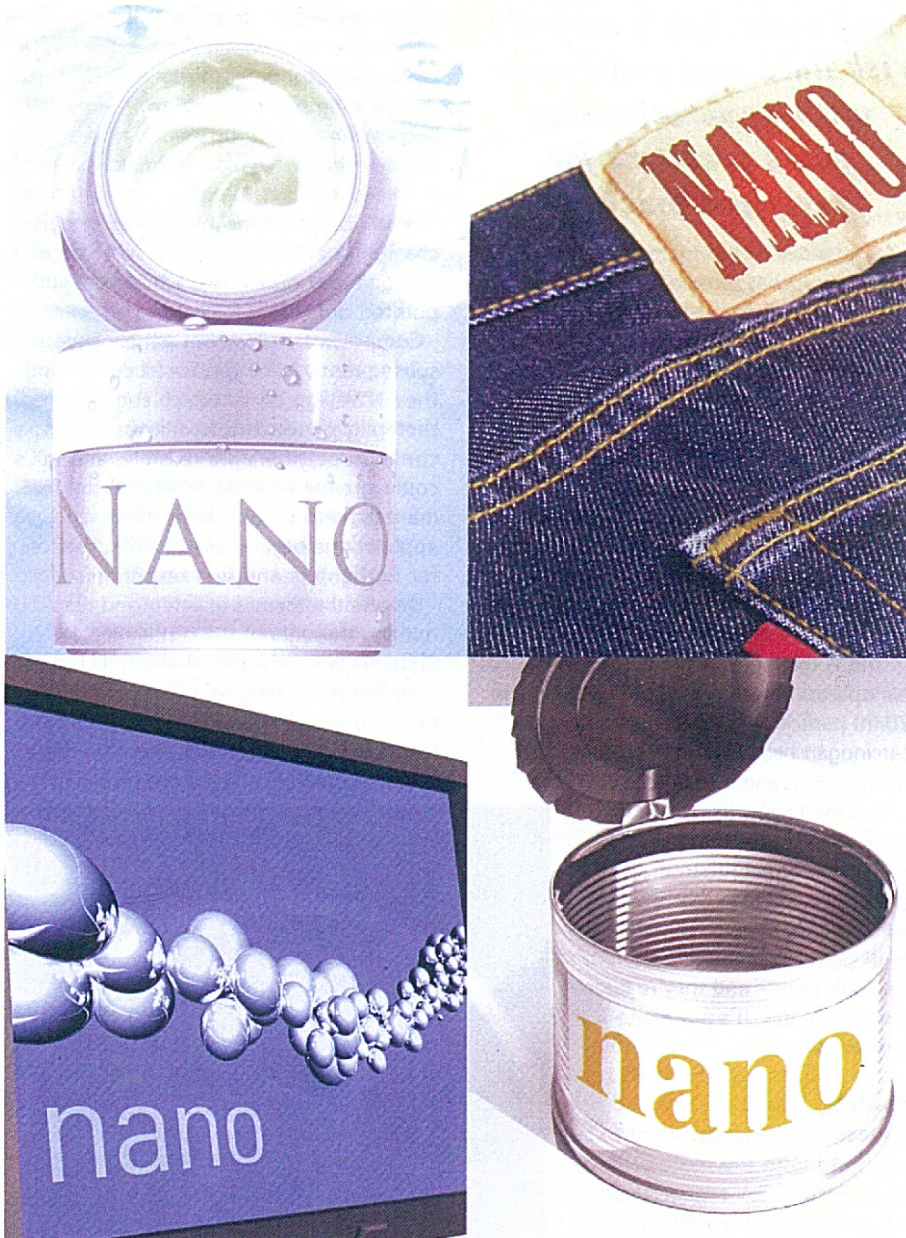


# Risk analysis

Perceived threats are now more vital than real ones in bringing new and untested products to market, reports Adrian Wilson



**T**here are three kinds of risks to be faced in introducing new nanotech products to the market – the real, the perceived and the regulatory. And in today's climate, some companies now consider a perceived threat to be a greater danger than a real one.

Speaking at the Intertech Nanotextiles conference (Prague, Dec. 10, 2007) Dr Christoph Meili, chief executive of the

Innovation Society, headquartered in St. Gallen, Switzerland, spoke of the safety, risk and regulatory issues which have become critical for nano-applying industries.

"From an insurance perspective, every new technology has benefits and risks," he said, "but a lack of risk data and experience with nanotechnology poses problems for premium pricing. These risks fall in several areas – dust and powders, product liability, occupational health,

cosmetics...and governmental bodies cannot urge insurance companies to cover unknown risks."

## Fuelling debate

Internationally-harmonised regulations for nanotechnology to provide security for industry and encourage innovation are still missing, Mr Meili added, citing three recent cases that have fuelled the nano-risk debate.

These were, firstly, a bath sealant chemical called 'Magic Nano', which was recalled from the market after being found to contain toxic substances. While it contained no nanoparticles at all, it still managed to achieve a negative association in the public's eye because of its name. In the second case, a very expensive skin cream containing fullerenes – retailing at over \$260 for a 30ml jar – led to a call for stricter regulations on cosmetics after fullerenes were found to be neurotoxic to fish.

The third case was probably most relevant to nanotextiles, involving Samsung's Nanosilver washing machine. This has been designed to provide an antibacterial effect via the release of silver ions into the water. The silver effect lasts for 3,000 wash processes – an average of ten years – and has led to calls by the US Environmental Protection Agency to label silver nanoparticles as potentially pesticides.

These cases resulted in very damaging press for nanotechnology in general, and led to further calls for regulations on nano at an international level.

Questions that need to be addressed by regulators, Mr Meili said, include:

- Can nanosized particles be treated the same as ordinary chemical substances?
- Which specific regulations are needed, especially in respect of product liability and workplace and consumer safety?
- Is 'nano-labelling' on products needed to avoid lawsuits?
- Are specific thresholds of nanoparticles required in terms of safety and health?
- How can regulations keep pace with technological developments?
- How can the industry's pro-active responsibility be strengthened?



LP Felipe Chibante of Nanotex Corporation: "Always a performance benefit to be balanced against any risks."

## Definition

The challenges to regulators, Mr Meili said, were in first defining nanomaterials, the need for standardised testing methodologies, and the evaluation of existing test requirements. Existing assessment tools do not take into account whether the dimension of a substance is relevant in terms of environmental impact and toxicity, he stressed.

Mr Meili identified the key consumer nanoproducts as TiO<sub>2</sub>, employed as UV-protection particles in suncreams and cosmetics, SiO<sub>2</sub>, as antiscratch additives in colours and lacquers, nanosilver particles in textiles and nanosilver coatings on wooden toys, the latter two both for their antibacterial properties.

He mentioned that 92 of the 580 commercial nanotech products listed in the Woodrow Wilson database were clothing, of which 49% contained silver, 15% carbon, 10% each for TiO<sub>2</sub>, zinc and silica and 5% gold.

## Risk management

The Innovation Society, as a spin-off from St. Gallen University, provides nanotech industry consulting in respect of research and monitoring, risk management and related services.

Following various attempts at establishing regulations on a national level in the UK, and also at European Union level, it has now become involved in the Cenarios programme with Tüv Süd, headquartered in Munich in Germany. Tüv Süd is the third biggest standards organisation in the world, with a turnover of over €1 billion, and has established the Cenarios (Certifiable Nanospecific Risk Management and Monitoring System) programme as an all-encompassing approach to minimising and controlling nano-specific risks.

It issued its first Cenarios certificate to Bühler of Switzerland in September 2007.

Recent questions put to the management board of a major European chemical company, Mr Meili revealed, put perceived threat as of higher risk to companies than

either regulatory or actual 'real' risks.

He mentioned GM food as a sobering lesson.

"With GM food, there was no suggestion that it was dangerous, but the fact was, the public just didn't want it," he said.

*"From an insurance perspective, every new technology has benefits and risks, but a lack of risk data and experience with nanotechnology poses problems for premium pricing"*

An attendee of the conference also pointed out that sunscreens had contained TiO<sub>2</sub> for the past twenty years, but are now perceived as a threat because they're labelled 'nano'.

## Benefits

Speaking later at the conference, however, LP Felipe Chibante CTO of Nanotex Corporation in Texas said that there was always a performance benefit to be balanced against any risks in new technologies, citing the example of the use of carbon black in tyres as a case in point.

"This is the largest volume-produced nanoparticle on the market," he said. "The 20nm particles are labelled as a Class II carcinogen because they are coated with hydrocarbon and it's toxic.

"But the fact is, its performance benefits in tyres – cheaper and higher performing than the alternatives – mean that the performance benefit far outweighs both perceived and real risks. We live with both – and they're huge – because of this. It's not a one-armed balance."

## NASA

Nanotex Corporation – not to be confused with the more well-known Nano-Tex organisation which is part of the Wilbur Ross textile empire – has been involved in a long-running programme for NASA involving the development of multi-functional conductive textiles based on nanocarbon.

It has worked closely with spacesuit manufacturers at the neighbouring Johnson Space Center in Houston with a view to increasing the heat removal capacity of textiles by increasing

thermal conductivity of textile fibres without significantly degrading their mechanical properties.

"Space suit designs that go back to the 1960s are still being used at the moment, and they have no mechanism for the release of heat," Mr Chibante said. "As a consequence, 100 metres of tubing is required to go through the EVA (Extra Vehicular) outfit as the cooling system."

It is this that all working on the NASA project are hoping to replace.

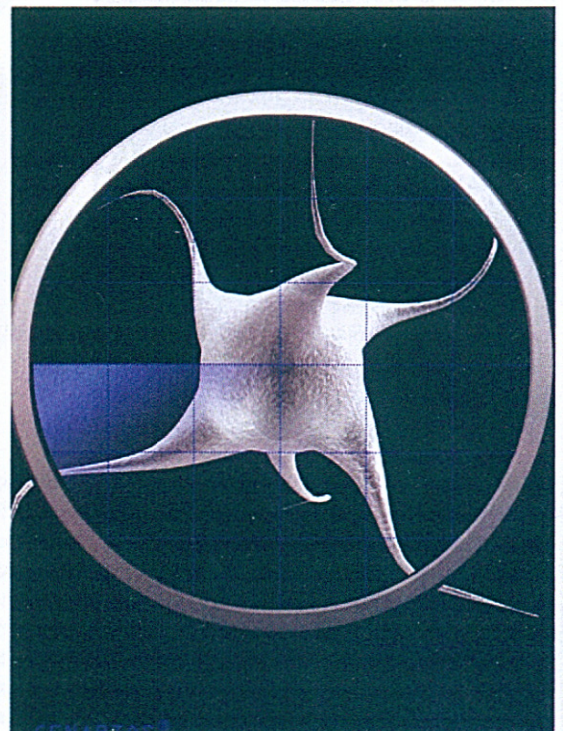
The work has involved the addition of carbon nanotubes to polyamide 6 fibres at the spinning stage and has, over time, been made possible by specialist fibre spinner Fiber Innovation Technology, based in Tennessee.

"With carbon nanotubes, everybody is chasing strength, but this is just one of carbon's attributes," Mr Chibante pointed out.

Composites and woven panels have subsequently been produced containing the CNT/nylon fibres which suggest that thermally conductive textiles based on common polymers are feasible, and could greatly enhance wearable thermal management design, with many applications beyond space suits, such as for firefighters and first responders.

Despite the themes of safety and risk running throughout the conference, Mr Chibante was very upbeat about its future.

"In five years' time we will see the prefix of 'nano' struck away from the technology," he predicted. "Because this is simply technology's latest progression."



The Cenarios programme aims to be an all-encompassing approach to minimising and controlling nano-specific risks.