

SPS Overlay being applied to the tank top (bottom of cargo hold) on a bulk carrier

on the threshold of a new era



We established Intelligent Engineering more than 10 years ago to develop and commercialise what we call SPS. Others have called SPS “the first new materials technology for heavy engineering in 150 years” and described it as “bringing the maritime and civil engineering industries to the threshold of a new era”.

In the decade since, we have spent more than 300 professional man-years and more than \$80m conducting thousands of tests, proving and re-proving every aspect of the performance, economics, safety and sustainability of SPS. Together with our partners at BASF, the world’s largest chemical company, we have developed 84 different groups of patents. We have built up a team of more than 50 professionals working out of offices in Europe, North America and Asia, supported by an Advisory Board of leading experts and businessmen.

We have completed more than 260 projects and have more than 200,000m² of our product in service. We have secured the approval of key regulatory authorities around the world and we have demonstrated, by example, that SPS makes maritime and civil engineering structures, such as ships, offshore platforms, bridges and buildings, stronger, lighter, faster to build, longer lasting, safer, more environmentally friendly and less expensive. What next?

In the decade to come, we will roll out SPS through a series of strategic partnerships, such as our joint venture with DSME, the world’s second largest shipbuilder. We will provide new applications, such as blast and ballistics protection for those young men who may still be in harm’s way. We will provide economic and sustainable solutions in new markets, such as India and China. We will continue to invest and to advance the frontiers of SPS.

When you take your son to a football match or your daughter takes you to a rock concert or when you take a lift in a tall building or a bridge or a ship across a river or an ocean, SPS will be there.

A handwritten signature in blue ink, appearing to read 'Michael Kennedy'. The signature is stylized with a long horizontal line and a vertical line at the end.

Michael Kennedy
CEO, Intelligent Engineering.

summary

Intelligent Engineering (IE) has developed and commercialised SPS.

- SPS offers substantial performance, economics, safety and sustainability advantages over steel and concrete for two major world markets: maritime and civil construction
- The technical capabilities of SPS have been proven by an extensive programme of tests conducted over the last ten years by IE in partnership with BASF and leading research institutions under the guidance of major regulatory bodies
- SPS is approved by the main maritime regulators and similar approvals have been granted for civil engineering applications in North America and the EU
- IE has completed over 260 commercial SPS projects across six continents. There are more than 200,000m² of SPS in demanding applications around the world
- SPS is protected by a portfolio of 84 different groups of patents filed in 85 jurisdictions which is jointly defended by IE, its partners and licensees
- IE works with leading architects, engineers and builders to design and integrate SPS solutions into construction programmes. SPS designs and prefabricated SPS products are available through a growing network of licensees



SPS Overlay showing placement of new top plate



The Norcape was the 20th SPS Overlay project for P&O



SPS Structure



Conventional Stiffened Steel



Conventional Concrete and Steel Structure

what is SPS?

SPS is a structural composite comprising two metal plates bonded with a polyurethane elastomer core.

SPS is much simpler and more robust than stiffened steel plate and much lighter and faster to erect than reinforced concrete.

SPS is used in a wide variety of applications including structural flooring, stadia and arena terraces, ship repair, shipbuilding and bridges.

benefits of SPS

SPS is a structural material used to make the load-bearing plates found in a wide variety of maritime and civil structures. SPS offers benefits in performance, economics, sustainability and safety.

Maritime applications

In maritime structures, such as the hulls and bulkheads of ships, load-bearing plates are usually made from steel, which is heavily stiffened to prevent buckling. SPS eliminates the stiffening elements, making these structures much less complicated and much less prone to fatigue and corrosion.

Civil applications

In civil engineering structures, such as the decks of bridges and floors in buildings, load-bearing plates are usually made from reinforced concrete. This is because it is difficult to control fatigue and vibration using steel and, with the exception of long-span bridges, the weight penalty of using concrete is tolerated. SPS controls fatigue and vibration and is much lighter than concrete. In addition, SPS plates are prefabricated to a high degree of dimensional accuracy. Using SPS plates reduces 'wet-work' on site and de-risks and accelerates the build programme.

Repair and conversion

SPS can also be used to reinstate or strengthen existing plate structures, such as the cargo holds of ships and the decks of bridges, in a process called SPS Overlay. Here again, the benefits are a much reduced schedule and a very robust and long lasting solution. Across the full range of applications, the composite properties of SPS give rise to a number of other valuable benefits. In summary, SPS offers:



Lifting a pre-assembled triple unit of SPS Terraces

Simpler, faster fabrication

- Elimination of stiffeners simplifies structures
- Prefabrication and ease of erection shortens and de-risks construction schedules
- Eliminating 'cropping' makes SPS Overlay a much faster and less risky method of reinstatement and strengthening

Improved designs and in-service performance

- Less susceptible to fatigue and corrosion, local buckling and the formation and propagation of cracks, compared to conventional stiffened steel structures
- Reduces weight and thickness and allows increased spans compared to conventional reinforced concrete structures

Cost savings and economic benefits

- Reduces build cost
- Reduces construction schedule and risk
- Reduces maintenance cost
- Increases service life
- Increases cargo capacity
- Increases rentable floor area

Enhanced protection and safety

- Greater resistance to accidental or extreme impact loads
- Built-in structural fire protection
- Built-in blast and ballistics protection
- Built-in acoustic insulation

Improved environmental sustainability

- Fully recyclable and reusable gives reduced carbon footprint
- Reduced weight results in less materials, less waste and fewer truck loads
- Faster construction means less disruption and public inconvenience

markets



The Silver Bell tank tops reinstated with SPS Overlay

→ New construction for full range of ship types including components such as:

- Hatch covers
- Vehicle decks
- Tank tops
- Bulkheads
- Hull plating
- Citadel protection

→ Repair and conversion of:

- Offshore vessels and structures
- Bulk carriers and tankers
- RoRos, ferries and passenger vessels
- A wide variety of other applications

→ Stadia and arena terraces

- New venues
- Refilling
- Extensions

→ Structural floors

- High rise
- Concourses
- Low rise
- Car parks

→ Bridge decks including:

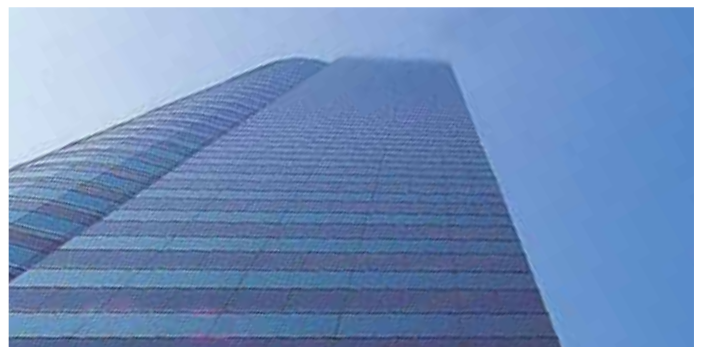
- New bridges
- Bridge replacement
- Deck reinstatement

→ Naval vessels with particular benefits for:

- Blast belts
- Flight decks

→ Construction including:

- Crash decks
- Blast walls



SPS Floors eliminate the need for concrete at height

SPS Overlay has set a new standard for ship repair and conversion, delivering a faster, less disruptive alternative to traditional 'crop and replace' techniques.



SPS Overlay uses existing plating as one side of a steel composite panel formed by a new top plate and an elastomer core. The results fully restore or enhance the strength of the original structure to deliver high impact resistance and permanently flatter surfaces that improve performance and cargo handling.

The benefits of SPS Overlay include:

- Faster repair schedules, minimal labour and reduced downtime
- Non-disruptive, safe, permanent improvements
- Reduced repair costs, lower operating costs and increased revenue potential

Over 200 commercial SPS Overlay projects have been completed. These fall into four categories:

- Offshore vessels and structures including FPSOs and FSOs, drilling rigs, semi-submersibles, and LNGs
- Bulk carriers and tankers including Capesize and Panamax vessels
- RoRos, car carriers, freight and passenger ferries
- A wide variety of other vessels from barges, dredgers and floating pontoons to helidecks and side shell protection



SPS Overlay has been used for extensive deck reinstatement of six Stena Line ferries.

The non-intrusive nature of SPS Overlay contributed to significant schedule savings and ensured the vessels were back in service quickly.

“The original programme of repairing 10,000m² of deck on three ships back to back in 70 days was the most demanding schedule that I have overseen as technical superintendent. The project would not have been possible with conventional repair techniques.”

Nigel Baalham, Technical Superintendent, Stena Line



CASE STUDY

Stena Line, Deck Reinstatement



Illustrative cross section showing new top plate and elastomer core of SPS Overlay. In spite of diminution and 'dishing', the original deck plate can be retained to form the bottom plate of the sandwich. New lashing pots are integrated during process.



CASE STUDY

Transocean Legend, Helideck Strengthening



The helideck of the Transocean Legend needed strengthening to accommodate heavier helicopters. The SPS Overlay solution was completed in 17 days.

“We are delighted with the end result and the speed with which the strengthening took place.”

Guy Cantwell, Transocean



The Capesize Docebay had 1,932m² of tank tops, hopper sides and stools reinstated with SPS Overlay in Cosco Nantong, China.

The “dishing” of the tank tops has been eliminated, which will lead to better cargo handling and reduced turnaround times.

“Using SPS Overlay rather than conventional crop and replace methods reduced our repair schedule by 40%.”

Atle Paulsen, Superintendent, V.Ships



CASE STUDY

Docebay, Tank tops





CASE STUDY

Conkouati, Side and Bottom Shell Repair



Wear and tear had resulted in steel diminution to the FPSO Conkouati's side and bottom shell.

SPS Overlay was used to reinstate the structural strength of the hull. Areas of side shell, which are vulnerable to impact damage from offloading tankers, were strengthened externally, while the bottom shell was strengthened intercostally below the waterline without the need for dry docking.

“SPS Overlay was an obvious choice for us. The repairs were not intrusive and were carried out on-station whilst normal operations continued on board. The equipment used for the job was small and portable and meant that its movement did not cause major inconvenience or involve many people. The work was finished with excellent results.”

Klervi Keryhuel, Marine Engineer, Perenco



SPS Overlay was used as side impact protection in the conversion of an FPSO to satisfy IMO MEP139 (53) “Guidelines for the application of MARPOL Annex 1 Requirements for FPSOs and FSUs”. It is also Class and Flag State approved.

“Keppel Singapore, Intelligent Engineering’s licensee of SPS Overlay continues to provide innovative, proven solutions for FPSO customers. The adoption of SPS Overlay offers the ideal side shell protection for FPSOs and we are pleased to be instrumental in this first application.”

Louis Chow, General Manager Commercial (Conversions) Keppel Shipyard Ltd



CASE STUDY

FPSO, Side Shell Protection

maritime new construction

IE and DSME (Daewoo Shipbuilding and Marine Engineering Co Ltd) have established a joint venture, **SPS Marine Technologies Ltd**, to bring SPS into mainstream shipbuilding. The company provides SPS solutions and licences the technology to other shipyards around the world. A wide variety of applications have been developed including hatch covers, vehicle decks, tank tops, bulkheads and hull plating.



SPS hatch cover at DSME shipyard

Benefits include:

- Simplified more robust structures
- Up to 40% reduction in labour, 50% less welding and 20% less surface area
- Superior in-service performance and reduced through-life maintenance
- Prefabrication guarantees quality and efficiency in construction

“Lloyd’s Register was the first to approve SPS for ship repair and now that this is well established we’re delighted to be supporting IE and DSME in their joint venture to bring SPS into new ship construction.”

Richard Sadler CEO, Lloyd’s Register



CASE STUDY

SPS Hatch Covers



Through the MTL partnership, DSME constructs and supplies SPS hatch covers for containerships. The advanced design uses SPS panels to replace the stiffened steel plating of a conventional hatch cover, eliminating all secondary stiffeners and greatly simplifying the structure. SPS hatch covers are functionally identical to the standard steel items, but possess greatly enhanced strength and resistance to impact and puncture from dropped or mishandled containers.

Hatch covers are obvious applications for SPS, not just for containerships, but also for bulk carriers and general cargo vessels. The simplified structure and inherent puncture resistance reduce maintenance costs, enhance lifetime performance and minimise the risk of costly delays due to accidental damage.



IE designed a Type C Tanker for the Rhine River to meet ADNR and Germanischer Lloyd requirements. A mock-up structure was built in Hanover, Germany. This verified the construction and assembly processes, confirmed the construction quality standards and demonstrated the simplicity resulting from the use of SPS.



CASE STUDY

Rhine Tanker (Type C)



MV "Bow Hunter" was one of the first vessels built by DSME. In 2011 DSME converted her into a floating company museum or "Storium". DSME selected SPS panels for the newly installed decks to provide high performance control of noise and vibration and allow fast installation in confined working areas.

"In the conversion of MV Bow Hunter, SPS gives installation and performance benefits over a normal steel deck. The innovation contained in SPS technology captures the spirit of DSME and is symbolic of DSME's past and future."

ManSoo Kim, Vice President, Head of Hull Design, DSME



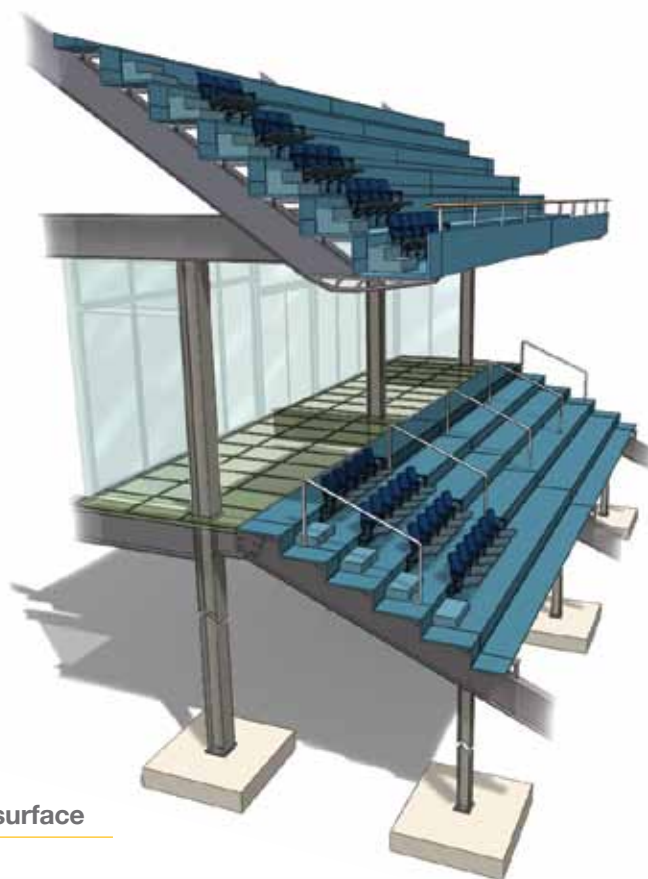
CASE STUDY

DSME "Storium"

SPS Terraces

SPS Terraces save weight, time and cost in the construction of high quality stadia and arenas:

- SPS Terraces weigh less than 25% of concrete terraces. This enables a 25% reduction in structural frame weights and 15% lighter foundations
- SPS Terraces can be erected quickly, with 6-10 times more units being transported per truck and 3-4 times more units lifted per hoist than concrete alternatives
- Project cost savings of over 20% are achieved using SPS Terraces
- At the end of a venue's life SPS Terraces can be readily dismantled and reused on future venues

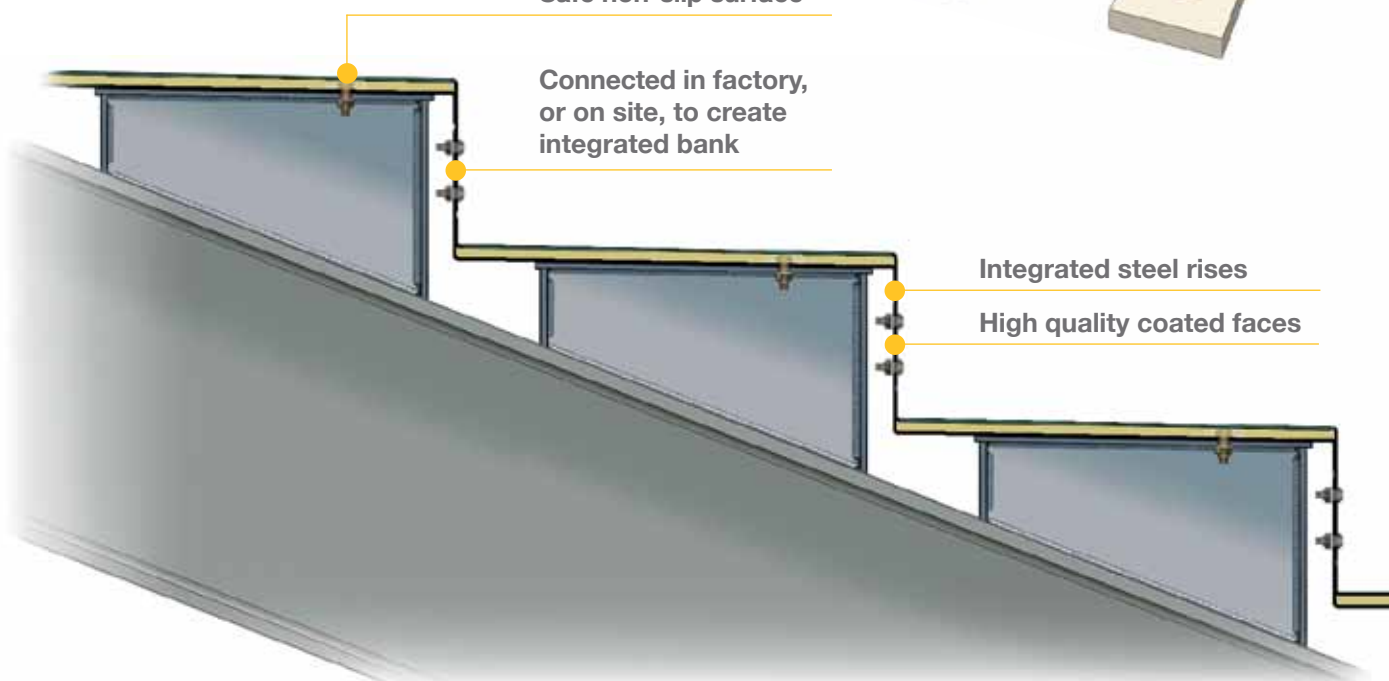


Safe non-slip surface

Connected in factory, or on site, to create integrated bank

Integrated steel rises

High quality coated faces





CASE STUDY

O₂ Dublin

Winner of BEX 2009 International Award for Best Use of Architectural or Structural Design



SPS Terraces delivered a lightweight, long span, cantilevered bowl with minimal supporting columns – allowing more of the audience to be closer to the stage and maximizing the venue’s capacity and versatility.

“We designed the arena bowl with SPS Terraces in mind; nothing else could have delivered the solution we wanted.

I am delighted with the quality of finish we have achieved using SPS Terraces – they are the future.”

Damon Lavelle, Architect, Populous



The LG Arena at The NEC, Birmingham has been redesigned, enlarged and completely refitted. SPS Terraces were used to create 8,000 permanent seats, of the total 16,000 capacity at the new venue.

“Using SPS Terraces helped to ensure that our new arena was ready for the start of our season, the Horse of the Year show, in October and has created more space for concessions and services under the new stands.”

Phil Mead, Managing Director of Arenas at The NEC Group



CASE STUDY

LG Arena



CASE STUDY

The Aquatics Centre



Zaha Hadid’s Aquatics Centre for the London 2012 Olympics is the iconic structure of the games. SPS Terraces helped to deliver a uniquely demountable structure with the feel of a permanent venue with the opportunity for the whole structure to be resold after the games. A breakthrough in sustainable construction and a valuable legacy.

“If it was up to me, I’d choose SPS Terraces over prefab concrete slabs every time. We threw them up onto the steelwork much faster than I’d first imagined possible, and with a schedule as tight and important as the Aquatics Centre build, that makes all the difference.”

Steve Burley, Site Manager, Watson Steel Structures

SPS Floors enable significantly lighter structures with shorter, safer construction programmes.

- SPS Floors weigh one quarter of comparable concrete flooring; they are supported by lighter frames and foundations
 - They are delivered to site finished to the highest tolerances ready to be assembled using standard steel working practices
 - Using SPS Floors reduces construction schedules. They are installed quickly and predictably with panels of SPS Floors being lifted at the same time as the structural frame
 - They provide 100% working load capacity as soon as they are fixed in position and with no wet-work above ground level
- work can start earlier and be completed faster
 - SPS Floors reduce health and safety risks by providing increased protection against falling objects and minimizing a range of on site hazards
 - Using SPS Floors reduces contractors' costs associated with time on site and project risk
 - They provide increased revenue for developers from earlier project completion and extra floors on tall buildings



A full-scale 9m x 9m bay, fitted out with M&E, suspended ceilings and raised access floors has been fully tested at the UK Building Research Establishment (BRE). Inset picture shows Techniks ceramic raised floor system installed on SPS panels



CASE STUDY

Residential Building



It is proposed to use SPS Floors on a 27 storey residential building in London.

“SPS panel system is the step change we have been waiting for in off-site construction. The system finally enables us to bring precision manufacturing and assembly to the site eliminating multiple trades to deliver the building faster and ultimately cheaper than conventional techniques.”

David Glover, Global Head of Building Engineering, AECOM



SPS Floors have been used to rebuild the main structural floor of the Grand Pier in Weston-super-Mare. The pier, which was gutted by fire in 2008, was being rebuilt on the existing 105 year old structure and extends 400m into the Bristol Channel.

The picture on the right, taken at low tide, shows work in progress on the superstructure and the SPS deck about 75% complete. Note the crane barge alongside.

“SPS Floors were key to meeting the challenges of rebuilding on an old and damaged structure with limitations on weight, restricted access and a demanding schedule. Intelligent Engineering has gone the extra mile in supporting us from design to installation to ensure the success of the project.”

Andy McGoldrick, Project Director, John Sisk & Son Ltd



CASE STUDY

Weston-super-Mare Grand Pier



CASE STUDY

Carnegie Hall



SPS Floors formed part of the improvements to Carnegie Hall, which is a 120 year old heritage structure and a New York City landmark. They were used for the renovation of a mezzanine floor in the South Tower and floor additions in the North Tower, which resulted in minimal disruption to the music hall, provision of immediate load capacity on installation and an easy installation in a site restricted area.

For the South Tower, the SPS Floor forms office space that is suspended at mid-height between top and bottom flanges of an existing truss. In the North Tower, the floors add lounge areas to existing rehearsal halls.

SPS Bridge Decks



SPS Bridge Decks are much lighter and less complicated than conventional concrete and steel structures. New construction, replacement and repair can be carried out much faster and with less disruption. SPS Bridge Decks are less vulnerable to fatigue and corrosion and have a longer service life.



Installation of new SPS Bridge Deck

New bridge decks

Prefabricated SPS Bridge Deck panels make new bridges more economic. As an alternative to concrete decks, the 70% lighter, prefabricated SPS Bridge Decks enable shallower, longer, lighter spans to be constructed faster and with less disruption to traffic. As an alternative to orthotropic steel decks SPS Bridge Decks offer a lighter solution with simple surfaces that are much less prone to fatigue and corrosion.

Replacement decks

The replacement of old concrete decks with SPS Bridge Decks can take days rather than weeks and bridges can often remain

operational throughout the procedure. Load restrictions can be removed and extra lanes added without the need for additional substructure.

Deck reinstatement

SPS Overlay is used to reinstate or strengthen steel bridge decks. This process does not require the removal of existing structure and is therefore much faster and less disruptive. SPS Overlay improves the distribution of wheel loads, decreasing deflections and increasing the life of the bridge.



CASE STUDY

M6 Footbridges



Prefabricated SPS Bridge Deck panels were used to replace concrete panels in four pedestrian bridges across the M6 motorway in England. The installation process required the motorway to be closed for just a few hours overnight, keeping disruption to a minimum.

“The Highways Agency is always on the lookout for new ways to get the job done and SPS is one of them.”

Peter Harner, Project Manager, UK Highways Agency



The Schönwasserpark Bridge is an orthotropic steel bridge spanning a busy state motorway in Germany. Using SPS Overlay to strengthen the bridge deck ensured the existing structure was retained and additional work on the superstructure was avoided. Disruption to traffic was kept to a minimum and the whole bridge deck was reinstated in just five weeks.

“SPS Overlay technology has proved to be an effective refurbishment measure to make steel deck bridges fit for modern traffic.”

Prof. Dr.-Ing Markus Feldmann, RWTH Aachen University



CASE STUDY

Schönwasserpark Bridge



CASE STUDY

Dawson Bridge



The Dawson Bridge is a 100 year old, 5 span truss bridge that forms an important link across the North Saskatchewan River running through the centre of Edmonton, Canada. SPS Bridge Decks were selected as the alternative that offered the simplest, quickest installation that minimized truss strengthening and provided another 100 years life for the bridge deck.

“The SPS Bridge Deck allowed the entire project to be completed months faster and millions of dollars less expensively than a traditional concrete deck.”

Jeff DiBattista, Principal, Dialog

SPS can be used in military and civil applications to reduce vulnerability and to increase survivability and safety. SPS is a lightweight alternative to stiffened plate and reinforced concrete with built-in fire protection and vibration damping as well as energy absorbing properties that enhance the blast, ballistics and impact resistance of structures.



Blast tests carried out at US Navy's Naval Surface Warfare Center (NSWC) demonstrate how SPS absorbs more blast energy, reduces risk of premature rupture and limits fragment penetration. The conventional steel panel (left) is ruptured by the blast while the SPS panel (right) absorbs the energy and deforms without rupture.



Tests carried out at the UK MoD's Defence Evaluation Research Agency (QinetiQ) showed that SPS stops projectiles at shorter strike ranges and higher angles of attack. SPS reduced risk of penetration by 75% compared with equivalent all steel structure.

The benefits of using SPS include:

- Lighter, stiffer, simpler structures with improved fatigue and corrosion resistance, more internal space and permanently smooth external surfaces
- Superior blast protection, transferring less energy to supporting structures and reducing risk of rupture
- Increased protection from projectiles at shorter ranges and higher angles of attack
- Built-in fire protection
- Reduced structure-borne noise and vibration signature
- Greater resistance to high energy impacts including groundings, collisions and falling objects

Example applications:

SPS protection can be incorporated into new designs, prefabricated for on-site installation or retrofitted as an SPS Overlay to existing structures.

- New build designs automatically incorporate full range of protection benefits wherever SPS is used as structural material
- Optimised designs where structures have specific requirements, e.g. high point loads on flight decks; reduced vulnerability on amphibious craft
- Retrofitted blast belt applied as additional protection above and below water-line or to provide impact protection for side shells of offshore structures
- Blast walls in refineries or vulnerable public buildings
- Crash decks (during construction) and permanent blast and impact resistant flooring structures



SPS Overlay for pontoons of drilling rig is able to absorb impact of 3 tonne drill collar falling from height of 37 metres without rupture.



SPS impact test dropping 2 tonne rocks from 3 metres onto a section of SPS deck. SPS sustained no damage; the all-steel equivalent was destroyed.



SPS impact test - sharp point-load on a 2 tonne sled striking SPS plate at 5m per second. SPS sustained minor indentation; the all-steel alternative was punctured through.



Tests carried out at the Danish Institute of Fire Technology (DIFT) show un-insulated steel structure red hot (left) after 60 minutes at 945°C vs. maximum temperature for SPS of 38°C (note the bare feet).



CASE STUDY

SPS Citadel Access Protection



Citadel protection is a proven concept that has a successful track record for protecting ships and crew from piracy. The internationally recognized Best Management Practice to Deter Piracy in the Gulf of Aden and off the Coast of Somalia recommends that a "Citadel is designated and lock-down procedures rehearsed to delay access to ship controls and buy time".

SPS Citadel Access Protection delays and deters entry to the safe refuge. Once installed, the SPS barrier creates a detail free surface that can be rapidly deployed within 2 minutes. When closed, the SPS panels create an extremely strong barrier that can withstand far higher impact loads than equivalent steel structures with superb blast protection against ballistics and shrapnel damage.

sustainability

SPS delivers a more sustainable, long term alternative to conventional steel and concrete when measured against key indicators including environmental, social and economic impact.



The steel and PU components of SPS can be readily recycled into high grade materials

SPS products offer important benefits in sustainability and the reduction of environmental risk in the construction and shipbuilding industries. These include increased structural efficiency and reduced use of materials and resources in construction. In service SPS structures are less vulnerable to damage, require less maintenance and have a longer service-life. SPS is easily recycled and, unusually for heavy engineering materials, SPS is easily reused. This means that SPS structures can also yield lower through-life emissions and a smaller carbon footprint than conventional concrete and steel structures.

- Potential for 100% reuse or recycling of all SPS materials
- Reduction in other construction materials and resources
- Off-site prefabrication reduces on-site disruption

- Reduced maintenance and increased service-life
- Increased safety and reduced environmental risk

Shipbuilding

SPS can improve sustainability and reduce the environmental impact of the construction and operation of ships in several ways. SPS requires less steel, welding and coatings to produce. SPS structures are less susceptible to fatigue and corrosion thereby increasing service-life. They are less vulnerable to accidental and extreme impact events thereby reducing the risk of environmental damage. SPS designs have the potential to allow for increased cargo volumes, resulting in proportionally fewer vessel movements, less fuel consumed and reduced risk.



SPS Floor panels are bolted into position and can be as easily unbolted for reuse at the end of a structure's life

Construction

Incorporating SPS in a building can improve its sustainability performance and rating with BREEAM and LEED. SPS Terraces and SPS Floors have been developed for 100% reuse. At the end of a structure's life SPS Terraces and SPS Floors can be dismantled and, unlike comparable concrete products, can be reused in new buildings without any additional processing. Alternatively at the end of their life the SPS panels can be recycled into new SPS and other high grade materials.

An independent study completed by Decarbonize concluded that reusing SPS can reduce the carbon footprint of a whole building by 10-20% compared with using concrete.

Using SPS also contributes to:

- 25% reduction in the overall weight of materials used in a structure
- 70% reduction in truck movements
- A reduction in site waste
- Safer on-site working practices resulting in fewer accidents and injuries



Building with SPS can reduce truck movements by 70%

Reinstatement and Conversion

In the repair or strengthening of ships and bridges, SPS Overlay incorporates – rather than cutting out and replacing – the existing structure, thereby reducing the quantity of new steel used by up to 75%. The process uses much less welding and is much less labour intensive in what are typically hazardous conditions. SPS Overlay requires a fraction of the time needed for conventional repairs and, in the case of bridges, can be completed with only partial closure, thereby substantially reducing the disruption to traffic.

Ongoing initiatives

IE continues to explore opportunities to further develop the sustainability benefits of SPS, including:

- Minimizing the full life emissions of a building
- Working with architects and engineers to design structures that capitalise on the potential to reuse SPS products
- Working with suppliers to maximize the recycled content in all SPS products and applications

intellectual property and approvals

Intellectual property

- The SPS intellectual property (IP) pool currently comprises 84 different groups of patents filed across 85 jurisdictions
- The scope and effective life of the IP pool are regularly expanded and increased. New patents added by IE, BASF and licensees presently extend the life of the pool to 2030
- IE and its partners and licensees, including BASF and DSME, are jointly responsible for maintaining and defending the SPS IP pool
- 'SPS' is a registered trademark of Intelligent Engineering

Regulatory approvals

- SPS applications have been granted approvals by Lloyd's Register, Det Norske Veritas, Germanischer Lloyd, Bureau Veritas, China Classification Society, American Bureau of Shipping, Russian Maritime Register, Korean Register of Shipping, Indian Register of Shipping and ClassNK. These classification societies account for over 80% of the global fleet
- Lloyd's Register published the first rules for the design of SPS structures, which are now being refined in collaboration with DSME. China Class has also published design assessment standards. Similar programmes are underway with other classification societies including DNV and GL. These allow owners and designers to specify SPS for repair and construction and enable SPS to be used directly by the global community of naval architects and marine engineers
- SPS Overlay is accepted by RightShip as a means of repair that meets their Condition Assessment Program (CAP) requirements
- SPS Bridges have been approved and are in use in Germany, Canada, the USA, China and the UK
- In 2009 SPS Terraces were Certified by BRE (BPS 7007), UL Listed and "Code-prescribed" under the New York City Construction Codes
- SPS Floors have completed certification testing at the UK's Building Research Establishment (BRE) and have UL Listed fire ratings. Equivalent approvals are pending in other jurisdictions





Global Reach – more than 200,000m², 260+ projects and approved by the major classification societies



industry partners

SPS technology has been developed and commercialised in collaboration with leading designers, fabricators and regulatory authorities in the maritime and civil engineering sectors. These long term partners provide the platform for SPS increasing its profits, activities and projects in many international markets.

The continuing support of these parties is secured through partnership agreements and a network of licensees. These agreements deliver market access and capacity for the fabrication of SPS plates, in addition to technical expertise and the reliability of execution of SPS projects in the field. SPS licences ensure that both current and future SPS patents are controlled by IE and are available to all licensees. This network of strategic partnerships is being extended by application and by region.

BASF

IE and BASF jointly developed the core material for the SPS technology. An exclusive agreement provides for continuing collaboration in research and development and the joint prosecution and maintenance of intellectual property rights.

Daewoo Shipbuilding and Marine Engineering Co Ltd (DSME)

In keeping with a strategy of partnering with the market leaders capable of transforming industries, IE has formed a joint venture, SPS Marine Technologies Ltd, with DSME to bring SPS technology into mainstream shipbuilding.

SPS Partners and Licensees

IE has licensed a number of service providers to deliver SPS, while continuing to maintain an IE field team to support the execution of specialist projects.

These include:

- Cemilas
- Clarkson Technical Services
- DSME
- Eiffel Deutschland
Stahltechnologie GmbH
- Harris Pye
- Keppel
- SMT
- SRC
- Walters Inc

SPS Customers

SPS is used by market leading companies in the maritime and offshore sectors including:

- BP
- Exxon Mobil
- MWNY
- P&O
- Petrobras
- Prosafe
- SBM
- Schuff
- Shell
- Siemens
- Starbulk S.A.
- Stena
- Southern Bleacher

SPS in Construction

IE is working with market leading architects, engineers and specialists including:

- AECOM
- Arup
- Bovis Lend Lease
- Buro Happold
- Charles H Thornton
- Franklin Sports Business
- Gardiner and Theobald
- John Sisk
- Mott MacDonald
- Populous
- Walls
- Walter P Moore
- WSP
- Tishman

company information

SPS was invented by Dr Stephen Kennedy following years of primary research in the field of ice-strengthened structures. Intelligent Engineering was established to develop and commercialise SPS technology and now licenses the use of SPS to market leaders by application and by region.

IE's team of over 50 professional staff work from offices in Europe, North America and Asia. Supervised by IE Holdings Ltd, the management team is supported by an operating board of directors and Advisory Board made up of leading experts and businessmen.

Operating Management Team and Directors



Michael Kennedy
Chief Executive Officer (CEO)



Dr Stephen Kennedy
Chief Technical Officer (CTO)



John Stallabrass
Chief Financial Officer (CFO)



Dr David Wilbraham
Chairman of Advisory Board



Sir Bruce MacPhail
Non-executive Director



Ton Voorham
Non-executive Director



Jen Geddes
Non-executive Director



Martin Brooking
Director, SPS Shipbuilding



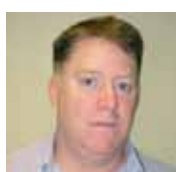
Leonard Chia
General Manager, SPS Asia



Rob Duffin
Director, SPS Overlay



Tim Kennedy
Director, Operations



Scott Kent
Director, Civil Engineering (UK)



Dr Neil Little
Director, Materials & Intellectual Property



Robert Maier
President, SPS Canada

advisory board



IE Management Team and Advisory Board pictured on the new terrace at Ascot Racecourse (2007) - Left to Right: Dr. Neil Little, John Ferguson, Dr Stephen Kennedy, Dr Roger Dorton, Sir Frank Lampl, Martin Brooking, Stuart Rolland, Jake Ulrich, John Redwood, Denis Welch, Prof Chengi Kuo, Dr Tom Murray, Dr Laurie Kennedy, Jeremy Lloyd, Guy Turner, Dr David Wilbraham, Dr Doug Wright, Sir Bruce MacPhail, Dr Peter Cheng, Michael Kennedy. Absent: George Blake, Tim Kennedy, Nicholas Lykiardopulo, Sir John Parker, Anthony Williams. New Members: Professor Yingqiu Chen, Dr Harlan Ullman.

Advisory Board Members

George Blake

Former EVP of Maritime Overseas Corporation

Professor Yingqiu Chen

Executive Vice Chairman of the Technical Consultation & Appraisal Committee of the China Classification Society (CCS)

Dr Peter Cheng

Member of ABS, Lloyd's and NK Hong Kong Committees and Chinese SNAME

Dr Roger Dorton

Former VP of the International Association of Bridge and Structural Engineering

John Ferguson

Former Deputy MD of Lloyd's Register

Dr Laurie Kennedy

Professor Emeritus of Civil Engineering, University of Alberta

Professor Chengi Kuo

Research Professor at the University of Strathclyde

Nicholas Lykiardopulo

Fellow of the Institute of Chartered Shipbrokers

Sir Bruce MacPhail

Non-executive Director of IE Ltd and former Managing Director of P&O and Chairman of P&O Property Holdings

Dr Tom Murray

Inaugural Montague-Betts Professor of Structural Steel Design at Virginia Tech

Sir John Parker

Chairman of National Grid Transco plc and non-exec Director of Carnival Cruise Corp Inc and Carnival plc
Past President of RINA

Rt Hon John Redwood MP

Former Cabinet Minister. Former Director of NM Rothschild and Chairman of Norcross plc

Dr Harlan Ullman

Senior Advisor to NATO's Supreme Allied Commander Europe and former professor of military strategy at US National Defense University

Jake Ulrich

MD of Centrica Energy and founding partner of Dynergy

Dr David Wilbraham

Chairman of IE Advisory Board. Former roles include CEO and Chairman of Hickson International plc, Chairman of Akers Bioscience Inc, Governor of Imperial College

Anthony Williams

Partner in DLA Piper and former Chairman of Coudert Brothers

Dr Douglas Wright

President Emeritus of University of Waterloo



SPS Bridge Deck panel in production

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