

impact

THOUGHT
LEADERSHIP
FROM



SPRING 2018 | ISSUE 07

INSIDE STORY
welcome to the ISEA
standard for back-of-hand
impact protection

BOOSTING BUSINESS
top tips for
effective innovation



HELPING HANDS

how D30 is protecting workers in the world's toughest environments

CONTENTS

impact magazine

THOUGHT LEADERSHIP FROM D30

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4 **WHEN THE GOING GETS TOUGH...**
D30 is developing protection for workers in some of the world's harshest environments. We find out about a new glove designed specifically to meet the needs of the offshore oil industry

7 **BUILDING SUCCESS**
D30's CEO Stuart Sawyer explores what turns a good idea into great business, as part of a new UK government report into the innovation economy

9 **THE BIG ISSUE**
A long-awaited ISEA standard for back-of-hand impact protection is nearly here. Lucie Ponting welcomes its arrival into a fast-expanding, multi-million dollar market

17 **CROSSTALK**
Industry experts discuss how the new ISEA standard will help safety specialists make more informed purchasing decisions

18 **DIGGING DEEP**
Hands and fingers can take a hammering in the mining industry. Construction aggregate producer Luck Stone took part in a wear trial of gloves containing D30 Impact Additive

20 **A DAY IN THE LIFE OF D30**
Senior material developer Jonathan Needham gives *Impact* a glimpse into his role in turning innovative ideas into market-defining products

23 **A STORY OF GLOBAL SUCCESS**
From major sporting events to the phone in your pocket, we take a visual look at how pioneering D30 products are changing the game worldwide



WELCOME

STUART SAWYER, CEO, 

At D3O our aim and mission is to protect what matters – and what matters to us is you and your workforce. In this edition of *Impact* magazine we explore just how we go about developing, engineering, designing and testing in some of the toughest and most challenging environments.

Working with global, world-class companies that supply the oil, gas, mining and construction industries, we apply our extensive research and innovation departments to developing products to protect the most precious resource of any business: its people.

Our protective solutions not only set new standards, they also create new levels of expectation. As a company which first came to prominence in the sporting arena, creating protection for the US and Canadian ski teams with the pioneering use of D3O soft armor in their race suits for the Winter Olympics, it's appropriate that we think of workers as 'industrial athletes'. This means applying the same mindset, advances in materials science and solutions that enable and enhance performance, whether for the Olympic Games, on an oil rig or construction site, or literally at the coalface.

Workers need comfort and dexterity as well as protection. An investment in personal protective equipment (PPE) that is high quality and truly fit for purpose will be amply repaid through greater productivity and performance, and lower accident rates.

We firmly believe that innovation transforms ideas into value, and our new D3O® Impact Additive is a pioneering ingredient designed to revolutionize back-of-hand thermoplastic rubber (TPR) impact performance. TPR is widely used by industrial glove manufacturers; instead of increasing protection by making parts stiffer or thicker, D3O® Impact Additive technology can be blended into existing TPR processing and manufacturing techniques. Manufacturers can deliver improved protection without compromising on comfort or dexterity, and still use their existing material, tooling and supply lines.

We are delighted to be supporting, chairing and playing an integral part in the development of the new International Safety Equipment Association (ISEA) standard for back-of-hand impact protection, which is expected to be published by the end of 2018. With no government-mandated requirement for manufacturers to test impact protection,

nor any voluntary standard, PPE procurement professionals in North America have lacked a reliable way to evaluate and assess the quality of the impact protection available in a market that is reckoned to be worth more than \$100 million annually. Our experts in materials, engineering and testing have been part of a collective endeavor across the industry to develop a much-needed standard that will enable customers to make more informed purchasing choices.

The story behind the standard is just one of the features in this edition, which shows just how science and innovation work together to create unique and trusted technologies that deliver superior protection for our worldwide partners and their people. I do hope you enjoy the read.

**MANUFACTURERS CAN
DELIVER IMPROVED
PROTECTION WITHOUT
COMPROMISING ON COMFORT
OR DEXTERITY, AND STILL USE
THEIR EXISTING MATERIAL,
TOOLING AND SUPPLY LINES**

FEATURE
SUPERIOR PROTECTION



HANDS IN GLOVE

IN THE OIL AND GAS INDUSTRY, HAZARDS ARE PART OF WORKING LIFE – WITH OPERATIVES’ HANDS PARTICULARLY VULNERABLE. *IMPACT* REPORTS ON A NEW PRODUCT COMMISSIONED BY SHELL AND DEVELOPED BY SUPERIOR GLOVE SPECIFICALLY TO PROTECT OFFSHORE WORKERS



The hard-working hands of an offshore oil worker are as routinely exposed to risk as the delicate digits of a concert pianist. Even with the best safety protocols, crushing, pinching, cuts and punctures can happen when handling and moving heavy pipes and equipment at a hectic pace. According to the International Association of Drilling Contractors, more than 40 per cent of all recordable incidents in the US oil and gas industry in 2015 affected the hands, wrists, fingers or thumbs. More than 38 per cent led to lost time.

The kind of gloves worn in other industries don't come close to meeting the needs of workers involved in oil and gas drilling, transportation, construction and refining. Back-of-hand impact protection, arc flash protection and secure grip in oil are just some of the requirements. "For example, a worker needs to be able to

pick up a 50-pound wrench covered in oil without it sliding out of their hands," says Chris Garrels, oil and gas specialist for Superior Glove.

"Large drilling contractors now understand the importance of glove selection and pick the glove appropriate for the job," adds Garrels. However, that hasn't always been the case. "Thirty years ago, most workers on drilling rigs didn't have a choice for gloves. In Texas and other parts of the world where there is oil exploration, they were issued a pair of black PVC-dotted cotton gloves. These were only available in a few sizes and didn't stretch so they were really uncomfortable.

"Until recently, it was uncommon for anyone to ask for cut-resistant gloves when working on a rig. Most companies now implement minimum cut and puncture standards, although most hand injuries actually occur when someone isn't wearing gloves.

"In 2010, anti-impact gloves became commonly used for drilling in the oilfield. Part of the struggle was to educate safety professionals about why they shouldn't just buy the cheapest pair of gloves. Companies had to realize the value of spending more money to better protect their workers."

Too many businesses tended to overlook the true cost of injuries, including direct costs such as compensation payments, medical and legal expenses, and indirect costs including replacement employees, accident investigation, lost productivity and even penalties for legislative breaches.

"Though the initial cost of buying a better product was more," Garrels explains, "the benefit was a reduction in hand injuries and a reduction in liability due to these injuries. When we started incorporating D3O® into back-of-hand protection, it was the next big step in the evolution of hand protection for drilling gloves.

"Companies now take hand safety seriously and some even have requirements that gloves are to be kept on when the employee is going to a vending machine to get a new pair of gloves."

GAME-CHANGING TECHNOLOGY

Shell UK are one such company taking the well-being of their workers very seriously indeed. Two years ago they approached Superior to develop a glove for oil workers that would set a new benchmark for protection in a fast-developing sector.

"As a forward-thinking organisation wanting to give their employees the best possible personal protective equipment, Shell were seeking cutting-edge technology," recalls Graham Ayers, Superior's Sales Manager – Europe & Middle East.

"Their key requirements were D3O® impact protection, with great attention to the size and positioning of bumpers; high cut resistance; comfort and flexibility; and liquid repellance. Conventional waterproofing would have made the glove too bulky, so the solution was a double dipped 3/4 nitrile coating. We checked it worked by putting the prototypes in the North Sea and none of the guys complained about getting wet!"

"Businesses in the oil industry are constantly striving for efficiency and cost-effectiveness," says Neil Henderson, Area Manager Scotland for Beeswift, who are Superior's European distribution partner. "It's no surprise that this glove is already attracting attention from other offshore service companies."

Superior's Chris Garrels concurs, stating that the introduction of D3O® technology into impact protection has been "a game changer. If you can get a glove that gives up to 50 per cent better impact protection than what's currently on the market, it's the difference between a trip to the hospital with a broken finger and the ability to continue working." ▶

"A GLOVE THAT GIVES UP TO 50 PER CENT BETTER IMPACT PROTECTION THAN WHAT'S CURRENTLY ON THE MARKET IS THE DIFFERENCE BETWEEN A TRIP TO THE HOSPITAL WITH A BROKEN FINGER AND THE ABILITY TO CONTINUE WORKING"

A LABOUR OF GLOVE

SUPERIOR'S STAG NFC D30 GLOVE HAS BEEN DESIGNED SPECIALLY TO PROTECT OFFSHORE OIL WORKERS

IMPROVED RESISTANCE TO OILS AND OTHER LIQUIDS FROM 3/4 NITRILE COATING

D30® ELASTOMER PROTECTS FROM KNOCKS BY ABSORBING AND DISPLACING ENERGY

MAXIMUM COMFORT AND PROTECTION FROM STRATEGICALLY PLACED D30® ACROSS FINGERS AND BACK-OF-HAND

SUPERIOR GRIP IN BOTH WET AND DRY CONDITIONS FROM TEXTURIZED MICROPOROUS NITRILE OVERLAY ON THE PALM



MATERIAL REINFORCEMENT BETWEEN THUMB AND FOREFINGER REDUCES WEAR AND EXTENDS THE LIFE OF THE GLOVE

"I USED THE GLOVES AROUND A TEST BED INSTALLATION PROJECT WHICH REQUIRED A LOT OF NUT AND BOLT MANIPULATION. DEXTERITY WAS INCREDIBLE AND PERFORMANCE WAS TOP NOTCH. THERE WERE PLENTY OF HAZARDS: SHARP EDGES, HOT METAL, DRILL BIT SHAVINGS AND A FEW OTHERS. THE GLOVES PROTECTED MY HANDS IN ALL CONDITIONS AND I'M CONTINUING TO USE THEM AS MY DAILY HAND PROTECTION FOR ROUTINE MAINTENANCE TASKS."

(DAVID, ELECTRICIAN)

RETHINKING THE FUTURE

INNOVATION IS THE BENCHMARK THAT COMPANIES NOW WANT TO BE JUDGED AGAINST, ACCORDING TO A NEW REPORT FROM THE UK'S DEPARTMENT FOR INTERNATIONAL TRADE

Innovation doesn't care about national boundaries,' states the foreword to 'Great Minds: Rethinking the Future Together', published in March 2018 by the UK government's international trade body. 'When a good idea exists in one country, it can spread far and wide. A collaborative agenda combined with a genuine commitment to innovation can transform the shape of a business on multiple levels.'

D3O's CEO Stuart Sawyer contributed to the report, which captures some of the thinking that has seen D3O make market-defining, high performance impact protection products.



OPEN UP FOR MAXIMUM INNOVATION BY STUART SAWYER, CEO, D3O

Open communication is key. In a quest to design helmets for US soldiers that significantly increase brain trauma protection without sacrificing comfort or adding extra weight, we joined forces with 3M.

3M worked on creating a new shell and tasked us to work in parallel to create the helmet liner solution. They tested our developments and gave feedback, which we would take into the next-generation versions.

If we were failing, 3M would tell us frankly. And if they saw something in some of the data and results that looked promising, they would focus in on it. The result was they won

the contract to deliver the new helmet, and we won the contract to deliver the pads.

Ensuring that both parties have the same appetite for risk is important.

We now ask potential partners, before entering an agreement, about their appetite for continuing a project if it does not succeed at first.

We have fallen foul of that and put a lot of energy into something, but when the first solution didn't deliver expected or hoped-for results, it was killed. I would rather go into partnership with a company that was going to be open and honest with me, so

we ask the tough questions upfront now, to gain a deep and thorough commitment – that kind of trust breeds success.

Innovation can come from unexpected directions. We have tried to force innovation in the past, with innovation people and an innovation room, but it's 24/7 and can come from anywhere.

We've now developed an open ideas culture so that anyone from test engineer to sales person to someone in finance can share their ideas. We recognise that you're just as likely to have those ideas in the bar as in the office. ▶

WHAT TURNS A GOOD IDEA INTO GREAT BUSINESS? A NEW REPORT OFFERS SIX KEY PRINCIPLES FOR EFFECTIVE INNOVATION

1. NO MORE INNOVATION FOR INNOVATION'S SAKE

From creatives to manufacturers, companies are keen to showcase innovation as a symbol of their success, growth and momentum. Lack it, and they risk being seen as failing. But if they pay lip service to innovation without any deeper corporate belief or involvement, they will fall short. Many companies that emphasise their innovation simply come up with ideas to solve problems that do not exist; without an end goal or objective, the innovation is redundant.

Others describe themselves as innovative but do not adopt a proper strategy, which means they cannot practise what they preach. Without a strategy, innovation is just a buzzword.

2. GENUINE INNOVATION SOLVES GENUINE PROBLEMS

Truly innovative companies are a breed apart. They understand that genuine innovation means applying new or existing products to real-world issues. The innovative step lies not in the product itself, but in its application and its impact. If it doesn't provide a solution that benefits the customer, then why do it?



3. CREATIVITY STARTS WITH PEOPLE

Talent is the bedrock of any organisation and having the right people on board is fundamental to an innovative culture. Once established, this culture must be nurtured through greater autonomy and ownership of ideas. Innovation and idea generation need to be woven into the fabric of the organisation with each person feeling like they can play their part.

Innovation must also come from the top and percolate down through the organisation. Without a wholehearted company commitment, innovation becomes stitched into one person's job title without endorsement from the board – and becomes little more than a soundbite. Furthermore, the danger of assigning innovation to one person or department is that it sits in a silo.



4. OPEN SHARING BOOSTS PERFORMANCE

Encouraging open sharing of ideas not only means that learnings are not lost, it can enhance performance. A study of 1,100 companies by the Institute for Corporate Productivity and Professor Robert Cross of Babson College in Massachusetts found

that those promoting collaborative working were five times more likely to be high performing. The risks of not encouraging open sharing were losing ideas – and also losing the people who had them.

5. CAPITALISING ON IDEAS MEANS MIXING UP SKILLS

Innovative teams are eclectic. It's not always the people who conceive the ideas who are most capable of envisaging that concept at scale or working out how it can become a future driver of growth and profitability. There needs to be a diverse mix of skills on hand, including someone who is happy to accept that failure is part of innovation. Try something and if it doesn't work, the quicker you know and the quicker you can try something else.



6. LISTEN IN – AND FILTER OUT THE NOISE

If the first step is to establish a way to source ideas, the second is to listen. Listen to technology innovations, social innovations, environmental innovations, pressure groups, scientific groups, other businesses and others in your marketplace.

However, it is important to be selective. You've got to distil all those facts and figures, and often conflicting information. Otherwise, you could be infinitely busy just meeting people.

Extracted from 'Great Minds: Rethinking the Future Together': www.events.trade.gov.uk/the-great-festival-of-innovation-hong-kong-2018/page/great-minds-report/

the big issue

Raising the Standard

with no government-mandated requirement for manufacturers to test impact protection, nor any voluntary standard, safety and personal protective equipment (PPE) procurement professionals in north America have lacked a reliable way to evaluate and assess the quality of the impact protection offered.

now, a new us voluntary standard from the international safety equipment Association is on track for publication by the end of 2018, creating clarity for both manufacturers and end-users.

A special report by Lucie Ponting

The bones and soft tissues in the back of the hand are all vulnerable to impact injuries, which are common in industries as varied as oil and gas, construction, mining, manufacturing, warehousing and transport.

To protect workers from impact hazards, personal protective equipment (PPE) manufacturers produce a wide range of gloves with new designs and materials constantly entering the market. Most of these gloves include some sort of performance claims but to date there has been no commonly agreed performance standard or test method for dorsal (back-of-hand) impact protection gloves in North America.

"Many people mistakenly believe that hand impact injuries affect a narrow range of industries, such as the offshore oil and gas sector, mining and construction," says Rodney Taylor, global sales and marketing manager for industrial PPE at D3O. "In reality, impact-related injuries can vary from a bump or bruise to severe bone fracture and everything in between. This means that hand impact protection is a very broad-based market."

In North America, the absence of any government-mandated requirement for manufacturers to test impact protection, as well as the lack of a voluntary standard, has left safety and PPE procurement professionals without a reliable means to evaluate and assess the quality of the impact protection offered. At best, this

'Throughout the standard's development, the working group has been determined that the end result will be simple, practicable and easy to understand'



results in market confusion; at worst, it can result in under- or over-specification of gloves, incurring unnecessary expense or leaving workers vulnerable to injury.

CREATING A MARKET FIRST

Work on the *ISEA 138 standard for performance and classification for impact resistant hand protection*, which has been underway since 2016, has been carried out by a specialist sub-group of ISEA's long-established hand protection group. The impact standard working group includes seven major glove manufacturers, as well as materials experts D3O and input from a physician who specializes in plastic and reconstructive hand surgery.

There is a hand protection standard in North America. However, the existing *ANSI/ISEA 105: 2016, American National Standard for Hand Protection Classification* covers cut, abrasion, tear and puncture performance, but does not address impact. Until recently the European industrial gloves market was in a similar position. This changed in 2016, however, with revision of the EN 388 glove standard. *EN 388: 2016 Protective gloves against mechanical risks* included a first-ever impact testing element.

A new US voluntary standard from ISEA (International Safety Equipment Association – an American National Standards Institute [ANSI]-accredited standards developing organisation) has developed the first-ever industrial glove performance standard. The new standard

aims to improve on the fairly limited treatment of impact performance recently incorporated into the main European hand protection standard, EN 388. This new standard is on track for publication by the end of 2018.

"This standard takes its cues from an existing motorcycle impact standard for hand protection," explains D3O's Taylor. "The ISEA 138 standard, by contrast, is specifically designed for industrial gloves and the special protection they offer to workers."

"When we started building gloves for the oil and gas industry, they asked us whether there was a standard for impact but, at that time, there was only a motorcycle standard in Europe," recalls Brian Lunniss, director of research and development at industrial glove manufacturer Mechanix Wear. ▶

OCCUPATIONAL INJURIES INVOLVING DAYS AWAY FROM WORK IN 2016 (SOURCE: US BUREAU OF LABOR STATISTICS 2017)

892,270 TOTAL DAYS AWAY FROM WORK

317,530
SPRAINS, STRAINS AND TEARS

283,900
INJURIES TO UPPER EXTREMITIES

79,530
FRACTURES

76,950
BRUISES AND CONTUSIONS

FILLING THE GAP IN STANDARDS

"The back-of-hand impact protection market for the industrial area has really exploded in the last eight years," explains Paul Harris, VP of product strategy and innovations at PPE experts MCR Safety. "That global category is now probably worth more than \$100 million in annual revenue. There's that much product in circulation yet it's alarming to think that outside the current European standard, there is no US-based standard to help measure the performance values of any of those products from an impact dissipation perspective."

The expansion of the impact gloves market has partly been driven by technological advances in materials available. "With the wide assortment of materials now being used in the market – different types of foam, such as EVA (ethylene vinyl acetate), and TPR (thermo-plastic rubber) and silicones and especially proprietary materials like D3O – we need some kind of measuring stick for the performance aspect because different materials and thicknesses will perform differently," says Harris.

"Taking one example, a wide range of materials are used in gloves claiming to provide impact protection, many of which come under the umbrella term TPR," adds Taylor. "Yet TPR is a generic term encompassing a broad range of materials,

so gloves may all be labeled TPR but have very different performance attributes."

The main consequence of the lack of any useful 'measuring stick' is to reduce the ability of end-users to choose the right protection for their workforces in a cost-effective way. "For employers, there seems to be an automatic go-to question: 'Does this product meet a standard?'," says Cristine Fargo, ISEA's director of membership and technical services. "They want to know, first and foremost, what does this mean? So if they have a document they can refer to, they have some confidence that at least there is a minimal level of performance a product is going to offer for a particular hazard."

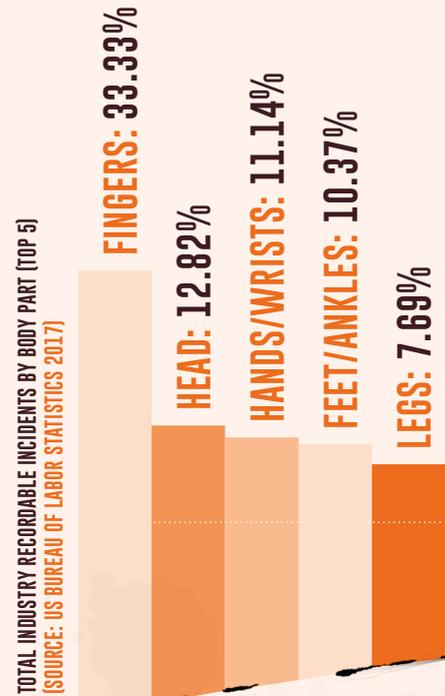
PROVIDING CHOICE AND FLEXIBILITY

The proposed ISEA 138 standard will provide industry-accepted test criteria to measure how different dorsal impact protective gloves reduce peak impact force across the hand. It will be a standalone document focused on impact performance, but it aims to complement the cut, abrasion, puncture and tear components of the existing *ANSI/ISEA 105: 2016* document.

The planned standard will:

- define an agreed test method;
- include three defined performance levels;
- specify a pictogram mark for each of the levels for compliant gloves; and
- require that product be tested in a laboratory having a certificate of accreditation meeting the requirements *ISO/IEC 17025:2017, General requirements for the competence of testing and calibration laboratories*.

Unlike EN 388, which specifies pass or fail for impact, the three levels should give greater choice and flexibility to the end-user. "The levels are designed to help the end-user make choices that meet the needs of their workforce and are appropriate to the level of hazard or risk they encounter," says



“Impact-related injuries can vary from a bump or bruise to severe bone fracture and everything in between. This makes the hand impact protection sector a very broad-based market”

RODNEY TAYLOR, D3O



Taylor. "The standard will provide a reliable, evidence-based starting point to which end users can then apply all the variables affecting their specific workforce, tasks, working environments and budgets."

PREVENTING REAL-LIFE INJURIES

EN 388 only covers the knuckles but the new standard will include knuckles and fingers, which is critical for industrial glove users where the fingers are frequently at risk. Harris is particularly pleased that 138 plans to test fingers, and multiple places on the fingers, because this reflects how the end-user really experiences workplace injuries.

The oil and gas sector, which is a large user of impact protection gloves, has collected figures through the International Association of Drilling Contractors showing that in 2016 the fingers remained the most vulnerable part of the body in terms of both

lost time and recordable injuries. Injuries to fingers accounted for one-third of all total recordable injuries and almost 20 per cent of lost time injuries. Meanwhile the hand/wrists accounted for around 11 per cent and 10 per cent respectively.

Because the working group was keen to ensure the final standard was accurately aimed at reducing the most common impact injuries at work, it brought in Dr Lloyd Champagne, a surgeon based in Phoenix, Arizona, who focuses on plastic and reconstructive hand surgery. His role was to advise on the real-life injuries he sees in hand trauma practice. "The technical detail of glove making is not what I'm about," he says. "I helped the group focus on what the standard should be in terms of what part of the anatomy the gloves are really trying to protect and to help them understand the clinical targets, whether the fingertip or finger or hand or wrist. I

also tried to help in understanding the magnitude of protection that is needed."

"As far as what anatomy in the hand is most vulnerable," says Champagne, "the two main problem areas are the fingertips, which are very commonly injured because they are the part that is universally in contact with everything, and the big knuckles, which are frequently impacted by things such as wrenches slipping or people catching their hands under the hood of a car."

GIVING MEANING AND ADDING VALUE

Throughout the standard's development, the working group has been determined that the end result will be simple, practical and easy to understand. "We have a common goal of creating an applicable standard that is understandable and can be replicated in labs worldwide," ▶



adds Harris. "We wanted this to be very clear for the people using it, along with the labs that will be performing the test."

"If you make it too complicated or too hard to implement, and there are other standards out there that are very complicated and hard to understand, then all of a sudden it doesn't have the same value," says Vincent Kruiniger, general manager at PPE manufacturer Majestic Glove. "If you make it simple, easy to understand and to implement, and clear that it protects workers' hands

– based on the performance of materials and coverage – then the value will continue to increase."

ISEA has a similar perspective. "Everyone wants to be able to write and design something that people are going to use," says Fargo. "At the end of the day, that standard has to be accepted in that marketplace. We want it to have meaning to manufacturers – and product performance standards tend to become blueprints for product design – and we want to add value to the end-user or employer trying to protect workers."

agencies and representatives from the end-user community. If the next steps stay on schedule, Fargo estimates that the standard should be published by ANSI by the end of 2018.

Once this happens, it will be up to the industry to inform and educate end-users about what it means, how to differentiate between different products and levels of protection, and how it will help improve workplace protection. "Ultimately worker safety is the most important thing," stresses Harris. "And we think this standard will shine a spotlight on the true performance levels of impact gloves and allow them to make a more educated decision." ■

"worker safety is the most important thing. And we think this standard will shine a spotlight on the true performance levels of impact gloves"

Paul Harris, MCR safety

SHINING A SPOTLIGHT ON PERFORMANCE

The draft standard is still working its way through the development process, which will include a final vote by an external group of industry stakeholders that incorporates test labs, subject matter experts, manufacturers, government

THE COST OF OCCUPATIONAL INJURIES IN 2015 (SOURCE: NSC INJURY FACTS 2017 EDITION)

\$45.8 BILLION
WAGE AND PRODUCTIVITY LOSSES

\$31.4 BILLION
MEDICAL COSTS

\$46.1 BILLION
ADMINISTRATIVE EXPENSES

\$11.3 BILLION
EMPLOYERS' UNINSURED COSTS

\$7.9 BILLION
OTHER



"They are taking a real look and spending a lot of time and money out of their own pockets to come up with a noble objective ... doing something that is really uplifting in stewardship of their businesses."

Dr. Lloyd Champagne

WORKING TOWARDS A NOBLE OBJECTIVE

The working group developing the ISEA 138 standard includes the major manufacturers in the impact protection gloves market, as well as D3O in its role as materials experts. All those involved believe the degree of collaboration and agreement within the group reflects the market's appetite for change and will be critical to the standard's final success.

"Through ISEA we have essentially been working with some of our fiercest competitors to produce the standard," explains Paul Harris, VP of product strategy and innovations at PPE manufacturer MCR Safety. "And it has been refreshing to sit down with the others and work towards a common goal: everyone putting their own self-interests aside in trying to produce a well-received standard. At the end of the day, what everyone wants to do is to offer safer options for the workers they provide product to."

Vincent Krainiger, general manager at fellow working group PPE manufacturer Majestic Glove, echoes this view: "Our goal the entire time has been to focus on what has greatest value to everyone in the industry. Cooperation has been incredibly important and we have had a very open-book policy within the working group; this has definitely contributed to giving more value to the standard."

"They are taking a real look and spending a lot of time and money out of their own pockets to come up with a noble objective," adds Dr. Lloyd Champagne, the trauma hand surgeon advising on the standard. "They are doing something that is really uplifting in stewardship of their businesses."

THE HAND IN NUMBERS

60
BLOOD
VESSELS

48
NERVES

34
MUSCLES

The hand is one of the most complex pieces of engineering in the human body.

Our fingers contain some of the densest areas of nerve endings. They are even more sensitive than our eyes.

Forty per cent of the hand's capabilities are vested in the thumb. It is controlled by nine individual muscles which are themselves controlled by all three major hand nerves.

There are six separate terms just to describe directions of movement of the joint at the base of the thumb.

27
JOINTS

27
BONES

123
LIGAMENTS
& TENDONS



CROSSTALK

TWO INDUSTRY EXPERTS CONSIDER THE BENEFITS OF THE NEW ISEA BACK-OF-HAND IMPACT PROTECTION STANDARD FOR BOTH MANUFACTURERS AND END-USERS



CHRISTINA YEUNG
PRODUCT DEVELOPER
WATSON GLOVES



BRIAN LUNISS
DIRECTOR, RESEARCH AND DEVELOPMENT
MECHANIX WEAR

Impact: Why is there a need for a back-of-hand impact protection standard?

CY: Blunt force trauma to the back of the hand is one of the most commonly occurring hand injuries. The new ISEA impact standard will help end users and safety specialists better differentiate between all the gloves available on the market to choose the right glove for their needs.

BL: We no longer want to see workers leaving gloves in their back pocket because they aren't fit for purpose. As a member of the working group developing this standard, our goal is to create a standard that is better for the end-user.

Impact: Is it fair to say that some manufacturers have over-claimed about the protection their products offer against such injuries?

CY: Impact resistant gloves have come a long way and I don't believe any reputable and responsible manufacturer would intentionally over-claim the type of protection their gloves provide. That said, there are a lot of gloves that claim impact resistance – and if your gloves do not stand up to your claims, the consumer has many other options to choose from.

BL: It's worth remembering the origins of this standard. When we started building gloves for the oil and gas industry, we were asked whether there was a standard for impact. At that time, there was only a motorcycle standard in Europe which was more about coming off a bike at speed. This was used to get a baseline for industrial use, which was not completely relevant to someone getting their hands caught in between two pieces of equipment.

Impact: Has there been a lack of uniformity across the products previously available?

CY: Yes, though this is not necessarily a bad thing. Some users only require minimal back of hand protection for incidental bumps and impact while, for others, the threat of injury from impact or crushing is huge. It all depends on the application. At Watson Gloves, we have a Specialized Watson Assessment Team that work with safety specialists to assess hazards on site to choose the right glove for the job.

Impact: How have manufacturers and end-users helped drive demand for this standard?

CY: With so many impact resistant gloves on the market, it can be confusing for

end-users to navigate through. The new standard will help educate our customers about the different levels of impact protection and which levels are best suited for use in specific applications. We have a few models of impact resistant gloves that have a proven track record in industrial uses. As a manufacturer, the new standard will allow us to quantify the protection the gloves provide.

BL: The working group developing the ISEA standard includes all the major manufacturers in the impact protection gloves market, as well as D3O in its role as materials supplier. We are competitors in business but in this project we are partners. That's because we as an industry recognise the need to work together to improve protection and the standards that govern it. We all believe the degree of collaboration reflects the market's appetite for change.

Impact: As a responsible manufacturer, how will the standard help you in your future product development?

CY: We always design with the end user in mind so we create protective gloves that not only meet industrial safety standards but are also comfortable and well made. The new standard will provide a guideline for performance to ensure that we have gloves to meet every level of protection required. Furthermore, by integrating innovative materials like D3O®, we can create gloves that are not only comfortable and lightweight but also provide a high level of impact protection as measured by the standard.

Impact: What next for the ISEA Hand Protection Group?

BL: Education and advocacy are part of our role. There is still work to be done in changing the mentality of those companies that only want to meet minimum requirements rather than genuinely investing in the well-being of their workers.



IMPACT INJURIES ARE A MAJOR OCCUPATIONAL HAZARD IN THE MINING INDUSTRY. RON HOPE OF LUCK STONE STRESSES THE IMPORTANCE OF EVERY WORKER "KEEPING THEIR HEAD IN THE GAME" – AND PROVIDING PPE THAT'S TRULY FIT FOR PURPOSE

Monongah, a small town in West Virginia with a population of just over 1,000, will forever be remembered as the scene of the worst mining disaster in US history. On 6 December 1907, 362 coal miners lost their lives when Fairmont Coal Company Mines No 6 and No 8 exploded. The tragedy is commemorated every year on National Miner's Day, established by Congress in 2009.

The dead comprised 171 Italians, 85 Americans, 52 Hungarians, 31 Russians, 15 Austrians, and five Turks – a reminder that mining is a global industry and workers everywhere must endure difficult conditions, both underground and on the surface, to extract the metals and minerals that are vital to our lives.

The last century has seen significant advances in worker safety. In the United

States, the National Institute for Occupational Safety and Health (NIOSH) is the federal agency responsible for conducting research and making recommendations for the prevention of physical, ergonomic and psychological injury and illness. NIOSH actively supports the health and well-being of mine workers, with similar organisations existing in many other countries.

Catastrophes such as Monongah are thankfully rare. However, health and safety has been a major concern to those involved in materials extraction ever since mining began on an industrial scale in the late 19th century. "The mining industry uses machines with multiple moving parts, both stationary and mobile," says Ron Hope, Value Safety Manager for Luck Companies, which includes Luck Stone, the US's largest family-owned operator and producer of construction aggregates.

REDUCING RISK, BOOSTING COMPLIANCE

Hope points to two key areas of focus for Luck Companies: the reduction and elimination of risk in working environments, and worker compliance in the use of personal protective equipment (PPE). A particular area of concern is impact injuries to hands and fingers, borne out by statistics from around the world.

"HAND PROTECTION IS CRITICAL. EACH ONE OF OUR 17 MINING LOCATIONS AND SIX DISTRIBUTION YARDS HAS A MECHANIC AND SERVICE PERSON REQUIRING THEM TO WORK WITH THEIR HANDS EXCLUSIVELY"

RON HOPE, LUCK STONE



In Papua New Guinea, for example, analysis of accident reports submitted during 2014 showed that 40 per cent of the 474 reported injuries related to hands and fingers. The most common causes were: 'Use of inappropriate and improvised tools'; 'Complacency or lack of concentration' and 'Behavioral-based issues'.

In Australia, WorkCover Queensland's statistics for 2013-14 showed that Queensland's mining industry, statistically one of the safest in the world, still reported almost 2,000 compensation claims with hands and fingers (13 per cent) the second most-commonly injured body part.

"Our associates use their hands during routine maintenance that is required to ensure the quality of our products and to supply the many different products we provide," adds Hope. "Hand protection is critical. Each one of our 17 mining locations and six distribution yards has a mechanic and service person requiring them to work with their hands exclusively. There is also climbing in and out of equipment, up and down conveyors and ladders where impact could be a factor."

Luck Stone has a philosophy of being 100 per cent knowingly compliant with all rules and regulations and works in partnership with the US Mine Safety and Health Administration (MSHA) to help protect its workforce. According to the MSHA's 2015 'Mining Facts' survey, the leading accident classification of non-fatal lost-time injuries in the Stone and Sand & Gravel Mine sector involved handling materials, at 38.9 per cent, with fingers (16 per cent) the most frequently injured body part.

Across the whole US mining industry, which employs almost a quarter of a million

people, handling materials was again the most frequent accident classification (35.8 per cent) in 2015 with fingers (12.6 per cent) the second most injured body part after the back.

INVESTING IN PEOPLE

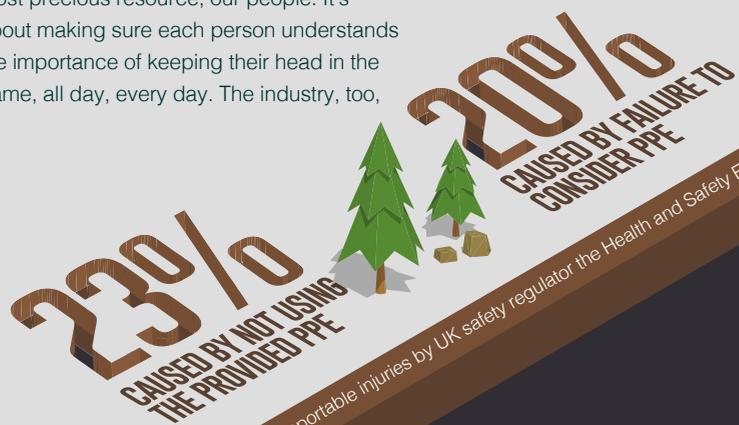
NIOSH estimates that 20 million workers use PPE on a regular basis in the US. Yet an ongoing problem across all sectors is that many victims were not wearing the PPE supplied, claiming that it was uncomfortable, impeded their work or of poor quality. In the UK, analysis of PPE-related reportable injuries by safety regulator the Health and Safety Executive found 23 per cent of injuries were caused by PPE being provided but not used and a further 21 per cent by failure even to consider the use of PPE.

Hope counters such figures with Luck's commitment to "continual investment in our most precious resource, our people. It's about making sure each person understands the importance of keeping their head in the game, all day, every day. The industry, too,

must take a stronger approach to providing preventative maintenance programs for its people. Education and training are essential to the well-being of all mining personnel to make the right choices throughout the day.

"There is a process of elimination to remove existing hazards when possible from the mining environment. If elimination is not possible, then providing a better tool and/or a different solution as a substitute to the current process will contribute to better protection of our people."

As part of the company's research into reliable hand protection for its field associates, Luck Stone were keen to partner with D3O in a D3O® Impact Additive wear trial [see below]. "We believe the ingredient will enhance hand protection from an impact perspective," says Hope, "and reduce both minor and major injuries."



TEST CONDITIONS:

- Three phases to identify the comfort and protection levels of D3O's product in a mining environment
- Approximately 30 wearers across five locations
- Almost all work done outside with temperatures ranging from 10°F to 40°F
- Harsh working conditions

TEST FINDINGS:

- No damage to any of the thermoplastic rubber (TPR) bumpers (including cracking, chipping, abrasion)
- No discernible stiffening of TPR at low temperatures
- Operators very pleased with comfort and dexterity of gloves, in terms of both softness and thickness

PUT TO THE TEST LUCK STONE'S WORKERS CONDUCTED A WEAR TRIAL OF GLOVES CONTAINING D3O® IMPACT ADDITIVE



BEHIND THE SCENES
FROM LAB TO MARKETPLACE

A DAY IN THE WORKING LIFE OF... JONATHAN NEEDHAM

D3O'S SENIOR MATERIAL DEVELOPER
GIVES *IMPACT* A TOUR OF THE
LABORATORIES AT THE HEART OF THE
COMPANY'S UNIQUE INNOVATION,
RESEARCH AND TESTING PROCESSES



Clad in white lab coat, protective gloves and goggles, paper cup of an extraordinary orange foaming substance in hand, Jonathan Needham is putting weeks of preparation and research into action. “This is a blend of polyol and isocyanate,” he enthusiastically explains. “They react together to form long chains of polymer. As the foam grows, the polymer becomes stronger and sets.

“We carefully measure the time it takes for the reaction to start, for the foam to reach full size and for it to become tack free. These statistics tell us a lot about the chemistry of the polymer and how it might behave when it’s molded into an article. This could be the start of a completely new D3O formulation.”

Because of the size of the samples made by the team of expert chemists in the Material Development Lab at D3O’s London headquarters, all experiments are carried out using paper cups and plastic buckets. However, this is a place where truly cutting-edge science takes place. Amid the work benches, tool racks, ovens and fridges, Needham and his colleagues devise new material formulations and optimize the properties of D3O’s existing 30-plus patented and proprietary technologies.

Next door is the Test Lab, with its two state-of-the-art test rigs and a shelf of weighted ‘striker’ to replicate the kind of impacts D3O technology seeks to protect against. It’s kept at a carefully regulated 23 degrees C and 55 per cent humidity level. “No day goes by without the thump-thump of someone testing on a rig,” says Needham.

Every sample created within the labs is recorded in a process known as ‘characterization’: its weight, density, dimensions and hardness, the last of these measured with a device called a durometer. “You can squeeze a sample and sense its hardness but a durometer puts a number on it. Each sample is tested in several places, marked O for hardness and X for impact. This helps ensure consistency and supports our commitment to making products that are comfortable and durable as well as protective.”

More than 146,000 samples have been logged in the D3O database since 2013. “We usually have a little celebration when we reach numerical landmarks!”

Likewise, every impact test is logged according to specific protocols, including height, angle of impact and striker used. “Here, a ▶

IN HIS OWN WORDS JONATHAN NEEDHAM



Title: “I’ve been a Senior Material Developer since November 2013.”

Background: “I studied a BSc degree in Chemistry then joined D3O as a Lab Technician.”

Role: “I primarily focus on product development as the senior scientist responsible for PU foam, silicone and PVC. As well as leading development projects, I also support the production, quality and supply chain functions of the business and manage the on-site development facilities.”

THE INSIDE STORY D3O® IMPACT ADDITIVE

“I’ve been lead developer for D3O® Impact additive (iA) right from its conception, through to production and now for ongoing trials,” says Needham. “It’s very exciting to have applied our expertise in materials science to this unique product.”

“iA is a liquid additive that can modify the existing properties of thermoplastic rubber (TPR) to create a material with higher levels of shock absorption, without affecting comfort or dexterity.

“Glove manufacturers use D3O impact protection as bumpers sewn into their products. Now they can add iA into their formulation with no change to their design, manufacturing and supply chain.

“It’s a completely disruptive process to be able to add impact protection to the back of a glove without altering the way in which a manufacturer processes TPR – and to improve the performance of their product by 30 per cent as well.”



5kg striker set at a height of 110cm represents 50 joules of energy. Back and limb protectors also have to be tested when wet, to simulate weather conditions. We test to international standards where they exist while, for new products that don't have a specific standard, we base testing on research and our own expertise."

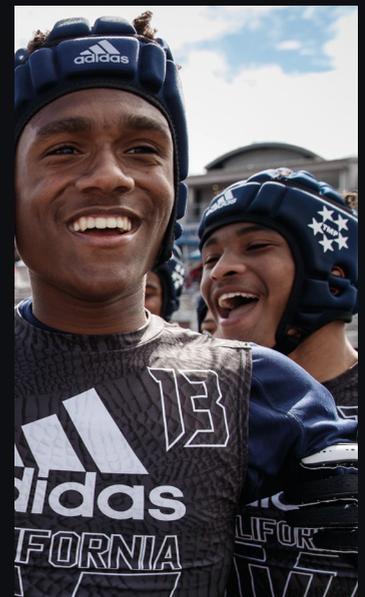
Needham's role is truly end-to-end: "I help to refine the opportunity into a brief, then I'm involved throughout the development and optimisation stages of a project: making samples, characterizing them, impacting them, doing the data analysis and helping refine the ultimate product.

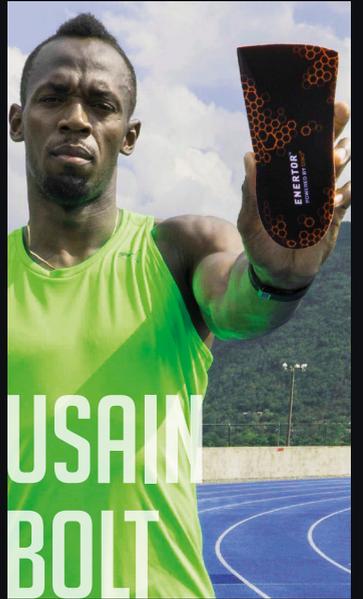
"Inevitably, the nature of R&D means that you sometimes head down a blind alley. However, our approach is to try as many routes as possible at the start of a project and never be afraid to fail. By being constantly alert to the possibilities of what I'm doing and evaluating each step, suddenly I might find a way forward for a brief that at first seemed almost impossible or didn't fit with our understanding of how materials behave.

"We have strong connections in business, in universities and among our suppliers and clients, and we access their knowledge too. It's hugely stimulating to have the freedom and autonomy to innovate in such a dynamic business sector." ■

GONE GLOBAL

SINCE OUR DAYS AS A START-UP, WE HAVE BEEN MAKING PIONEERING PROTECTIVE PRODUCTS USED WORLDWIDE BY SOLDIERS, PROFESSIONAL ATHLETES, INDUSTRIAL WORKERS AND PEOPLE LIKE YOU





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