from the GTA are hired around the world and well respected for their strong project management skills.

**17. Environmental Responsibility**

Working in collaboration with innovative clients, GTA designers are taking a proactive stance in helping companies to reduce environmental impacts in product development, production processes, materials sourcing, packaging and distribution practices.

**18. Integrated Approach to Design Process**

Architects, industrial, interior and communication designers work on cross-disciplinary teams within the GTA to integrate strategic design practices, smart technologies and sustainability strategies into the development of state-of-the-art industrial facilities to facilitate innovative product development and to enhance productivity.

**19. Products of Local Suppliers Informed by Design**

Local suppliers to the manufacturing industry have drawn on the local design talent pool and worked closely with designers to improve the quality and added value of the products and services they provide to manufacturers located in the region.

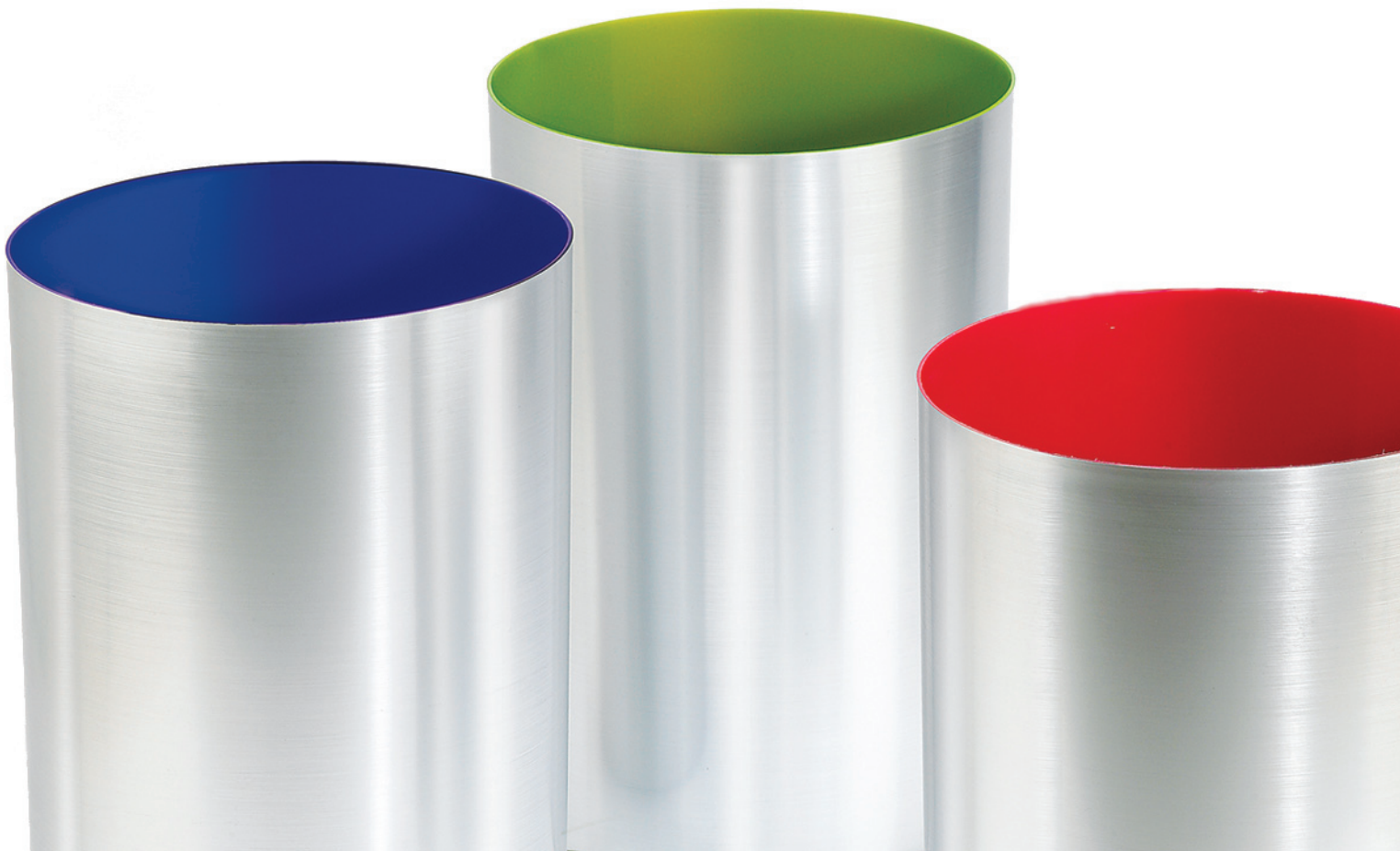
**20. Proximity to Major US Business Centres**

By concentrating both design and production in the GTA, manufacturers have easy access to North America's top markets (135 million people within a 500 mile radius). This proximity can also help to reduce the costs and environmental impacts of distribution.

# Umbra

Case Study

Innovating with cutting-edge design, colour, injection-molded plastics and laminating technologies.



## Umbra

Reinventing Everyday  
Products for the Home



### Case Summary

“Masterminding new products to send around the world”. That’s how Umbra co-founder and Vice President of Design, Paul Rowan, describes the company business strategy. Umbra’s core competency is breakthrough design.

Its products are currently sold through 25,000 retailers in more than 75 countries. As a world-leading manufacturer in housewares, Umbra focuses on developing innovative and affordable products and accessories for every room in the home. The vision is to establish Umbra as the number one global brand in the category.

To achieve this vision, Umbra has established a winning formula: a red-hot design team based in Toronto, and a rigorous methodology for integrating smart design with advanced manufacturing processes. Umbra’s design and production teams rotate between the Toronto head office and a major production facility in China. They are continuously working with carefully selected suppliers and sub-contractors to find better, more efficient, more innovative, and more environmentally sensitive ways to make things. They experiment with colour, new materials, forms and finishes to produce well-designed, affordable products to fit post-modern consumer tastes. This proposition has enabled them to rise to the top in a fiercely competitive industry.

Umbra has demonstrated its capabilities as an advanced manufacturer through its investment in research and design innovation; through its work with injection-molded plastics; and most recently through its experiments with laminating technologies. With the launch of its first Concept Store in downtown Toronto, and a new sustainability research plan focusing on transformative business practices, the company is entering a mature phase in its evolution as a successful Canadian manufacturer.

### Early History

Umbra was founded in 1979 by two former high school friends, Les Mandelbaum and Paul Rowan. In their first collaboration, Mandelbaum and Rowan formed a rock band. Later, they combined their entrepreneurial talents to produce a few simple, useful, witty and whimsical products for the home. They launched a company and called it Umbra (meaning “shade” in Latin) because their first success was a printed roller window blind.

Mandelbaum is the business and marketing strategist and Rowan the design guru. However, both are passionately involved in all aspects of the company. Paul Rowan is a graduate in graphic design from George Brown College in Toronto. As Vice President of Design he leads new product development and manages the company’s creative team. The company has a flat organizational structure with all of the designers reporting directly to him. Both



Mandelbaum and Rowan maintain an open door policy so anyone with a good idea can go straight to the founders and have their ideas considered.

### **Design Drives New Business Model**

From the start, the company was driven and inspired by design as it tried to develop new home products that were on trend and filled a gap in the marketplace.

Today, the design studio at Umbra's Scarborough, Ontario headquarters is truly the creative brain and engine of the business. It's a hotbed of creative activity generating an average of 300 to 400 new products a year. Each of its dedicated designers develops about 50 products in that time. To reflect this focus, local architect John Schnier, of the architectural firm Kohn Schnier, created the building with the design studio at the centre, and marketing, sales and operations situated around the periphery on the mezzanine and lower floor.

"This creates a continuous dialogue between the designers and staff in the other functions," says Rowan. "It's completely different from the traditional business model, even for enlightened manufacturing companies, which are usually built around sales and marketing."

The exterior of the facility sends the same message: an undulating, translucent polyester wall wraps the front facade, setting the building apart from its neighbours in this traditional manufacturing enclave of north east Toronto.

Umbra has always hired and nurtured homegrown design talent. As well as industrial design graduates from Humber College and the Ontario College of Art & Design, the studio currently employs designers from Carleton University in Ottawa, Ryerson University and George Brown College in Toronto, and from Sheridan Institute in Oakville. David Quan, longtime Umbra employee and currently the Creative Lead for the company, is a Humber graduate. Other members of the creative team have been recruited from Stanford University, from the Rhode Island School of Design and the Pratt Institute in the United States, and from Europe. And Umbra regularly takes on co-op students from the numerous design programs at colleges and universities in the GTA. A number of these co-op students have been hired on after they graduate.

This is a manufacturing company where the designers completely outnumber the engineers. In fact, there is only one engineer on staff. That's because, according to Rowan, the role of the 21st Century designer is changing. Today's designer is part engineer, part business manager and part design manager.

Umbra talks about the "whole brain designer" as playing a pivotal role in the success of 21st century manufacturing companies.

“Today, designers need to be concerned not only with making products look good and function well, but also with business and the environment,” says Rowan. “They are expected to deal with manufacturing issues, and to determine saleability and marketing value. But, they are also increasingly concerned with the sustainability of the product. They are taking on more responsibility for whether we can make a particular product cost efficiently and ethically so that it can achieve sustainable business success.”

“Technology advances have given designers a lot more control. With sophisticated prototyping technology like the 3-D printer, designers are moving into the sphere of the engineers. Now, they can really do it all.”

### **Signature of the Craft-based Atelier**

Umbra is extremely proud of its design talent – in fact, the company pioneered the practice of having its designers sign their names to the products they create. This practice links the Umbra brand equity to the personal talent of its creative team and personalizes each item as if it were coming from a craft-based atelier which, in a way, the Umbra studio still is.

The company employs designers trained in graphic communications as well as in industrial design. Though their focus is on brand management, packaging and communications, the graphic designers also develop new products. “Design is all about problem-solving and we make no distinction” says Rowan.

The studio hones the multi-disciplinary, whole brain skills of its designers by encouraging them to work on marketing plans for their new products, and by sending them to work in rotating stints in its production facilities in China.

One of the great strengths of this creative team - like the GTA itself - is its diversity. Staff from around 50 different cultural backgrounds work and eat lunch together every day. Umbra values this aspect of its corporate culture. In fact, the cultural inspiration for many Umbra new products comes from this diversity in the creative team.

### **Euro Style in Translation**

The multi-cultural background of the team has a direct impact on the Umbra design aesthetic.

“We have an international design style” says Rowan. Coming from a company with lesser credentials, this could sound like a bland statement. In this case, however, international style is a precise term referring to the essence of the company’s creative sensibility that includes a:

- European aesthetic
- culture of high innovation & risk-taking
- concern for environmental impacts
- respectful use of natural materials,
- philosophy of design for simplicity

- minimal use of materials
- rigorous adherence to quality standards in manufacturing

Its young creative staff, who are ingenious, street wise and savvy to the latest cultural trends, also informs Umbra's design style. Quite frequently the idea for a new product comes from the personal taste of one of the designers. They embrace design research with a sense of curiosity, adventure and fun that is often reflected in the end result.

One of its best selling gift items has been the oval playing cards packaged in brightly coloured plastic tubes. Oval cards? The idea came from one of the junior members of the creative team and the tube packaging was adapted from early experiments with an eyeglass case. The largest manufacturer of playing cards in the United States rejected the idea, saying the cards would never sell. But Umbra took a risk and this product has produced record sales, particularly in the critical fourth-quarter Christmas gift period.

Another young designer came up with the idea to collect vintage china teacups from charity shops and dip them in brightly coloured silicone to create a tongue-in-cheek new product. The Tassa teacups have attracted great media coverage as an example of innovative re-use.

### **Production Facilities**

Every domestic manufacturer would prefer to make its products locally to control quality and to shorten lead times. But Umbra co-founders, Mandelbaum and Rowan, maintain that it would not have been possible for the company to establish its high-value/low-cost competitive positioning by manufacturing most of its products close to home. By setting up production facilities in Asia and maintaining the low end manufacturing jobs offshore, Umbra has managed to grow the company significantly and to create high-value jobs in management, marketing, operations and design at its GTA head office. That office currently employs about 200 people.

### **Designed in Toronto, Made in Shenzhen**

The bulk of the smaller housewares products are made in the state-of-the-art production facility the company now owns and operates in Shenzhen, China. Many manufacturers have found outsourcing production to offshore facilities to be a tricky business, particularly because of the challenges of maintaining the pace and the quality of the output. But Umbra has turned these challenges into a competitive advantage by keeping hands-on control. The company sends members of its creative team to Shenzhen on a rotating basis. This keeps Umbra designers close to the means of production, to oversee, to manage and even to adapt the process based on the latest innovation in design thinking. This also gives the young designers first-hand knowledge of how products are made, and ensures that design supervision is integrated into the manufacturing process.

A second manufacturing facility in Buffalo, New York produces the larger injection-molded furniture. This plant was strategically located close to the Canadian-US border to make maximum use of economic resources along the Toronto – Buffalo regional corridor. The plant is within easy reach of the GTA, close to suppliers and close to major US clients for easy shipping back and forth. “Our American retailers wanted a US distribution point,” explains Rowan. “And we were the model company for the NAFTA agreement.”

The strategic location for this plant is also a good example of how smart Canadian manufacturers are leveraging the strengths of what Richard Florida (who is now based in Toronto), calls the powerful Toronto Buffalo mega-region.<sup>8</sup> The company also does some manufacturing in Fort Erie on the Canadian side of the border.

### **Thinking Smarter at the Front End**

Umbra has demonstrated the core competencies of an advanced manufacturer through applying brains over brawn and by using design thinking at the fuzzy front end of the manufacturing process.

The strategic use of cost-effective materials is one of the cornerstones of this front-end strategy. The company has a strong track record of experimentation and innovation in working with injection-molded plastics, particularly the polyolefin-based polymer, polypropylene.

### **Material of Choice**

“It’s a commodity resin, not super-refined, so it uses less embodied energy than polycarbonate (the preferred plastic in automotive design)”, explains David Quan, Creative Lead in the Umbra Design Studio. “Polypropylene is one of the most common plastics. It has great recyclability and its translucent quality has good potential for design.”

### **Colour Management**

Colour has proved to be another jewel in the Umbra creative tool box because, in working with polypropylene, the designers only needed to add one or two percent of the colour to the plastic to obtain the desired effect. Through several generations of design, Umbra has been able to play with colour skillfully to obtain a high-end look for everyday products from business card cases to bathroom accessories and plastic furniture.

Umbra was the first to introduce a translucent, frosted finish to plastic housewares at a time when most manufacturers favoured a high-tech black box look. As competitors caught up, Umbra changed its colour palette to a super high gloss finish, and then switched again, to stronger brighter colours like bright metallic and lime green. Working closely with the industry’s best colour suppliers, (the same suppliers who work for the automotive and cosmetic industries) and their additive suppliers, they perfected

a technique for adding metallic flakes to pigment. This produced a chameleon-like dichromatic finish that tricked the human eye, registering as one colour from a particular angle, but changing to another hue when viewed from a different angle. Use of the metallic finish is a good illustration of how Umbra has added value to relatively low cost materials in its manufacturing process. The result is a finished product with the cachet of high-end design that can be sold at an everyday low price.

### **Reverse Engineering**

Once the creative team has approved a new concept, Umbra uses a reverse engineering process to find ways of taking cost out of the production process. To do this, the team has established close working relationships with their raw material, tooling, and mold-making suppliers. Some of these suppliers are in the GTA, others are located in the US, Europe and Asia. With astute supply chain management they are continuously finding new ways to make their well-designed products even better, cheaper and faster. Umbra has also made use of the Ontario R&D Tax Credit to defray the cost of research at the front end of this process.

### **Signature Product: The Garbo**

The first Umbra product to achieve mass-market success was the swing top trashcan. Why a trash can? Well, the creative team looked around the house for objects that had so far escaped notice of the designer. The trash can, designed by engineers, produced in drab colours and sold through hardware stores, just cried out for redesign. With the success of the swing top can, Umbra began to consider an open top version. They wanted to add handles to make it more portable and multi-functional. At that time, they connected with Karim Rashid, an Ontario-trained designer working in New York. Rashid (a graduate of the School of Industrial Design at Carleton University in Ottawa) had been experimenting with curved forms. Apart from their aesthetic appeal, Umbra realized that this designer's sensuous shapes could facilitate the speed with which a plastic material like polypropylene could flow out of the mold form, and that this could help to significantly bring down costs in production.

In 1995, Rashid designed the Garbo trash can for Umbra. The can was formed from polypropylene coloured in a translucent, white hue. "The first white prototype looked like a body cast" Rowan recalls. No matter. The Garbo was a runaway hit at the New York Gift Show where it was launched.

The Garbo became Umbra's signature product and launched the company on a new era of success. It also became the first successful mass-market product designed by Rashid who has gone on to establish a stellar career as an international designer of fashion and consumer products.

According to Rowan, the Garbo was a very strategic design based on three curves that give the can its signature look - the top edge, side and handles. Though design patents are difficult to acquire, Umbra has been clever enough to patent those

distinctive three curves as intellectual property. A competitor could copy one or two of the curves on the can, but not all three. To date, the company has sold 7 million Garbo trash cans worldwide. An early prototype is in the collection of the Museum of Modern Art (MOMA) in New York.

### **Strategic Relationship with Major Retailers**

Though Umbra has strong competitors in each of its product categories, the co-founders claim that they do not have a single competitor that challenges them in all of their product categories. This is one reason the company has been able to evolve a strong product portfolio, to meet the market and fashion needs of consumers in North America, Europe and more recently in Asia.

Another major success factor is the synergistic relationships Umbra has been able to establish with leading North American retailers like Target, the Container Store, and Bed, Bath and Beyond.

For traditional market intelligence, Umbra relies mostly on these long-standing relationships with major retailers who share relevant research with them. And to identify emerging trends, members of the creative team walk the international design shows each season.

### **Brand Segmentation**

Umbra has produced private label products for major international retail chains including IKEA. To cater to customers at different price points through various distribution channels, the company has established a four-level brand strategy under the following categories:

- Private label
- Umbra Loft
- Umbra
- U + Studio Collection

Sales and marketing have been highly innovative in forging relationships with a wide range of merchants in North America and Europe including mass merchandisers, specialty retailers and high-end boutiques. Museum gift shops in London, New York and other top tier cities around the world now feature Umbra products, making the company a strong ambassador for Canadian design. The Umbra brand sells particularly well in the UK where its products can be found in Harrods and Selfridges Department Store, as well as in the Victoria and Albert and other museum shops. And Umbra has become very hot in Japan, where its products are competing favourably against the more generic look of the Muji private label brand.

### **Benefits of “Export Mindedness”**

Umbra is extremely proud of what it calls its “export minded” stance on distribution. Canadian companies have always been export-minded because the domestic market is so small. Umbra

### **Story of the Oh Chair**

To expand its expertise in injection-molded engineering and to add prestige to its house wares portfolio, Umbra turned its attention to plastic furniture. In North America plastic furniture was relegated to the backyard, but in Europe stylishly designed plastic furniture had made its way indoors. Umbra’s design team set itself the challenge of developing an indoor plastic chair for the North American market to retail at US\$50. At this time Karim Rashid had progressed in his experiments with oval forms and the use of negative space in object design. Umbra commissioned him to work on the chair. The iconic design that Rashid developed consisted of a simple shell seat made of thin polypropylene, with four holes creating a witty play between solid and void, structure and form. Umbra’s lead designer, David Quan, worked closely with Rashid to translate his design with its fluid contours and thin, flat arms, into a two-dimensional software program. From that software, an expert Toronto model-maker fashioned over 30 plastic templates and used the templates to hand-carve a wooden form. The final product was called the Oh Chair.

sees this as an advantage.

As a Canadian manufacturer based in the GTA, the company worked to expand sales in the US from its early days. “That is how Canadian companies can stay competitive,” says Paul Rowan. “Many American companies have become complacent because they relied on growth in their domestic market for so long. When that market dried up, many of these companies failed because they didn’t have solid export experience.

### **Integrated Sustainability Planning**

In its latest research initiative, Umbra is experimenting with new technologies, new materials and new processes that will help the company to reduce its environmental footprint, to cut costs and to develop the next competitive edge. In fact, this research promises to transform the company’s fundamental business practices. Creative lead David Quan is leading the project.

There are four pillars in the company’s sustainability plan:

#### **1. Materials and Product Self-Assessment**

The first step in this process is to develop a customized auditing tool to assess the environmental impacts of the company’s products, processes and packaging. In this process, Umbra hopes to develop its own definition of a sustainable product.

#### **2. Redesigning the Way Products are made**

Based on this definition, the company will make a conscious effort to rationalize the number of products in its portfolio. The plan is to make less, in order to ensure that the products that are made are thoughtful and have a higher quality. The business rationale for this bold move is that the reduced product mix should have the same profit potential as the current product portfolio.

The company has thought deeply about its use of plastic, and particularly about its continuing use of polypropylene. It concluded that this is a reasonable choice because polypropylene can be melted down and recycled many times.

With environmental impacts in mind, Umbra is also experimenting with the creation of hybrid materials and reuse of existing products. Examples include the recently launched line of foil-wrapped containers and the Tassa teacups.

#### **3. Changing Corporate Culture**

Umbra is working towards raising the consciousness of all its employees about social and sustainability issues. The co-founders have already established a strong corporate culture reflecting ethical values in the manufacturing process. They do not employ child labour in any of their factories and maintain a safe, suitable and equitable workplace for all of their staff in North America, Europe and Asia. Recently, Umbra achieved ISO 14000 status for high ethical and environmental standards for its factory in China.

#### **4. Branding Eco Products**

The fourth pillar will involve the creation of an eco-friendly mark for products and packaging materials that have passed an environmental assessment. Both the auditing process and this new brand will be promoted on the web site and in product literature.

“There is still a lot of work to be done” admits David Quan. However, adopting sustainable business practices fits right in with Umbra’s values, corporate culture and Canadian roots. Design thinking will be the road map for this initiative, as it has been for other aspects of the business strategy.

#### **The New Look: Foil-Wrapped Plastic**

As a means of adding value and developing more sustainable manufacturing techniques, Quan and his new product development team have been experimenting with foil-wrapping, an advanced technology that can create a new look and feel for its container products. The technique has sustainability benefits because, as a hybrid material, foil-wrapped plastic uses less embodied energy than plastic on its own. Another benefit is that both the molding and the wrapping can be done in Canada, enabling Umbra to employ more local workers.

The technique of foil-wrapped plastic actually comes from the cosmetic industry where lipsticks are often wrapped in a very thin foil laminate for protection and for a better aesthetic look. Umbra took that technique and scaled it up to produce a much larger product - the foil-wrapped container. The foil exterior is sturdier than plastic and will not dent or fingerprint.

This experiment with hybrid materials is partly driven by Umbra’s need to continuously originate new design-inspired manufacturing techniques to keep one jump ahead of the competition. Lately, following Umbra’s lead, competitors have become more skillful in their use of plastics, so it was definitely time to move on. The creative team observed that, in Europe, metal and wood are seen as having a higher intrinsic value than plastic. So by wrapping a very thin layer of metal (or wood) around a brightly coloured plastic core, Umbra has created a unique new look – at least until the competition catches up once again. But, by then, this highly innovative and nimble manufacturer will probably be experimenting with next generation materials.

#### **Retail Concept Store**

In May 2007, Umbra opened a corporate-owned retail concept store in Toronto. The 7,000 square foot two-level space wrapped in pink plastic (which is backlit to glow at night) looks like a big box Umbra product - strategically set down in the midst of a trendy downtown shopping strip. John Shnier, the same architect who created the Scarborough head office, designed the Umbra store. The store was developed to showcase the latest products and to extend the Umbra brand into public space. About 20%



of Umbra's extensive product portfolio is on view at one time. The products are grouped in categories based on their use in various rooms of the home. Umbra is hosting its international design partners here and the store is attracting the buzz as the latest design space for parties, product launches and seminars led by Umbra designers. At the opening party in May, 2007, Les Mandelbaum and Paul Rowan reincarnated a mini version of the band they formed in high school, with Mandelbaum on guitar and Rowan on harmonica and providing vocals.

"This is an exciting new venture for the company" says Mandelbaum who is always focused on the next big idea.

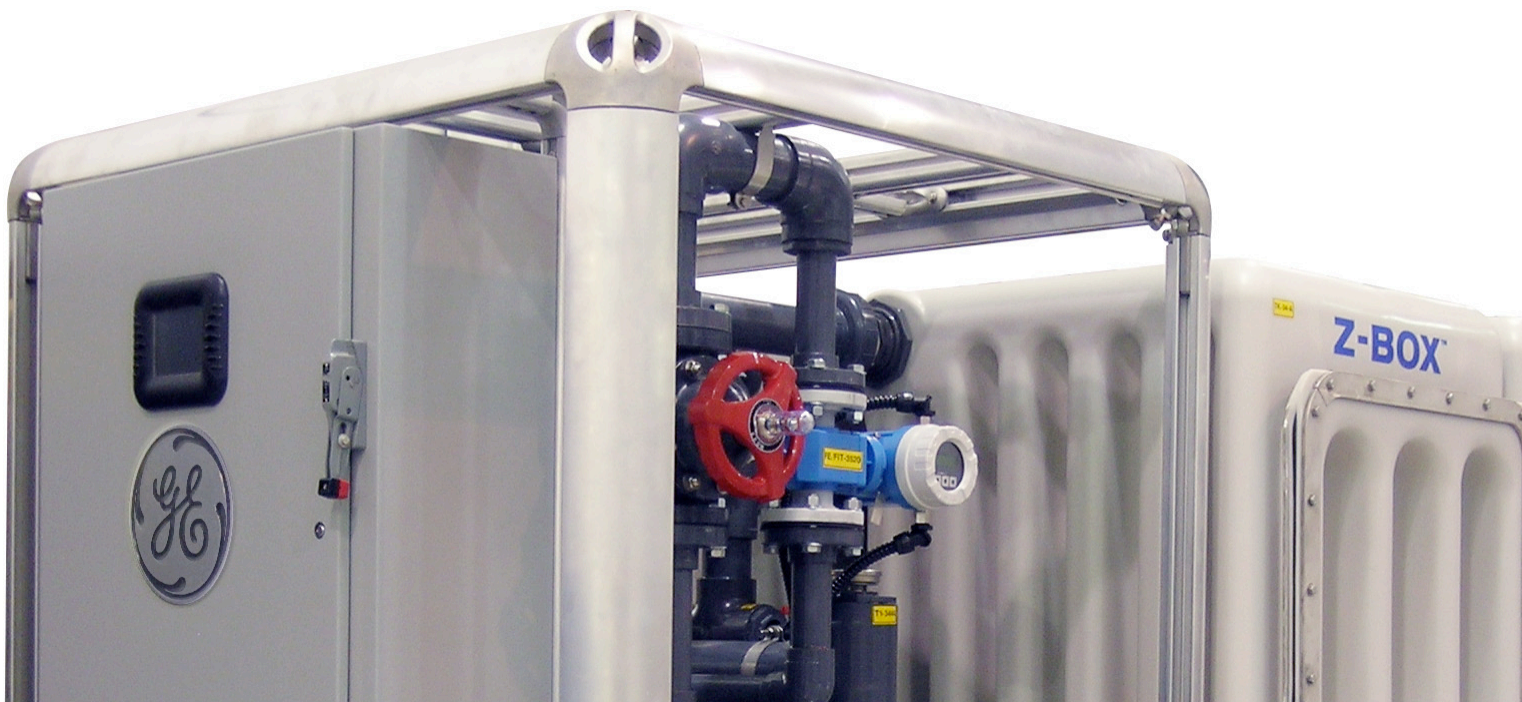
### **Conclusion**

The Umbra store is the latest chapter in a growing success story, based on a strong design vision and creative management of the manufacturing process. Umbra's skills as an advanced manufacturer may not be readily apparent to the consumer, though they are reflected in the price point of its end product. The company has honed its design-driven business strategy to expand internationally and to maintain competitive advantage in a challenging and volatile market sector. Umbra's vision of becoming the leading global brand for housewares may not be far off.

# GE Water & Process Technologies – Zenon Membrane Solutions

Case Study

A design vision  
inspires the process,  
the products,  
the brands and  
the workplace.



## GE Water & Process Technologies - Zenon Membrane Solutions

Global Leader in UF Membrane Technology



### Case Summary

Zenon Membrane Solutions, now part of GE Water and Process Technologies, is a research and innovation-driven company with a world-leading track record in advanced membrane technology. The company pioneered the use of ultrafiltration (UF) immersed membranes for water and wastewater treatment. Its evolution has been marked by innovation breakthroughs from the development of the early tubular microfiltration and ultrafiltration prototypes to the full-scale water treatment plants developed and commissioned for public and private sector clients in North America, Europe and Asia. Its extensive product portfolio has set the industry standard by providing low life-cycle cost for customers in one of the fastest growing sectors in water purification and wastewater treatment. GE Water and Process Technologies acquired Zenon Membrane Solutions in 2006. The acquisition of the Oakville, Ontario based company has enabled GE to add UF membrane technology to its extensive portfolio of water and process technology products.

As well as positioning itself as a world leading environmental technology manufacturer, this company has always maintained a strong branding and design vision. So, it is not surprising to find that its head office facility houses a full-scale science exhibit in its central atrium demonstrating the technology breakthroughs in generations of filtration products. Or that its ZeeWeed family of products has been branded with memorable names that blend science fact with science fiction. Or that a high-profile Toronto industrial designer working with the company's product development team, has won a design award for one of its signature products: the packaged water treatment plant called the Z-Box. Design improvements to the Z-Box have taken cost out of production, and made this pre-engineered packaged UF plant faster to install and simpler to operate. Overall the design improvements helped to reduce costs of the Z-Box by nearly half. Sales are up and the new and improved Z-Box has a strong aesthetic look which makes it a show stopper at the trade fairs.

In line with its global vision for the management of water resources, GE Water & Process Technologies is poised to expand the ZeeWeed product portfolio in the areas of research, new product development and international marketing.

### Early History

In Hamilton, Ontario in 1980, Andrew Benedek, a professor of water chemistry in the chemical engineering department at McMaster University, set out to realize his dream. He wanted to use his research capabilities to make a difference, and he decided to focus on a solution to protect one of the world's most basic and most precious commodities: water. Dr. Benedek started work on commercializing his research from a small lab

set up in the basement of his Hamilton home. In June, 1980, he left his university post to found the company originally called Zenon Environmental. By May, 1983, Zenon had moved to a larger research and production facility in Burlington, Ontario. In the same year, the company founded the Zenon Environmental Laboratory and began to manufacture its first generation of tubular microfiltration and ultrafiltration membranes.

Today, this market leader in the manufacture of advanced membrane products has a strong corporate culture and a dedicated staff of highly trained engineering, technology and marketing professionals. Approximately 400 people currently working at its Oakville, Ontario headquarters.

### **How Does Membrane Filtration Work?**

Membrane filtration is based on the principles of biomimicry, or copying the ways of nature. Biomimicry has become a hot trend for designers and manufacturers ever since biologist Janine Benyus wrote her seminal book of that title in 1997.<sup>9</sup> However, Zenon Environmental had been innovating with ultrafiltration membrane technology since the early 1980s. ZeeWeed membranes resemble long strands of spaghetti hollowed out on the inside. The membrane walls are made from a polymer composite with billions of microscopic pores on the surface. The pores are smaller than the common solid contaminants, bacteria and viruses, so these contaminants are blocked while the clean water is allowed to pass through.

The process guarantees exceptional water quality and clarity on a continuous basis. Only a slight vacuum is required to draw the water through the membrane. The water is both filtered and disinfected in one step.

Through generations of innovation, product development engineers and technologists have improved the effectiveness of the process, reduced the size of the filtration systems, and minimized costs in production.

### **Benefits of UF Technology**

GE Water & Process Technologies is poised to take UF membrane filtration technology to the next level supported by its global reach and world-leading expertise in R&D, sales and marketing. And the timing is right. The process is now widely recognized as superior to the older technology of sand filtration because UF technology uses fewer chemicals, takes up a smaller footprint for equipment and treats water to a higher, more rigorous standard. The system is also more reliable in terms of maintenance and testing. (Reverse Osmosis is a higher-level filtration process that will filter out both solid and liquid contaminants. However, this process is more expensive and may also remove beneficial ingredients from drinking water.)

### **Leveraging Regional Resources**

The company has always supported and nurtured its industry-

### **Water: Who Will Have Enough To Drink?**

“Our most basic commodities – potable water, fossil fuels, arable land, clean air – as well as critical industrial commodities such as aluminum, steel, and even silicon, are all under stress. Water provides a typical example: By 2030, more than one in three human beings will not have enough to drink, or will run the risk of dying by drinking what they’ve got. “

“Business 3.0: The Oblivious Capitalist’s Days are Numbered”  
Andrew Zolli  
Fast Company  
March 2007

leading design teams and leveraged the strategic resources at hand. For technological development, it has benefited from its strategic location in southern Ontario's technology triangle, close to the science and engineering laboratories of McMaster and Waterloo universities. It has also benefited from the R&D tax credit in Ontario that supports innovation-driven research for small and medium-size enterprises (SMEs). The company regularly hires co-op students from nearby Waterloo University and other institutions in the region to work on research and development projects, and some of these placements can lead to full-time employment. This company is a sterling example of how breakthrough innovation can be supported by government policy, economic conditions -- and design thinking.

### **Brand Management**

While the proprietary manufacturing process used to produce the UF membranes is sealed away at the production facilities, the company has used its marketing savvy and design flair to celebrate its innovation breakthroughs in public. The intrinsic value of the ZeeWeed membranes is reflected in their brand names, and in their outer look and feel. The ZeeWeed brand name was introduced in 1988 to commercialize the first membrane bioreactor, which integrated membrane filtration with biologic degradation for wastewater treatment. There is an emotional appeal to the ZeeWeed name and, beyond science fact, an aura of science fiction. When the company developed and launched its packaged drinking water treatment plant, it was branded, with consumer product flair, as the Z-Box. The bioreactor unit that treats wastewater is called the Mod-Box. And the whole home water filtration system, launched in 2002, was also given a consumer-friendly name: Homespring.

### **ZeeWeed Museum**

The design vision is reflected in the state-of-the-art in-house exhibition that the company has mounted at its Oakville head office. The exhibit celebrates the generations of UF immersed membrane technology products that have been developed and commercialized. Like the names of its products, there is something supernatural about the look of the ultra filtration (UF) membranes: a myriad of densely-packed fibres, resembling spaghetti strands, manufactured under water in one of the most complex manufacturing processes to be developed and commercialized in the GTA. The in-house museum artfully captures the science and the magic of the UF membrane story. When the exhibit was launched it included a McDonald's type counter to track the number of gallons of water treated every day by ZeeWeed membranes worldwide.

The ZeeWeed Museum (the company's name for the exhibition space) presents a chronological tour of the company's history of innovation. The tour begins in the reception area with a GE branded water cooler and a tank full of healthy-looking fish. A sign explains that because the Zenon facility is off-grid, the company uses its own membrane filtration process to treat all of the drinking and wastewater used in the building. The fish in the

tank are thriving on treated wastewater. The drinking water in the cooler has also been purified by the ZeeWeed process.

A showcase in the reception area houses the company's numerous awards for product innovation, management excellence, environmental performance, corporate social responsibility and export success. Canada's Top 100 Employers ranked this company in their top 100 list for the past six years. In 2004, the company was named Canada's Top Corporate Citizen.

A main corridor off the reception area is lined with technology patents three rows deep as evidence of the company's extensive patent portfolio. The US patents have been filed by in-house product development teams over the last 25 years. Each plaque bears the name of the design and production team involved.

This is a company focused on innovation leadership, so much so that its product development teams have taken out patents on a particular process even before it has been tested in the field. (A US technology patent typically costs around US\$125,000).

The reception area opens into a large, bright atrium with indoor plants and bench seating at the centre and exhibit stations around the walls, each one capturing a close up view of a ZeeWeed product prototype. The breakthrough innovation represented by each of these artifacts is carefully explained in captions and diagrams.

"This is much better than a video," explains Anthony Kobilnyk, a marketing specialist with GE. Following the vision of the company's founder, the museum was developed and designed over time by in-house staff. Since the GE acquisition, state-of-the-art products from other units in GE Water & Process Technologies have been added to the display. It's an extremely ambitious realization of the company's design vision. The display is not open to the public and doesn't usually take school tours. It has been put together for marketing the technology to both public and private sector clients from around the world.

And, as Kobilnyk explains, most importantly for the benefit of the staff: "to give them a sense of what they are part of."

### **Attracting Top Talent**

"People choose to work at GE Water & Process Technologies because we have a tremendous opportunity to leave a positive global footprint – it's not just a nuts and bolts company" says the company's Global Marketing Director, Mike Stadnyckyj, referring to the benefit of using membrane filtration to recycle water instead of constantly pumping clean water and dumping wastewater.

Many star engineers expertly trained in this region, known as Ontario's technology hot spot, work here because the vision and corporate culture connect with their personal and professional values. At a time when challenges of water quality and scarcity are growing, the company's commitment to "Enabling the Future" (a corporate slogan) has attracted top talent, built employee

loyalty and established local and international brand recognition.

### **Adding Value by Design**

When, Miles Keller, a well-known Toronto industrial designer, came to pitch his services a few years ago, the product development team contracted him to work on several projects. Keller has a strong track record in furniture design, rather than advanced technology products. But, one of the managers told him:

“We can get hundreds of CAD jockeys. We’re not hiring you for your computer skills, we’re hiring you for your thinking.”

In fact, Keller’s thinking was different but complementary to that of the design engineers, so the relationship worked out very well.

As Keller observes: “The creative contribution of the designer may represent only 10% of the work involved in the development of a new or improved product, but that contribution can make all the difference.”

Keller has worked full-time with the engineering department on three major projects. He is most proud of his contribution to the redesign of the self-contained, packaged water filtration system the company has branded as the Z-Box. The pre-engineered product which can be customized and then shipped on a skid, is used to add capacity to existing systems or to set up stand-alone filtration for diverse clients including hospitals, hotels, ski resorts and golf courses. The project Keller worked on was a conceptual redesign of an existing modular system.

With Keller’s industrial design input, the team developed a stronger and better looking, more efficient and user-centred unit that takes less time to assemble, ships more easily and is less challenging to operate. The frame is now made of lighter weight aluminum and the tank has been switched from stainless steel to Roto molded Poly Ethylene (PE). The membrane modules can now be easily loaded from the side at shoulder height (instead of from the top). The redesign also features a sloping drain that improves performance. In short, the new Z-Box looks stronger and more efficient, and yet is simpler and less confusing to operate and to maintain. Keller worked on the layout and integration for the various parts of the system, streamlining the shape of the container and the overall visual look.

According to Duncan Millar, the company’s Director for Global Packaged Plants, the redesign has reduced costs by nearly half. “And the team wanted the aesthetics to send the right message to the client,” he explains. “The product now has a higher overall perceived value.”

Anthony Kobilnyk adds: “We can build them quickly, ship them easily, and set up and commission on site. And, when we take that thing to tradeshow, it’s a show stopper.” The Z-Box packaged plant won a silver medal at the 2006 Design Effectiveness Awards in Canada.

## **Market Development**

Today, GE Water & Process Technologies sells its ultra filtration membrane products to municipalities and industrial clients in 45 countries worldwide. The main market is North America where it has received a growing number of large-scale commissions in both the United States and in Canada.

Over the past ten years, sales of the wastewater and drinking water treatment systems have expanded rapidly. The first ZeeWeed membrane bioreactor for wastewater treatment was commissioned for Skylands Baseball Park Stadium in New Jersey in October 1993. The next year the company manufactured and installed the world's largest membrane bioreactor at the GM Plant in Windsor, Ontario. In 1998, it developed Canada's largest drinking water treatment plant in Collingwood, Ontario.

In Asia, GE Water & Process Technologies has been selected to build one of the world's largest pretreatment plants for seawater desalination at the Yuhuan Power Plant in the Zhejiang Province of China.

An important opportunity for new commissions is coming from LEED certified buildings in North America, since the environmental accreditation system offers up to six points for innovative water management. A high-profile commission in this sustainable building category is the Solaire Apartment Building in Battery Park, New York that has been recognized as the first environmentally advanced residential tower in America.

When a comparative long-term cost/benefit analysis is conducted on current RFP's, the Zenon technology compares favourably with other systems. This has resulted in a number of new commissions and successful bids for large-scale projects including the ZeeWeed 1000 membrane system for Twin Oak Valley in San Diego, California awarded in October of 2005. The contract, valued in excess of \$20 million, is currently one of the largest ultrafiltration membrane plants in the world.

In Canada, GE Water & Process Technologies is currently working on a major commission in the Peel region of Ontario and an expansion to the water treatment system for the Vancouver Convention Centre that will be showcased during the 2010 Olympics.

## **Water for the Home**

Though most of the product portfolio has been developed for commercial applications, the Homespring Central Water Purifier system was introduced for residential use in 2002. A compact self-contained product that connects to the point-of-entry for the water source, the Homespring unit can provide safe and secure water for cottages, homes, hotels and recreation communities built in developments that are off grid. Homespring systems have also been used in emergency post-disaster situations. The system fits well within the GE Water & Process Technologies portfolio and seems poised for broader distribution to residential



communities as a cost efficient, more reliable and environmentally sensitive alternative to bottled water, or to other water treatment systems that require constant monitoring.

### **Production Facilities**

To keep up with the demand of new commissions, the primary manufacturing centre was relocated to a larger 3,500 square metre facility in Burlington, Ontario in 1996. In 1999, a second system production facility was opened in Tatabanya, Hungary. All of the wastewater filtration products are now produced in the Hungary plant and the drinking water membranes in the Burlington, Ontario facility. Tight security is maintained at both production facilities to protect the proprietary technology involved in the complex manufacturing process.

### **Corporate Social Responsibility**

The company has supported numerous humanitarian and good will projects. In collaboration with Maytag, it donated water treatment systems to protect the victims of Hurricane Katrina in the Gulf Coast and participated in a massive relief effort following the Asian Tsunami of December, 2004.

Staff engineers have also participated in the Water for Humanity program, donating their time and sourcing materials at cost to build water treatment plants for a number of marginalized communities in Canada, Vietnam and South Africa.

### **Sustainability**

ZeeWeed products have always been developed and produced with the environment in mind. But under the auspices of GE's world-leading clean energy initiative called Ecomagination, the significant sustainability benefits of the UF membrane technology are being clearly articulated and trumpeted. Those benefits include the small ecological footprint of the ZeeWeed treatment systems, the adaptability, ease of use and minimal maintenance required, and the cost saving to municipalities and developers represented by the closed loop water cycle (enabled by the ZeeWeed membrane bioreactors for wastewater treatment). So far, a number of ZeeWeed products including the Homespring Whole House Water Purifier have been assessed and accredited for energy efficiency in the Ecomagination program.

### **Conclusions**

GE Water & Process Technologies - Zenon Membrane Solutions has always been an innovation-obsessed company guided by humanitarian values and a strong design vision. The ZeeWeed family of products has established GE Water & Process Technologies as a global leader in UF membrane technology for drinking water and wastewater treatment. As GE is now focused on developing a major portion of future revenues from products for the developing world, the ZeeWeed product portfolio is poised to expand in the areas of research, new product development and global marketing. As a result, the ZeeWeed Museum may have to make room for many more exhibits before long.

# D&V Electronics

Case Study

Custom testing tools based on a universal software platform and user-centred design principles.



## D&V Electronics

The Gold Standard in  
Automotive Testing



### Case Summary

D&V Electronics is North America's leading manufacturer of custom automotive testing equipment for rotating electrical systems. Its competitive advantage is based on a commitment to continuous innovation, supported by a significant investment in R&D and a strong design vision. The computerized assessment tools developed by the company are based on a universal software platform and user-centred design principles that have enabled the customization of products and services for over 400 large and small automotive clients worldwide. The international client base includes Remy, Ford, Bosch, Valeo, Denso, Hitachi, Mitsubishi, Rayloc, MPA, Holger Christensen and many others.

The company has grown rapidly since it was launched just ten years ago, and its rapid growth has coincided with the pace of technological change in the automotive industry. D&V's entrepreneurial founder is a former university professor with a Ph.D in electronics who maintains strong links with university research departments in the region. Building on these relationships and the expertise of local computer scientists, engineers and designers, the company has created breakthrough solutions for several generations of testing equipment. The products and services have helped clients to maintain their technological edge in a fast-paced and ever changing industry.

D&V Electronics has used its design know-how to build a dynamic interactive web site that extends the company brand internationally and delivers high-level remote access services to its broad client base. The company's design philosophy is also clearly articulated on the site.

The company manufactures its leading-edge electronic equipment in an elegant facility situated in a Vaughan, Ontario industrial park. The interior design ambience of the plant reflects the company commitment to a design-led culture of innovation.

Current research is focused on developing testing tools for hybrid vehicles. The company vision is to expand its global leadership in automotive testing equipment and to mobilize its technological capability to enter new markets.

### Early History

Voiko Loukanov, a Bulgarian born and trained professor with a Ph.D. in electronics, established D&V Electronics in 1997. Dr. Loukanov has an intellectual approach to business strategy and a highly sophisticated understanding of the way in which design can create and add value to advanced technology and customer service models. The idea for the company started in a lab with experiments in scientific testing of automotive electronic systems.

"At one time" says Loukanov, "no one imagined that all the electronics in a car could be simulated".

The former university professor has no formal business training, but he is an astute observer of the marketplace. A decade ago, he realized that there was a significant gap between the sophistication of automotive electronics and the equipment available to test the technology. Companies were doing automotive testing with no standardized tests or quality controls. From this observation, he conceived and conceptualized a product and service offering that integrated higher-level thinking in electronics, mechanical engineering and software programming. The technology was successfully commercialized with the help of user-centred design, and that same principle underpins the company's innovation strategy to this day.

"Every electronic device should be a confirmation of form, function and good design," says Loukanov. "Then you know you have a winner."

### **Design-led R&D**

Over the past ten years, D&V Electronics has grown rapidly to establish North American leadership in automotive testing and competitive positioning worldwide. Its strategic advantage is maintained through a continuous investment in cutting-edge research.

Loukanov has built the business on a deep commitment to R&D. "Over 15% of our revenue is invested in research," he says. "We can't compete with the manufacturing capability of China, so, we have to beat them on innovations. We are continuously moving on, and it is hard to hit a moving target."

In the past, many large automotive companies developed their own testing equipment in-house. However, D&V Electronics has raised the bar on automotive testing and many large corporations have learned that this company can rapidly develop the complete package required at a fraction of the cost.

The R&D department consists of a team of experienced and highly talented engineers and designers working at the cutting edge of technological innovation. Design thinking is also very much part of this fuzzy front end of new product development. "We always start with a design idea," says Loukanov.

The equipment the company develops and customizes services a wide range of vehicles. Within the past four years, D&V Electronics has researched, developed, manufactured and marketed over 50 different types of testing equipment.

Its focus on customer needs connects directly to the company's product design philosophy that goes well beyond the functionality of its equipment to consider the adaptability, usability and ergonomics of specific product features.

"Even our first equipment was significantly better ergonomically than what customers had previously used" Loukanov explains.

### **Design Philosophy**

The company's new and improved vision for automotive testing originated with design thinking. When the company began, "only engineering people were designing in this industry" says Loukanov. To change that perspective, the company has worked in a fully integrated research and product development process with engineers, computer programmers, and designers to enhance the features and benefits and overall look and feel of its various generations of equipment.

The company has a clear understanding of the critical role of design in developing products that meet and exceed client expectations. The corporate design philosophy is summed up on the web site as follows:

"Our design team consists of some very creative minds. We know that the machine layout and user interface are very important to the customer, which is why we dedicate so much time and effort to designing our equipment. The secret to our success is that we listen to our customers and we design products that provide unparalleled accuracy, functionality and reliability."

## **User-Centred Design**

The company does not only focus on OEM customers, but also develops products for large retailers such as UAP/NAPA and smaller body shops and rebuilders. In the case of the small garages, the product development and service team has been very thoughtful about how the equipment operates in various modes and even in extreme conditions, and how to integrate it into the limited physical spaces of certain client venues.

For D&V Electronics user-centred design begins with user and context research in the field. Close observation of work models and behaviors in different categories of users has enabled the design and product development team to adapt the equipment to specific but also universal user needs. For example, they noticed that the aesthetic look of the testing equipment was not a priority to their larger automotive clients. But their small customers cared about the form. The look of the machines was very important to small body shops because the machines had to look good to impress their customers and had to be compact enough to fit into small garages. The shop owners would even place the testing equipment in their front window to reinforce the perception that they were offering reliable, high-quality service. In the case of these clients, the equipment had to compensate for specific customers' issues and gain their trust.

The company has established the gold standard in the industry because of its sophisticated design and customization of products and services, and in the way in which it integrates a web-based client support centre as a communication tool to build customer interaction, confidence and loyalty.

## **Long-time Relationship with Designer**

Vasko Studio, an award-winning local design firm led by seasoned professional Vassil Popvassilev has worked with the company since its inception. Popvassilev, a faculty member at the Ontario College of Art & Design (OCAD), is a certified Industrial Designer specializing in product, exhibit and design of in-store solutions. He has used his multi-disciplinary skills to focus on accessibility – to make D&V's products easily operable by a broad variety of users through logical and functional arrangement of components, modules and controls, through a simple, intuitive user interface. He has contributed in the development of concepts and the look and shape for several lines of D&V equipment to meet user needs and match the exigency and elegance of the automotive category as a whole. Vasko Studio has also designed the corporate identity and branding architecture for the company, and the layout of the state-of-the-art web site.

## **Value of the Printout**

In developing the early product prototypes, D&V Electronics, considered the psychological perspective of electronic testing devices. The product development team decided that customers would need reassurance in the form of a tangible record of the

testing results. To address this need they developed the technology to generate a hard copy printout of assessment activities. The printout has become the symbol of quality assurance for customers using D&V equipment.

### **Interactive Online Service Centre**

With its easily understandable architecture, vibrant colours, sharp images and flashy opening sequence of speeding racing cars, the D&V Electronics web site could be the virtual home of a consumer products or fashion company.

But, beyond the compelling imagery and clear, clean typography, the corporate web site is an extremely sophisticated strategic tool for service delivery and customer engagement. It provides personalized services to customers through a proprietary remote access Client Support Centre. Customers can download software to help with troubleshooting on specific problems. This online service saves time and money for the company and its clients by diverting calls from the help-line. The Client Support Centre includes a business networking forum where companies can share experiences and learn about the latest trends from an electronic newsletter.

Like the printout generated by D&V machinery, the online service centre demonstrates how this advanced manufacturing company has leveraged design to add value to technology, to deliver a superior service and to build trust and long-term relationships with its customers.

### **Benefits of Manufacturing in the GTA**

Voiko Loukanov believes that the Greater Toronto Area is an ideal region for manufacturing. His company has taken advantage of the Ontario R&D Tax Credit to support its commitment to driving innovation through continuous research. He has received strategic advice and strong support from the NRC Industrial Research Assistance Program. The company has also benefited from the strong university and college network in the region. Loukanov has developed research projects with faculty and students at McMaster University in Hamilton and hires graduates from McMaster and from Waterloo University. Both these world-leading research institutions are easily accessible from the D&V headquarters in Vaughan. A spacious office equipped with the latest computer technology is reserved for the steady stream of university co-op students who come to intern here.

The company has also benefited from the well-trained multi-cultural labour force in the GTA. An immigrant himself, Voiko Loukanov is keen to provide employment opportunities to new immigrants who have the skills and talent relevant to his industry.

### **Interior Design Reflects Corporate Culture**

Voiko Loukanov is a scientist with a strong appreciation for the way the tangible symbols of art and design bring value to any business.

The D&V Corporate Culture is reflected in the physical environment of its head office facility. The elegant exterior of the building stands out, as the jewel in the crown in the efficient industrial park where it is located. You might not expect an advanced technology company to decorate its head office with soft yellow walls, contemporary paintings, and a client area accessorized with fresh flowers, carpets and comfortable sofas. But, this company's strategic positioning as a creative, innovation-driven and service-oriented technology manufacturer is reflected in this space as well as in the immaculate environment on the shop floor.

### **Hybrid Technology Testing**

It is not surprising to learn that a current focus for new product development is on testing equipment for hybrid vehicles. This is an area of innovation well suited to the creative technology team at D&V as well as to the preoccupations of its major customers. Voiko Loukanov believes that North American automotive companies should be playing a leading role in advancing this technology.

"Most of the hybrid technology was originally developed in North America," he points out, "and now is the time for North American companies to take a leading position."

### **Conclusion**

As for the future, Loukanov has thoughts of transferring the technological expertise of the company to other industries. This former university professor began his career conducting technological research on medical devices. The future could take the company back to this sector, or in another direction.

"I am genuinely excited about the future of D&V Electronics. I believe we are well positioned for growth. Our goal has been, and continues to be, setting industry standards for providing high quality products based on synergy of design, innovation and technology. "

A simple but charged statement from the leader of an advanced manufacturing company who is also a design visionary with a winning formula for success.

## End Notes

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