

A CULTURE IN PAPER**It's pulp, but not as we know it**

When asked what makes a decent chair, most people would think of wood, leather, plastic, or maybe cast iron for the garden. The chances are that no one would name woodpulp as a possible contender. Nor would they associate Södra Cell, Europe's largest market pulp supplier, with furniture design. In a few years' time, however, it could be an altogether different picture.

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Södra Cell is of the fundamental belief that the world would be a better place with a little more paper. And to prove it, it has just launched PulpLabs, an innovative on-line workspace where new ideas and applications for woodpulp can be put to the test. The first of its challenges has just been completed and launched with resounding success at the Milan Furniture Fair: a fully recyclable, biodegradable yet durable children's chair made of woodpulp.

OPPORTUNITY KNOCKS. It all started when an engineering student looking for work knocked on the door of one of Sweden's best-known architect and design firms, Claesson Koivisto Rune. Joakim Nygren has an MSc in machine design, so when one of the partners threw an egg carton onto the table and challenged him to make a chair from it, Nygren's reply was "Sure, I can do that."

"In truth, I was thinking it was going to be a real challenge," Nygren recalls. "50 years ago, a lot of research was being conducted into cellulose applications, but when oil-based products became fashionable, we dropped all that. Now we need to return to cellulose once again in our quest for alternatives to fossil-fuel based products."

One of the biggest problems with paper, and an obvious reason why it has never been used to make furniture (until now), is its fragility. In 2004, the Swedish research firm formerly known as STFI Packforsk (now Innventia) had taken on the challenge of mixing woodpulp with 25% polylactic acid or PLA, a corn-based polymer. It found that when the mix was heated to 167°C, the plastic encapsulated the paper fibres. The result was a material with all the properties of ordinary paper but with a key difference: it could cope with large changes in weight and humidity. Just a couple of millimetres thickness had the strength of wood or hard plastic, even steel: its inventors just needed a chance to prove it.

That chance came when Nygren, who had contacts at Innventia from his student days, approached them with his chair challenge. They in turn contacted Mikael Lindström, head of research at Södra. After a good few months of overtime, one thing became clear to Lindström: the creep in the material, which determines how it is affected by temperature fluctuations and air humidity, proved non-existent.

Some 18 months and a lot of testing later, the first DuraPulp product was born and named Parupu, after the Japanese word for paper, (a culture famed for its innovative use of paper). DuraPulp's first application as a children's chair seemed particularly appropriate since the chair has a life expectancy with heavy use of 3-4 years, after which it is completely biodegradable - when the child outgrows it, simply throw it on the compost.

As well as being biodegradable, Parupu is stackable, inexpensive and lightweight (imagine how easy the vacuuming would be, say its inventors, if you could lift all the furniture with one hand, not to mention the savings on transportation and emission levels if loads were cut by 80%). Nygren's brief was not to include any kind of glue, tape, staples or anything that could compromise its complete recyclability. "I dare you to find a more eco-friendly chair. The pulp used is classified for food substances," he says. "I wouldn't eat it, but you can eat off it. It's completely safe."

"Before this project started, we admitted to ourselves that if we could make a chair from DuraPulp, we could do almost anything. The chair is done. Now it's time for almost anything, the only question is what next - car engines, disaster relief housing, playhouses or pallets?"

NEXT PLEASE! Nygren hopes that Parupu will be available commercially by next year (the team is currently talking to various interested parties on taking Parupu to market). In the meantime, there's no rest for the innovative. Nygren, now project manager for Södra's PulpLabs, is already working on his next challenges, FoamPulp and NanoPulp.

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Is it possible to make paper which is light as well as insulating against sound, heat and cold? Together with the research institute, SIK, the team at PulpLabs has started investigating what happens if it mixes wet cellulose with starch and then heats the mix to 100°C to create steam. When the steam expands, it creates foam. "Depending on the amount of water you use, the foam becomes soft and flexible or stiff like Styrofoam," explains Nygren. "The question is, what can it stand up to and how can we use it..."

Challenge number three is investigating the potential of nanofibres to find out how strong paper could really be. Nygren explains: "Normal paper consists of whole wood fibres, but by mixing pulp with enzymes, we can break down the wood fibres to their smallest component parts, nanofibers. If you mix nanofibers with water, they develop extremely strong bonds to one another. The mix can then be pressed together and dried to produce a completely unique material which Södra has called NanoPulp."

Nygren is looking to see if researchers' claims that nano pulp is as tough as steel wire can be proved. "We don't want to limit ourselves to an idea for a product at this stage and these are really very early days. We need to see what research we can come up with and then bring other people on board to see how far we can take the ideas that are born in the PulpLabs, so keep watching this space." o

To find out more about these projects and follow their progress, visit www.sodrapulplabs.com. If you have an idea and it involves using a little more paper in a new way, no matter how far-fetched, Södra Cell would like to hear from you.

Ulf Edman, President of Södra Cell International: "Research is traditionally quite closed, but at Södra Pulp Labs we invite participation and hope that as many people as possible will share their thoughts and ideas. In fact, we're convinced the most challenging and difficult projects are best tackled in the company of others. That's why we've always worked with our customers under a philosophy we call 'Growing Together'".

Joakim Nygren. Following the successful launch of the prototype of Parupu in Milan, Joakim Nygren is now Project Manager of Pulp Labs for Södra. "I have no idea where these projects are going to end up. At the moment we don't want to limit ourselves to any thinking inside the box."