

Sustainable Design Resource

A resource to provide information on the critical
topic of sustainability for our profession

An Introduction to Sustainable Design

Sustainable or Green design has rapidly become a big deal and what defines it is perhaps best dealt with on an individual level. We often get asked what the definition of Sustainable Design is, the simple fact is that there are no universal definitions, it is open to interpretation. I can give you as many different diagrams as there are design processes.

Every designer will have a unique and interesting perspective on what it means in relation to their work. This should be encouraged as it provides a diverse range of responses, ideas and solutions to the problem represented by sustainability, and let's face it bio-diversity is something nature's been perfecting for a very long time, so it's a proven model.

Radiating through the thought pieces in this resource is the continuum that sustainability needs to be an 'integrated' part of the process and that all stakeholders in the design process need to 'collaborate'. There is also an underlying belief that design has a role to play in 'getting us out of this mess' to quote one. Signs of perhaps an optimistic search for what design's ultimate role is within the larger sphere of sustainable development.

Mechanically, sustainable design is the consideration of economic, environmental and social factors. This sounds straight forward, but the reality of extended supply chains, lack of proximity to manufacturing and our distance from market, conspire to make this a complex and time consuming task.

Pike Research has Ewaste modelled to peak in 2014. They noted that the most significant variable is 'consumer behavior'. Designers are often the interface between consumers and new products and services. Understanding consumers and influencing them through the design of products and services, communications, and spaces is a true creative challenge.

And a creative challenge is something any good designer just simply can't resist.

TIMOTHY ALLAN FDINZ

Thought Pieces

In order to get a broad perspective on sustainability across a range of design disciplines we gathered thought pieces from design professionals that have either a product, spatial, or graphic design background. These individuals were provided with a template containing specific questions that were aimed at gathering information on their personal philosophy and approach to sustainability in their work.

Ed Burak

Ed Burak's field is Industrial Design and Design Communication. He works as part of the wider studio; focusing their enquiry and resulting solutions toward furniture for workplace environments. The continual aspiration at Formway is to improve workplace performance through the provision of their designs and products.

Design Philosophy

Sustainability needs to be an integral part of our conversation at every level of our business. And it's becoming that way here at Formway design, but the consideration has to be, say, as natural as turning off a light as you leave the room; in other words – no longer a 'consideration', instead it is just part of what we do, another opportunity for us to add value and feel better for it. Saying that, it's often not the easy option, so it requires genuine commitment from us, our partners & our clients.

Sustainable Approach

Going forward, you won't read or hear us talking specifically about the 'sustainable' aspects of our designs (unless asked of course), and our unique proposition should never be about selling the Green. I'd like to think that our contribution will be in this idea of integration of sustainable practices into thinking & doing. After all it just seems wrong to make a big deal out of what we all have a responsibility to do.

The proof is in the pudding of course, and in this regard having products that are tangibly better and not compromised by price or performance because of sustainable thinking is a great start.

David Trubridge

David Trubridge is a furniture and light-shade designer with about 35 years of experience in both making and designing. Also large, one-off installations are undertaken. Most of his work is done in wood, but metals and plastics are used as well.

Design Philosophy

Sustainability is not an add-on or afterthought but a fundamental component to all the work we do. Fundamental to our philosophy is the belief that nothing we currently do – or are likely to do in the near future – is anywhere remotely near being sustainable. We define this as anything that can be done indefinitely without any detrimental effects on the environment or people. Anything other than this is green-wash, and we make no such claims. Our ideals are usually far beyond the practicality of what we are actually able to do, because our aim is not so much to produce product as ideas and cultural nourishment. But for now the company is dependent on selling product, so we make everything we do as sustainable as we can.

We are one of a handful of companies being put through a Life Cycle Management programme as part of a government funded pilot scheme. In the process we are working towards Enviromark diamond status which is also ISO 14001. Our urgent

need is access to locally relevant data with which to be able to analyse the relative merits of different materials and manufacturing processes

Sustainable Approach

One of our strongest attributes is our long term vision and our ability to propose moral standards and creative solutions that responsible design can aspire to. We believe that if design is not responsible it is irrelevant. There is only good design or bad design: if design is not striving to protect the planet and people on it, then it is actively destroying them.

We believe that ultimately only radical changes are capable of solving our mess. These have to come from very creative design thinking allied to governmental assistance both in funding and legislation (without which self-interest will prevail). NZ is a small, easily adaptable community that has the ability to take on this challenge, if we have the right leadership. We have the innovative creativity to move rapidly ahead of other more ponderous countries, but so far we are lagging behind.

We also have the rare luxury of a bio-capacity excess, which few other countries have – i.e. we can produce more than we use. We should exploit valuable indigenous resources ‘designed’ for this environment such as harakeke (not imported exotic weeds that threaten to destroy our natural habitat, like Radiata). Our aim is to develop products made from such a resource, which will be part of our culture and our story.

Jo Monaghan

Jo Monaghan is a UK trained architect who has worked in the field of Commercial Interiors for many years. She shifted her focus towards sustainability about five years ago and now provides Green Star Accredited Professional Services and Strategy advice.

Design Philosophy

Working for a construction company, we are always looking for ways to add value to a project for the client, and sustainability can do this from an internal and external perspective. Better places to work retain staff and there are studies showing that productivity is also increased by having well designed, “green” workplaces.

Sustainable Approach

An integrated design approach is vital to successful sustainable design as it requires that all parties be

brought on board early enough to maximise the benefit of everyone’s knowledge. As an architect working in Construction, I will hopefully be able to bridge some of the gaps between the builder and the design team which have traditionally existed to get a better outcome for the client.

Gary Stewart

Gary Stewart is a trained graphic designer with over twenty years experience in brand, identity and publication design.

Design Philosophy

We use a checklist when working on a piece at brief stage, which asks questions such as “do we need to print this?” If the answer is ‘yes’ we go through a process of looking at the best way of doing this, aligning with suppliers who have stringent sustainability practices like recycling, vegetable inks etc. For some larger projects such as a large multimedia project, we’ll calculate the footprint by measuring all inputs.

Sustainable Approach

An article in creative review from earlier this year said designers need to see themselves as ‘producers’. I can’t argue with that. We need to move from the concept of ‘saving the planet’ to a notion that is more morally driven - we need to be responsible for decisions that impact on all parts of society, and as designers, we have the ability to make changes at almost every level. ‘Bad’ design or ‘undesign’ got us into this mess, ‘good’ design can get us out of it, or at least delay the effects.

We have an office ‘green team’ which monitors our resource use and looks at ways to reduce this, along with initiatives to reduce or modify the way we do things for clients. We went through a process two years ago to only align ourselves with suppliers with similar values to ours. This is an ongoing process.

Dean Poole

Dean Poole and Ben Corban founded Alt Group back in 2000. Alt Group is a strategy-led design studio based in Auckland.

The Joy of Wobbling - Survival is not enough.

In 'Collapse: How societies choose to fail or survive', Jarrod Diamond writes about the main bodies of research into why societies have failed over the years.

With regards to environmental failures, past societies have undermined themselves in eight broad ways: deforestation and habitat destruction; soil problems; water management problems; over-hunting; over-fishing; effects of introduced species on native species; human population growth; and increased per capita impact of people.

Although these are with regards to the environment, impacts in other contexts seem to map onto variations on these themes. In the end Diamond presents a five-point framework, four of these factors - environmental damage, climate change, hostile neighbours, and friendly trade partners - may or may not prove significant for a particular society; however, the fifth factor in the framework - the society's response to its problems - seems to be the most significant.

He goes on to say that a society's response depends on a number of factors such as its political, economic and social institutions and on its cultural values. Two factors come to mind: FRAGILITY, or the susceptibility to damage; and RESILIENCE, or the potential for recovery from damage.

Defining resilience

Broadly, resilience is defined in two competing ways that emphasize two different aspects of stability. One definition of resilience is the rate at which a system returns to a single steady or cyclic state following a perturbation. This definition of resilience assumes that the behavior of the system remains within the same domain as before. In this sense it is similar to the physics and engineering uses of the word, and is termed engineering resilience.

The second definition emphasizes conditions where instabilities can flip a system into another regime of behavior - i.e. to another stability domain. In this case resilience is measured by the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behavior. This type of resilience is often termed ecological resilience.

The first type of resilience focuses on maintaining efficiency of function, and indeed the mental models of 'sustainability' are grounded in this use of the word. The problem with an exclusive focus on this type of resilience is that it reinforces the myth that the variability of open systems can be effectively

controlled, that the consequences are predictable and that sustained production is an attainable and sustainable goal. The second type of resilience is one that focuses on maintaining the existence of the function, and in this sense is more suited to natural and human relationships. It provides access to new ways of looking at the concepts of sustainability and perhaps in managing systems in better ways.

The first deals with aspects of engineering resilience and the latter two with the aspects of ecological resilience. In essence, enterprise resilience is the ability of an organisation to take a wobble and, not only to bounce back, but to readjust itself, perhaps even reposition itself and learn. It is about the ability of the organisation to adapt to the circumstances around it in a dynamic way.

Most small and medium enterprises in New Zealand are still grappling with issues around vulnerability and fragility and rarely have time, or make time to consider what would happen if there were to be minor shifts in their worlds, let alone seismic changes. Yet these skills are inherent in us from birth, if we look at the ability of resilience in children, then there is indeed learning to be done

Resilience & Business

The concept of enterprise resilience covers 3 areas:

- The amount of change the system can undergo and still retain the same controls on function and structure.
- The degree to which the system is capable of self-organization.
- Ability to build and increase the capacity for learning and adaptation.

Instigating your own wobbles

Yet, how do organisations know if they are resilient or not? This is not an easy question and there are really no guarantees, the test is unfortunately in action.

However, organisations can prepare themselves, and the better prepared they are, the better propensity for enterprise resilience. One way is to instigate their own wobbles, to prepare the minds of their own executives to, firstly recognise signs of instability, secondly to respond to them and thirdly to develop enterprise learning and memory. Abductive thinking, or that ability to come up with 'what if?' type thoughts are an essential part of any business organisation. Something about the design for wobbles... etc....

Kevin Sloan

Kevin spent the early years of his career working in New Zealand as a model maker for Te Papa and as an industrial designer for both Burroughs Pilcher Design and Shape Design.

Kevin is currently a Senior Industrial Design Manager with M3 Design in Austin Texas, where he has spent the last 4+ years specializing in leading teams of industrial designers and mechanical engineers through strategic product development programs in the both consumer and enterprise computing sectors for clients such as Dell and NetApp.

Design Philosophy

I traverse the commoditised development space of Network Storage and Computing for business infrastructure, where my clients own a series of relationships with the worlds leading electronics manufacturers.

The challenge for a consultant; is how do you influence the practices of a sub contracted relationship where you have limited control over the way in which products are produced and the materials used? Unlike the consumer lines of business the enterprise world is predominantly engineering led and is intensely focused on performance, efficiency, reliability and security. Often the real product being sold in enterprise computing is the software and the associated products are just the vehicles developed to deliver the ultimate services.

So, with limited control over manufacturing materials and processes; my axe to grind starts with Systemic Product Strategies that set about evolving flexible development platforms that drive both Engineering and Industrial Design/Usability requirements toward the creation of products that leverage common components and subassemblies to create the product range. Moreover:

- To enhance reliability and performance in order to triumph over the redundancy (fail in place mindset);
- Energy efficiency;
- Minimal system footprint;
- Deliver truth in materiality (elimination of secondary coatings);
- Minimising multiple material streams successful repair and field replacement;
- End of life strategies;
- These considerations are paramount when approaching systemic productisation of a complex product.

Beyond this, the rationalisation and creation of a multifunctional system based product is a strong foundation for developing a model for sustainable design. Does this approach represent revolutionary thinking or massive change in ownership of environmental responsibility? No not yet. But If we are to change we have to start somewhere.

The biggest challenge that confronts a designer in an enterprise is developing credibility and expanding their circle of influence in the engineering and manufacturing arms of a clients business, as such as altering the way we think collectively about the options available to us and influence the way contract manufacturers produce, and the materials and processes they employ.

Sustainable Approach

Design thinking has become a more integral and critical component of business/product development strategy. As a result industrial design as a profession has a growing and instrumental role to play and more importantly if positioned correctly, has a voice at the table much earlier in the process.

It is our ability to ensure sustainable design practices are considered which is intrinsically linked to how we communicate their value to the business and engineering stakeholders in the process.

In order to do this effectively in enterprise computing, industrial design as a profession has to come to terms with our responsibility to the environment and the impact the products we create. If we are directly responsible for our development strategy we should ultimately be able to also influence the way the products we design are manufactured.

The only way to do this is to develop momentum from the inside of a clients business and change the fabric of the brand and the associated business focus; then drive this change through manufacturing practices. The bigger challenge is defining how a business evolves systemic product development strategies through a contract manufacturing organization from the outside.

We have to help manufacturers create viable models for responsible manufacturing through design and engineering not just demand change through product or engineering requirements.

Case Studies

The case studies are of selected companies that have successfully applied sustainability into their day to day operation.

The case studies were completed where possible by design professionals that own, operate or work for one of these companies.

Zespri - Horticulture

Zespri are an iconic New Zealand brand. The exporter of Kiwifruit has one of the best overall sustainability platforms in the country. It is integrated into the Research and Development projects and their data collection and analysis linked to mitigation measures. They have managed to turn a perceived negative of distance to market around and created a leadership position internationally for the proactive stance.

CASE STUDY AUTHOR:

ALISTAIR MOWATT (ZESPRI)

Cortex - Building Product

Pacific Wood Products is part of Pan Pac, a vertically integrated forestry operation. They have the Forest Stewardship Certification for both their forestry and Chain of Custody, so have an in-depth commitment to sustainability within the operations of the company. Developing new products required a life cycle approach to be taken to develop products that aligned with the company's existing commitment and philosophy.

CASE STUDY AUTHOR:

TIMOTHY ALLAN (LOCUS RESEARCH)

Formway - Furniture

Formway have invested in sustainability by creating an environmental manager within their broader design team. Their design team has worked hard to build sustainability into the process as a natural consideration, whilst producing award winning designs.

CASE STUDY AUTHOR:

JAKE MCLAREN (FORMWAY)

Patagonia - Apparel

Patagonia has been a leader in corporate environmental sustainability for over 20 years. They have a multi-faceted programme that works through design, materials, and supply chain to communication and working with groups on environmental causes.

CASE STUDY AUTHOR:

BLYTHE REES-JONES (LOCUS RESEARCH)

Actronic - Electronics

A leader in the industrial electronics sector for New Zealand. Actronic started looking seriously at environmental issues in 2005. Jeff Vickers began his PHD there after this and analyzed the information comprehensively. This led to a better understanding how the products get used in the field. It also promoted a new way of looking at their products. It has also raised environmental awareness across the board within the company.

CASE STUDY AUTHOR:

JEFF VICKERS (ACTRONIC)

Zespri



Zespri are an iconic New Zealand brand. The exporter of Kiwifruit has one of the best overall sustainability platforms in the country. It is integrated into the Research and Development projects and their data collection and analysis linked to mitigation measures. They have managed to turn a perceived negative of distance to market around and created a leadership position internationally for the proactive stance.

As a leader in NZ's kiwifruit industry, Zespri strive to use the best practise and process. They are dedicated to becoming a sustainable business and market leader in the industry.

Process/Approach

Our business is to generate new products by using natural plant breeding techniques to produce new branded cultivars such as ZESPRI GOLD™.

Once we have the new product we look at designing additional services that can we bundle with the new cultivar. For example, health-based services that enhance the health and wellbeing of the consumer. In the case of sustainability-based services we will explore a range of options that could provide environmental, social or economic benefits to the consumer. Note, this step is consumer centric and uses the product, a ZESPRI branded cultivar, to carry or deliver the sustainability-based service to the consumer.

Consumer Awareness

Being very consumer centric we need to get good insights into what services a consumer is seeking. One of the challenges is for us to get significant lead time into the design process so that we can almost anticipate the service that a consumer is seeking out by the time we have developed and launched the new service. To do this, we exploit the notion that a consumer is also a citizen who in combination with other citizens expresses their views and aspirations through government agencies and non-government organisations (NGO's) to raise awareness for an issue.

We find that new emerging consumer trends in sustainability often have origins in citizen initiated awareness. For example, the demand for environmentally friendly packaging. By working closely with governments agencies and NGO's we can better understand and use emerging

sustainability trends to complement our existing consumer insight work to develop more effective leads for our sustainable design process.

Outcomes

Our breeding program allows us to introduce new consumer products into the market. Historically, we considered the value that could be generated from the product was limited to the physical product itself.

However, by looking at the possible services that we can bundle around the product we have been able to realise that we can generate more value from the product than would intuitively be considered possible. For example, fruit labels are an important service that allows a consumer to conveniently find the consistently good tasting ZESPRI branded kiwifruit that they previously purchased. However, we have found that with the introduction of waste minimisation laws by various European government agencies, fruit labels adhering to fruit waste after consumption create an inconvenience when they are composted or put through worm farms.

We have designed compostable fruit labels that retain the functionality of the original label but provide the consumer with a convenient disposal solution that will biodegrade with the fruit waste into nutrients that can then be returned to the soil.

Overall, such an approach has allowed us to change our product/service design process to one that also considers where we can add value whilst at the same time lowering our environmental footprint.

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Cortex

Pacific Wood Products is part of Pan Pac, a vertically integrated forestry operation. They have the Forest Stewardship Certification for both their forestry and Chain of Custody, so have an in-depth commitment to sustainability within the operations of the company. Developing new products required a life cycle approach to be taken to develop products that aligned with the company's existing commitment and philosophy.

The Cortex timber cladding system is the first 'end' product for the vertically integrated forestry client.

Process/Approach

'Life cycle thinking' was integrated throughout the Cortex design process. Initial research conducted by the design team in both the New Zealand and US markets (on both east and west coast) determined that consumers and builders were very concerned about low maintenance, extended durability and greater perceived value (as an investment). In addition, research isolated that in the US 87% of decisions relating to exterior cladding products were made by the builder or specifier rather than the end consumer (given there are a range of options to achieve different looks). Stability was an area of ongoing concern for builders and contractors with timber cladding. This was considered a result of poor material processing, handling and installation detailing. Often poor quality documentation of the products further aggravated the situation and non-systemized detailing made installation time consuming.

Screening Life Cycle Assessments of 8 competing products were undertaken to benchmark the existing timber weatherboard and isolate hot spots within the product life cycle. Through this work the Paint Coating and Preservation were highlighted as key problems. The application of 60 microns of Acrylic paint every 7 years over the expected lifespan has a cumulative impact on the product and the preservation system produces localized VOC emissions through the use of solvent carriers.

In order to effectively communicate the complex results, the design team developed a method of mapping the balance data from the LCA's into a single graphic using postscript and XML, so that graphics are data driven. This enabled the team to broadly understand where the product sat and then evaluate the product specifically to understand what the key impacts were.

Outcomes

This research drove the idea of a 'Factory Finished' weatherboard system, the first of its kind in the market. Information from leading coating suppliers indicated a consistent factory finish would double the initial maintenance free period to 15 years, with a better cross-link and anticipated reduction in refinishing which would dramatically reduce the volume of paint required over the weatherboards life span. LCA work was also conducted concurrently to the performance testing on four shortlisted paint systems, along with the three shortlisted preservation methods. This enabled a selection of system based on performance, price and environmental factors.

Specific colours were selected to ensure the photo-degradation during the life was kept to a minimum, further extending lifespan.

This sounds relatively straight forward, but required the design and engineering team to develop and certify a concealed fixing system that enabled assembly without penetration of the exposed face, increasing both strength and durability and providing a patented point of difference. The system includes a series of proprietary extrusions that provide systemized detailing for all key interfaces and improves weather-tightness and ease of installation.

Cortex is the first cladding system on the market that can be disassembled to replace or refinish boards. Integrating life cycle thinking into the design process enabled the creation of a real point of difference and a structural improvement in the products lifespan and environmental impact. Sustainable design underpinned the product development, complementing the clients existing commitment to sustainability through Forest Stewardship Certification (FSC) of its own forest estate and chain of custody.

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Formway BE Chair

Formway have invested in sustainability by creating an environmental manager within their broader design team. Their design team has worked hard to build sustainability into the process as a natural consideration, whilst producing award winning designs.



The Be chair combines a wealth of experience in task seating with a new body of research insights. The result is a chair that automatically responds to natural human behavior and adapts to the changing nature of work.

Process/Approach

During the design and research phase of product development, the design team identified key environmental goals to improve on the environmental features of an existing Formway benchmark chair. The Be chair design goals included: reduction in product mass, part count, material types and processes, design for easy disassembly and refurbishment, increase recycled content and utilise clean manufacturing processes. The design team also reviewed a comprehensive Life Cycle Assessment (LCA) study of the existing benchmark product and defined specific targets for the development of Be, including:

- Research developments in renewable and recycled polymers.
- Reduce carbon footprint, by minimising product mass and carbon intensive materials.
- Prioritise compatible polymers for efficient recycling.

A global review of materials was conducted for environmental and technical performance. Dupont Hytrel and Crastin polymers were finally selected as candidates due to the possibility of renewable sourced (corn based) versions of these polymers under development.

Life Cycle Environmental Outcomes

The Be chair has reduced mass, minimised material types and part count relative to the benchmark product. A streamlined Life Cycle Assessment shows that for the suspension module and seat structure, material mass has been reduced by 44% and carbon footprint by 48%. An ISO compliant LCA study of Be is being undertaken and results will be published in an Environmental Product Declaration.

Overall recycled content is 40% - 46% depending on the chair base specified. Additionally 30% of

Be is capable of using renewably sourced Dupont polymers, however, implementation of this is planned in the US market only due to market size and current cost premium.

Be is PVC and virtually VOC-free. Manufacturing and assembly and takes place at Knoll inc. in the United States. Manufacturing is certified to ISO14001 in a LEED Gold certified building where electricity use is 100% offset by wind generated energy.

Be is designed for an extended life (10yr warranty) with a modular construction that enables refurbishment. Take back and recycling services are available and new product stewardship partners are being engaged across NZ. The polymers used predominantly throughout the chair are both polyester based and therefore compatible for recycling, thus reducing disassembly time at end-of-life. An expert review of recycling Be states:

"the design leads itself well for recyclers.....the chair would be a high value recyclable product and reasonably easy to sort the different material types. The Hytrel can be reprocessed in NZ. The other materials used are of common varieties that pose no issue for re-use" NZ Manager Astron Plastics.

Awards and Certifications

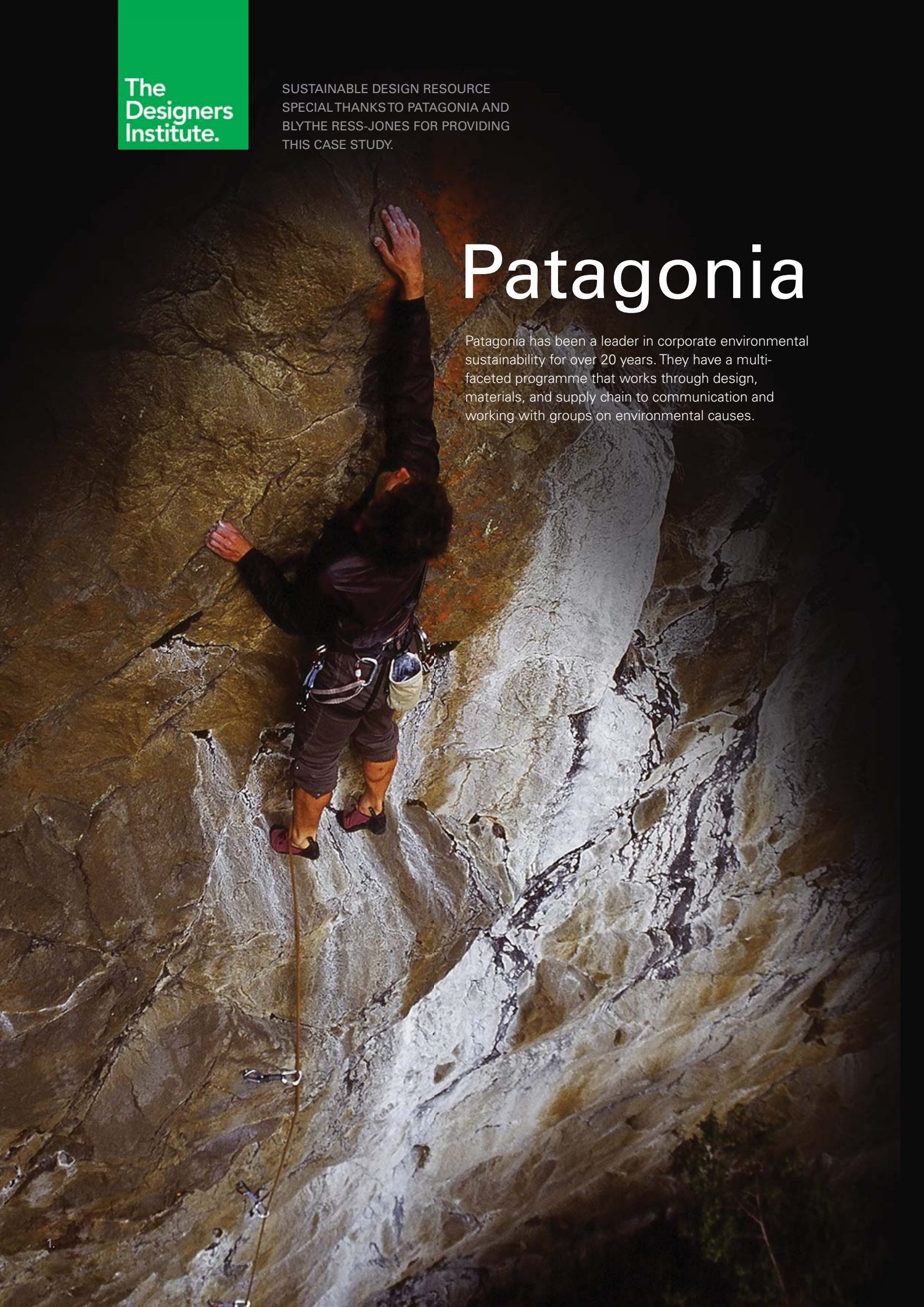
Be environmental performance is recognised with the 2009 Gold Sustainable Product BeST Award from the Designers Institute New Zealand. Be holds licences from Environmental Choice New Zealand and Good Environmental Choice Australia.

In the United States the chair is the first Sustainable Platinum rated furniture under the SMaRT® Sustainable Product Standard and GREENGUARD Children & SchoolsSM certified for low-emitting materials. Additionally Be conforms to the BIFMA e3 2008 Furniture sustainability standard: LevelTM 3.

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Patagonia

Patagonia has been a leader in corporate environmental sustainability for over 20 years. They have a multi-faceted programme that works through design, materials, and supply chain to communication and working with groups on environmental causes.



Patagonia is a manufacturer of outdoor clothing and equipment from California, USA. Yvonne Chouinard founded Patagonia in 1972 after many years designing and manufacturing elite outdoor hardware products for Chouinard Equipment.

Patagonia is very committed to environmental sustainability and donates grants every year to environmental programs, including funding development of the Patagonia Future Park in Argentina. Patagonia is also registered with 1% For the Planet, a business alliance where companies donate 1% of their profit to active international environmental programs.

Taking Responsibility

Patagonia's company vision is to develop environmentally responsible outdoor clothing and equipment. "Our goal is to take responsibility for every product we make. Re-recycling is simply our first step towards a truly environmentally sound process. We recognize that most of what we produce ends up in landfills," Michael Crooke, President and CEO, Patagonia, Inc.

Process/Approach

Patagonia needed to reinvent its supply chain and align itself closer to the needs of its customers and the environment. Patagonia created their own supply chain and developed a closed loop manufacturing process that recycles worn products instead of using raw virgin resources. The 'Eco-Circle System' or 'Common Threads Recycling Program' established in 2005 by Patagonia and Japanese company Teijin Fibres Ltd, involves the collection of old Capilene polyester and PET garments from consumers and recycling of the material into new outdoor clothing garments. Patagonia customers can return worn-out Capilene garments to Patagonia by mail or directly to any Patagonia retail store. These worn-out items are then transported by container ship to Teijin Fibres Matsuyama Factory where they are chopped up and granulated into pellets before being chemically broken down to a molecular level and purified to produce the

original polyester (dimethyl terephthalate, or DMT), equal in quality to those being made from virgin petroleum. The new DMT is then polymerised and turned into polyester chips before Teijin melts the chips down and spins it into a new filament fibre that will then be processed into a new fabric garment by Patagonia.

The Cost of Being Green

The 'Common Threads Program' consumes 84% less energy and emits 77% less CO₂ than the production of polyester fibers from virgin petroleum. While the Common Threads Program does not save money for Patagonia in the short term, it does not add extra costs to the manufacturing process. The added expense of the recycling program and logistical costs of recollecting old products is offset by the fact that Patagonia does not have to purchase or create raw polyester material.

Outcomes

Patagonia now uses the post consumer recycled material in about 30 of its products. By offering incentives to Patagonia's customers, Patagonia has developed a stronger bond with its customers and has developed its own closed loop product system, which is taking significant steps in eliminating the 1.3 million Capilene products Patagonia sells each year from landfill. Patagonia's environmental approach has helped develop the company into a world leader and supplier of innovative outdoor equipment and apparel products. As Jill Vlahos, Patagonia's director of environmental analysis states, the company is now *"constantly trying to innovate our supply chain and improve every step of the way."*

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Actronic

A leader in the industrial electronics sector for New Zealand. Actronic started looking seriously at environmental issues in 2005. Jeff Vickers began his PHD there after this and analyzed the information comprehensively. This led to a better understanding how the products get used in the field. It also promoted a new way of looking at their products. It has also raised environmental awareness across the board within the company.



Actronic Technologies designs and manufactures electronic measurement and control products as well as integrated information systems and exports to over 30 countries.

Process/Approach

Actronic Technologies designs and manufactures electronic measurement and control products as well as integrated information systems. These solutions are exported to more than 30 countries and used in rugged environments such as quarrying, mining and forestry to improve productivity.

We started to think seriously about sustainable product development in 2005. While the initial driver was legislation – particularly from the European Union – we now try to stay ahead of the curve and introduce stricter environmental performance criteria for each new product generation.

One of the things we did early on was to benchmark the environmental performance of our highest selling product, the Loadrite® Pro™ onboard weighing system. This product is typically installed in the cab of a wheel loader and displays the weight of material in the bucket for the operator in real time.

Benchmarking was done using a streamlined Life Cycle Assessment (LCA) tool called eVerdEE. This is a free tool designed specifically for SMEs. One area where eVerdEE stood out was its large database of electronic components and processes, something lacking in many other streamlined LCA tools.

The reason for carrying out the LCA was to identify “hot spots”: which environmental impacts were most significant and which parts of the product’s life cycle had the biggest contribution to these impacts? The product chosen was quite complicated (containing hundreds of components), so the process was time consuming (taking roughly two months of full time work). However, the results paint a comprehensive picture of the product over its full life cycle from “cradle to grave”.

Environmental Impact Indicators

Across its 8.5 year average life, a Loadrite® Pro™ uses roughly 8% of the energy of one “average” person (from the USA to Ethiopia) in one year. The biggest opportunities to reduce environmental

impact are during the use of the product and its distribution. The research findings showed that major impacts were the burning of diesel in an engine to power the product and its transportation from New Zealand to the customer.

Because Actronic makes high-value, low-volume products, we have chosen to specify increasingly strict requirements for new products rather than tinkering with existing ones. Examples of requirements in new product specifications include compliance with the European Union’s Restriction of Hazardous Substances (RoHS) Directive, design for disassembly and recycling, and a focus on energy efficiency in the use phase.

Another important consideration for Actronic product designers is the influence our products have on our customers’ operations. This creates a potential trade-off between improving environmental performance and improving energy saving functionality for customers. To illustrate this point, consider the example below.

A common application for the Loadrite® Pro™ is to assist wheel loader drivers in quarries to load road trucks. Without an onboard weighing system, the loader driver loads by eye and the truck’s weight is checked when it drives over a weigh-bridge before leaving the site. If the truck is significantly overweight it must tip off excess material, if it is significantly underweight it must be topped up by the loader. By loading each truck to its rated capacity first time, it is possible to minimise the number of trucks that must have their weight adjusted. The significance of this when compared to the impact of the product itself over its whole life cycle is shown below.

Normalised Environmental Impact

Given that huge savings are possible, we are currently running a number of trials to better understand our customers’ processes. Expertise developed in this area may lead us to sell services as well as products.

Looking further forward, we are also interviewing important players in the earth-moving equipment industry to identify future trends for this equipment globally up to the year 2030. Many people believe that sustainable development requires radical change, but the earth-moving equipment industry has been characterised by incremental improvements over a very long period of time. This project aims to identify possible future paths for the industry, both incremental and radical, and it adds an important strategic dimension to sustainable product development. The logic is that before investing heavily in optimising environmental performance, it is important to know that you are offering the right products and services to meet future market needs.

Sustainable product development is an ongoing process at Actronic. To help ensure that it continues to evolve we are currently setting up an internal wiki to discuss and promote best practice. It is hoped that this will give greater visibility to the process and act as a knowledge base of past experiences.

Outcomes

The LCA study highlighted how critical it is for us to understand how our products are used in the field and how they can help improve customers' processes. While we have always considered cost and time savings, we now also focus on environmental improvements, particularly reductions in energy use and greenhouse gas emissions. This requires more and better data and we are now working closely with customers to obtain, analyse and present this data. Not only will this help us to develop better products, but the initial results have already been published in leading international industry magazines, with more publications to follow.

Another advantage of carrying out an LCA is that it helps people to focus on the function that is being fulfilled as well as the product/service that currently fulfils it. For example, Toyota manufactures cars, but these cars meet a need for personal transport. This concept – focusing on needs rather than products – is enabling us to be more creative and shift the company's focus away from standalone products.

Taking the environmental performance of our products into consideration during product development is also changing the way we work with our suppliers. For example, we have already been able to reduce environmental impact by moving from air freight to sea freight for one of our major system components.

Another significant change has been to the general level of environmental awareness within the company. The first company-wide presentation on sustainability and sustainable product development was made in 2006. This led to more questions and follow-up presentations. When Actronic moved into new premises in 2007, environmental factors were considered in everything from the choice of furniture supplier to the design of the heating and cooling systems. Not every idea was acted upon, but there was a noticeable change in people's awareness of the issues.

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