

PROTECTIVE SOLUTIONS

THE REAL COST OF SAFETY

Competitive companies like to keep operational costs well under control. Some costs are more visible than others. Many companies, for example, find it difficult to assess the ongoing cost of industrial accidents and injuries as well as the longer term benefit of investing in improved safety systems, including high quality, high performance Personal Protective Equipment (PPE).

Tip of the Iceberg

Throughout the European Union, statutory company insurance generally covers the basic costs of medical treatment and compensation. However, as the American researcher H.W. Heinrich first noted in the 1930s, insured costs generally represent only 25% of the final "bottom-line" total ' (see Fig. 1). The majority of costs that companies need to take into consideration remain hidden. More than sixty years later, Heinrich's "iceberg" principle still holds water.

Fig. 1.
The Accident Iceberg: the hidden costs of accidents (The Costs of Accidents at Work, HSE Books 4/97 p11)



Fig. 2.

The results of the five case studies from the UK show that it is possible to identify and quantify accurately the costs of preventable accidental loss arising from failures of management control. The studies were made in 1990/1991. The figures have not been adjusted for inflation (The Costs of Accidents at Work, HSE Books, 4/97 p 9)

	Total Loss	Annualised Loss	Representing
Construction Site	£ 245,075 (€ 409,275)	£700,000 (€1,169,000)	8.5% of tender price
Creamery	£ 243,834 (€ 407,202)	£ 975,336 (€ 1,628,811)	1.4% of operating costs
Transport Company	£ 48,928 (€81,710)	£ 195,712 (€ 326,839)	1.8% of operating costs, 37% of profits
Oil Platform	£ 940,921 (€ 1,571,338)	£ 3,763,684 (€ 6,285,352)	14.2% of potential output
Hospital	£ 99,285 (€ 165,805)	£ 397,140 (€ 663,223)	5% of annual running costs

¹ Heinrich H. W., Industrial Accident Prevention: A safety management approach, New York, McGraw Hill (4th Edition 1959).

Data published in 1995 by the UK's Health and Safety Executive, for example, concludes that for every £1 (€1.67)² of insured costs, companies should allow between £8 (€13.35) and £36 (€60.10) to cover additional operating expenses such as emergency supplies, overtime working, loss of expertise, investigation time, legal costs and penalties³. A second study notes that incident related losses could, in some cases, represent up to 1.8% of operating costs or 37% of profits⁴ (see Fig.2).

The "Big" Issue: Hands and Wrists

According to official statistics, hand and wrist injuries are Europe's single biggest safety issue⁵ with 50% of all these injuries involving cuts and open wounds (see Fig.3). The annual cost of these hand and wrist injuries runs into millions of Euro.

In France, where the direct cost of a hand injury that results in temporary disablement is thought to be around € 2,050, CRAM estimates total annual costs can be as high as € 381 million. High risk sectors include the leather, wood and metal processing industries, where hand and wrist injuries account for between 38% and 47% of total recorded incidents⁶

Although allowance must be made for differences in reporting, Italian statistics paint an even more dramatic picture. Here

Fig. 3.

Hands and wrists represent by far the biggest safety hazard for European industry.

Up to 58% of all hand and wrist injuries might have been prevented or reduced by wearing adequate Personal Protective Equipment (PPE).

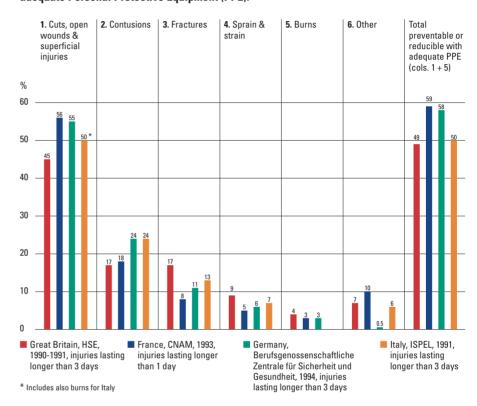


Fig. 4.

Nissan Motor Manufacturing (UK) maintains detailed accident-costing statistics. Gloves made from KEVLAR® Performance Technologies are used widely throughout the plant. Of the 10 hand injuries recorded in 1995, all were in the high risk press and body shop areas and classified as minor. These ten injuries equated to a lost time ratio of approximately 2.5 hours for every 1 million hours worked − a total cost according to Nissan of less than £1,000 (€ 1.67).

Minor Injuries	Repeats	Lost Time
£81.80 (€136.60)	£347.10 (€579.65)	£2,594.70 (€4,333.15)

Database:

1995, Courtesy of Nissan Motor Manufacturing (UK). Data has not been adjusted for inflation. **Minor Injuries:**

Injuries treated at the medical centre or by first-aid personnel and requiring no more than two visits for dressings etc. Injured person returns to work with a lost time from task of approximately 15 minutes.

Repeats:

Repeats included accidents requiring hospital treatment or repeated visit to the Medical Centre. Employee absent from production line for approximately 3.8 hours.

Lost time:

All work-caused accidents or ill health resulting in the loss of one full shift or more. The average period of absence is 12.5 days.

 $^{^2\,\}text{f}$ to \in conversion rate (throughout the text) as of mid September 2002.

³ The costs to the British Economy of work accidents and work related ill health, HSE Books 1/95.

⁴ The Cost of Accidents at Work, HSE Books, HS(G)96. ⁵ UK, HSE 1990-1994, injuries involving more than 3 lost work days (25% of total); France 1993, injuries involving more than 24 hours lost time (28% of total); Italy, ISPEL, 1991, injuries involving more than 3 lost work days (37% of total); Germany, Berufsgenossenschaftliche Zentrale für Sicherheit und Gesundheit, 1994, injuries involving more than 3 lost work days (42% of total).

⁶ CRAM, Ile de France (Caisse Regionale Assurance Maladie, Ile de France/Organisation for Sickness and Accident Insurance, Paris Region): direct costs - 1997; sector statistics - 1995.

the total cost of hand injuries is estimated to be some € 2.6 billion with around 16% of all accidents resulting in a permanent disability. Again, most at risk are workers in the extraction, forestry, construction and metal processing industries where hand injuries represent between 44% and 57% of the total.⁷

Many experts believe that injury rates and costs could be dramatically reduced if companies were able to identify and issue the correct type of hand protection.

An earlier edition of this brochure, for example, reported on the detailed injury-cost evaluation matrix developed by Nissan Motor Manufacturing (UK) Ltd. (see Fig.4). The company has an outstanding safety management and cost analysis system as well as one of the best safety records in the motor industry. In 1995 only 2.5 hours per 1 million hours worked were lost to hand injuries, a total cost to the company of £1,000 (€ 1,670). Nissan Motor Manufacturing (UK) Ltd. has been using Category II CE Marked cut-resistant gloves and sleeves made from DuPont KEVLAR® since production started in the 1980s.

The Special Challenge for Smaller Organisations

Most large companies like Nissan already have dedicated safety management systems. But, as Jaqueline Jeynes of the Federation of Small Businesses in the UK says, many smaller and medium sized firms simply lack the necessary expertise and/or resources to cover all angles in adequate detail.

One solution, says Jeynes, is to look for external support. Insurance companies, business and trade federations as well as local, national and EU agencies are often able to give guidance on current legislation as well as provide recommendations as to how organisations could start to implement safer working practices. Introducing or improving a safety management system may prove less complicated than expected.

Lean on the Law!

In 1989, the Council of the European Communities issued two Directives, 89/656 EEC and 89/686 EEC, covering health and safety at work and the provision of PPE.

To comply with the Directives, companies must complete a fully documented hazard/risk assessment and introduce appropriate controls that will either eliminate or limit potential injuries. Where hazards cannot be eliminated via process or equipment modifications, employers are required to provide PPE bearing the relevant CE Mark of Conformity.

Directive 89/686 EEC specifies how the three basic Categories of PPE must be identified, tested and certified.

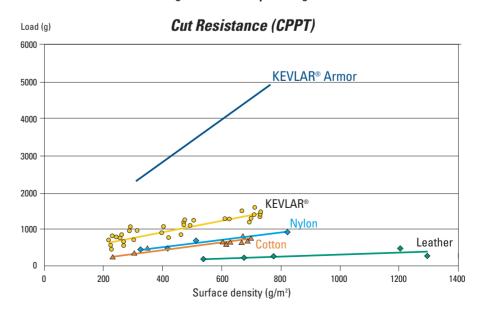
The list of Category I items, described in the Directives as "Models of Simple Design", covers equipment that will offer protection against minor hazards or exposure risks, which can be safely identified in good time. Gloves designed to be worn for gardening are one example of Category I equipment.

Category III items, or "Models of Complex Design", are intended to protect against risks that could either prove fatal or, alternatively, seriously and irreversibly harm the health of the employee. Included in the list are respiratory devices and chemical protective suits as well as heat- and flame-resistant clothing.

Bridging the gap between Categories I and III, Category II covers an unspecified list of

Fig. 5.

Gloves and sleeves made with KEVLAR® Performance Technologies offer a cut resistance superior to items of a similar weight made from leather, cotton or Nylon, used for similar applications. Keeping the weight and thickness of hand protection down to a minimum improves dexterity and comfort, helping to ensure that PPE items provided by the employer will be worn. KEVLAR® Armor Technology provides even greater cut resistance compared to traditional KEVLAR® technologies without compromising on comfort.



equipment that offers an "intermediate" level of protection. Industrial cut-resistant gloves and sleeves are considered to be a Category II item.

Whilst Category I items require no independent certification, both Category II and Category III items must be assessed by an accredited test house (the "Notified Body") to the relevant European (EN) Standard. The manufacturer is responsible for completing the compliance testing and, either directly or through a distributor, must be able to provide the user with the relevant information and certificates. If the items have not been manufactured in an EU or EFTA country, the vendor becomes responsible for the compliance testing.

Cut-resistant gloves and sleeves CE Marked as a Category II item will have been tested to EN Standard 388. To help users differentiate between the protection offered by different models, EN 388 ranks cut resistance according to five different grades or "levels" (level 5 being the highest level of performance). The majority of gloves produced with KEVLAR® Technology and KEVLAR® Clean Technology (a solution that adds low linting to the existing mechanical and thermal properties) offer cut-resistance levels 3 and 4, while KEVLAR® Armor Technology offers at least level 5 protection. It has been demonstrated that EN 388 under-represents the cut resistance of high performance material, and that other standards such as ASTM F1790-97 (widely used in the Americas) and ISO 13997 distinguish better between the real cut behaviours of each material and each structure. These two standards also confirm the extremely high cut resistance of our KEVLAR® solutions.

EN 388 also specifies tests for abrasion, tear and puncture resistance. Most KEVLAR® solutions offer an abrasion resistance of 1 to 2, a tear resistance

always at the maximum level 4 and a puncture resistance of 1 to 4 depending on the designs selected.

Levels of protection offered against heat are specified in EN 407. When it comes to mechanical and thermal resistance, KEVLAR® solutions are an excellent material for enhanced protection. Depending on their design, KEVLAR® gloves can take operating temperatures of up to 250°C over an extended period and a short-term exposure of up to 700°C. Because of their molecular structure, KEVLAR® gloves will not shrink when exposed to high temperatures (coefficient of thermal expansion at 100°C: -4 * 10 ·6 /°C).



DuPont's KEVLAR® brand fibre is used in many items of Personal Protective Equipment, from chain-saw trousers to bullet-resistant vests, helmets, boots and socks.

In protective gloves and sleeves, KEVLAR® Performance Technology solutions provide a cut resistance up to five times higher than that of leather and up to three times higher than that of both cotton and Nylon (see Fig.5). KEVLAR® also displays an excellent resistance to a range of chemicals and heat, is flame resistant and will not melt







or drip. KEVLAR® Armor Technology, one of our latest technologies aimed specifically at extremely high risk situations, offers even superior cut resistance compared to traditional KEVLAR® solutions (see Fig. 5).

Fig. 6.

German forklift truck manufacturer Wagner made a detailed study of the comparative in-service cost of gloves made from leather and DuPont KEVLAR® brand fibre. The results highlight the value that the durability of KEVLAR® can bring in helping to reduce equipment costs as well as hand and wrist injuries. Data is based on 1995 prices and has not been adjusted for inflation.

	KEVLAR® Heavyweight Glove	Leather
Price (new, €/pair)	7.70	4.60
Cleaning – 10 times @ €0.77/time	7.70	_
Times used	11	3
Cost/time used (€/pair)	1.40	1.53

KEVLAR® Performance Technologies can be applied in a wide range of glove and sleeve designs that combine protection with both comfort and manual dexterity. Selecting items of PPE that match the demands of the job and are comfortable to wear is probably the best way to ensure that protective equipment is worn when it needs to be worn. Most manufacturers and distributors of gloves and sleeves made from KEVLAR® Performance Technologies are able to give guidance on which type of hand and wrist protection would be best suited to the user's working environment. In some instances manufacturers may be able to design and supply specially tailored items.

When it comes to care, gloves and sleeves made from KEVLAR® Performance
Technologies can be dry-cleaned or laundered at temperatures up to 60°C, ordinarily on a repeated basis. Since KEVLAR® fibre is extremely durable, wearlife is generally greater than that of comparable items made from leather and cotton. Although the initial cost of a PPE item with KEVLAR® may be higher, the combination of durability and reduced

injuries can help many companies reduce overall operational costs (see Fig. 6).

Look for the Label

DuPont's focus on branding and trade-mark protection helps consumers of products in KEVLAR® Performance Technologies avoid sub-standard quality. DuPont has established KEVLAR® Quality and Labelling Programmes with performance specifications exceeding basic European Standards. Items that comply with the requirements of the KEVLAR® Quality Programme are marked by a special KEVLAR® Technology Label available only from DuPont (see Fig.7).

Misuse of the label or any infringement of the trademark may lead to prosecution by DuPont. As part of its crackdown on trademark violators, DuPont recently helped prosecute a British company using the KEVLAR® trademark on gloves that tests proved were made from other materials.

Could You Do Better?

Industrial health and safety are an important – yet still often overlooked – issue

of operational cost reduction, particularly in many small and medium sized firms. Undisputed is the fact that industrial injuries are a heavy burden for society as well as for individual organisations and their employees.

The first step towards a comprehensive safety management system is a thorough hazard and risk assessment. Protective equipment should always be seen as the last line of defence. But where hands and wrists are exposed, paying that little bit extra for reliable, high performance gloves and sleeves in KEVLAR® could ultimately make all the difference. Many leading European companies already rely on the protection provided by gloves and sleeves in KEVLAR® to keep injury rates and costs down.

If your company would like more information about gloves and sleeves made with DuPont KEVLAR® brand fibre, please contact us at: fax: +41 22 717 6131, web site: www.dpp-europe.com or, alternatively, your local PPE distributor.

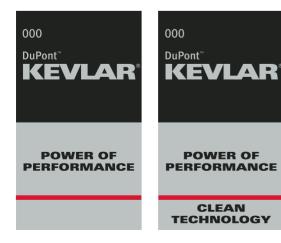




Fig. 7.
The Label is not a substitute for appropriate
CE Marking as specified in the PPE
Directive (European Directive 89/686).





For further information, please contact: DuPont Personal Protection - KEVLAR® P. O. Box 50 CH-1218 Le Grand-Saconnex Geneva, Switzerland Fax: +41 22 717 6131

www.dpp-europe.com

Product safety information is available upon request.

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