



Sophie Thomas, co-founder of Greengaged interviews David De Rothschild about the Plastik Expedition. This skype interview was part of 'The Materials Behind Sustainability' day at Greengaged, Friday 25th September 2009.

ST: Welcome to London Greengaged 2009 David and thanks for waking up so early in San Francisco to join us on our final day here at The Design Council. We have been looking at materials and resource depletion today within the context of design.

This morning we had a really lively debate about the confusion and complexities of how to specify material, with a good understanding on the its impact, and all the hidden impact and all the stories behind it. In particular they were talking about PVC, so it was quite heated.

DdR: I was going to wear some PVC in today for you guys, but I thought better of it.

ST: Perhaps you could tell us about the voyage and what you're hoping to achieve from the Expedition Plastik? And explain a bit for those people who don't really know about the boat you're currently building.

DdR: The Expedition started back in 2006. I was reading a report to the United Nations that was all about the fragility of our deep oceans. It's funny because we talk about the 'blue ocean' above us almost daily and we have a connection with that through the weather. It's raining, it's sunny, it's cold, you know, those types of interactions, but we don't talk about the blue ocean around us, which is really driving life. It's our blood system, it's our circulation system. It's pushing everything around, and here I was reading this report, and what shocked me was the fact there was this mass accumulation, this really-, this very blatant human thing on a natural world. I think there's been a lot of futile debate around the percentage of human impact, especially relating to climate change. That's a debate that will rage on and on because there are so many little ways to get in and break that down. When you take the issue of something like waste and focus on this human fingerprint. You look at the pollution that is accumulating in our natural world, it's not something you can deny.

People assume the garbage patches are more physical than they are which makes the challenge even harder for me. They envisage it's this beautifully refined island, albeit twice the size of Texas, but nevertheless an island. They think it's just floating there, and you know they email us asking if we can go along and they ask 'Can you scoop up this island?'

Well wouldn't that be easy -you know, if you can just pull it out, it's all nice and contained then hey, we are allowed to use our oceans as we have been doing; as dumping grounds. Wherever there's current conversion somewhere within our oceans, there is going to be high concentrations of plastics.

So marine debris is a major, major issue, and here I was reading this report, and the statistic that jumped out at me was a well known statistic - the six to one ratio of plastic to plankton - and I was thinking, 'Six to one? How does nobody know about this? Why don't we know about it and what are we doing about it?' Your gut reaction, and I think the gut reaction from a lot of environmentalists is 'Oh, plastic, it's awful, ban it. Let's just ban it.' I think there's a knee jerk reaction that, 'Oh, yes, plastic, I don't use bags anymore, and you know, everyone who uses plastic is the devil.' The reality is we all use plastic, it's a ubiquitous material. It was in 1899 that Leo Hendrik Baekeland sold his Velox technology to Eastman Kodak and from there the first really synthetic plastic was developed. My reaction was that we had to take this 'out of sight, out of mind' issue and really look at how we connect people to the fact that waste was a design flaw which we need to design out.

We're talking about the blue ocean out there that a lot of people don't ever see, touch or feel. Then we've got the removal responsibility of someone saying, 'Well I put my stuff in a bin.' It's like this vortex, bins are an amazing thing, you put it in there and you're done – end of responsibility. So the connection between the blue ocean out there that you don't even see, and the fact that most people don't think about where their garbage may end up. There's diminished responsibility already, plus the fact that is very hard to see because that floating patch, is microscopic. So all these things are working against us. The one thing that is working for you is that it's very real in that our waste input, and our accumulation of waste in our oceans and the touching of waste is something we can all see much more than a kilowatt of energy or carbon. It's very present. I don't know what kind of carbon-

ST: Yes waste is tangible and you can be brought back to face it as with the Garbage Patches. We have spent this week talking about all these processes and the impact. What is so interesting about the expedition is that it is not just the Expedition, it's the processes and stories building up around it. What do you think we could do to address, as an industry, these kinds of problems?

DdR: Yes so to fast forward to what happened - I went from this report which opened my eyes and looking around to see what was the most wasteful and iconic item that we have and concluded that really it was the disposable plastic water bottle. It just doesn't make sense to have on any source level at all. It's just a dumb product and it's one that needs to be eliminated. I decided that I wanted to design the project around this. So we used the design process as an opportunity.

ST: So tell us about the history and the lengthy research and design process of the Plastiki boat itself and some of the team involved.

DdR: I was very fortunate to sit on a panel with Michael Pawlyn, who had designed the biomes for the Eden Project when he was with Grimshaw. I went up to him and said 'I want to build a boat, can you help?' Actually I didn't want to build a boat, I lied, I wanted to take a boat with a bunch of artists out to the Eastern Garbage Patch, and I did this whole fantastic pitch about how we were going to take this rubbish out and create an art show. We would come back, present it and engage people through this 'creativity for change' model. I took it to a producer, a guy called Jeff Skoll who produced A Convenient Truth, I gave him my best pitch, I thought, 'He's going to really buy into this.' I thought I pulled out every card possible and idea, and he looked at me and he just said, 'It's great, I like it, but where's the drama?' I said 'Well, you know, it's going to be a bunch of interesting artists, interesting interactions, tragic obviously you know, visually.' Went through it all, and he said 'Yes, but if it's twice the size of Texas, it's not like you're not going to find it. It's not like the lost and lone mountain of it, you know, you're going to sail right into it, and at the end of the day, there's no real drama.'

So I came back to the UK and I thought about what was the greatest ocean drama or adventure of all time. For me it was the Kontiki. Really, it started there, and at that point it became 'Plastiki', and then thought why don't we build a boat out of the materials that we were seeing accumulating in our ocean, and actually design something that is driven by design, and use that to sail out and look at this material, and then sail across the Pacific Ocean. To actually build something that showcased waste as a resource by actually showing the dumbest planet-wide bit of waste, the plastic water bottle at the heart of the design. The brief was that the bottles had to be functional, and had to be visible.

Now the reason those two things have driven the project to where it is, and I would love to say that I knew from day one that we were going to start creating new materials and start to really push the project from the material point of view from day one, but we didn't.

I think one of the big takeaway lessons from the project is as Kermit the Frog said, 'It's not easy being green.' If you're trying to design sustainably, or just live sustainably, it's not easy, and what we tend to do is cut corners and take the path of least resistance, such has been the trait of humanity. When it is a little bit harder, or when it's not available, or it's too expensive,...in our case we were constantly bombarded with designers who were saying we needed to take the bottles and melt them down and make a traditional monomer material. We knew that instead of taking this more conventional path we had to evolve a solution to that kept the bottles in their original format and function. We pushed this thinking hard and ended up sticking to our brief and had developed new materials and helped pioneer these new self-reinforcing plastics.

It was Michael's design thinking at the very beginning, during the concept stage, based in Biomimicry, of using nature as reference that influenced the outcome. Some of the design looks like the pomegranate, you know the way the seeds fit into a hard compact skin. Look at how the Japanese used to carry eggs - you've got a very fragile structure, the egg, and then around it you've got a very high tensile structure, in this case bamboo. We knew our main building block was the 2 litre plastic bottle. We knew that it had to be functional as a vessel and it had travel, to sail. So it wasn't just an aesthetic, it wasn't just like we had to have one bottle in the air on the mast!

ST: And your boat. The Plastiki itself. A 60 foot catamaran made using reclaimed PET bottles. What principles you have adopted in its design. I know that you have been using 12,000 reclaimed PET bottles within the pontoons but what about your search for new materials. How has the design of the Plastiki boat been pioneering the new self reinforcing plastics?

DdR: We started designing down this pomegranate route. Very long tubes that were entirely made of balsa wood and were seeing a lot of twisting. Expert boat builders we saying 'Do you realise the forces this boat will have to take?' and we answered 'Yes, we know it's going to experience forces.' But they said 'No, the revolutions that run across the pacific will force the centre and start to break it apart.' It was a turning point. We knew we had to change our design drastically to actually feature a frame and buoyancy. But we wanted a fully recycled boat so we were looking around for a frame material and finding it hard to find anything authentically sustainable. As you know it seems easy to label something as green and as a sustainable option easy to paint it with greenwash. We were seeing a lot of materials marketed as eco-lumber, eco-timber, eco-board, and it's basically old PET they are mixing plastics, you know, mixing LDPE, high density polyethylenes, PETs, and PVCS, and crushing together into a board supposedly creating a material that you can build bridges with and decking and offering a quick solution for the West. For certain purposes it's great.

I got quite excited at the start but then found out it that the materials didn't offer what we had hoped for; lots of virgin plastic mixed in and not the right kind of recycled message which we had put at the heart of our design brief.

ST: With your message are you trying to make a distinction between the useful and re-usable, recyclable plastics and the disposable plastics that we as a society have become obsessed with? What do you think the design industry can do to address some of the problems you are revealing?

DdR: We want to separate plastic into two categories, throwaway plastics, the water bottles, the bags, you know, the lighters, the avocado wrapping and the useful, the reusable and the recyclable. The disposable polyurethanes - the stuff that gets used once and thrown away - these need to be taxed out of existence. We need to reduce them drastically, or if we are going to use them, make there are systems in place to put back into the system. Then there's the other style of plastics. The longer life cycle uses - your computer, your phone, everything up to a piece of lifesaving machinery in a hospital - these plastics are going to stay, but we have to get smarter with them and understand how we're using them. So that's the challenge, it's how we use them, what we're using them for, and then how we make sure that they reused. How do they become the technical nutrition for something else? So, in the case boat building one of the most used materials is fibreglass epoxy (or fibreglass polyester resin) and they're very hazardous and complicated to use. And you've got a non-recyclable and hazardous material which we didn't want to use. We had a look out there, and we came across a couple of Danish scientists, one a great fly fisherman, and the other a great wine lover, who were tinkering with PET.

We asked them 'What is it that you have there in the corner?' They said, 'Well it's a PET fabric that's self reinforcing'. This is a very exciting development; rather than having to use another material to give it structural integrity like glass in fibreglass or exotic blends like nylon and carbon which are super tough and expensive, and which cost a fortune to manufacture and are incredibly damaging to the environment you have a monomaterial. The imaginatively named SRPET, Self-Reinforcing Polyethylene Terephthalate, (try say that one five times in a row!) has two types of fibre. It has a high tenacity strength fibre and it has a PET matrix which it uses to support itself. This mono material can continue to be used and reused. This material is so flexible in its application it has allowed us to create the frame that we wanted. It allowed us to stay true to our story and create a bottle boat, because the frame is 100% PET.

ST: Does that mean that the whole boat is of one material?

DdR: Yes, the whole boat is of one mono material – PET. Apart from some small fixings and fittings that we bought off the shelf and the mast and decking which had to be 98% post consumer Aluminium.

But there's another quite exciting part of the project. We were faced with the challenge of gluing or welding our mono material. Gluing meant using that obnoxious epoxy. It defeated the whole point, and everyone was saying 'You're taking this all too far - no one will know if you use this glue!' which made me cross because I would know and it spurred me on to engineer a new glue.

It's a bio-based glue that uses cashew nuts and sugar and it's about 75% comparable to the marine epoxy in the tests that we did. We know that marine epoxies are massively over-engineered, so we are confident and have used it on the main crossbeam joins on some of the actual fittings between the sub-panel and the main panel. And its biodegradable. After the voyage one of the guys is to actually recycling the entire vessel and turning it back into its raw materials.

So the material is really interesting, because even at a very basic level to work with it has eliminated risk. Generally boat building is hazardous. There is a lot of fibreglass dust and clean up. If you go into a workshop, anyone who knows about building boats or using fibreglass, everybody is always covered up. If you went into our workshop, there's no dust, there are no fibres flying around, no people wearing gloves, no people wearing masks. There are no hazardous materials at the end of the process. We literally drive all of our material, our off-cuts, down to a local recycling centre and put it straight into the same bin we put the plastic bottles in. And it's a thermoplastic instead of a thermoset, like epoxies are and polyester resins are, which means it can be formed infinitely. Which means that if someone does mess up our process, we can reform it rather than throw it away.

ST: Using local infrastructure to recycle your construction waste - that's a pretty amazing example of closed loop design.

DdR: The impact for this is potentially enormous and not just within the boating industry. It could be used in the building in the housing industry, it's strong, flexible and flame resistant. It could go into automated

panelling; it's half the weight of fibreglass, and it's three quarters of its strength. So all of a sudden you can pose new materials when it comes down to efficiency and weight versus propulsion and traction. You can start to make cars and trains lighter and stronger so they naturally use less fuel.

ST: It seems what is really important about the Plastiki Expedition is that you've building a bank of new materials and new products that have been trialled on the boat and which could potentially change production processes in a multitude of areas. It showcases the positive benefits that come out of thinking or designing something in a more lateral way with sustainability at its core and as part of the brief. You end up with not just a good solution, but propositions as added value – a brilliant example of the benefits of designing with systemic sustainable thinking.

DdR: It has been one of the most exciting parts of this project. We work by a very simple ethos that nobody is as smart as everybody and it has been a collaborative approach from the start. We've had a lot of people come through the project and contribute and I think a lot of ideas have been created in conversations, a lot of which never came to fruition actually in the boat, but sort of planted the seeds for the future. For example one of our designers came in when we were looking at the limited space we had for solar energy and he designed some inflatable solar cells that sat on the water, which could be dragged alongside. At that point we didn't have the time or the budget to go and develop them, but the concept is out there, and I have no doubt in the next year you'll have somebody saying 'let's create a solar farm at sea. A floating grid that's movable...'

ST: You mentioned before that this project has taken over four years to realise; from meeting Michael Pawlyn to the Rand D of materials and now you are over budget. Have you considered patenting your glue to help raise some funds?

DdR: Yes, that's a dilemma isn't it? I think the idea of actually patenting something that has potential for global positive impact for the purpose of profit is one of the biggest problems that we've had as a society, instead of our ability to share solutions. We aim to commercialise it first, and then we'll share it. There was an interesting moment in working quite closely with Nike, a very interesting company, a company which is still necessarily apologising for lots of things but like many corporations they are moving forward. They've created the Green Exchange that allows open source information for most of the materials that have been developed over the years through the process of designing shoes and clothing. You can go and look up materials and look at uses and impacts. They have effectively said 'If it's non-competitive to us and it's not going to go straight to leaders or our direct competition, then why should we sit on these papers? There's a huge amount of companies sitting on papers, locking away the knowledge we need to create shifts in material usage.

It's very cost prohibitive for anybody to go out and invent a new material. It's very hard, very expensive, and we were lucky that we found somebody who had been commissioned, it was a stroke of luck, I mean literally two guys who were commissioned to produce this material then the people who commissioned them never came back, they just disappeared and we were lucky to be able to have the chance to develop a use for it!

ST: So tell us about your voyage. When's your departure date?

DdR: It's not long now, we've got a great crew of people and some cool people coming on board to hope tell the story along with a strong support team on land helping to network and keeping everyone up to date.

The adventure is only really one part of the challenge. It's about an evolution of the story, together influencing and inspiring industries and to be able to actually adapt. We've got a system that's very rigid, and so even if you do create a material, you have to build a new understanding of the material so to actually get into the marketplace and fight against the headwind of the existing system is very hard.. The question is how do we scale up use of the materials? So we will try to use the adventure as live laboratory to showcase the material and further understand the RandD of the material. Then really working with the partners who want to be involved with the project, like Hewlett Packard. Hewlett Packard makes

50 million PCs a year. Now imagine if we could turn around and say to them, 'Why don't you make all the cases of your computers out of self-reinforcing plastic. It's half the weight of fibreglass, it's got the strength, it's unique resistance, it's a great insulator, all the rest of that, and it can all be made of plastic bottles!'

ST: Yes that's when these developments take on a whole new ball game. 50 million computers is quite an impact. Any general lessons and principles that you think we should offer for sustainable design

DdR: So using those relationships to start to try and push the needle inside corporations that we work with, to really act and think more sustainably, and I think people realise now that it's not black or white. It's not good or bad, there are shades of grey, and that's something that people are learning the whole time. That it isn't that simple.

ST: On a last note I wanted to ask you about your design competition. What do you think the design industry can do to address some of the problems you are revealing?

DdR: Yes, definitely, you know, a big part of it is obviously using power-, through the media awareness, and again not just to articulate the problem, so we've taken the word SMART. It came from the idea that the 'green thing' has become externalised for a lot of people. It's becomes something over there.

So we've taken SMART as an acronym and given it five categories. S is Science, M is Marketing, the A is for All your designers, then there's the Research of the R, and the Technology of the T. So if you have a smart way of beating waste that falls into one of those five categories, then come to the Plastiki website. We're launching a competition website which is going to be a collaborative partner site which allows people to post a solution to a problem, We will bring publicity and exposure that will accelerate those projects and help people, through winning, the best ideas, help them come to fruition giving them a platform for their projects.

ST: Well thank you for sharing all this insight into the Plastiki Expedition and we wish you luck with your voyage and thank you so much for talking to us here in the UK, David.

<http://www.theplastiki.com/>

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