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INNOVATION

Material Witness

AUTOMOTIVE HISTORY ■ CONSUMER ELECTRONICS ■ IN HIS OWN WRITE





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MAKING THE "RIGHT" CHOICE

I have a relatively simple task for you that will hopefully illuminate the purpose of this article. Push your chair back from where you are sitting and survey your surroundings. Let your eyes alight on some of the products that undoubtedly litter your field of view. You probably have some ideas about how you would improve at least one of them, right? How to simplify the design, make it more functional, update the aesthetics and create an iconic brand identifier?

Your schooling, your professional experience and your genius will all aid in this process of improving the design of this product. You can imagine how it might look—this updated product—and how effortlessly and enjoyably the users will experience this new category-killer design. So now take it one step further. How is it going to be made and from what materials? We know (or can make a good assumption about) what the current product is made from. But the new design, the one currently in your head, clearly needs to be made of something new, different, *innovative*. At this point in your thinking, the path divides.

The Road Less Traveled

You can keep designing, assuming that there will be a material to suit your ideas when you have everything else worked out. Following this path means that you will either end up using the same materials and process as the original product or will have to radically alter your vision (the indignity!) when it becomes clear that transparent, elastic, glow-in-the-dark bamboo does not exist yet.

The other, happier, path is one on which you ask yourself, how could a new material or process *enhance* my design and possibly even solve some of the current problems that exist in that product category? This then requires some research to find out what else is out there, what new material, process or finish could be used to create

this enhancement? Because of our wonderful digital age, the problem is no longer how to access information about new research, but more how to sift through the millions of possibilities that are found within a microsecond of typing "bamboo" into a search engine.

The key is not access to information, but the ability to decide which information you need to heed in order to select the material best suited for your project. The answer to this question is beyond even the most experienced of product designers. In addition, when the innovative material or process is from another industry (saves you the time of inventing or developing it yourself), then you need an idea about how that innovation will translate to your application, something that is not always obvious even to the owner of that technology. What I have found through years of trying to solve these types of problems is that a specialist in that field is worth a thousand Google searches. **Get one experienced engineer for one hour and I guarantee you will come away with an understanding of the limitations of a material or technology that will enhance your ability to create a good design. Understand the true limitations of a material (and where those limitations can be pushed) and you will innovate.**

So you now know to begin your materials research at the concept stage and to find experts in the field (engineer, tech specialist for a manufacturer, consultant, hell, even



an academic) and to let the material selection—whether it be innovation or simply greater knowledge of limitations—influence your design. And because you are a brilliant young wunderkind and you lapped up the sustainability section of your design schooling, your new vision is totally sustainable, right? (I can hear the collective shuffling of feet and the universal response of “Well, yeah, sure ...” from here.) And it was a good school; so you know you can’t just rely on the “We’ll make it from recycled materials!” defense. This is where it becomes a little more complicated.

The Reality of Sustainable Materials

What you learn from undertaking quantitative sustainability (assessments of impacts from all aspects of the product’s life cycle) is that the best solution is not always the most obvious and, more confusingly, does not always use the most sustainable materials. A recent example is the Clever Little Bag from PUMA, a new packaging concept that aims to remove the iconic shoe box completely, replacing it with a structural skeleton and a reusable bag that significantly reduces the carbon footprint of the entire delivery system for the shoe—from manufacturer to store to consumer. And also saves a considerable amount of money in the process. This lower-impact solution was a result of conducting a life-cycle analysis of numerous packaging concepts. It was found that a 100 percent recycled paper-pulp box, which

used less material, less ink and more recycled content than the iconic PUMA red shoe box, did not quantifiably outperform the existing box due to the simple fact that the molding process took more energy than the hand assembly of the existing corrugated version.

The only real way to reduce the impact was to drastically reduce the amount of corrugated material, resulting in the Clever Little Bag design. Thus, **the life-cycle analysis tells us often not what we want to hear but what we need to hear. It shows us that the best solution often does not fit in nicely with our preconceived ideas of what sustainability should be (natural, green, brown or neutral in color; nontechnical or comforting).**

And this is why if you want to create the “best” design, and this includes sustainability as a central tenet of the solution, the decision about what options are available for material selection needs to be made by those who understand the wider implications of each material choice and are not influenced by preconceived ideas of what materials seem “right” for an application. Material selection needs to be considered at the concept stage, and the available options should include both those materials beyond what the designer currently understands as possible (the innovative) but also those that can result in a quantifiably lower environmental impact solution regardless of preconceptions (the sustainable).

2010 Material ConneXion MEDIUM Award Winners

WHAT'S NEW?

Novacem's Carbon Negative Cement was selected as the winner of Material ConneXion's second annual MEDIUM Award for Material of the Year. The award recognizes materials that demonstrate outstanding technological innovation and the potential to make a significant contribution to the advancement of design, industry, society and economy. "The year in material innovation reveals a continuing drive for sustainability. Whether it's through a clever substitution of natural materials, improvements to existing ideas or a manipulation of high-tech processes, these tougher economic times are seeing a turn to simple, creative and powerful innovations that will help lessen our impact on the planet," noted Andrew Dent, Material ConneXion's vice president of library and materials research.

Material of the Year 2010

Novacem

Carbon Negative Cement (Novacem, UK): By replacing the calcium carbonates used in cement formulation with magnesium silicates, and by using a low-temperature production process that runs on biomass fuels, Novacem has developed a new class of cement that offers performance and cost parity with ordinary cement, but with a negative carbon footprint. "Concrete constitutes the greatest amount of manmade material on this planet—one that is claimed to contribute to five percent of humanity's carbon footprint," said Dent. "With a simple change of ingredient, Novacem has achieved what could be one of the single largest reductions in CO₂ emissions in construction to date."

Honorable Mentions

Ad-Air® (MicroGREEN, US): By injecting polymer sheets with waste CO₂, then precisely manipulating the size and density of the gas bubbles, Ad-Air expands sheets of plastic to double the thickness while reducing density by 20 percent. The strength and surface integrity of the plastic is maintained, but material usage per given need is ultimately reduced as much as three times.

EcoCradle™ (Ecovative, US): EcoCradle is a radically new approach to packaging that is grown, not manufactured. This biodegradable, compostable solution utilizes agricultural waste to grow mushroom roots into a safe, protective packaging material.

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Lumisys by Top Nanosys



PaperLite by Flextrus

ECOR™ (Noble Environmental Technologies, US): ECOR is a line of low-weight construction panels made with bovine processed fiber and post-consumer waste, offering an energy-efficient, sustainable means of producing furniture, displays, signage and other products.

ECO-HPL (Dekodur, Germany): The world's first high-pressure laminate (HPL) made without the use of phenol formaldehyde resins. Unlike traditional HPLs, this carbon-neutral product can be recycled back into more laminate at the end of its life. The material can significantly improve sustainability in interiors, furniture production and transportation design.

Hyperform® (Milliken Chemical, US): Developed specifically for polyethylene and polypropylene, Hyperform is a breakthrough nucleation agent that offers the potential to increase durability, sustainability and performance in packaging and products.

Lumisys™ (Top Nanosys, South Korea): Lumisys demonstrates a pioneering use of carbon nanotubes to achieve a level of transparency and flexibility never before seen in the lighting and signage industry. The product makes it possible to achieve dramatic visual effects in signage and consumer electronics while taking advantage of the low-energy, long-lasting performance benefits of LEDs.

MiraFoil® (Henkel, Germany/US): Long used to distinguish products in a crowded marketplace, metallic effects are used on everything from retail packaging to POP displays. While other techniques used to achieve this look render the packaging material unrecyclable, MiraFoil is a VOC-free coating that can be removed through the de-inking process, enabling the underlying paper or polymer to be recycled.

PaperLite (Flextrus, Sweden): PaperLite is a new solution for protecting perishable foods and industrial products. The material contains no solvents, is FDA approved and can be used to contain meats, cheeses, electronics, ink cartridges and other products that require a packing material that provides durability, toughness and optimal barrier protection.

Saratech® Permasorb Wallpaper (Blücher, Germany) Saratech Permasorb Wallpaper is an ingenious solution for combating air pollution in contaminated buildings. The durable covering removes toxins embedded in wall surfaces, like PCBs, PCP, pesticides and radon, and safely contains these chemicals over time. ■