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Tetex.

EUROPEAN TECHNICAL TEXTILES MAGAZINE

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BEAM CAPSULE
How textiles can be used in space?

MEET TESTLAB
The best project of a Moon base

TEXTILE BADGE
To control hydration

ANTI-BURGLARY TARPAULINS
Market report

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Editorial

Dear Readers,

Once again we meet at the most important event of the textile industry in Europe. Techtextil is always an opportunity to sum up the actions undertaken over the past two years, to plan new ones as well as to make prominent contacts.

This year's edition of the Fair is entitled "Living in Space". For this reason, we have started collaboration with the tycoons of spatial conquest – NASA and Boeing, to be able to offer you first-hand information.

In this issue of Tetex Magazine we present the latest materials, technology and production processes. We hope that each and every one of you will be able to find something to their taste in our magazine and that it will make your stay in Frankfurt all the more enjoyable.

I wish you all a very productive, stimulating, and enjoyable time at Techtextil 2017!

Dorota Sakowska-Hunt

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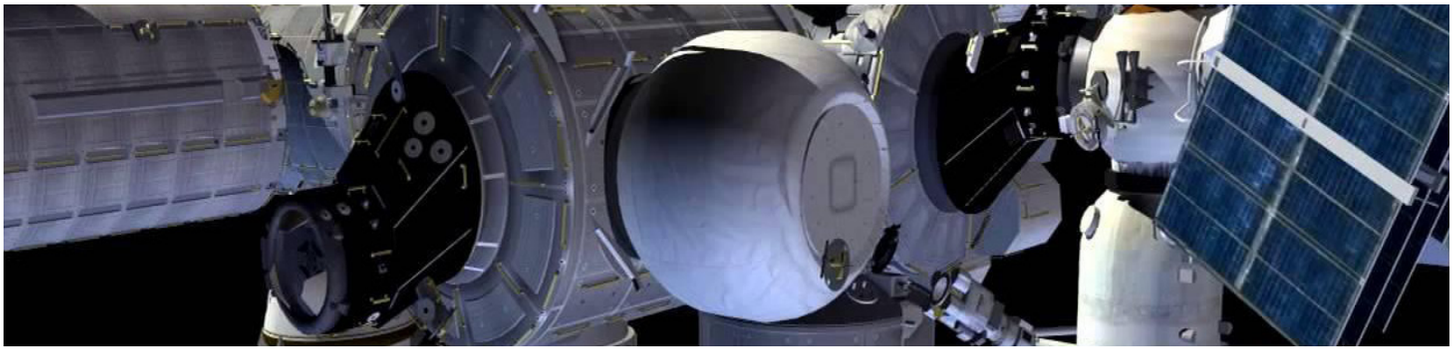
BEAM (Bigelow Expandable Activity Module) Demonstrating Technologies For Deep Space Habitation

NASA is investigating concepts for habitats that can keep astronauts healthy and productive during missions that take them farther from Earth than humans have ever gone before. Through public-private partnerships with U.S. industry, NASA is evaluating different habitation concepts that can sustain astronauts who are living and working in the harsh environment of deep space.

Expandable habitats are one such concept under consideration. To demonstrate expandable habitation capabilities, NASA attached the Bigelow Expandable Activity Module (BEAM) to the International Space Station for a minimum two-year technology demonstration. The space station is the world's leading laboratory for conducting cutting-edge technology research, development and testing in space to enable human and robotic exploration of destinations beyond low-Earth orbit, including asteroids and Mars.

How does BEAM work?

In late May, with careful instructions from the ground, NASA astronaut Jeff Williams conducted the manual expansion of the module through a series of seconds-long valve openings that allowed space station air to enter and expand BEAM. After BEAM was fully expanded with low pressure, air tanks inside the BEAM were opened with an automated controller to fully pressurize BEAM to match station pressure. From its packed to expanded configurations,



the module nearly doubled in length and increased by 40 percent in diameter. This capability to increase a spacecraft's useable internal volume after launch offers a potentially significant advantage for mission planners who seek to reduce cargo volume, maximize payload space and efficiently package structures inside a launch vehicle fairing.

The NASA sensor suites inside BEAM help analyze module performance as it orbits Earth attached to a port on the space station's Tranquility Node. Bulkhead accelerometers measured structural dynamics during deployment, wireless thermal sensors help assess the insulation performance of the fabric shell layers and metallic bulkheads, active and passive dosimeters measure radiation penetration, and Distributed Impact Detection System (DIDS) sensors detect and locate any space debris impacts on the BEAM exterior.

Expandable habitats require less payload volume on a rocket than traditional rigid structures, and expand after being deployed in space to potentially provide a comfortable area for astronauts to live and work inside. They also provide a varying degree of protection from solar and cosmic radiation, space debris, atomic oxygen, ultraviolet radiation and other elements in space that could be harmful to humans.

Launching on the eighth SpaceX Commercial Resupply Services mission, BEAM has been removed from the SpaceX Dragon capsule and attached to the Tranquility Node using the station's robotic Canadarm2. After it has been installed, the BEAM was expanded for a planned two-year test period during which astronauts aboard the space station conduct a series of tests to validate overall performance and capability of expandable habitats.

Space station crew members enter the BEAM three to four times a year for a few hours at a time. They take measurements and monitor its performance to help inform designs for future habitat systems. Learning how an expandable habitat performs in an orbital environment and how it reacts to temperature changes, radiation, micrometeoroids, and other forms of orbital debris will provide information to address key concerns about living and working in an expandable module in the harsh environment of space.

Perspectives

Following the approximate two-year test and validation period, astronauts will robotically jettison the BEAM from the space station. It will leave orbit to burn up during its descent through Earth's atmospher as many cargo spacecraft do. Expandable modules, which require less volume on a rocket and could weigh less than traditional rigid structures, might increase the efficiency of cargo shipments, possibly reducing the number of launches needed and overall mission costs. This technology be also used in the future journey to Mars.

BEAM FACTS AND FIGURES:

- In its packed launch configuration, the module will measure 7.09 feet long and just under 7.75 feet in diameter.
- In its deployed, expanded configuration, the BEAM will measure 13.16 feet long and 10.5 feet in diameter, providing 565 cubic feet of habitable volume.
- The BEAM's mass is approximately 3,000 pounds (1,360 kg).
- The BEAM is composed of: two metal bulkheads, an aluminum structure, and multiple layers of soft fabric with spacing between layers, protecting an internal restraint layer and bladder system. It has no windows.
- The BEAM traveled to the space station in the unpressurized aft trunk of the Dragon capsule during the eighth SpaceX Commercial Resupply Mission.
- Robotics ground controllers will use the robotic Canadarm2 robotic arm to extract the BEAM from the Dragon capsule and attach it to the aft section of the Tranquility Node on the space station.
- The BEAM's planned mission duration is two years.
- The BEAM is outfitted with various sensors and radiation monitors.
- It took two attempts to success in expanding of the BEAM, finally it was fully expanded on May 28, 2016.

Once it was confirmed that the module was maintaining pressure with no leaks during the week following deployment, Williams commenced the beginning of BEAM's two-year demonstration when he entered the module for the first time on June 6, 2016.

Article and photos courtesy of NASA

New Spacesuit
Unveiled for Starliner Astronauts

Astronauts heading into orbit aboard Boeing's Starliner spacecraft will wear lighter and more comfortable spacesuits than earlier suits astronauts wore. The suit capitalizes on historical designs, meets NASA requirements for safety and functionality, and introduces cutting-edge innovations. Boeing unveiled its spacesuit design January as the company continues to move toward flight tests of its Starliner spacecraft and launch systems that will fly astronauts to the International Space Station.

A few of the advances in the design:

- Lighter and more flexible through use of advanced materials and new joint patterns
- Helmet and visor incorporated into the suit instead of detachable
- Touchscreen-sensitive gloves
- Vents that allow astronauts to be cooler, but can still pressurize the suit immediately

The full suit, which includes an integrated shoe, weighs about 20 pounds with all its accessories – about 10 pounds lighter than the launch-and-entry suits worn by space shuttle astronauts.

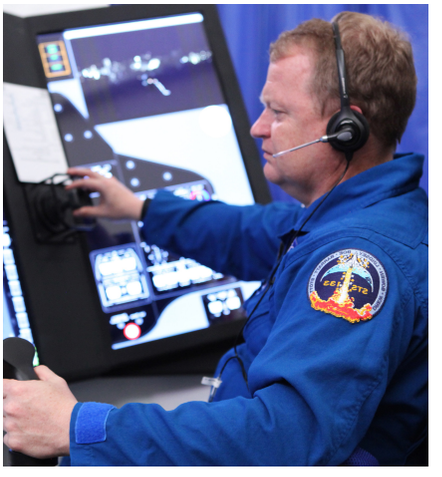
The new Starliner suit's material lets water vapor pass out of the suit, away from the astronaut, but keeps air inside. That makes the suit cooler without sacrificing safety. Materials in the elbows and knees give astronauts more movement, too, while strategically located zippers allow them to adapt the suit's shape when standing or seated.

"The most important part is that the suit will keep you alive," astronaut Eric Boe said. "It is a lot lighter, more form-fitting and it's simpler, which is always a good thing. Complicated systems have more ways they can break, so simple is better on something like this."

Of course, the suit has to be as functional as it is safe, Boe said. If an astronaut gets strapped in but can't reach the switches or work the touchscreen, the spacesuit would not be effective. That's why astronauts have spent some of their time sitting inside a Starliner mock-up wearing the spacesuit. They climb in and out repeatedly and try out different reaches and positions so they can establish the best ways for astronauts to work inside the spacecraft's confines. "The spacesuit acts as the emergency backup to the spacecraft's redundant life support systems," said Richard Watson, subsystem manager for spacesuits for NASA's Commercial Crew Program. "If everything goes perfectly on a mission, then you don't need a spacesuit. It's like having a fire extinguisher close by in the cockpit. You need it to be effective if it is needed."

Boe and astronauts Bob Behnken, Doug Hurley and Suni Williams are training for flight tests using spacecraft under development for NASA's Commercial Crew Program, including Boeing's Starliner and SpaceX's Crew Dragon systems. Flight tests with astronauts aboard are slated to begin in 2018.

The spacesuits astronauts wear for walking in space are already aboard the



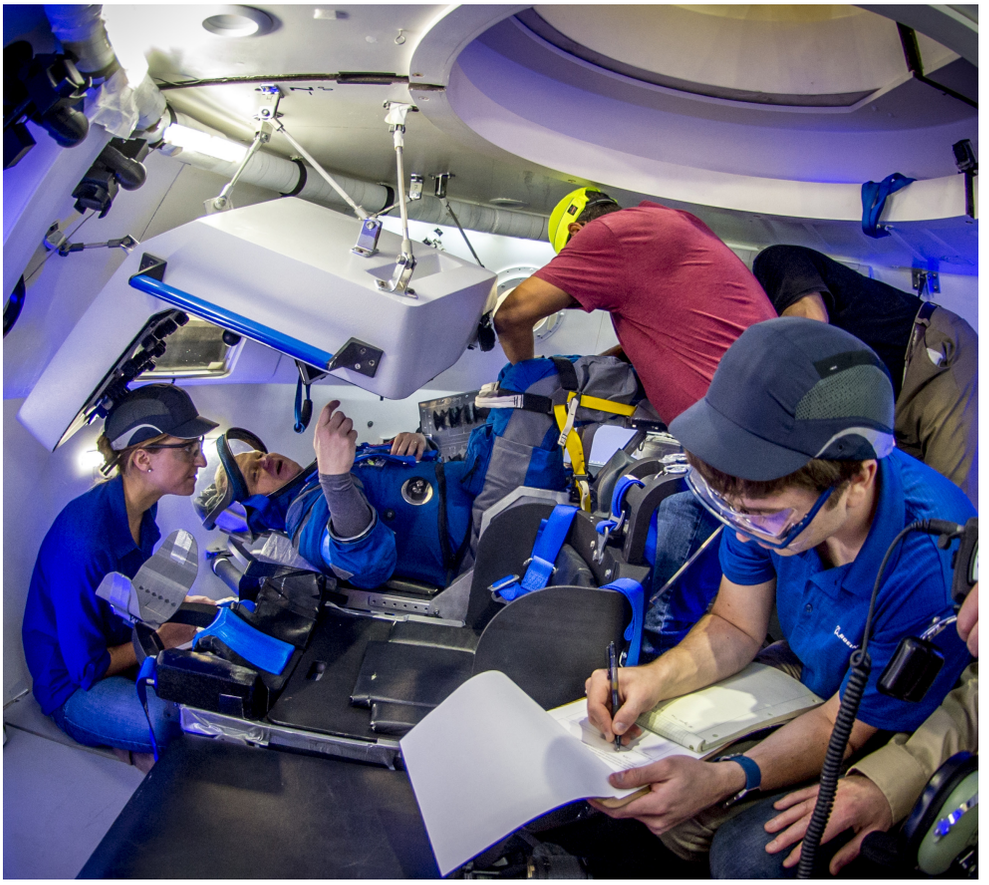
station. Heavier and bulkier than launch-and-entry suits, spacewalking ensembles – called EMUs for extravehicular mobility units – have to function as a spacecraft unto themselves.

Standing inside the company's Commercial Crew and Cargo Processing Facility at NASA's Kennedy Space Center in Florida, former astronaut Chris Ferguson, who is now director of Crew and Mission Systems for Boeing, modeled the new suit in front of a mock-up of the Starliner spacecraft. On launch day, astronauts will don the suit in the historic Crew Quarters before striding across the Crew Access Arm at Space Launch Complex 41 and boarding a Starliner as it stands atop a United Launch Alliance Atlas V rocket.

"We slogged through some of the real engineering challenges and now we are getting to the point where those challenges are largely behind us and it's time to get on to the rubber meeting the road," Ferguson said.

Carrying up to four astronauts at a time for NASA, operational Commercial Crew missions are to take astronauts to the space station on a regular basis permitting the crew on the orbiting laboratory to grow to seven residents. That will mean more science and research time for NASA to seek vital answers for the challenges of future deep-space missions. From this point, Boeing will continue fit checks and other testing alongside the astronauts as all the teams train for the missions and push toward flight tests. "To me, it's a very tangible sign that we are really moving forward and we are a lot closer than we've been," Ferguson said. "The next time we pull all this together, it might be when astronauts are climbing into the actual spacecraft."

By Steven Siceloff,
NASA's Kennedy Space Center, Florida



Article and photos courtesy of

BOEING NASA

Innovative Fabrics

ContiTech Uses Innovative Fabrics to Ensure High Level of Safety at Extremes of Heat and Cold

- "Next Generation" protective clothing material certified to fire protection standard NFPA
- Elastomer-coated heat protective materials with Conti Barrier System for extreme temperatures
- Materials for divers' drysuits satisfy the most stringent safety and comfort requirements
- Concertina wall materials feature high level of fire protection and long service life
- Innovative surface materials for industrial and automotive applications

Hanover, April 2017. Materials from international technology company and industrial partner ContiTech ensure safety and security in a wide range of operating environments. For example, a chemical protection suit – manufactured using ContiTech's innovative "Next Generation" fabric – is now certified to American fire safety standard NFPA. The flame-retardant material guarantees a high degree of safety in working environments where gases are generated and there is a fire hazard. It is therefore a reliable aid for firefighters, in industry and in shipbuilding.

Protective suits for which ContiTech supplies innovative materials are also available for work in extreme temperatures. They are absolutely ideal for preventing direct contact with

a heat source. They provide brief protection even at 850°C. These protective suits are also designed for use at extremely low temperatures, offering protection even at -196°C briefly. All ContiTech fabrics are based on the Conti Barrier System, which uses high-performance elastomer coatings. Depending on the finish, this offers secure protection against chemicals, flames, heat or cold.

ContiTech is exhibiting these protective suits and other highlights at TechTextil (Hall 3.0, Booth D32) in Frankfurt am Main, Germany from May 9 to 12, 2017.

Very watertight in and under water

Extremely thin but, at the same time, as stable as a protective shield: ContiTech supplies materials for drysuits that offer optimal protection and a high degree of safety in and under water. This tough material – 0.5 mm thin and weighing about 450 g/m^2 – remains watertight even when pushed to extremes. Comfort is also guaranteed, as the coated fabric is very flexible and has a pleasing feel. The innovative Condensation Control Technology (CCT) ensures optimal regulation of the body climate. This makes the material suitable as the basis for professional and leisure divewear.

Tough concertina wall materials for rail vehicles

Concertina wall materials for road and rail applications face stringent demands. As a flexible connecting system in articulated buses and between individual railway carriages, they are constantly in motion. In addition, they have to withstand stone chipping, UV radiation, rain and snow. All in a day's work for ContiTech. The concertina wall materials satisfy demanding requirements – and that includes fire protection specifications. They have also been tested to European standard EN 45545-2 for use in rail vehicles. The materials are available in thicknesses from 0.8 to 3.0 mm, in different material finishes such as CSM or silicone rubber, and in several colors.

In addition to its classic finishes, ContiTech is also presenting a translucent variant that is already successfully in operation in buses. The composite material used, Conti Vitroflex, consists of synthetic rubber and fiberglass fabric. Not only is it light-permeable, it also amplifies the brightness thanks to its special refraction properties.

Innovative surfaces for a large number of applications

At its booth, surface specialist ContiTech is exhibiting its product and service portfolio for a wide range of industrial and automotive applications. In its Dynactiv Surfaces product family, the company is presenting dynamically active materials for surfaces especially in industrial environments.

Furthermore, at booth G46 in Hall 3, Hornschuch – the surface specialist acquired in March – is presenting materials for interiors in residential and contract areas and vehicles under the slogan "Surfaces that touch". "The Pioneer", its concept car, will demonstrate how surfaces can transform the character of automotive spaces. They will therefore provide a realistic look ahead to the impact that the new understanding of mobility will have on the design of the interior.

Meet the man behind the mask

When he's developing a new respirator, 3M scientist John Bryant takes his work home with him, wearing the prototype to go running and cycling and even to knock down walls!

Explained John: "I find that wearing the test respirator in real life conditions, such as a hot and sweaty gym or doing a spot of DIY, is the best way to get inspiration for new designs that are comfortable for the user to wear and give the best protection against hazardous particles.

"Developing any new product needs a mixture of scientific insight, learning from techniques used in other industries, common sense and trial and error. It also needs curiosity on the part of the scientist and working for a company like 3M that understands that inventions come partly through experimenting. One of the great things about working for 3M is that as technical employees we can spend 15 per cent of our time exploring and 'playing' with techniques and ideas that interest us and this leads to some of our best inventions."

John has a degree in electrical engineering and a post graduate diploma in environmental engineering and his first job was with the British government. He said: "I soon decided that working for 3M would give me more opportunities, so I joined the engineering team in Bracknell in the 1980s, looking after facilities, buildings and processes."

After 18 months John relocated to 3M's Gorseinon plant in Wales where he worked as a process engineer on the nappy tape production line followed by a move to 3M's respirator plant in Newton Aycliffe, County Durham.

Said John: "I joined the development team in Aycliffe to apply the science of air flow and heat transmission to developing the next generation of respirators. I also studied management and gained a Master's Degree in manufacturing and marketing so I could better understand the full product development process. As well as designing new products for the European market, such as a respirator for cyclists to protect against pollution, I worked on a number of joint developments with our US team. These included developing the 3M™ Cool Flow™ Valve for our respirators to help regulate temperature flow inside the respirator. The aesthetic design was partially inspired by the design of

the front grill of a 1959 Chevrolet Corvette Stingray. John also led the development team (including Chris Henderson and Des Curran) behind 3M's first three-panel flat-fold disposable respirator setting new standards for comfort and convenience.

He said: "We know that the main barrier to workers wearing respirators for protection against contaminants is comfort and so we constantly re-invent our own technologies to improve on comfort and fit to help create safe working environments with no loss in productivity. "Disposable cup shaped respirators were originally launched by 3M around 50 years ago, followed by a two-panel respirator. We launched the first threepanel design in 1997 based on detailed research to understand how to convert a 2D shape when carried into a 3D shape when worn. This involved us investigating a number of related techniques, including origami! "To find the best solution for wearing a product against the skin, we also looked at how inventors had addressed similar problems in the past. We researched patents going back 200 years for everything from respirators, nappies and boxing gloves to see how they were designed and made.

"As well as testing a new design in the lab, we ask customers to try them out in the field and give us their feedback. Then we optimise and test again until we have a final product that gives the most natural feel.", added John. "I love applying knowledge, science and experience to creating a product that people actually want to wear and contributes to a better, healthier world. Knowing that our products protect people working across a range of industries gives me great pride and satisfaction."

Biography

John has a degree in electrical engineering, a postgraduate diploma in environmental engineering and a Master's Degree in manufacturing and marketing.

His first job was with the British Government before he joined 3M's Bracknell based engineering team in the 1980s.

After 18 months John relocated to 3M's Gorseinon plant in Wales where he worked as a process engineer on the nappy tape production line.

Moved to 3M's Respirator plant in Newton Aycliffe, Durham applying the science of air flow and heat transmission to respirators.

FIRST ROCKET FROM THE EDGE OF SPACE

This milestone opens the door for safer and more efficient Space access for small satellites.

Zero 2 Infinity, a company specialized in Space transportation systems, successfully launched its first rocket from the Edge of Space on March 1st.

Part of the Zero 2 Infinity team sailed a few miles off the Spanish coast to launch the balloon carrying the rocket. After soaring to 25 km (more than twice the cruising altitude of commercial airplanes), the other part of the launch team gave the order of the controlled ignition of the first Bloostar prototype from the facilities of the National Institute of Aerospace Technology (INTA) in El Arenosillo (Huelva, Spain).

The goals of the mission were:

- validation of the telemetry systems in Space conditions,
- controlled ignition,
- stabilization of the rocket,
- monitoring of the launch sequence,
- parachute deployment, and finally,
- sea recovery.

All these goals were achieved in full.

This mission is part of the development of Bloostar, the first small satellite launcher to use a stratospheric balloon as a first stage. By initiating the rocket ignition from above airspace, the targeted orbit can be reached with expediency and efficiency.

This patented technique is less risky than any systems used until now. The rocket-powered phase starts already from above 95% of the mass of the atmosphere, getting there with no polluting emissions. Besides the environmental angle, this new method lets Zero 2 Infinity launch satellites with more flexibility (2 weeks notice), at a drastically lower cost and more often than ever before.

From the day it was presented, Bloostar has attracted the attention of the leading satellite companies around the world. Zero 2 Infinity already has gathered upwards of 250 million euros in Letters of Intent for future launches. The Space sector has become more open to private initiatives and is nowadays living a revolution. From global communication services to meteorological predictions, interconnection of machines through the Internet of Things and even the possibility of having a daily picture of the entire Planet. These advances have paved the way for the creation of hundreds of companies that need efficient and safe

transportation services like the ones Zero 2 Infinity is offering and developing. Zero 2 Infinity, a private company headquartered in Barcelona, Spain, with subsidiaries around the world, is radically simplifying access to Space. It is the only company in Europe specialized in the elevation to the Edge of Space of components that require testing and certifying in Space conditions. At the moment, it is working on sending small satellites into orbit through its project Bloostar and has mid-term plans to send people to Near Space for science and leisure (project Bloon).

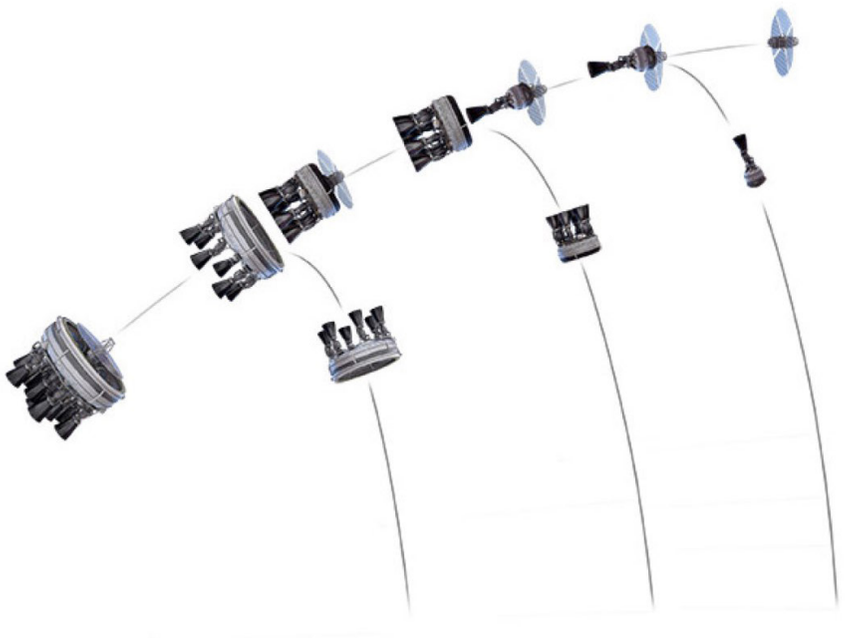
Article and photos courtesy of

Zero 2 Infinity

Zero 2 Infinity

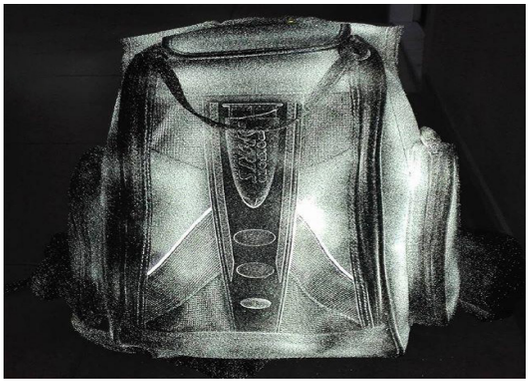
Our mission is to enable people with a project and a passion to place themselves above the Earth in order to collect rich data, take high definition images, manage communications and more, much more.

BLOOSTAR LAUNCH CYCLE



LifePaint reflective spray

Volvo Car UK has reintroduced LifePaint, the hugely popular reflective spray designed to increase the visibility and safety of cyclists. Available to buy online in time for the longest night, December 21st, LifePaint is an innovative product that reacts to a vehicle's headlights, warning drivers of the presence of cyclists in the dark. With more than 19,000 cyclists injured on the UK's roads every year, the long dark nights are the perfect time to reintroduce this potentially life-saving safety product.



What is a LifePaint?

LifePaint is invisible in daylight, but in the dark reflects light in the same direction as the light source, shining brightly to illuminate the objects it has been sprayed on. The spray sticks to dry textiles and is most effective on fibrous materials such as cotton, fleece, linen and certain nylons. It can also be applied to shoes, helmets, pushchairs and children's backpacks – and even dog leads and collars.

LifePaint washes off, and will not affect the colour or surface of your chosen material. It will last for approximately one week after application, depending on what surface you spray it onto and how much you apply.

Volvo is working in partnership with the makers of LifePaint, Swedish start-up Albedo100, to distribute the product online and via its dealer network.

Whether you drive a Volvo or not...

Volvo is already a market leader in terms of protecting all road users – including cyclists. Its range-topping 90 series models all come with City Safety, which detects pedestrians, cyclists and large animals in the path of the car and can automatically apply the brakes in an emergency to help avoid a collision. This technology works day or night and is fitted as standard to the S90 premium saloon, V90 estate, V90 Cross Country all-road car and the XC90 SUV. Volvo is also the only car manufacturer that has automatic emergency braking (AEB) as standard across its full product range.

Jon Wakefield, Managing Director of Volvo Car UK, said: „LifePaint is another example of Volvo's human-centric approach to safety. Not only are we a world leader in safety technology for our cars, by offering this innovative spray online, we're helping to protect more people on our roads than ever – whether they drive a Volvo or not."

The reintroduction of LifePaint is being supported by an on-street advertising campaign, which includes 183 digital six-sheet sites on some of the most dangerous roads in and around London.

LifePaint is available now in participating Volvo dealers and, for the first time, online (only with a shipment at the teritory of the United Kingdom).

Article and photos courtesy of
VOLVO

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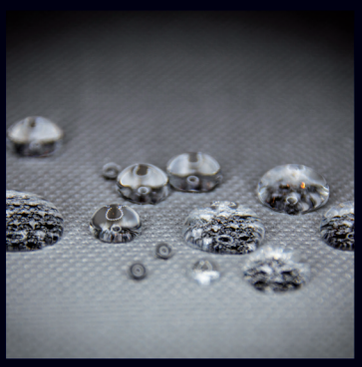

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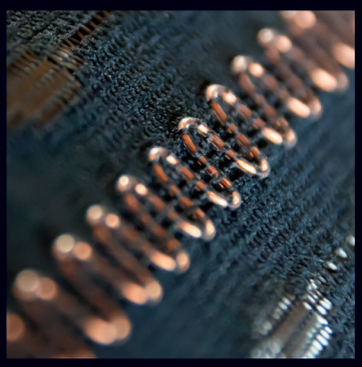


Liebaert Connected Lab

www.liebaert.com

A colony on the Moon

The Moontopia contest, organized by the Eleven magazine, identified the best project of the Moon base. The winning team consists of 3 women under the Polish leadership of Monika Lipińska.

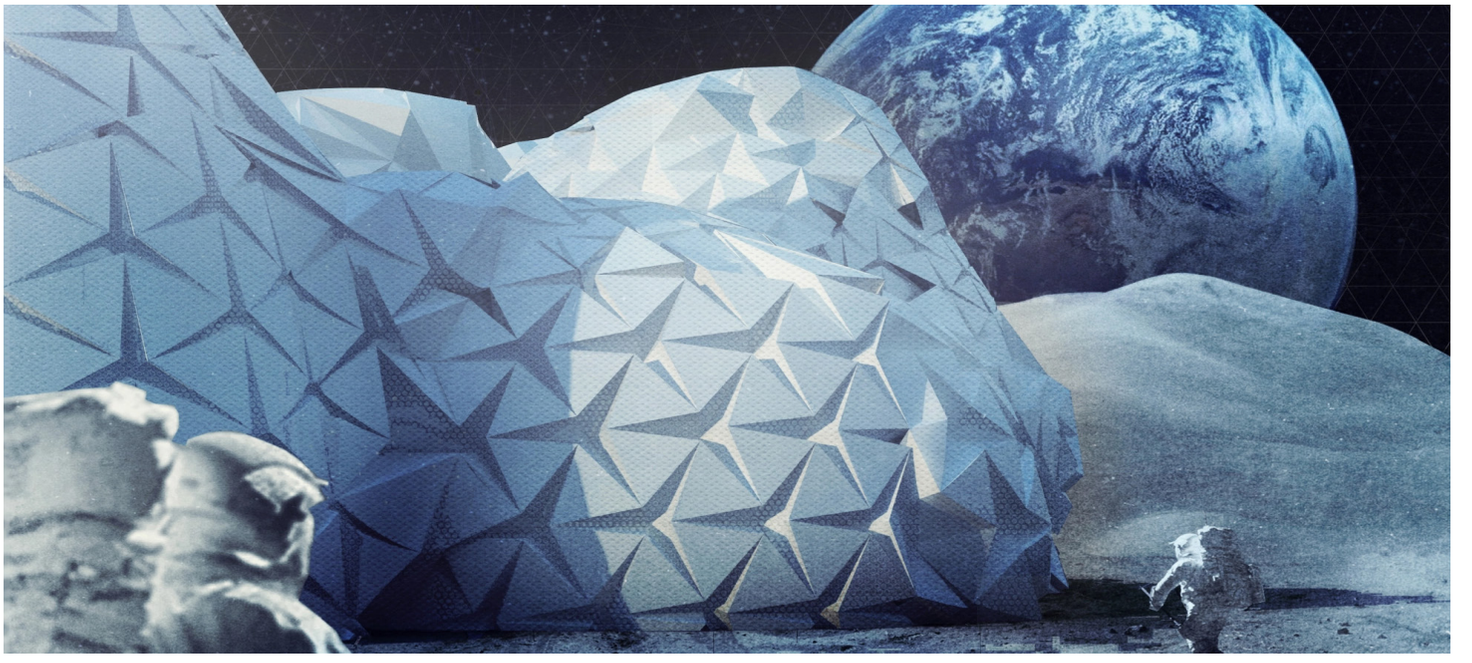
The contest emerged as a result of the growing interest in Moon colonization. The intention of its organizers was to summarize how the designers' vision of living on the Moon has evolved together with the technology.

The task was to design a self-sufficient colony on the Moon – a place of living, of work, of doing research and accepting visits of terrestrial tourists. More than 100 projects were submitted. The winning concept by Testlab is based mostly on 3D printing technology.

Testlab Project

Project is designed to handle more and more vistors by adding subsequent modules. New inhabitants would run farming and 3D & 4D printing experiments. Project can also be replicated in another places if the Moon colonization runs successfully.

As we can read in space24.pl:
"The most important structure of a whole project will be an external membrane. Simplicity of this approach lies in the

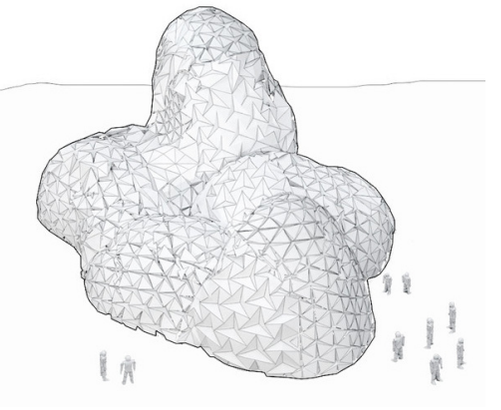


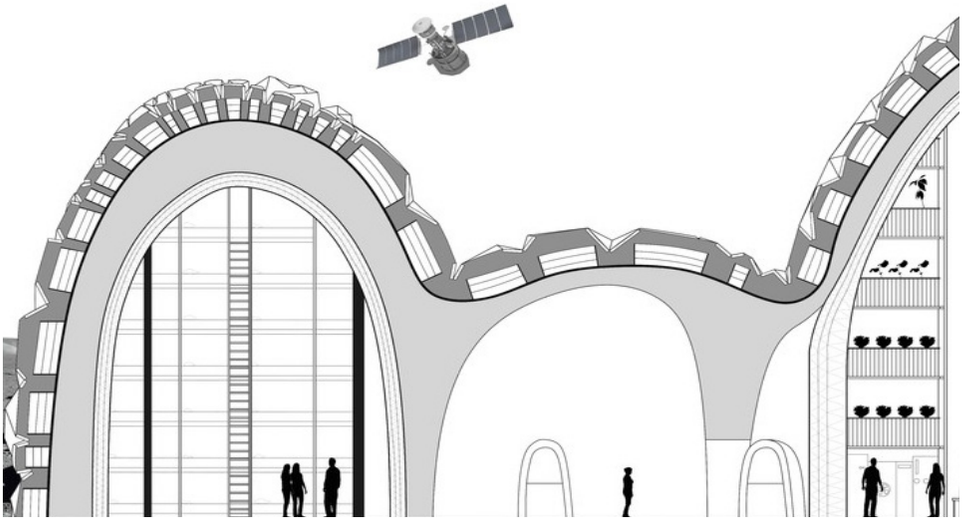
fact that the surface based on origami pattern and made from a programmable carbon fiber can be printed out and placed on the surface of the Moon. It's a technologically complex structure which will serve as a protective shield enabling water and oxygen absorption."

Water will be produced thanks to solar wind. It carries particles of hydrogen which are then isolated by the membrane and kept in its external layers. The membrane is made of several layers, each of them having different function in the process of water production. First layer contains water solution and its task is to select and transfer the positive ions of hydrogen into deeper layers. Subsequent membrane has a reverse electrodialysis heat engine with 3 modules. Each module contains the negative ions which are present in the Moon's regolith - iron (Fe), silicon (Si), chloride (Cl) and nitrogen (N). Thanks to the layers' nanoporosity the migration of particles in one direction only – towards the lower density – is maintained. As hydrogen is transferred through subsequent layers, the existing compounds are broken into basic particles and a byproducts of this process are water and oxygen.

The product owner is Monika Lipińska – an architect by trade, but she is also studying cosmic engineering. Joining these two interests resulted in creating Testlab project. Its principles seems genial in their simplicity which was acknowledged by the jury. Testing the solution in natural conditions is still to take place some day in the future and we shall patiently wait for it to happen.

Photos source: Monika Lipińska, www.eleven-magazine.com





aQ-Printer

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Textile is digital

The world is changing and also the way we live, the way we work as well as our habits. The industries, the products and services are changing, too. Raw materials and energy are becoming more expensive, product life cycles are becoming shorter and customers are more sophisticated. Moreover, the increasing digitalization is changing the way we buy, consume and how we inform ourselves. In order to take account of these changes, a rethinking for companies in the textile industry is necessary. Traditional production processes must be reconsidered to meet today's requirements of a fast-moving and challenging environment.

Digital printing is not just something for print shops. The technology helps companies all along the textile chain to enhance their products and to save raw materials and energy by reducing production costs and manufacturing time.

druckprozess is a company with the focus of consulting textile companies who want to produce their products by using the digital printing technology. With the expertise gathered over many years, druckprozess has developed and coordinated a product portfolio which, on the one hand, meets the requirements of quality, but also meets the requirements of a competitive prices on the other. druckprozess is a supplier of digital printing systems, both for direct printing and for transfer printing. Furthermore they supply ink, transfer papers and RIP software.

When druckprozess is selecting components, the product of the customer is always in the spot, because the product give the requirement for the printing result. The best printing results in terms of quality and durability are the efforts of druckprozess and here the long-term experience comes to bear when optimizing production processes, process parameters and color calibrations. druckprozess offers to companies independent consulting and optimization of existing plants and develops processes for the implementation of project-related applications.

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Project M.A.R.S.
Interview with FREEDOMES

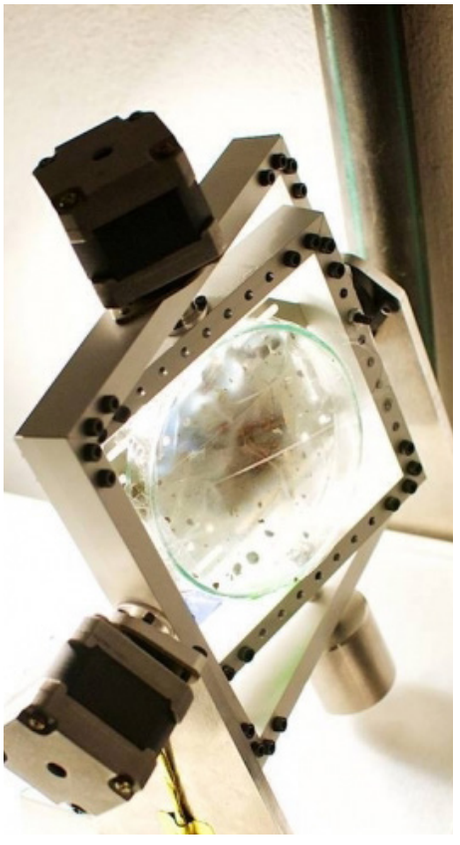
What is Project M.A.R.S. and why was it established?

Project M.A.R.S. is one of the first analogue space habitats in Europe. This unique research facility is designed to prepare volunteers for manned lunar missions, in time also to other extraterrestrial trips, such as to Mars. The habitat consists of 4 underground modules and headquarters with a kitchen and social rooms. The modules include bedrooms, a gym, a sanitation area, research tools, bioreactors, warehouses and a laboratory. All of this is to make the participants of a given mission feel as if they really were far from Earth. During the training, future astronauts print the tools they need on a 3D printer, produce vitamins, microelements and proteins in special bioreactors completely by themselves, investigate the composition of rocks, drive a rover and wander on the surface in special suits. Just as under the conditions of a space mission, the participants get warnings about changing radiation levels and sandstorms. Their biological clock and day length are also modified. In addition, mission organisers constantly monitor the behaviour and vitals of astronauts as analogue planetary missions are at this point the only form of gathering knowledge about the challenges that may be faced by teams during the mission.

This professional platform, along with the research area, is located in Rzepiennik Biskupi near the Queen Jadwiga Astronomical Observatory (Poland) and is supported by the Polish and European Space Agency.

The marshub.pl website claims that the project was to begin in the second half of August in 2016. How did it turn out in practice and have there been lunar missions conducted there?

Yes, first so-called analogue astronauts have already completed their training missions at the base. The goal and dream of the designers is to make it serve not only as a training center for future astronauts, scientists and engineers, but also for students and all space enthusiasts.



What was your company's participation in this venture?

Freedomes, as the world leading manufacturer of geodesic tents, secured the central module of the lunar base. The geodesic dome-shaped module is of key importance in Project M.A.R.S., since spherical structures are considered by scientists as the most optimal architectural solution for the construction of an extraterrestrial base. Geodesic domes owe their "space" future to the fact that they constitute one of the most effective ways of covering a surface in relation to the amount of necessary materials. Moreover, their construction guarantees remarkable structural stability, durability and ease of installation.

The Freedomes dome serve within Project M.A.R.S. as headquarters, the most important element to which minor components are attached. The central module has a kitchen and social areas. An important part of the project is that astronauts and scientists can explore the advantages of a geodesic dome as the best architectural solution for future manned missions.

What were the technical characteristics of the central dome-shaped module?

The central module of the lunar base within Project M.A.R.S. is the Freedome 50 geodesic construction. The geodesic dome is a spherical structure divided into isosceles triangles, which is a universal and self-supporting design. The Freedome spherical tent covering the surface of 50 m^2 was coated using the Opak type sheating, which is a perfectly opaque 3-layered PVC membrane 800 g/m^2 thick. Such a cover makes it possible to totally black out the dome inside. In addition, thanks to its 3-layered structure, OPAK type tarpaulin prevents overheating of the interior of the tent on sunny days.

Is Freedomes involved in other projects related to space exploration?

The mission of Freedomes is to create the future of mobile architecture. One

of the elements of this future is the use of geodesic domes for building extraterrestrial habitats. Therefore, we are happy to act wherever we can show that spherical structures are inextricably associated with space exploration. A good example of our "space" project regards building an extraterrestrial base on the set of "The Martian" directed by Ridley Scott. It is our design that helped Matt Damon - playing Mark Watney in the movie - survive those four lonely years on the Red Planet.

Another great example is a Mars-like settlement in the desert of Wadi Rum in Jordan, which consists of 20 of our "space" structures. In the place where "The Martian" was filmed and which is confusingly similar to the surface of the Red Planet, a Mars habitat for tourists has been built recently. Inside our SunCity Camp, the domes resemble small extraterrestrial bases, where everyone can comfortably and stylishly experience truly Martian views and feel exactly like Matt Damon in "The Martian."

Interview with Adam Łyczakowski
Managing Partner at

freedomes
WORLD IN A SPHERE

Anti-burglary tarpaulins
classification, characteristics, application

The problem of theft of cargo in road transport affects a growing number of entrepreneurs. According to TAPA (Transport Asset Protection Association) reports, the total value of the reported loss amounted to nearly 8 million euros only in the 1st quarter of 2016 (444 registered cases of theft or attempted theft). This problem affected 19 European, Middle East and African countries.

Although the ways of stealing cargo are becoming more and more advanced (in connection with technological development), this does not change the fact that the second most common way of walking off with truckloads is burglary (e.g. in car parks). Criminal groups are most attracted by expensive and fast moving goods – electronic equipment, domestic appliances, computers, but also cosmetics, food and clothing *(source: www.automotive-fleet.com).*

How to prevent theft?

On the market there are several solutions that help to raise the safety of cargo. These solutions are focused mainly on mechanical protection devices. Tarps are strengthened in a way so as to ensure they are more difficult or virtually impossible to cut through with a knife or other sharp tool. These reinforcements can be divided into:

- steel cord reinforced PVC tapes
- steel mesh grid
- steel cord reinforced fabric
- external reinforcements
- flat bar mesh

Reinforcements differ not only in terms of protective materials used, but also in the way of their implementation in the fabric. In this respect they are divided into those:

- bonded with fabrics by means of heat (such as reinforced tape)
- woven into the fabric at the stage of production (e.g. steel cords)

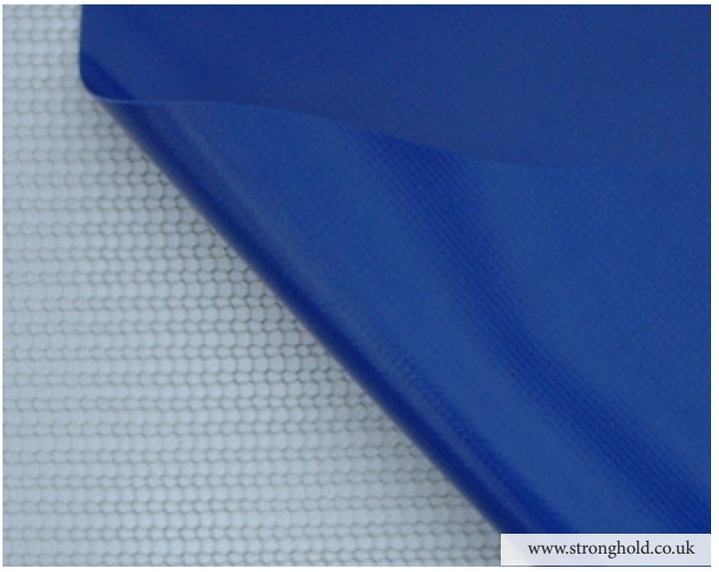
Choosing the right kind of security measure depends on one's needs and financial capabilities. They differ mainly in terms of application (e.g. rolled or curtain tarps) and lifetime (e.g. resistance to UV rays, frost resistance). Apart from mechanical protection, there are also electronic security measures with alarm function available on the market. Below presented are the characteristics of each type of anti-burglary tarpaulins.

Methods of tarpaulin reinforcement

Steel cord reinforced PVC tapes

Steel cord reinforced PVC tape made of hard metal is heat sealed to the inner side of the tarp. The tape is arranged in form of a grid with its size adapted to customer needs. In this way, reinforced tarpaulin keeps relatively good flexibility, and thanks to the grid pattern it can be adapted to the needs of the customer in terms of density.

What draws special attention here is the most cutting-edge product to enter the market which uses this technology – the **SAPLAN-High Security** system, which features an innovative implementation of tape on the PVC material. The system will have its premiere at Techtexti Trade Fair in 2017.

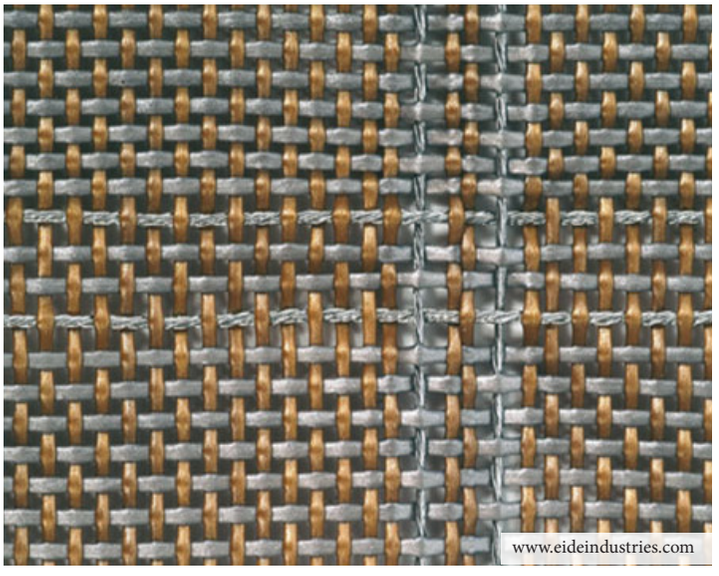


Steel mesh grid

A solution used by Knit Mesh Technologies. Steel grid with a dense mesh is woven between two PVC materials; the outer material weight can differ depending on customer needs. Then, it is heat sealed to the high weight material. Materials made using this technology are characterised by a very dense reinforcement system, but their production process is also more complex. Reinforcements can also be appropriate for broader purposes, such as production of protective clothing.

Flat bar mesh

A solution used in the Siosteel tarpaulin (by SIOEN Industry) which involves heat sealing of PVC coated metal mesh to the tarpaulin. In addition, the basic tarpaulin material is heat sealed with flat bars that form a large mesh grid (approx. 10 x 10 cm). The tarp is rather rigid, but the manufacturer also offers an alternative version with increased flexibility – Coasecure.



Steel cord reinforcement woven into fabric

A reinforcement installed at the production stage. Steel cords are woven into the base fabric so that they constitute an integral entity, which results in a relatively high flexibility of the final product. Currently, not many companies on the market offer similar solutions. The leading brand specialising in this technology is the Ferrari's Defender. In the case of this brand, the basic security measures are PVC materials weighing 500-620 g/m^2 available in two heights (1.4 and 1.8 m).

External reinforcements

These are not applied on the surface of the tarp, but only on the so-called tarpaulin weak points. So as not to leave any opportunities for thieves, it is worth investing in steel cords used for running though eyelets and durable fastening straps. Keep in mind that this type of reinforcement applied alone does not provide sufficient protection. However, it constitutes a good complement to cargo protection. Steel cords are available in most shops that deal with tarpaulin accessories (eg. Sako Expo).

Alarm systems

They can be an additional form of cargo protection as regards mechanical security measures. Their advantage are instant notifications to relevant persons, companies and authorities about the theft and a possibility of rapid intervention. The alarms can be additionally equipped with acoustic signals and GPS systems (mounted in the semitrailer), which enables identification of burglary location.

Laser barrier

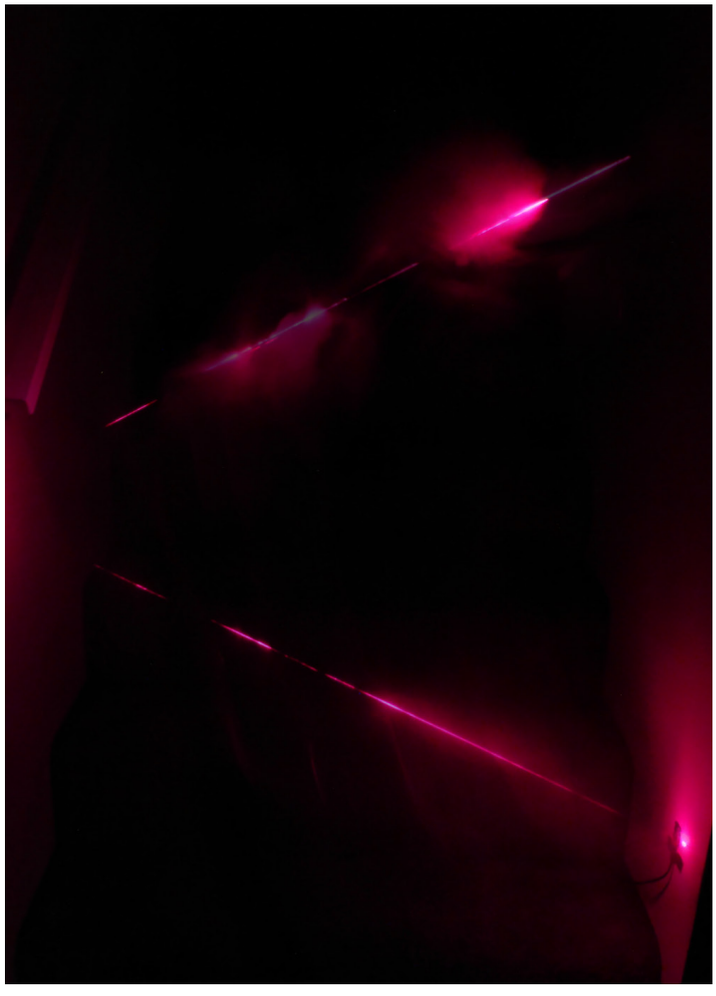
Laser beams are mounted around the perimeter of the semitrailer. The alarm starts in case of interruption in the laser beam. The disadvantage of this type of solution is the possibility of accidental alarm in case of intentional cargo displacement. Laser alarms are a new technology and are relatively the least common method in semitrailer protection.

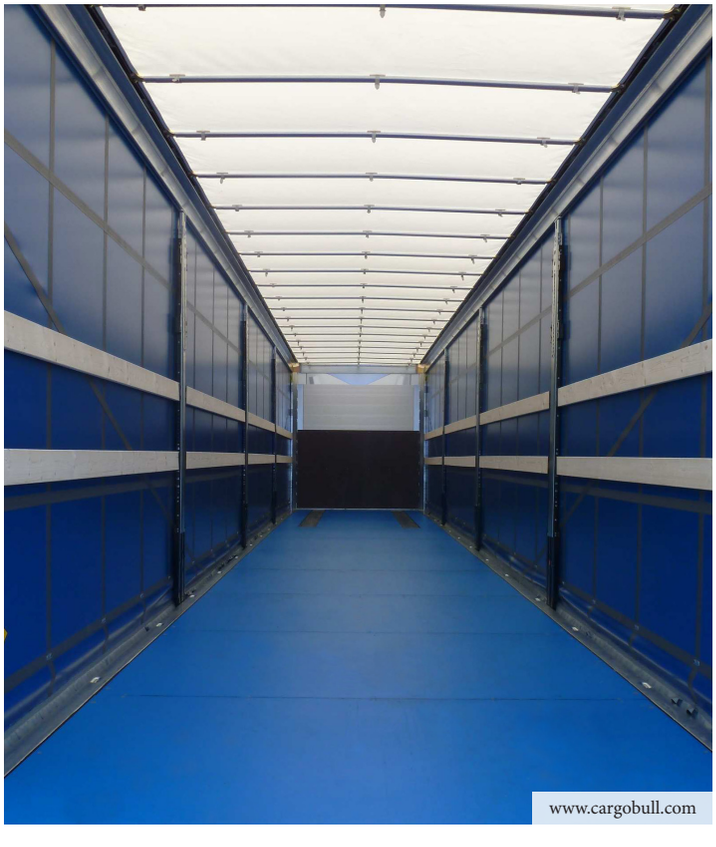
Electronic alarm

It is connectable when there is some type of conductor on (or in) the material (e.g., conductive fibres in the fabric or steel cord heat sealed onto the material). In the event of short circuit or circuit break, the alarm is activated. Such systems can be found in several manufacturers of anti-burglary tarpaulins; for example in the aforementioned Sako High Security system and in some solutions by the SIOEN company (Protector Alarm).

REMEMBER!

If you are choosing an anti-burglary system for your fleet, be sure to find out if it is approved as a security device in a given country. If so, you may be entitled to insurance discounts.





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ANTI-BURGLARY MATERIALS

SAPLAN-HIGH SECURITY

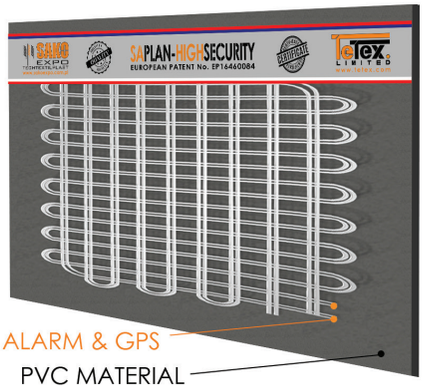
The **SAPLAN-High Security** anti-burglary tarpaulins are an innovative security solution for semitrailers and warehouses.

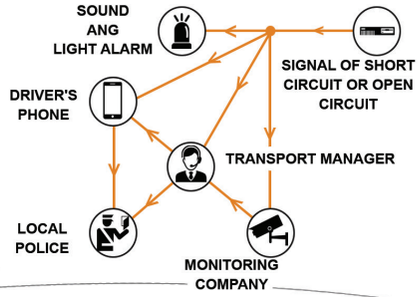
This protection system is based on steel cords providing double protection:
- **mechanical - against cutting with sharp tools**
- **electronical – alarm starts when the circuit breaks**

The system is based on two rows of steel cords. Depending on the installation needs, the cords may converge in one or two separate spots. Steel cord insulated with a 0,7 mm braid is welded permanently to the **BS900 tarpaulin**.

In the basic version for semitrailer sides and tent halls, **SAPLAN-High Security** is reinforced with steel cords formed in a grid intersecting at right angles. There is also a version dedicated for trailer roofs - **CAROPLAN-High Security**.

In the event of an electrical short-circuit, the system triggers a **sound and light alarm**. Additional options also offer sending notifications to the monitoring company, relevant authorities, dispatcher and drivers. The system is also equipped with a **GPS module** to enable identification of the semi-trailer location in the event of theft.





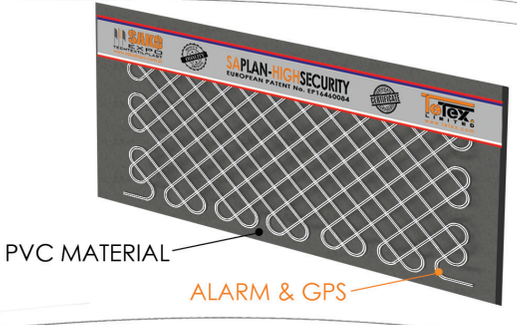
Why choose SAPLAN-High Security
- Innovative patented system of reinforcement **(EP 16460084)**
- Double protection – mechanical and electronical
- Customisable tarpaulin dimensions
- Very good tarp flexibility
- Best price on the market
- Wide colour range **(all colours of BS900 fabric)**

ANTI-BURGLARY MATERIALS

CAROPLAN-HIGH SECURITY

Reinforced tarpaulin dedicated for semitrailer roofs
- A system of steel cords that intersect at **45°**
- Double protection – mechanical and electronical
- With **alarm** and **GPS** on demand
- Very good tarp flexibility
- One of the few solutions on the market for roof tarps

*The details of the alarm system operation are the same as in the **SAPLAN-High Security** system described above.



PANAMA

BS900 SAKOPLAN

900 g/m²	650/500 N	29 | 58 rm	210 cm

INFORMATION
- **PVC** coated on both sides
- Lacquered (glossy) on both sides
- Holds **NIH** hygienic attest
- Double weave - **PANAMA**
- Curtain tarpaulin materials

1003	3002	5002
6026	7038	7500
9005	9016	***PRINT*** 9917

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Phthalates in materials
why should they be avoided?

In the age of the depleting ozone layer and the ubiquitous smog repeatedly exceeding acceptable norms, the environmental awareness in the society is constantly growing. Technical materials used nowadays include those that may have a negative impact on our health. These are the materials applied in daily use products containing phthalates. In this article I will try to answer why and how to avoid phthalates.

Phthalates in materials - why should they be avoided?

In the age of the depleting ozone layer and the ubiquitous smog repeatedly exceeding acceptable norms, the environmental awareness in the society is constantly growing. Technical materials used nowadays include those that may have a negative impact on our health. These are the materials applied in daily use products containing phthalates. In this article I will try to answer why and how to avoid phthalates.

What are phthalates?

From the chemical point of view, phthalates are salts and esters of phthalic acid. In the material industry, they are mainly used in the production of certain laminates, but are also employed in the production of paints, varnishes and adhesives. The phthalate coating is characterised by high resistance to external factors such as humidity or air temperature as well as mechanical damage. Phthalates are used as softening agents to provide flexibility (the so-called phthalate plasticisers).

What impact do phthalates have on our health?

Probably some phthalates may increase the risk of developing asthma, which is especially dangerous for children and pregnant women. Some sources claim that these substances can interfere with the activity of certain hormones and damage the central nervous system in children. Studies on a group of seven-year-olds show that children

whose mothers were exposed to breathing air heavily polluted with phthalates during pregnancy have lower IQ by an average of 7 points compared with peers in the control group.

Phthalates are easily eluted, which is particularly dangerous for small children that have the habit of inserting toys in their mouths. However, it is important to know that phthalates can enter the body also through the respiratory tract and the skin. In this case, even playing on a floor made of PVC materials with the addition of phthalates can be harmful for children.

Preventive measures

In the year 2005 the Directive 2005/84/EC of the European Parliament determined that phthalates may not be used for the production of toys and articles for children. Then, in 2013 the EN 71-3 standard was adopted for all sorts of coatings used on toys. Now, each toy that enters the European market should be examined in terms of content of paint, laminates, coatings, etc. that were used in its production. EN 71-3 is also used to prevent the existence of heavy metals in toys.

In 2012, phthalates have been added to the candidate list of SVHC (substances of very high concern). The main reason for the inclusion of phthalates on the list was their toxicity to reproductive organs (according to some studies phthalates may cause infertility in men). This list is one of the effects of the implementation of the EU REACH regulation in 2008 which aims to increase the protection of the environment and human health against threats posed by chemical substances. The presence of phthalates on the candidate list of SVHC may mean that using these materials in production will be prohibited or limited in the future. However, there is no precise information when such changes may occur.

What is more, phthalates are still used in the production of many other everyday use objects that are not intended for children, but with which children are inevitably in contact. These include PVC floor coverings, plastic food wraps, deodorants or perfumes. It seems, therefore, that the measures taken so far are not sufficient to ensure maximum safety for children.

How to protect yourself against phthalates?

When it comes to purchasing toys for children, the issue is simple. If a toy bears the “CE” stamp, it means that the product meets the requirements of the EU directives and its use does not endanger the child or the environment. The situation is slightly different if we are dealing with products that do not have specific requirements as to their content. Pay attention to the presence of phthalates when choosing:

- carpets, especially linoleum
- roller shutters
- paints for indoor use
- deodorants
- garden furniture made of MESH

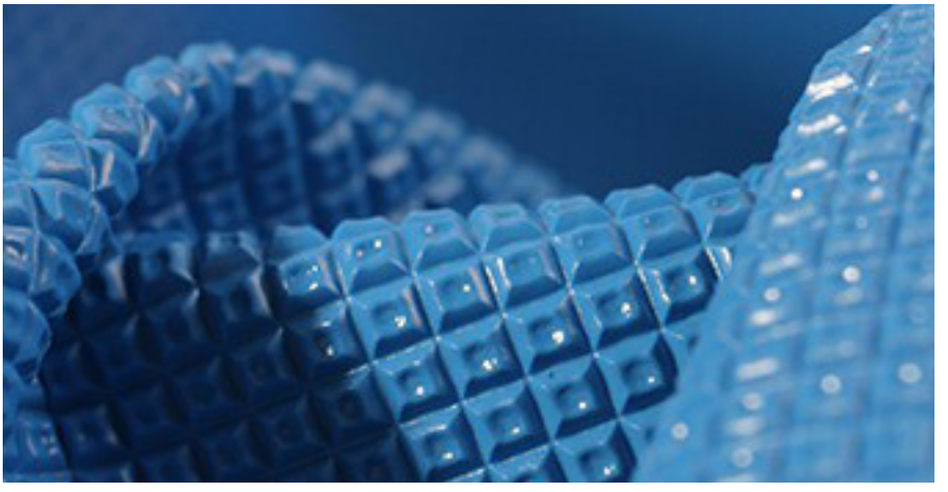
Phthalates are used in the construction industry and most often appear under the name „DEHP” (diethylhexyl terephthalate). Phthalates can also be present in food wraps, in which processed food is packaged and sold. In such cases, getting to know the actual content of such packaging can be very difficult or simply impossible, so it would be better to develop a habit of avoiding buying this kind of food.

Where to find phthalate free materials?

In our Sako Expo shop you will find a wide variety of phthalate free materials, mainly for use in sports. These materials can be safely used in the manufacture of sport mats and in coating other gymnastic equipment (e.g., vaulting horses, rehabilitation rollers, etc.). Below are examples of phthalate free materials available at our online shop:

- Anti-slip cube texture material, available in two weights (G2700, G2759)
- Material for the manufacture of “tatami” judo mats imitating reed texture (G7655)
- Artificial leather material, flame retardant (G7650)
- Material for the manufacture of wrestling mats, smooth (G7000)
- Transparent foil FWP/05 BZ, frost proof

Radosław Łuczak
Sako Expo



Unfair practices of Chinese businessmen and how to avoid them

China is currently the biggest exporter of goods in the world, only in 2015 the total worth of exported goods reached 2 274,9 billion US dollars *(source: msz.gov.pl)*. The EU remains China's biggest market. Benefits of importing Chinese goods are obvious – competitive price and the speed of production being the major ones. Still, one should be aware of possible traps when making business ties with Chinese businessmen, to avoid generating huge losses.

Currently The International Rating Agency "Moody" awarded China with a negative rate of Aa3 *(source: countryeconomy.com)* which indicates a higher trading risk. Chinese market, being one of the fastest growing economies in the world, develops rapidly which means that thousands of new companies emerge in China each year. Unfortunately, not all of them operate in a transparent way. This is why one should always apply a limited trust rule when dealing with a newly acquainted Chinese company. We've talked to the representatives of a few Polish companies which have had negative experiences with Chinese contractors.

The most frequent traps to avoid when trading with Chinese companies are:

First things first – trade agreement

Never save time and money on drafting out a trade agreement. Correctly formulated agreement will save you dozens of problems and will back up your standing. It's worth remembering that according to Chinese law all agreements should be made in writing. On the other hand, there were known cases in which the agreement proved to

be invalid, because it was signed by a person who wasn't entitled to sign it.

A non-existing company

Most of the trading ties are made through recommendation, on fairs and via big selling websites like alibaba.com. It's easier to trust a referral, other new connections should always be verified and cleared up. It may happen that a newly acquainted company has no address and isn't registered at all. Always check its registry number which will secure your business and raise the chances that the contact won't cease as soon as you transfer the money.

Invalid bank account number

Before transferring money please ensure that the recipient's bank account number is their company's account. Unfair contractors may provide bank account numbers registered for private people, non affiliated with the company. Otherwise you may find yourself in a situation when you have paid for the goods and the recipient claims they have never received any money. In such cases your transfer is practically lost and cannot be redeemed.

Product certificates

Ensure that the product you are importing has valid certificates allowing it to enter the EU market (like ISO, CE). Goods without these certificates are not accepted on the EU market and won't pass customs clearance. Sometimes providers claim that their products have all required certificates, but it may apply to a different product and not the specific one that you ordered. Such goods are practically useless on the EU market.

Export licence

Experts who deal with auditing Chinese companies warn that lack of valid export licence indicates that a company isn't a credible business partner. Export licence enables Chinese contractors to transfer their goods outside of the country and receive money in currencies other than RMB. Smaller factories which can't afford applying for such licence often use bigger partners as go-betweens, but if the company you are trading with uses such partners, it should be mentioned in the agreement accordingly.

Production control

Experts underline that the Chinese understanding of quality differs from the European one. This is why production should be controlled and supervised at every stage, either directly or via the agency, to avoid leaving room for the errors on contractor's side.

Warranty issues

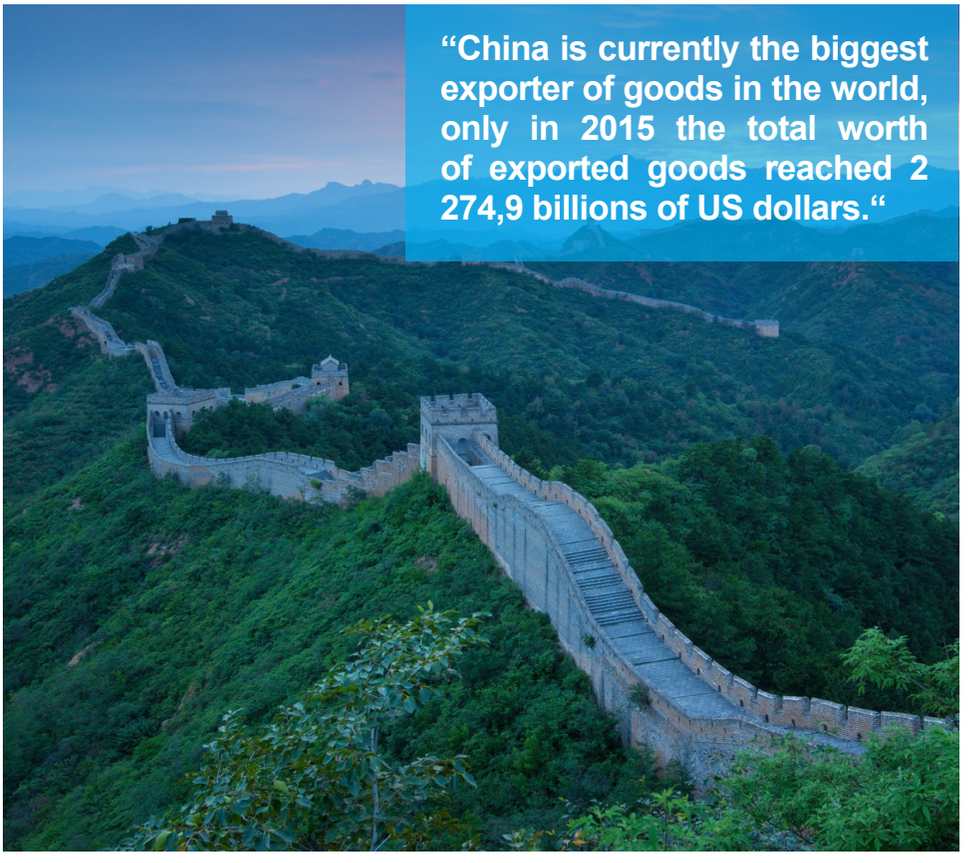
Warranty isn't always easy to handle. Things get even harder when there are geographical, linguistic or cultural barriers. One of a Polish company (Sako Expo) has been trying for a few months to claim refund from a Chinese company Jinda. To make the story even more interesting, it's enough to day that the aforementioned companies have been cooperating for several years and the faulty batch of PVC was only a part of another order.

When Sako Expo claimed refund for the faulty batch, at first Jinda refused to acknowledge it. Finally, after 4 months-long email exchange, Jinda promised to refund the costs totalling of $3000 in 10 installments and in 10 containers. Sako Expo declined such terms informing that it wouldn't order any new batch until the refund is filled. (The story has been based on the emails handed over to us).

What's the biggest barrier when trading with China? (N=84)

- 33% unfairness of business contractors
- 27% lack of information regarding business terms and regulations
- 18% low quality of products
- 14% cultural differences
- 8% non-transparent procedures

source: biznes.trojmiasto.pl



Textile badge

to control the level of human hydration

A textile badge with a printed electronic layout has been developed by experts at a startup company based at Lodz University of Technology. The purpose of the badge is to enable people doing sports, small children or the elderly – whose urge to drink decreases with age - to control their level of hydration.

myHydro is an innovative solution which joins textiles with electronics and medicine. Its trial on a group of patients is to start soon and the full product is to emerge on the market in about 3 years. "The badge is to control the level of rehydration and signalize whether it's within the norm or no – says Magdalena Owczarek Eng.Sc.D. – assistant professor at Institute of Architecture of Textiles in Technical University of Lodz.

"Our body signalizes thirst in majority of cases, but in many of them this mechanism fails. It happens in the elderly which often forget to drink and their sense of thirst diminishes with age, also in hard working people, especially young people who follow fitness trends, do jogging without analyzing their nutritional and hydrational needs." – explains Owczarek.

Dehydration can manifest itself as headaches, general tiredness and weakness, lack of efficiency. "In consequence, may lead to weakening the muscles and disruptions in the functioning of many internal organs, like heart, kidneys or cardiovascular system." – adds the expert.

The solution to control the level of human hydration, designed by Lodz expert, is to be very easy in its principle – a textile badge with printed electronic layout. The idea came from a sport badge which is used by sportsmen to wipe sweat from their foreheads. "We want to build electronics into this badge. It will monitor hydration and signalize whether its within or outside the physiological norm. We want the information to be clear and easy to understand to any target group." – says Owczarek.

In the basic version of the device hydration level is to signalized with LED – its blue colour will indicate the healthy level and red one – below the physiological norm.

Product owners plan to customize it to fit the needs of every organism and the optimal level of hydration for each target group. They also plan to create version with electronic display fetching even more data regarding hydration. They do not wish to reveal more details at this point, but they ensure that the product will be a non-invasive one.

"We do not ingerate into skin surface or the body in any way, it's a non-invasive measure" – underlines Owczarek.

Currently the team is working on the transitional prototype of the badge – as for now it's a pretty big capsule containing all electronics joined with the textile badge. Final product will be minimized to a flat textile badge with printed electronics. "We will be implementing and testing our prototype on a selected statistical group of

patients."- adds Owczarek. The research will be held in Lodz Medical University laboratory, called DynamoLab.

In June last year the prototype won the contest organized within the international consortium called The European Platform of Innovation and Technology (EIT Health) dedicated to research on healthy aging and in partnership with Lodz Medical University. Awarded grant enabled winners to set up a technology company and develop subsequent prototype. During the contest in Barcelona, they also had a chance to present their idea to potential investors.

The start-up co-founder and a PhD student Ewelina Pabjańczyk-Wlazło says that the works should take up to 2-3 more years.

"We plan to spend the nearest 2-3 years developing the prototype and creating an application which will handle the measurement system, to be installed on a smartphone or PC, and also further customizing it. It means we need to write all algorithms covering the research area and standardize data. Last but not least, we would like to start its production then." – concluded Pabjańczyk-Wlazło.

Source: pap.pl

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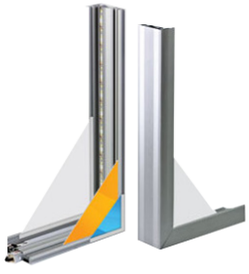
Aluminum profiles SAKOFRAMES were created as a response to the demand for alternative advertising banner presentations. Our profiles are available in raw and anode editions, suitable for indoor and outdoor use. What is distinctive for our profiles is the possibility of personalising them according to specific project realisations.



LEDO-FRAME
LED 100x50x6000 mm

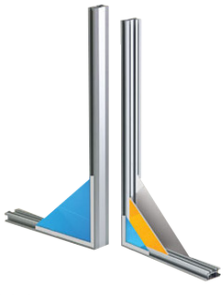
The Ledo-frame, anode profile is designed to connect the frame and LED lights. Thanks to a special lens, the light is evenly spread (up to 80-90 cm heights) which makes it suitable for store expositions. For greater heights, we use LED panels. There is a generator inside the profiles.

LEDO-PANEL
LED 22x18x6000 mm

The panel was specially designed as an illuminating element to advertising caissons or as an item of modern interior design. It is easily and quickly installed, thanks to PVC borders, to wood, drywall or between tiles as a piece of decoration.

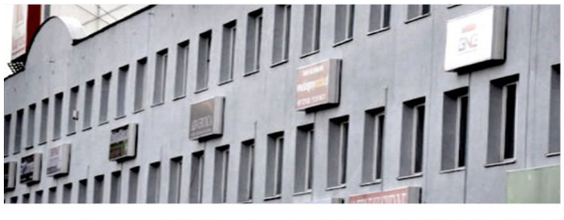
CAISSON
25x20x6000 mm

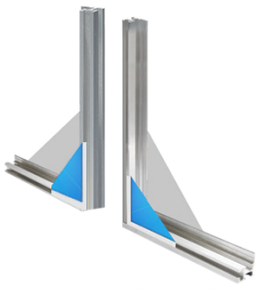
Wide and strong profile to present backlit ads. Applicable to two-sided caissons illuminated with old-fashioned lamps or new LED lights (e.g. LED-panel). Compatible with 52x25 40x25 raw/anode profiles . They can be freely combined when building the caissons or when enlarging the caissons' size.



WALL
52x25x6000 mm

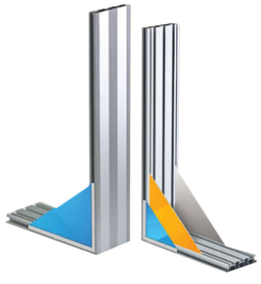
Profile used for two-sided front-lit caissons on elastic and hard frames. Part of the system that was rewarded with a gold prize at EuroReklama 2010, the International Trade Fair in Poznań. Compatible with 125x25 and 40x25 anode/raw profiles. They can be freely combined when building the caissons or when enlarging the caissons' size.





WITH ATT. BOARDS
36x30x6000 mm

A panel created for direct installing with e.g. wall screws (without using mounting brackets or other junctions). The profile is universal and suitable for presenting small and medium size printouts. The most recent element in the SAKOFRAME system.

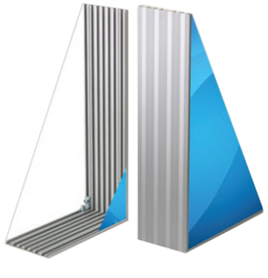


ALUMINUM BOARD
125x25x6000 mm

Aluminum board allows installing internal illumination, using both, LED systems and traditional lights. To create big advertising caissons an additional raw 36x20 profile is necessary for reinforcement. Also, designed for use in interiors to wall linings or risers for granite and glass stairs. The board can be tailored to smaller sizes.

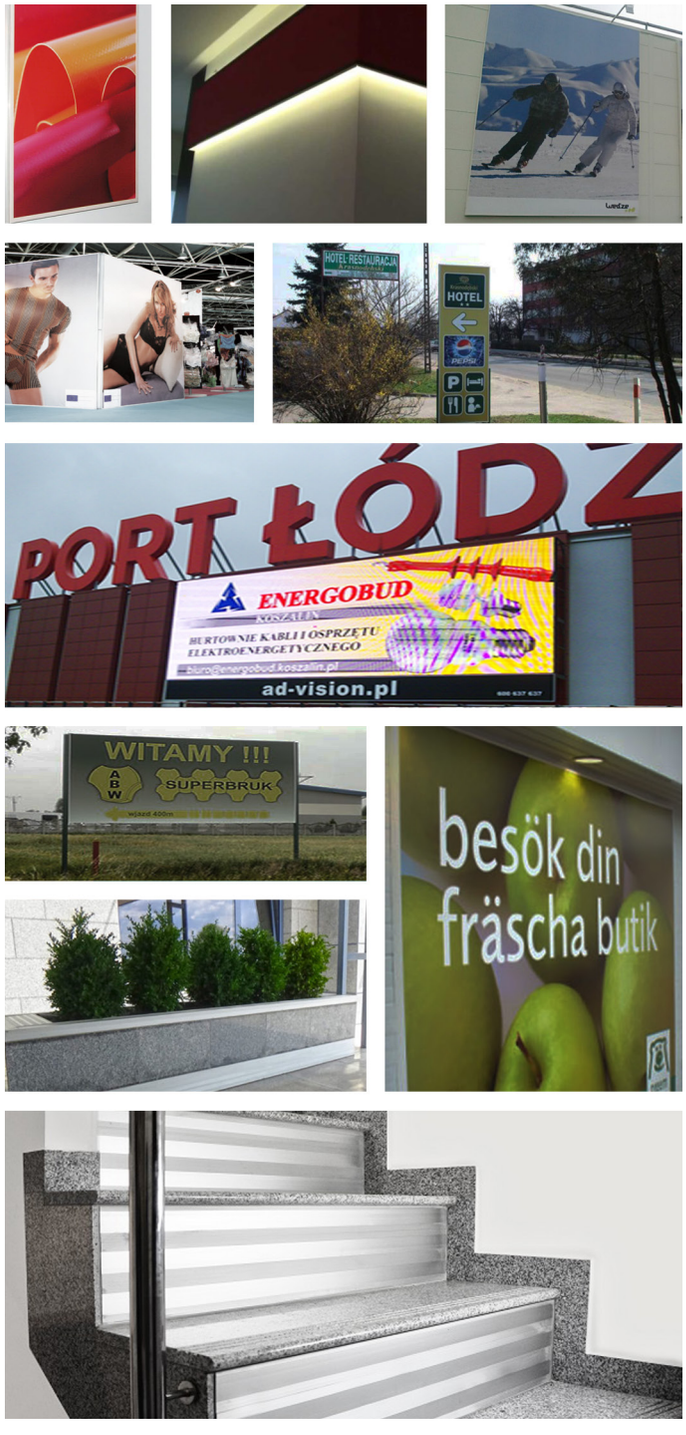
ECONOMIC
36x20x6000 mm

Universal construction profile made for presenting small and medium front-lit elastic-faced printouts. Thanks to its symmetric construction the frames can be created in two options with hidden front borders, which significantly increases the frames' aesthetic aspect and doesn't interfere with the presented printout.



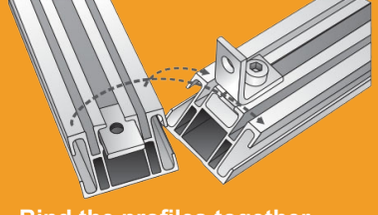
ART-FRAME
150x10x6000 mm

Combines a solid frame with a modern design. Created relying on aluminum profiles where the side areas are screwed with tightening borders to present the printouts better. Thanks to this effect there is no picture frame. Perfect for people who enjoy modern interiors. The art-frame can be created in each size and is perfect for pictures or advertisement; it's possible to easily switch the presented materials when needed.



Assembly instructions

1



Bind the profiles together with angle brackets

2

Mount the clamping bars one by one

3

Trim off the excess of material

Virtual braiding as a design tool for shoe laces, ropes or medical stents

Figure 1.b

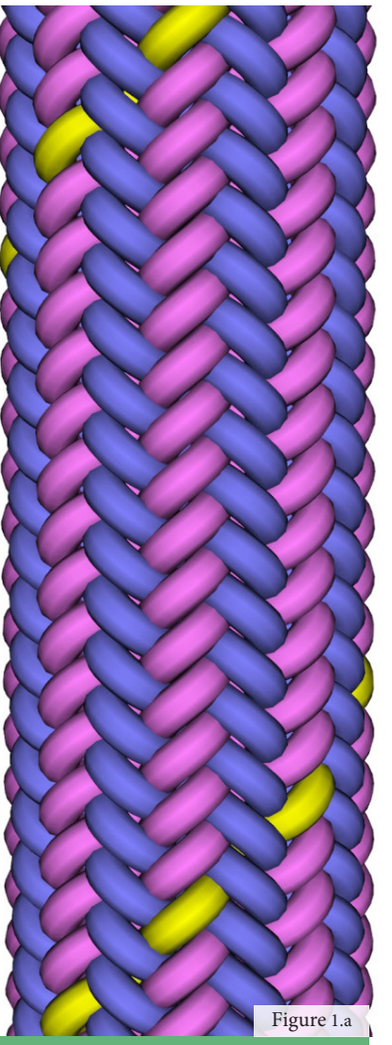


Figure 1.a

Braiding is a process of interlacement of yarns at a certain angle to the product axis used for production of shoe laces, decorative tapes, ropes, medical stents and other linear articles [1]. In the recent time the same process is used for covering (overbrading) of light cores with high performance fibers, as a step for the production of textile composites. (Over)-braided carbon fibers profiles are used for instance for the production of composite parts for the aerospace, automotive and other industries, for which the low weight or the complex hollow form are very important [2].

The most people do not notice many braid products during their daily usage. For example the shoe laces, the elastic tapes in the sport clothing or the heat insulation in the cars. Actually every modern car contains more than 1500 meter of braids [3] as heat insulation, oil pressure sleeves, electrical cable shielding, flexible high current cable between the battery and starter motor, etc. All these products and the braided ropes and the braided medical stents are designed and optimized very precisely before the serial production takes part.

The possibility to create virtual twins of the products and to evaluate their properties bevor the start of production process

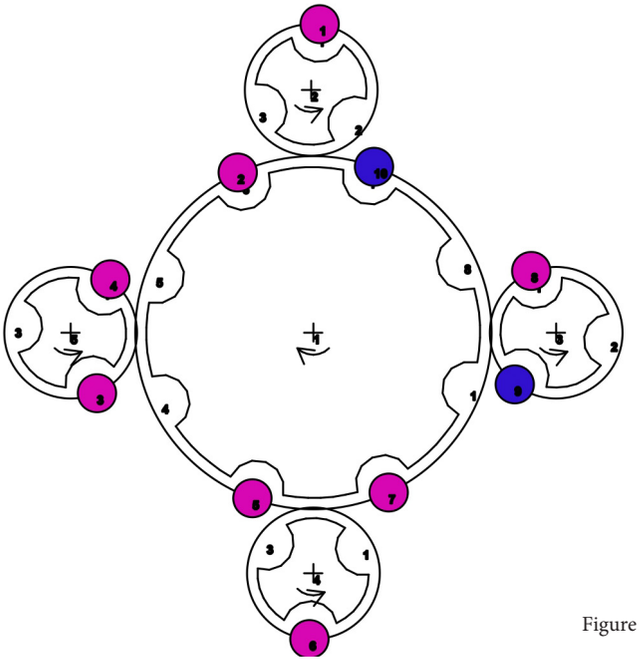


Figure 3.a

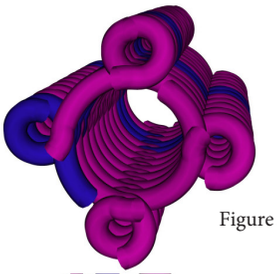


Figure 3.b

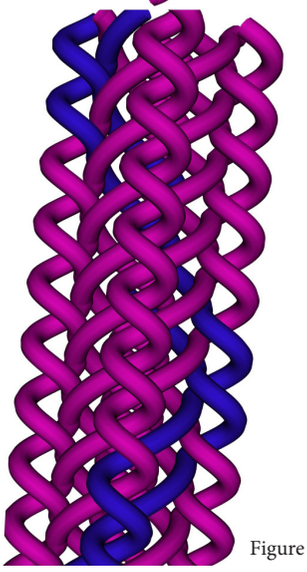


Figure 3.c

can speed up the time for designing significantly and can reduce the costs of the products. The braiding machines are not so flexible in the selection of the number of yarns per product, as in the case of weaving and knitting machines are. Once built, a braiding machine with for instance 32 carriers, cannot be used for braids with 30, 28 or 26 carriers. For this reason the virtual design of the braided products and their evaluation at the early stage of designing has much more meaning as for the other textiles products.

Virtual products can be created in different ways. Some researchers simulate the complete braiding process using Finite Element Method software [4] or using kinematic approaches [5]. These tools require users, who can handle with complex simulation software (for Finite Element Method), or are not able to represent the classical braids (for the kinematic approach).
The geometrical models are much simpler than the above mentioned methods. In the case of classical tubular and flat braids the geometrical models can provide virtual models with enough good accuracy for rapid modelling and evaluation and because of this these methods are implemented in the software package “TexMind Braider” is based.

Figure 1a represents created virtual rope. It can be used for evaluation of the approximate diameter of the rope, its weight per meter and the required yarn length, for checking the colour arrangement and the view in different braiding angles. Additionally, the single filaments of the strands can be visualized as shown on Figure 1b, so that their twist direction can be determined as well. Calculation of the tensile behavior and the strength for the rope are included currently only in their basic form. More precise simulation of the tensile behavior is a under development.

Figure 2 represents a virtual braided medical stent. The geometry of this product can be exported to STL format for 3D printing and evaluation or in various formats for CAD or FEM programs for simulations.

For the situations where the braids have complex form, for example solid profiles, sealings, etc., the emulation of the braiding machine and the motion of the carriers can be done easily by using the software “TexMind Braiding Machine Configurator”. It calculates and visualizes the motion of the carriers and thus can be used to check if the configuration will produce crash of the carriers or not. If the selected carrier arrangement can be used on the designed machine (figure 3a), then the braided product will be generated and shown as a 3D picture (figure 3b and c).

The current Version of the Configurator does not compute the contact process between the yarns, in order to allow rapid evaluation of the product, even bevor the braid and the machine for its production are built.

In this way the CAD Packages “TexMind Braider” and “TexMind Braiding Machine Configurator” support the development of braided products, by helping the engineers with a possibility for a rapid evaluation of the braids and their machines.

TexMind is presented at the TechTextil Frankfurt 2017, Hall 6.1, Stand A82.

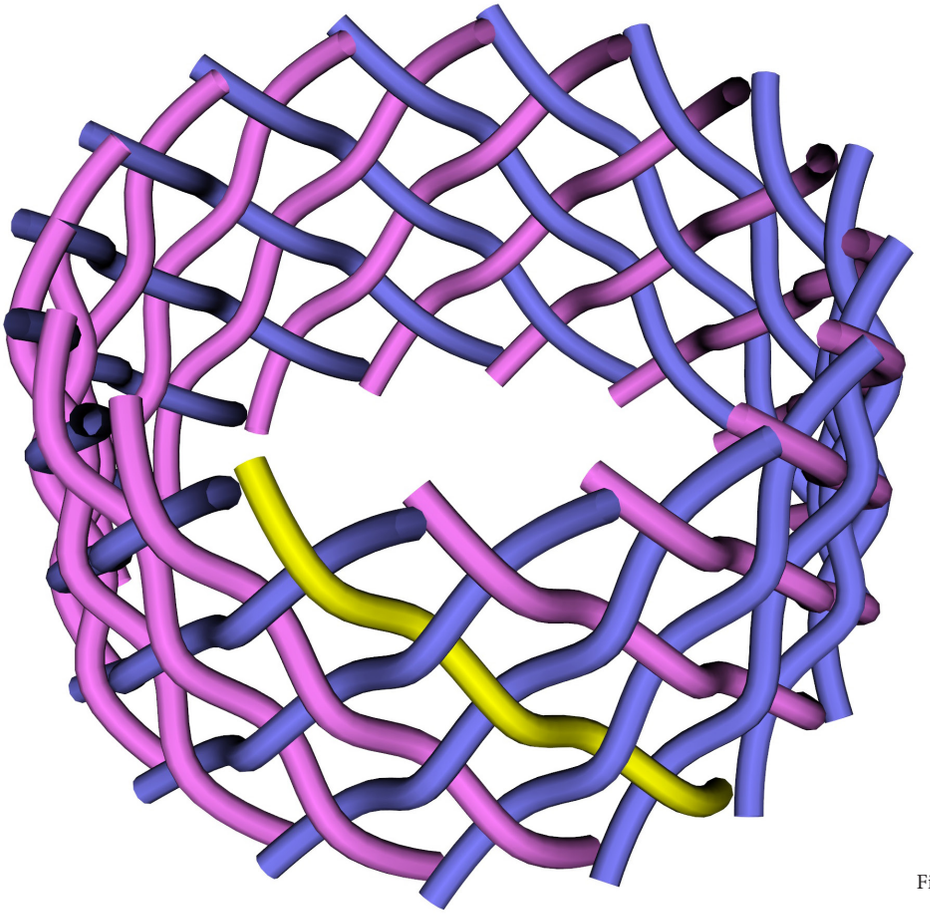


Figure 2.

Figure 1. Virtual rope with 32 strands. a) view of the macro level, b) close view with visualization of the filaments in the strands
Figure 2. Virtual medical stent
Figure 3. a) Braiding machine with a common configuration b) the generated braid using carrier motion emulation on the top c) side view.

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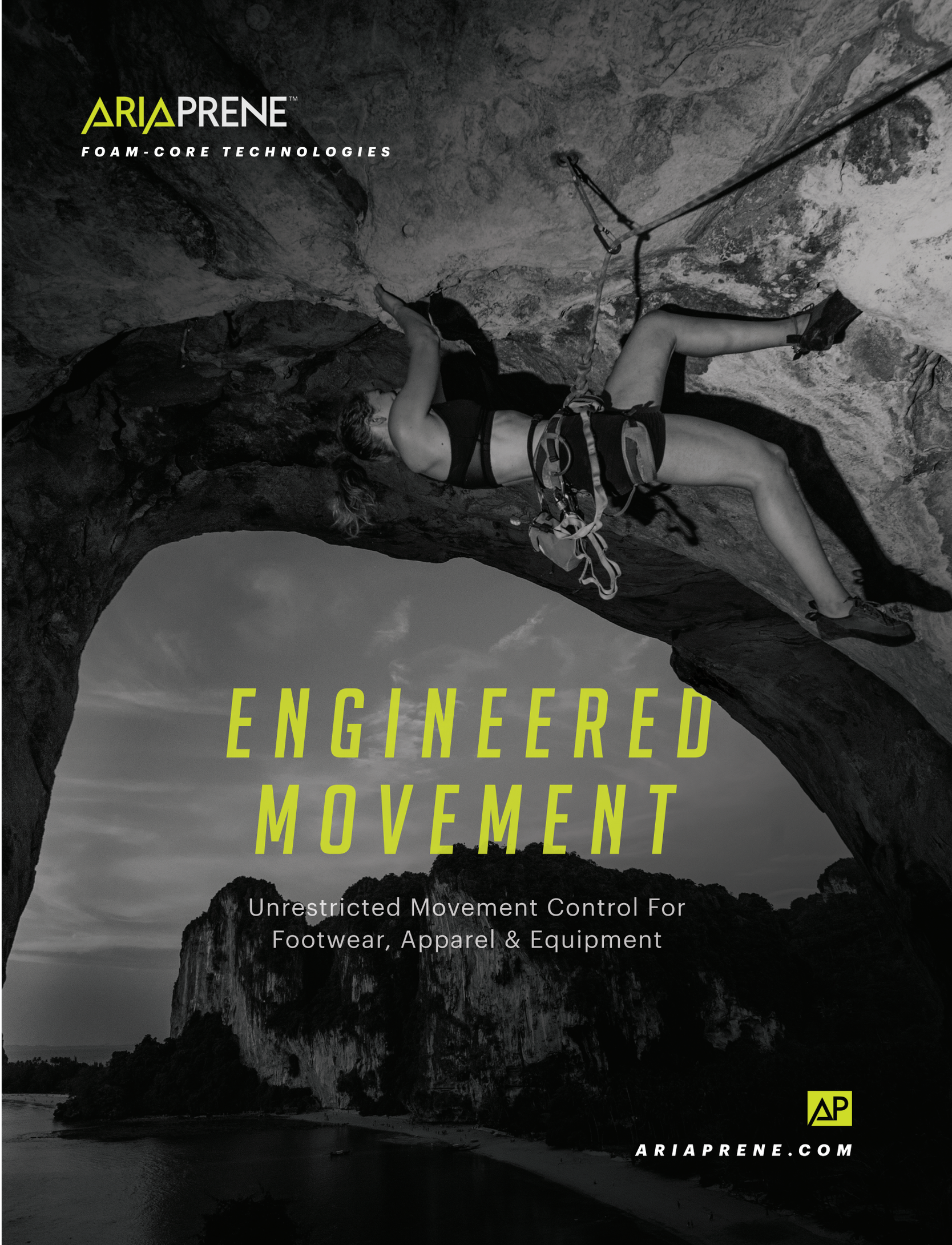

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