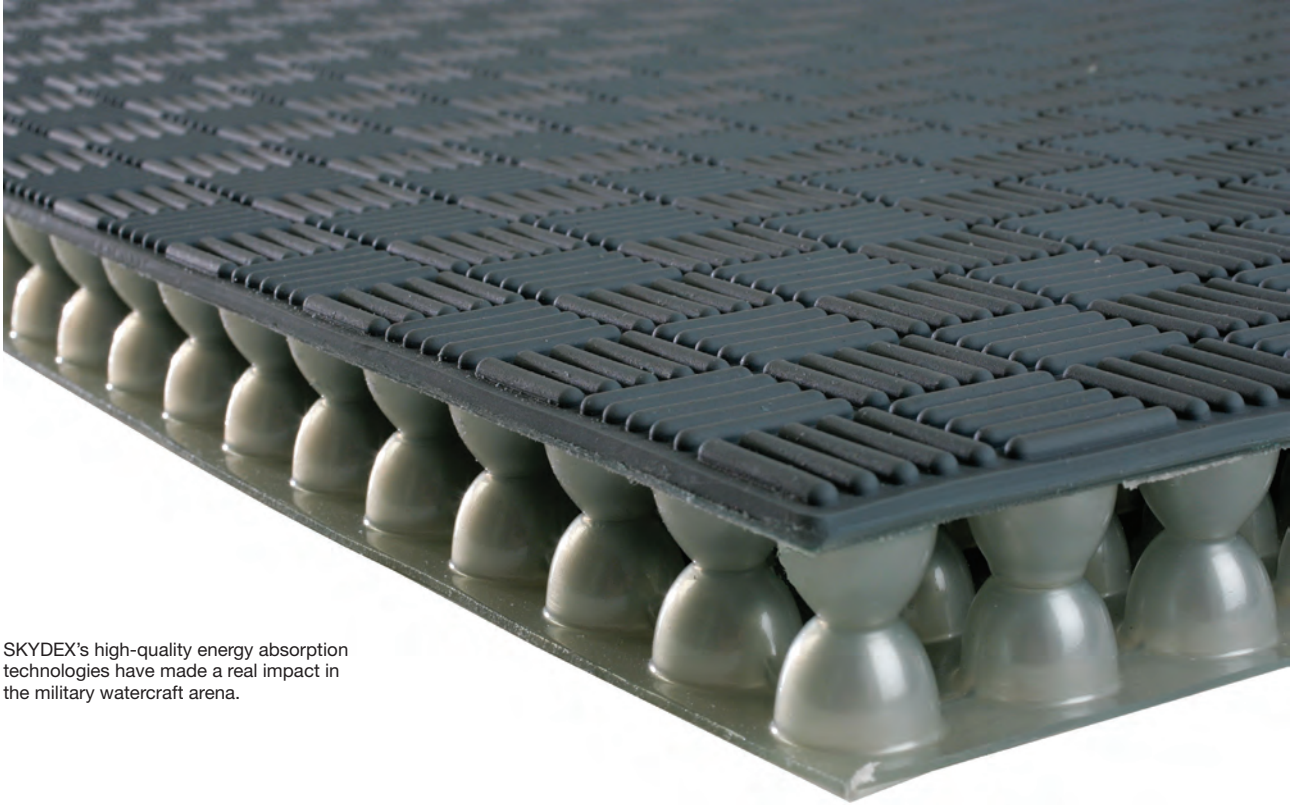


Absorb the impact

There is a pressing need for impact-mitigating technologies, not least on military ships, which pose a number of challenges not experienced on land. Peter Foley, chief technology officer at US-based **SKYDEX Technologies**, explains how his organisation has risen to the challenges, providing some of the most innovative solutions for boat surfaces on the market.



SKYDEX's high-quality energy absorption technologies have made a real impact in the military watercraft arena.

SKYDEX started out as a developer of athletic shoe components. How did you make the transition into providing impact mitigation?

Peter Foley: SKYDEX Technologies was launched in 2001 by USA Retama Corporation to develop commercial and military applications using its patented energy absorption technology. Materials originally developed by USA Retama were engineered to absorb the impact of the foot hitting the ground in running, which is over three times the body weight of the runner and can produce a lot of injuries. Nike used these performance cushioning components for several of its popular sports shoes.

SKYDEX's engineering team has taken the original application of the patented twin-hemisphere technology from a high-impact and injury-producing sport application and applied it to new products with multiple applications in the commercial and military industries.

Athletic shoes require absorption of more than 1,500 impacts for every mile run. The transition from protecting legs, joints and bodies with a high-performance running shoe technology to protecting legs and bodies via flooring or decking seemed like a natural progression for us.

The company was uniquely positioned to engineer other impact-mitigating solutions because we have the capability to tune our geometry-based materials to match specifically to the shock-mitigation requirements the new applications presented. SKYDEX can change the dimensions of the hemispheres and thickness properties of the base material – thermoplastic polyurethane – to absorb greater amounts of impact energy than foams or elastomeric materials.

The US Marine Corps originally approached SKYDEX to develop an impact-mitigating system for its high-speed watercraft. The Marines, who spend long periods of time on boats, were experiencing back pain and joint discomfort due to the multiple impacts from hitting the waves while travelling at high speeds. SKYDEX took its existing technology and engineered a boat deck surface that reduces the forces of these impacts.

In what sorts of commercial and military applications are your technologies used?

SKYDEX has developed innovative attenuation solutions for blast mitigation, cushioning, impact absorption and vibration reduction for today's most important and demanding

applications. Our technology is used in a wide array of products – including military ground vehicle convoy decking, high-impact boat decking, combative wall surfaces, vehicle and helicopter seating, ballistic helmet pads, body protection and mattresses.

On boats, the technology can be applied to provide solutions for impacts, vibration, cushioning and sound. The SKYDEX IMBD (Impact Mitigating Boat Decking) product is one of the most advanced impact-mitigating solutions for boat surfaces on the market, providing greater protection as the degree of impact increases.

What specific challenges are posed by a marine environment? How does SKYDEX tackle these challenges?

One of the most significant challenges posed by the marine environment is humidity and extreme temperatures. Any product that is placed onto a boat deck will be exposed to extreme weather elements including rain, seawater, heat, cold and UV sunlight.

SKYDEX's challenge was to develop a product that would maintain its impact-mitigating characteristics under these circumstances. SKYDEX combined its proprietary technology with thermoplastic polyurethane (TPU) to develop a product that sustains energy and impact-absorbing properties through extreme conditions.

Other important challenges are the cleaning and the durability of the surface. When boats are used in seawater, the salt and unique microorganisms can cause products to prematurely wear out or become damaged. A simple solution is regular cleaning using fresh water and a mild soap. The IMBD is manufactured with an open-ended design and is cut for easy installation and removal, allowing for regular cleaning.

Boat decking top surfaces can also be subjected to blunt impacts from objects falling onto the deck. As anyone can imagine, travelling at high speeds across the water surface will jar items loose, causing them to fall to the deck below. SKYDEX has developed a top surface that is extremely durable and pliable to meet the criteria for military and commercial use. Our top surface does not tear or peel under the most demanding uses.

How does your twin hemisphere technology limit shock?

Our twin hemisphere geometry absorbs shock by compressing under the shock's load. The amount and rate of energy absorption is dictated by the geometry's design, the placement of the geometry within the part, the stiffness of the raw material used, and the amount of the raw material used.

SKYDEX is engineered to support a set load before compression begins, so it is not like walking on sand. When the load reaches the point where it needs to be dampened – usually the point at which the load might cause an injury – it begins to compress. One hemi flexes first, then the other. At full compression the SKYDEX is only as thick as its two

layers of film, usually just hundredths of thousandths of an inch thick. This is different from foam, which still has 30% or more of the thickness remaining at maximum compression. After absorbing the impact, the hemi returns to its original height, maintaining its ability to absorb the next impact at full strength.

While traditional impact and cushioning technologies typically involve foam materials, which lose performance over time, SKYDEX retains its ability to absorb energy. The SKYDEX materials can be engineered to be thinner still, while still absorbing the same, or in some cases greater, amount of energy from impacts.

Could you explain a bit about your R&D process?

The R&D process at SKYDEX is focused on exceeding industry testing standards and moving quickly to a marketable solution. Our philosophy is to continually expand the capabilities and applications of our technology through systematic laboratory and field testing.

SKYDEX has brought the R&D process in-house. We have created a world-class testing lab at the company headquarters in Colorado, which allows us to move quickly from the concept phase to the testing phase to manufacturing and finally to production. We have purchased industry-leading testing instruments and tool die machines, enabling us to reduce our R&D process from days to hours.

As part of our continued research, SKYDEX will keep testing existing solutions to improve on the design. We recently performed an on-water scientific evaluation of our shock-mitigation decking solution to fine-tune the geometry. Our goal is to make products that are leading the industry in thought and design, while providing the highest quality at an affordable price.

What sort of market trends are you seeing at present and, as the picture changes, how is SKYDEX equipped to rise to future challenges?

The market for impact-absorbing materials is growing as the long-term effects of vibration and repetitive impacts on the body are documented. More and more industries are looking at how to better protect their employees from harmful forces while on the job. With SKYDEX's versatility, we feel there is tremendous potential for our technology to expand into new markets as well as grow with our existing customer base.

One of the challenges within the market will be to provide even greater protection while reducing costs to the customer. With the world's economies weak, we are constantly looking for ways to improve the performance of our technology while at the same time seeking out new materials or solutions to make it more affordable for our clients. ■

Further information

SKYDEX
www.skydex.com



PROTECTING THINGS THAT MATTER



U.S. Navy photo by Lt. Ed Early/Released.



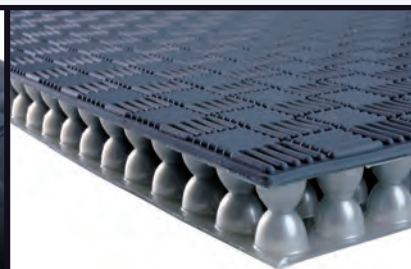
SKYDEX is the industry leader in developing innovative impact mitigation, blast-limiting and vibration attenuation solutions for today's most demanding military and commercial applications. SKYDEX utilizes its patented twin-hemisphere thermoplastic polyurethane (TPU) technology to design and manufacture a wide range of products that absorb the energy from blasts and reduce operation vibrations to increase survivability and stamina for our client's most important assets – the human operator.



Ballistic Helmet Pads



Crew Mat



IMBD - Impact Mitigating Boat Decking



X-Treme Duty Knee Pads

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