

# AramidVision

NEWS FROM THE WORLD OF TEIJIN ARAMID



## Lift-off in record time

Knowledge-sharing gives new technology a flying start

### **Striking out on his own**

From complete beginner to record-breaker?

### **Sulfron keeps wheels turning**

New emissions-saving rubber ingredient goes into production

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I often like to use this introduction as a light-hearted chance to talk to you about the changes and progress that we've made in recent months. Today, however, I would like to use this space for something quite different – as a place to remember our friend and colleague, Dr. Rabin Datta, who sadly passed away in March at the age of 49. Not all of you will have been fortunate enough to work with Rabin, and to get to know one of the most charming and knowledgeable people I ever met in my life. But everyone at Teijin Aramid is aware of his work, and can guess at the creativity, expertise and energy that he poured into his constant search for improvements to our products Twaron and Sulfron for Tires.

Rabin joined us in April 2003, when we were still known as Teijin Twaron. An expert on rubber, he had to get accustomed to working with fibers: a completely different world. But for Rabin, it was just another exciting challenge. He quickly settled into his role as Teijin Aramid's Business Manager for Tires, and before long had come up with Sulfron, a ground-breaking aramid-based rubber compound that will revolutionize the transport industry (see page 6 for more details). Rabin has not lived to see the project reach its final stages, but we will do our utmost to make Sulfron a success in his name.

Rabin was an extraordinary man and an extraordinary scientist who brought life and energy to both his home and his work place. Enthusiastic and encouraging, he always found the time and the creativity to bring out the very best in people. Since news of his death was heard, expressions of sympathy and condolence have poured in from his many friends and colleagues around the world – a real testimony to how well-loved and respected he was by us all. He will be greatly missed.

Gert Frederiks  
President, Teijin Aramid



# Striking out on his own

From complete beginner to record-breaker?

**All of us have a secret ambition, whether it's to run a marathon, climb Everest, or learn how to pilot a plane. But while most of us never get around to fulfilling these dreams, Charlie Girard, an 'ordinary' engineer from Aix-les-Bains in France, has just set out to make his secret ambition a reality. Right now, he's attempting to break the world record for rowing solo across the Atlantic. Before he left, he explained what made a complete novice decide to attempt such a dangerous challenge.**

## At home on the sea

Charlie Girard grew up next to the sea, playing in the waves almost every day. So it's not surprising that the story of the first person to row solo across the Atlantic grabbed his imagination. "When I was a kid, I was fascinated by the fact that one person could test themselves to the limit like that," says Charlie. "Years later, I remembered the image of a man rowing alone from America to Europe, and I knew I wanted to do it myself." But Charlie's rowing experience didn't stretch much further than a few sessions on the machine in the gym. "That didn't matter to me – I wanted an adventure, one that would test me physically and mentally." And as if simply rowing across the Atlantic single-handedly wasn't tough enough, Charlie has challenged himself to do it faster than anyone else ever has.

## From novice to expert

In 2004, Charlie started training. At first, he trained on his own, but to prepare properly, he needed help. "In 2006, I started training with a coach, and together we raised my cardio fitness and muscle strength to the levels I would need to keep going for over eight weeks." Charlie also needed to get his gastrointestinal tract into shape. "It would be impossible to keep enough fresh food onboard, so I can only have freeze-dried food. And that's pretty tough on your guts." That's why Charlie has to follow a special diet with no cheese, milk, eggs, fresh fruit or vegetables in the weeks before he leaves. Although he didn't mention whether he was still allowed to eat fresh fish!

## Building the boat

Despite all his preparation, Charlie couldn't get going without a boat. As an engineer, Charlie decided to design his own craft – with a little help from other experts. "My teachers at the Ecole des Mines de Nancy and at the engineering institute GIP InSIC helped me calculate the dimensions of the craft. For the construction, we turned to several research centers, which gave us advice on materials. The boat itself was built at a composite materials training center for unemployed people called Air & Ocean." The result is a hull made from a sandwich of Twaron fibers and epoxy resin with a PVC foam core. This light, tough construction ensures that the boat will not sink, even when full of water, and that it will right itself if it capsizes. Inside, there is only space for the bare essentials. "A GPS beacon tells me where I am. Radar equipment warns larger vessels that I'm there. And my solar-powered laptop gives me crucial weather forecasts and progress updates. The single most important piece of kit, however, is my desalinator – I simply wouldn't last long without it."

## Second time lucky

So with his boat and equipment checked and double-checked, Charlie is ready to go. But this isn't the first time Charlie has been on the verge of making this journey. In July 2007, he was hit by a storm just one day after leaving shore. "Something crashed into the boat. It left the hull structurally undamaged, but it broke the rudder. I could have fixed it, but it would have taken too long for the record to still be beatable." Even though two years ago the aborted attempt seemed like a disaster, those two days at sea enabled Charlie to pinpoint several features that needed to be re-designed – including a stronger rudder! Those adjustments could make the difference between failure and a new world record. The result is a new, improved boat – which is already on the waves. Charlie is rowing between six and ten hours a day to cross the 5,300km between Cape Cod in the USA and La Tranche in France. The current record is 62 days and 19 hours, and with so much ambition driving him on, we're sure he'll beat it. You can check out exactly how Charlie's is doing at [www.atlantique2009.com](http://www.atlantique2009.com). We'll also be following his progress closely and will let you know whether he smashes the record in the next issue of Aramid Vision. ■



So with his boat and equipment checked and double-checked, Charlie is ready to go. But this isn't the first time.

## MEET THE CRAFT

Thanks to the combination of materials used to build it, and to the manufacturing process used to make it, the boat is:

- Twice as light as conventional craft
- Unsinkable, even when full of water
- Capable of righting itself after capsizing

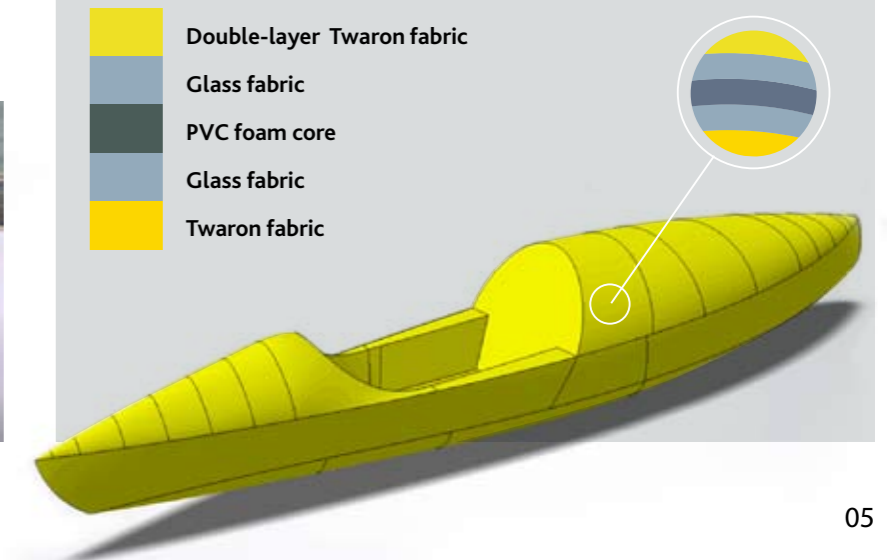
The hull of the boat consists of a composite sandwich of epoxy resin and Twaron fabric that has been molded around a core of PVC foam. The resin and aramid layers ensure the craft is tough, lightweight and watertight, while the PVC foam separates the layers for extra strength. It was constructed using Vacuum Infusion, which uses a vacuum pump to literally suck resin through the layers of reinforcing fibers that line the mould.

### Specifications:

- PVC foam core
  - Thickness: 15mm
  - Weight: 80kg/m<sup>3</sup>
- Epoxy resin
  - Low viscosity especially for infusion molding
- Twaron fabric
  - Weight: 170g/m<sup>2</sup>
  - Weave style: 4H satin
  - Dtex: 2200-1210
- Glass fabric
  - Weight: 280g/m<sup>2</sup>
  - Weave style: 2x2 twill

### High-tech sandwich (from outermost to innermost layer):

- Double-layer Twaron fabric
- Glass fabric
- PVC foam core
- Glass fabric
- Twaron fabric



# Sulfron keeps the wheels turning

New emissions-saving rubber ingredient goes into production

For once, governments, markets, environmentalists and consumers are all agreed on something – the need to lower fuel consumption. In the tire industry, this has intensified the search for tires that need less power to keep them rolling. The end of that search may well now be in sight – Teijin Aramid's wonder-working new rubber ingredient Sulfron has just gone into production.



## Global focus

The European Union has been investigating ways to cut carbon emissions since evidence for climate change became unavoidable. And now that the global credit crunch has turned into deep recession for the world's biggest economies, the pressure on most companies to cut costs – and to offer cost-cutting solutions – has reached fever pitch. Even consumers are looking to stretch their weekly budget that little bit further. But however much we want to save either the environment or money, we still need to drive cars and transport goods. So the search is on for ever more fuel-efficient vehicles. And because every single component affects a vehicle's fuel efficiency, tires are also coming under close scrutiny.

## The issue of rolling resistance

One of the biggest tire-related causes of increased fuel consumption is 'rolling resistance'. This occurs when heat deforms a tire's regular round shape. Because the deformed tire comes into more contact with the road surface, it generates extra friction, and as a result, the vehicle requires more power to keep moving at the same speed. Rubber compounders and tire manufacturers have been searching for a way to reduce rolling resistance for many years. But because the industry demands high safety standards, the challenge has been to develop a tire that not only has lower rolling resistance, but that grips the road just as firmly as existing tires, and doesn't heat up with prolonged use. Teijin Aramid has been investigating this issue at a molecular level, and the result has just entered production. In Emmen, close to the Dutch border with Germany, a brand-new production plant has just come on-stream. It produces Sulfron, a new aramid-based rubber ingredient that promises to provide tire and rubber manufacturers with a new weapon against rolling resistance, without limiting traction or causing heat to build up.

## MIRACLE CURE

It's not just tires that benefit from Sulfron. Adding just a little Sulfron to a rubber mix before curing can bring significant benefits to many applications. For example:

- **Tank tracks**
  - Benefits: Improved abrasion resistance and reduced heat build-up, which leads to a reduced risk of blow-out and longer working life.
- **Pump liners**
  - Benefits: Improved dynamic properties and resistance to compressive stress, which is especially important for progressive cavity pumps.
- **Anti-vibration dampers**
  - Benefits: Improved resistance to compressive stress, delayed fatigue failure and reduced heat build-up, which can lead to a longer working life.

## A little goes a long way

The search for this "magic trio" of properties drove Teijin Aramid's Sulfron project right from its initiation in 2006. Barely a year later, the research team had worked out a way to modify an aramid's chemical structure using sulfur, so that crucial chemical bonds within the rubber itself were strengthened. Once this principle had been established, the team continued to develop the new compound, working closely with customers to investigate its potential and fine-tune its properties. The final product may not look special, but the company points out that adding just 1kg of these tiny yellow granules to 170-180kg of rubber compound will reduce rolling resistance by 4-5%. What's more, tires made with Sulfron-enhanced rubber have each of the three properties demanded by manufacturers: as well as having lower rolling resistance, these tires meet the high traction requirements demanded by the safety lobby, and they run cooler.

## Climbing the agenda

Customers have responded enthusiastically to the new rubber ingredient, and the production capacity of the new plant is geared toward satisfying this promising early demand. Technology leaders have recognized that Sulfron can play an important role in lowering fuel bills, and rolling resistance is set to become an even hotter issue in the next few years. Most urgently, the EU has just proposed the introduction of mandatory caps on rolling resistance, which could come into force as early as 2012 for new tires. So it's not surprising that major tire manufacturers are currently investigating Sulfron's application. In fact, Sulfron is already being used in tires for trucks, passenger cars – and even in bicycle tires. One thing looks certain: the new Teijin Aramid plant at Emmen is set to be very busy, very soon. ■

"Tires made with Sulfron-enhanced rubber have each of the three properties demanded by manufacturers."



# In short

NEW DEVELOPMENTS IN THE WORLD OF ARAMID



## MAKING HIGH-SPEED COMMUNICATIONS GREENER

Earlier this year, Teijin Aramid successfully introduced the next generation of water-blocking yarns – essential for the optical-fiber cables industry as they ensure water cannot penetrate to the optical-fiber bundle. Compared with existing yarns, the new Twaron D3052 series brings clear advantages: for example, it's much easier to process, enabling cable developers and manufacturers to increase productivity significantly. And because it's produced using a more environmentally friendly process, it's greener, too. The sector has responded very positively. In fact, only a few months after the launch, several companies around the world have already approved the Twaron D3052-series and are using it as their water-blocking solution of choice. [www.teijinaramid.com](http://www.teijinaramid.com)



## Using fibers to the max

Innovative cable manufacturer FibreMax has set a new performance benchmark with its new winding technique, called "Endless Winding Technology". It's called 'endless' for a good reason: the entire cable, complete with integrated cable terminations, is produced in one go. During winding, all fibers are held in parallel and under constant tension, and the two terminations are incorporated automatically, saving time, money and weight. By doing this, fiber properties are directly translated to the end product, without creating disadvantages such as internal abrasion and construction stretch, such as

with conventionally-produced cables. When used with aramid fibers, such as Twaron and Technora, the result is up to 90% lighter than steel cables. The advantages of these high-performance cables will be clear for a wide range of static tension applications, such as mooring lines for offshore structures and pendant cables for cranes. [www.fibremax.nl](http://www.fibremax.nl)



## Aramid under your feet

Serious runners and walkers consider comfort, low weight and high wear resistance above all else when choosing a new shoe. Kevlex® – a rubber enhanced with both Twaron and Sulfron – is purpose-designed for making shoe soles that meet these demanding criteria. It's the invention of Procalçado, a molded-shoe and shoe-sole manufacturer based in Portugal, who have conducted intensive research into how best to combine the key properties of high-strength aramid and high-elasticity polymers. Because Sulfron has such a powerful effect, Procalçado needs only to add a small amount to its rubber compound in order to produce low-density rubber materials that are both lightweight and easy to wear.

[www.forever.pt](http://www.forever.pt)



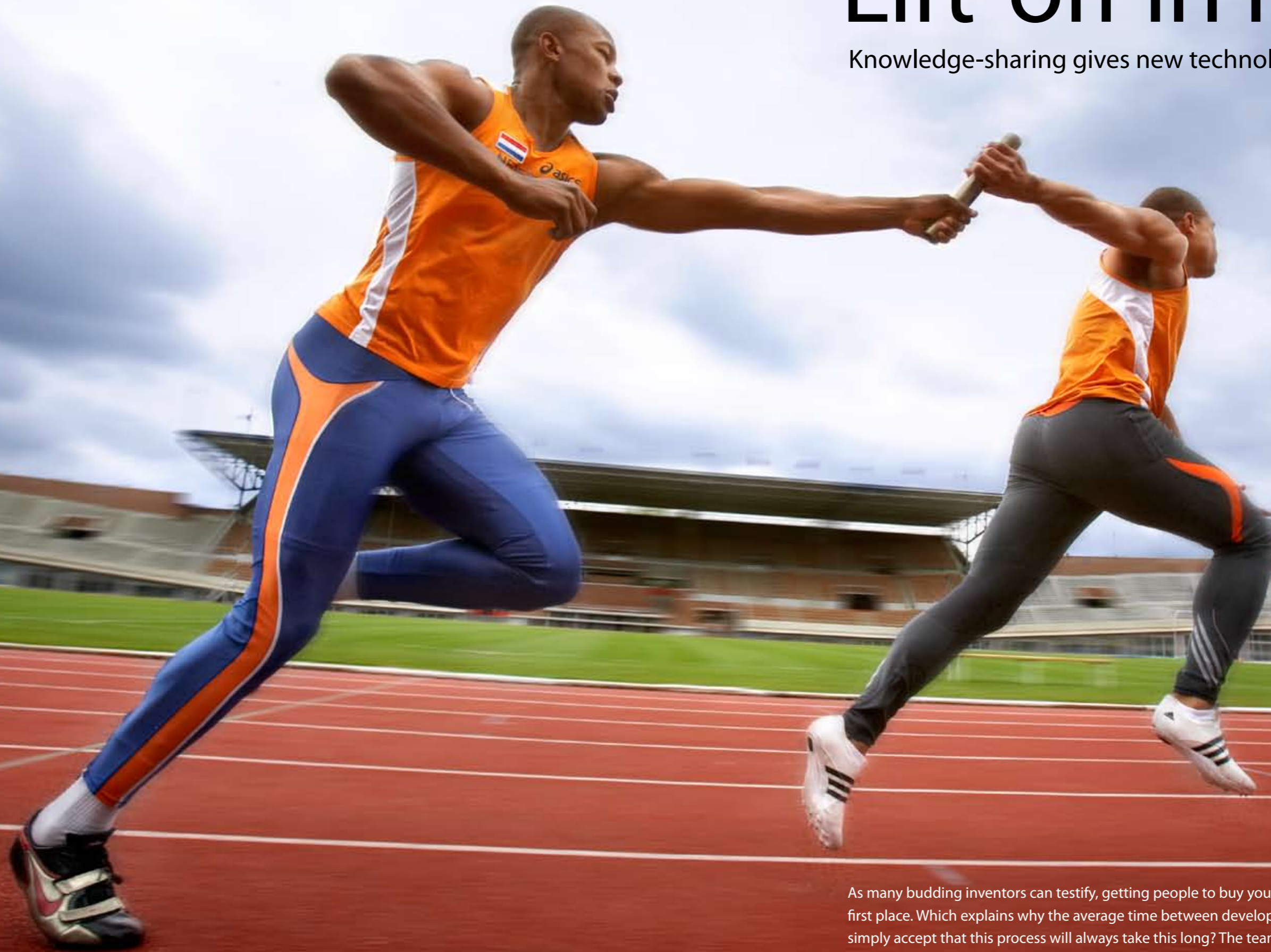
## CONNECTING OLD AND NEW

The integration of old-world infrastructure with new technology is rarely seamless, as Italian optical fiber cable developers and manufacturers Tratos Cavi know well. To solve the problem of connecting older homes to the optical-fiber network, the company has recently developed a new tiny-diameter optical-fiber cable (FTTH), called Picobreakout®. It has an outer diameter of just 0.75mm – including the outer sheath – which enables engineers to draw the cables through the existing, and already crowded, building ducts, as well as through passages used for previous TV cables. The key to the design is the Technora strength members, which have an extremely small dtex of just 220. These fibers enable Tratos Cavi to produce a cable that has an extremely narrow diameter, and yet still has a high tensile strength.

[www.tratos.it](http://www.tratos.it)

# Lift-off in record time

Knowledge-sharing gives new technology a flying start



As many budding inventors can testify, getting people to buy your innovation can be just as challenging as developing it in the first place. Which explains why the average time between developing and launching a new technology is 12 years. But should you simply accept that this process will always take this long? The team behind Teijin Aramid's Technical Paper group didn't think so, and went looking for a way to achieve a record time-to-market.

**It all started with a hunch**

The story begins back in 2001, when researchers discovered that what they had thought had been an unsuccessful experiment had actually produced a new, relatively stable polymer solution. They decided to act on a hunch – perhaps the substance could form the basis of a new technology for producing pulp for technical paper products. The company already produces conventional paper pulp, which its customers use to produce friction or sealing papers, materials that can insulate against heat and electricity, or products for specialized applications. This conventional pulp is produced by chopping traditionally produced aramid fibers into short lengths, then dispersing them in water and refining them. However, the new technology platform, called jet-spinning, doesn't use conventionally produced fibers at all. Instead, it creates the fibers by spraying the new solution through specially developed nozzle technology, as part of a modified polymerization process. As a result, the fibers behave differently once they are part of the paper – they cause a 'binding action' that increases the strength and resistance of the finished paper far beyond the levels provided by standard paper pulp.

**A question of time**

The Teijin Aramid team knew that the technical paper sector was eagerly searching for this binding function, so there was great potential for jet-spinning to make a big impact right from the start. But they still faced the problem of convincing people to invest in it. The biggest challenge, according to Chris Buiting, Business Manager of Friction, Sealing and Paper

at Teijin Aramid, was the innate conservatism of technical markets. "Companies are always wary about investing in untried innovations, but to make matters especially difficult, our company was relatively unknown in the technical paper sector – we couldn't even build on our reputation to generate trust." Chris's team members all recognized that if they followed the normal approach to product commercialization, it would certainly take over a decade to persuade people to trust their new technology. Surely there had to be a better way?

**Testing the waters**

For help, the company contacted global experts in evaluating new materials and technologies – the Herty Advanced Materials Development Center, based in Georgia, in the US. After assessing the new technology, the Herty Center put Chris in touch with Synergics Corporation, an American firm that specializes in helping companies to find, formulate and develop business from new or underexploited assets. Jack Dyer, Synergics' CEO, takes up the story: "In this sort of project, the first task is always to reach a thorough understanding of the product or technology, and to define the expectations for the project. We dedicated a whole week to discovering Teijin Aramid's technology platform, goals and aims, as well as pinpointing restrictions or concerns." The next step was to find out who in the marketplace might be interested – and to what extent. "We approached over 100 key opinion leaders from candidate customers for their commercial assessment of the jet-spinning platform. Interest was immediate and enthusiastic.



**"The team behind Teijin Aramid's Technical Paper group went looking for a way to achieve a record time-to-market."**

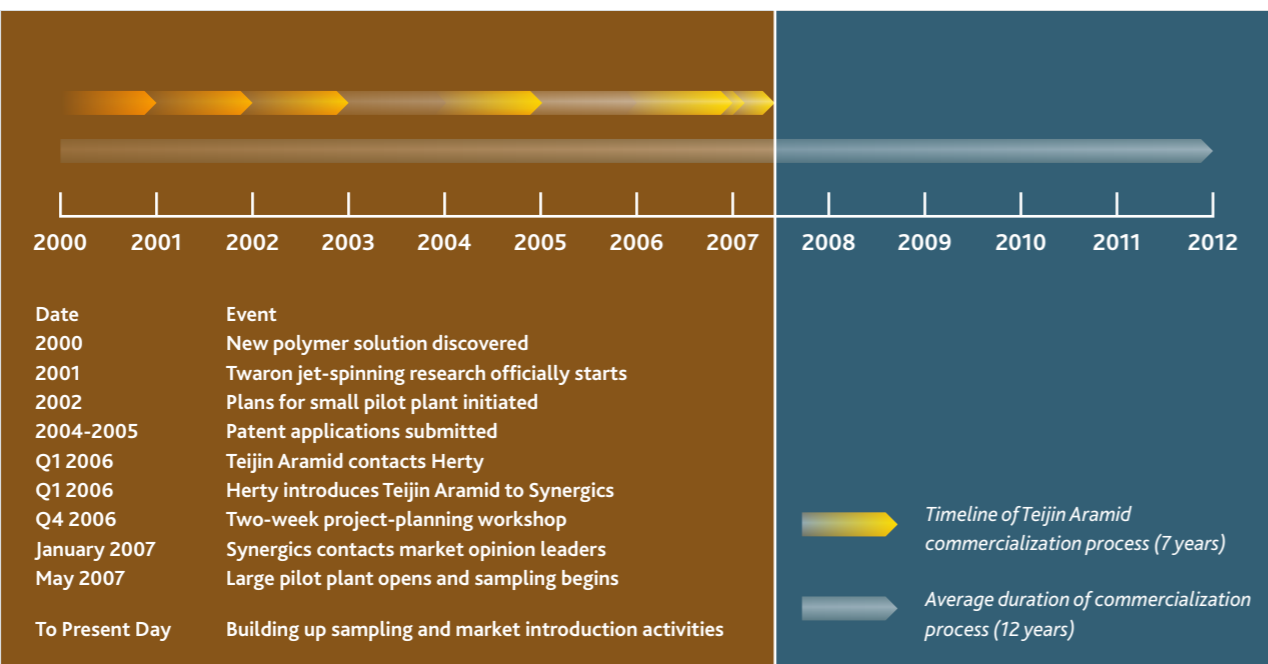
And because we initiated contact with top decision makers, things could move fast. Even before the half-way stage, we put Teijin Aramid in touch with over 50 potential customers." By the end of the eight-month project, and just six years after jet-spinning was first developed, Teijin Aramid had 30 companies involved in sampling and collaboration projects.

**An exemplary performance**

Now, two years later, the Technical Paper group at Teijin Aramid is busy building and consolidating demand for jet-spinning and jet-spun products. Chris points out that without Synergics on board, it would have taken at least another five years of knocking on doors to persuade the market to try them out. From Jack's point of view, the project was driven by the high level of motivation from the Teijin Aramid side. "The whole team believed in their technology and was open to collaboration – researchers, marketers, and

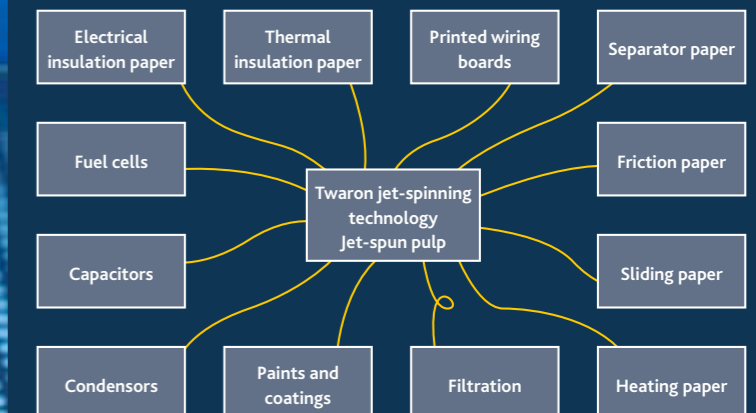
plant engineers." They both agree that the process was like attempting to win a relay race. "First you invest in state-of-the-art training equipment, then you build a solid team," says Chris. "Finally, you get out there and start running. You can't finish first without your team. And when you cross the finish line, the reward is well worth it!" Their achievement may not be in the record books, but they certainly set a new gold standard for realizing an efficient time-to-market. So what's Chris's key advice for achieving this kind of result? "Don't be afraid to ask for help, and when you get it, take full advantage of it."

**Racing to market**



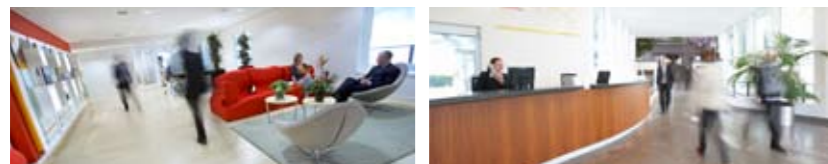
**Broad potential**

The new jet-spinning technology platform has the potential to bring significant benefits to a wide range of applications.



# Teijin Aramid newsflash

UPDATES FROM THE ARAMID SPECIALISTS



## HOUSE-WARMING PARTY

The Teijin Aramid management team realized that the company had outgrown its current premises. Not only were the research and head-office personnel working in separate locations, but there was simply no more space for growth. The most efficient answer was to find a completely new space. After a meticulous search for the right building, Teijin Aramid moved into its new home this April. We're still based in Arnhem in the Netherlands, but now we're closer to the middle of the city, in a landmark building. You can find our new contact details on the inside front cover of this magazine – or email us at [information@teijinaramid.com](mailto:information@teijinaramid.com) for more information about how to find us. We hope to welcome you here soon!

## THANKS FOR THE FEEDBACK

Thank you to everyone who completed our online questionnaire about Aramid Vision last November – we had a fantastic response, and it's great to find out exactly what you think of this magazine. The responses showed that the majority of our readers think Aramid Vision provides a clearly presented overview of the world of aramid today. Nevertheless, there were good suggestions for improving the information we provide, including requests for more technical information. In response, we are releasing a series of industry-specific newsletters, which will provide targeted technical details. Alongside the questionnaire, we ran a competition to win a PlayStation®. The lucky winner of the console was Bent Conradsen, from Roblon, who should be an expert gamer by now!



## A common thread

Do you notice anything special about the image on the back cover of this magazine? For example, that there is a yellow line running through the picture? This is our 'golden thread', a key part of our new visual identity. It's inspired by our characteristic yellow aramid fiber, but it stands for much more than that. It represents our commitment to sustainable endurance, in both our products and applications and in our long-lasting relationships with you, our customers. Wherever you see our golden thread, it represents the continuous and unbreakable line that connects people, ideas and products in order to create the best possible solutions.

# Teijin Group newsflash

BULLETINS FROM TEIJIN ARAMID'S PARENT COMPANY

## World's deepest dig

The deepest points of our oceans remain mysterious and unexplored places. That's why researchers at the Japanese Agency for Marine-Earth Science and Technology (JAMSTEC) have developed the 'Automatic Bottom Inspection and Sampling Mobile' (ABISMO) – a remotely operated vehicle that can explore these distant, harsh environments. After reaching the sea floor, ABISMO launches a remote vehicle that drills for soil samples. The vehicle is linked to the launcher via a 160m-long secondary cable, which is reinforced with high-strength, chemically resistant Technora. ABISMO holds the current record for the deepest dive by an unmanned vehicle – 10,258 meters – which it set in the Challenger Deep of the Mariana Trench in June 2008.



Eiso W.A. Alberda van Ekenstein, General Manager of Aramid Fibers Business Group and President of Teijin Techno Products Limited

## Ready to grow

Although market news is generally cautious worldwide right now, both the aramid and carbon-fiber sectors are forecast to see high growth in the long term. In preparation for this, Teijin Group has strategically reorganized its High Performance Fibers Business Group into two separate and dedicated business groups. Both the new Aramid Fibers Business Group and the new Carbon Fibers Business Group will be directly supervised by Teijin Group's CEO, enabling business and investment decisions to be made quickly and efficiently. Eiso Alberda van Ekenstein has been appointed the first General Manager of the new Aramid Fiber Business Group, and Gert Frederiks is taking his place as the new President of Teijin Aramid.

## Building a recycling community

It's now certain that the world will, one day, have to learn to live sustainably without fossil fuels, and Teijin Group is helping the world to prepare. Since 2002, the Group has been encouraging companies to join its recycling community, and use its environmentally friendly closed-loop polyester recycling system – called ECO CIRCLE. This system can recycle used clothes, turning them back into usable polyester that performs just as well as polyester derived directly from petroleum. Teijin works alongside registered clothes and sportswear manufacturers to develop recyclable products and collect used items. To date, over 100 companies worldwide have taken part in the ECO CIRCLE project, including major manufacturers such as Patagonia Inc. and Swamy in the US and Quiksilver in France.



## IMPROVING QUALITY OF LIFE IN EUROPE

Teijin Group's medical pharmaceutical arm, Teijin Pharma, works to enhance patients' quality of life. In February, it launched its home respiratory-therapy business in Europe, by teaming up with Esteve, a major Spanish pharmaceutical firm. Teijin Pharma Ltd. is already doing business in South Korea and the US, and currently provides approximately 60% of all home oxygen therapy delivered in Japan. For the future, Teijin Pharma Ltd. plans to expand its global presence by establishing fully operational bases in Europe and North America, and growing its business in Asia.



Osamu Nishikawa, President of Teijin Pharma Ltd. and Antoni Esteve, President of Laboratorios del Dr. Esteve, shaking hands at the signing ceremony

**TEIJIN**

Human Chemistry, Human Solutions

**Let's make  
protection  
comfortable**



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