The mix at the Techtextil and Avantex Innovation Prizes in Frankfurt is interesting. Award-winners range from university students to multi-national companies, with—for one night only—everyone sharing the same spotlight.

A fresh take on the lotus position

At the most recent edition, in June 2007, the big-name winners included BASF, for a nanotechnology development it has named Mincor. The idea is to produce textile surfaces that are self-cleaning because the Mincor nano-finish repels water, oil and dirt particles. The first application areas the company has focused on include outdoor equipment such as tents and awnings.

Dr. Ralf Noerenberg from BASF's Competence Centre for Technical Textiles describes the idea as "the lotus effect". There is a nano-structure—a dense concentration of fine needles or poles—protruding from the micro-structure of the textile surface, imitating the tiny horns or papillae that the lotus flower develops on its leaves.

Botanists have known for many years that the lotus had self-cleaning properties, but centuries before the invention of the microscope (in the early 1600s) Hindu and Buddhist tradition already venerated the lotus as a symbol of the divine. BASF is far from the first manufacturer to try to apply this particular lesson from nature to its textile production. "There have been many products in the past," Dr. Noerenberg explains. "I think we have succeeded by going to the extreme on having such a high frequency of needles. We decided to take a tougher path and get as close to the lotus as we could. The frequency and the height of the needles compared to the flat areas in between are the important things here."

He uses as an analogy the idea of walking across a river using stepping-stones. The water is there, underneath your feet the whole time, but you only ever touch the stones. In the same way, dirt, bacteria, fungi, oil and moisture stay high up



What science has learned from studying the lotus flower is that a structure raised by a few dozen nanometers repels dirt and water more effectively than a smooth surface. Other plants that show the same effect include the nasturtium, the reed or the alchemilla (also known as lady's mantle).



Self-cleaning is well-suited to outdoor textiles that we cannot wash. Tents and other difficult-to-clean outdoor fabrics could benefit from the new BASF technology.

BASF

on the surface of Mincor-treated textiles, making it easier for rain to carry them off.

He says the work of botanist, Professor Wilhelm Barthlott at the University of Bonn, who has been examining the structure of plants for decades and advising architects and designers on ways to incorporate the effects he has observed into their work, has been an inspiration.

In textiles, though, a further reason why companies have failed so far to perfect the idea is, Dr. Noerenberg suggests, that they have focused too firmly on apparel, which consumers these days want to be ever-easier to wash. BASF decided to move away from apparel and to concentrate on items that users do not, cannot or even must not wash, making the outdoor sector an ideal marketplace. The Mincor finish cannot withstand washing-machine conditions.

Apart from awnings, tarpaulins and covers are an application area Dr. Noerenberg is excited about. The nano-finishing would make it possible to keep the textiles dry and stop bacteria from settling on them. He can also see an important use for Mincor in the manufacture of backpacks, parachutes and high-end hiking shoes. For tents, the possibilities also seem good, although he does have some concern about the effect on the Mincor finishing of the intense friction tents often have to put up with.

"I suppose I'm just thinking back to the days when, as a student, I used to camp in the Alps or at the beach," he says. "At the start of each day, we would just tear down the tent and stuff it in a bag, so there was a lot of abrasion. I'm not sure the nano finishing could stand years and years of that kind of treatment, so there is still a challenge for us to achieve high quality in this application area."

To return to the Techtextil Innovation Prizes, the chairman of the judges, Dr. Jan Laperre—research and development manager of the Belgian textile industry's Centexbel research centre in Ghent—made an interesting point on announcing the BASF award. "Innovation is a key success factor today," he said, "so we want to reward new developments in technical textiles. We want to recognise the creativity of our scientists and engineers. This idea [Mincor] brings nanotechnology closer to the textile industry and we want to encourage BASF and other technology providers to continue innovating in this area."

According to Dr. Noerenberg, nano is just one of the areas in which BASF is working to develop new solutions for different markets. "It's just a means of achieving performance," he says. "If we can't achieve performance with micro, we will go to nano."

But the company is taking a cautious approach to moving forward with nano, conscious that the various bodies around the world that control dangerous substances are paying close attention to developments in this area. Dr. Noerenberg's conclusion is that any application in the textile arena requires an especially high level of care because consumers come into such intimate contact with products. "There is no question," he says. "You have to look extremely carefully at what you're exposing them to. There is a certain amount of hype behind nano and we will not support that. At the same time, however, we are not afraid of nano and we are looking for new ways of using it."

Tiny nubs on the textile surface keep water droplets and particles of dirt at bay.

BASF

