

DuPont Personal Protection



The HSE Manager's Guide to sustainability considerations for PPE

Key Steps to Optimising Safety and
Sustainability in the Workplace



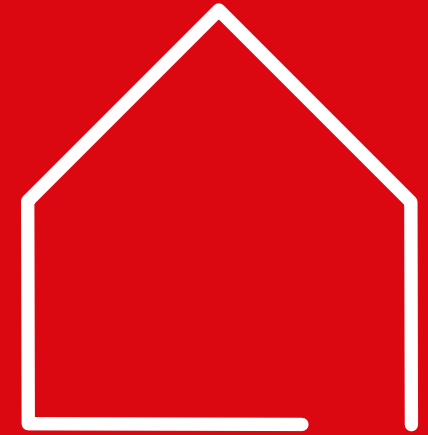
Sustainability is becoming a top concern for organisations around the world

This Guide looks at how Personal Protective Equipment (PPE) can be part of the solution, supporting Health, Safety and Environment (HSE) departments in achieving their sustainability goals.

While PPE is essential to protect workers from hazards, disposing of it continues to represent an ecological challenge, now more than ever. The COVID-19 pandemic brought to the fore the environmental footprint of single-use PPE. The Guide examines some key factors to consider when selecting and using PPE that can help reduce waste significantly. The Guide then looks at how sustainability can be embedded in the PPE supply chain by minimising waste during production, adopting alternative energy sources, and shortening transport routes. The Guide finally looks at how PPE technology can support the companies at the forefront of the transition to a net-zero and a circular economy.



Content overview





1/ Why PPE is Critical to Sustainability



Many organisations are striving to increase their sustainability and reduce their environmental footprint. According to a recent [Deloitte report](#), nearly 1 in 2 companies are “adopting public policy positions that promote sustainability” and “encouraging or requiring suppliers and business partners to meet specific environmental-sustainability criteria”¹. The procurement of PPE is an important consideration when setting sustainability goals, now more than ever.

Since the start of the COVID-19 pandemic, PPE such as disposable masks has become part of our daily lives. Even workplaces where PPE had never been a requirement had to start providing their workers with appropriate safety equipment.

The increased use of disposable PPE during the pandemic has also exposed its environmental impact. The [WHO](#) estimates that the PPE procured between March 2020 and November 2021 generated up to 87,000 tonnes of waste globally². Other studies corroborated these findings:

- 25,900 tonnes of plastic waste resulting from single-use PPE used during the pandemic leaked into the ocean according to a Nanjing University study published in November 2021³;
- Every day, approximately 3.4 billion single-use face-masks/face shields were discarded, according to a research paper published in Heliyon in February 2021⁴.

But waste is only one aspect of the environmental footprint of PPE. The manufacturing of PPE is typically energy-intensive, while the supply chain contributes to emissions due to long-distance shipping. A UK study estimated that the production and distribution of 3 billion pieces of PPE - used by the National Health Service between February and August 2020 - resulted in over 106,000 tonnes of carbon dioxide emissions⁵. The study also estimated that overall emissions could have been cut by 12% if production had occurred in the UK instead of overseas. Finding new ways to improve the sustainability of PPE is, therefore, critical.



2/ Improving Sustainability Without Sacrificing Safety

When talking about PPE sustainability, it is critical to highlight how prioritising the health and safety of workers must always be the primary concern. EU Directive 89/656/EEC⁵ (use of personal protective equipment PPE) mandates that PPE must:

- be appropriate for the risks involved, without itself leading to any increased risk;
- correspond to existing conditions at the workplace;
- take account of ergonomic requirements and the worker's state of health;
- fit the wearer correctly after any necessary adjustment.

However, significant steps can be taken to reduce the environmental impact of PPE without compromising on workers' safety. Let's begin by looking at ways to minimise waste.



3/ How to Reduce PPE Waste in the Workplace



In some workplaces, the use of disposable PPE is essential. Disposable protective equipment (CE certified as category III, Type 5-B and 6-B) protects workers against hazardous chemical or biological substances. It also prevents the contamination of the surrounding environments, which is mandatory in cleanrooms.

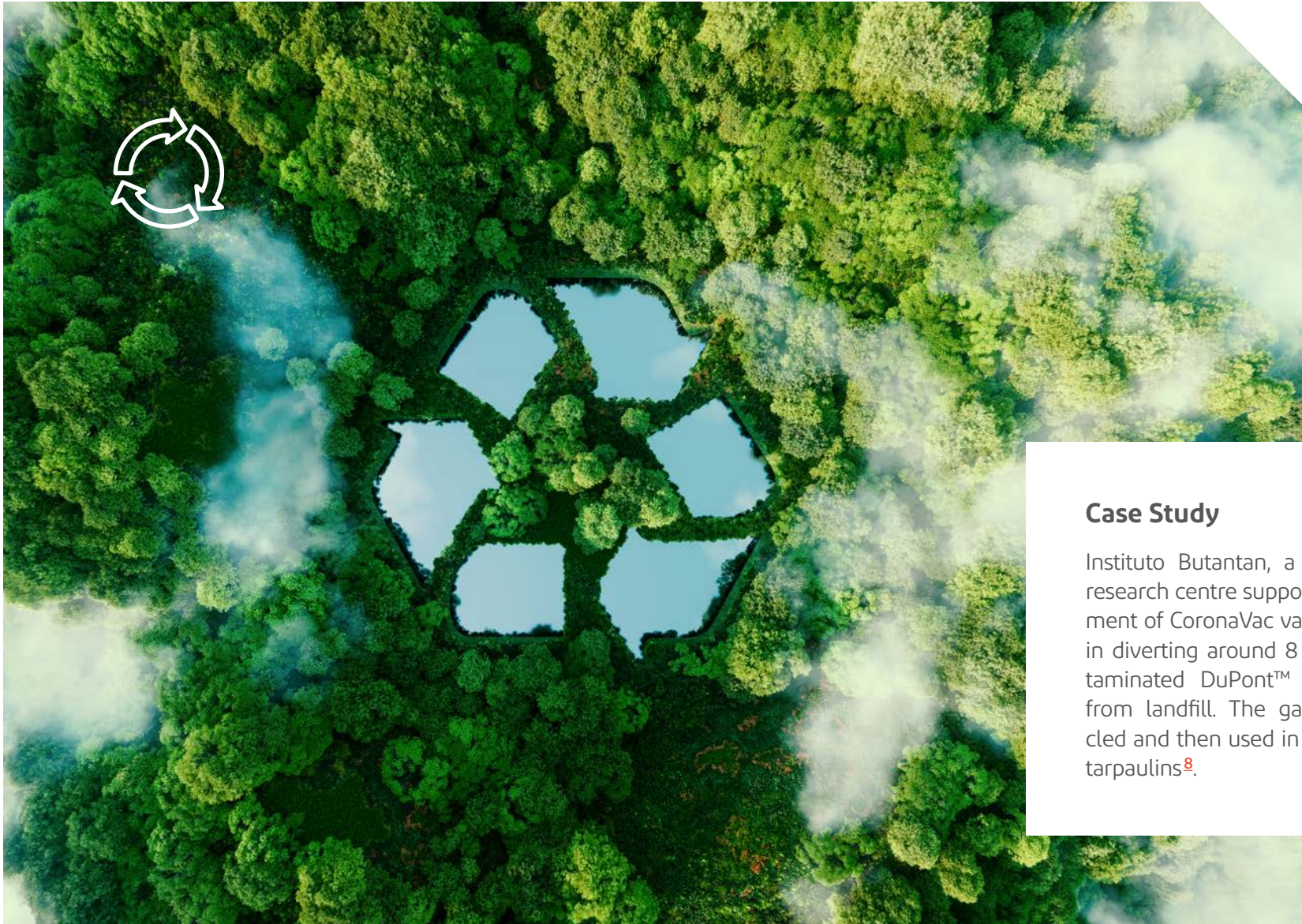
There are different ways to reduce waste when selecting and using disposable PPE:

- **Choose recyclable materials** - Chemically or biologically contaminated PPE such as garments cannot be recycled for safety reasons. However, non-contaminated items are potentially recyclable. DuPont has fully operational recycling programmes for its Dupont™ Tyvek® garments in North and South America and is currently in the testing phase for setting up a similar recycling system in Europe;
- **Select non-ecotoxic materials** - Contaminated PPE constitutes hazardous waste and must be

incinerated. Garments made using non-ecotoxic materials do not produce hazardous substances after incineration. For example, Tyvek® only releases water and CO₂;

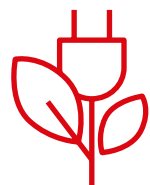
- **Opt for multi-use single exposure garments** - Garments with self-adhesive tape sealing the zipper and chin flaps can only be worn once, even if they are not contaminated, By contrast, garments such as DuPont™ Tychem® 4000 S and Tychem® 6000 F Plus feature Velcro closures (instead of tape), allowing workers to wear them several times over a work shift (until contamination occurs);
- **Select durable materials** -if a garment tears it must be discarded immediately. This is to ensure that the wearer is protected while preventing contamination. Tyvek® and Tychem® fabrics are abrasion and tear-resistant, significantly reducing the number of garments being disposed of during a work shift;

- **Choose lightweight materials** - The heavier the material, the more waste is generated at the end of the PPE's life. Therefore, opting for lighter fabrics – without compromising on protection levels - can help reduce waste. For example, Tyvek® is typically 20 to 50% lighter than MPF and SMS materials;
- **Choose more sustainable packaging** – PPE packaging can be a significant source of waste, not to mention the emissions associated with production and distribution. The recently-launched DuPont™ Tyvek® 500 Xpert Eco Pack decreases solid waste by 820kg by eliminating individually packed garments and reducing the number of Instructions for Use from 1 per garment to 1 per box⁷. DuPont is also working on reducing packaging waste further by increasing the use of recycled packaging materials.



Case Study

Instituto Butantan, a leading Brazilian research centre supporting the development of CoronaVac vaccines, succeeded in diverting around 8 tonnes of uncontaminated DuPont™ Tyvek® garments from landfill. The garments are recycled and then used in the production of tarpaulins⁸.



4/ Building a More Sustainable PPE Supply Chain

Besides waste reduction, there are different ways to improve sustainability throughout the PPE supply chain, from manufacturing to distribution. When selecting PPE, it is important to choose suppliers that have set clear sustainability goals, including transitioning to less wasteful and energy-intensive practices.

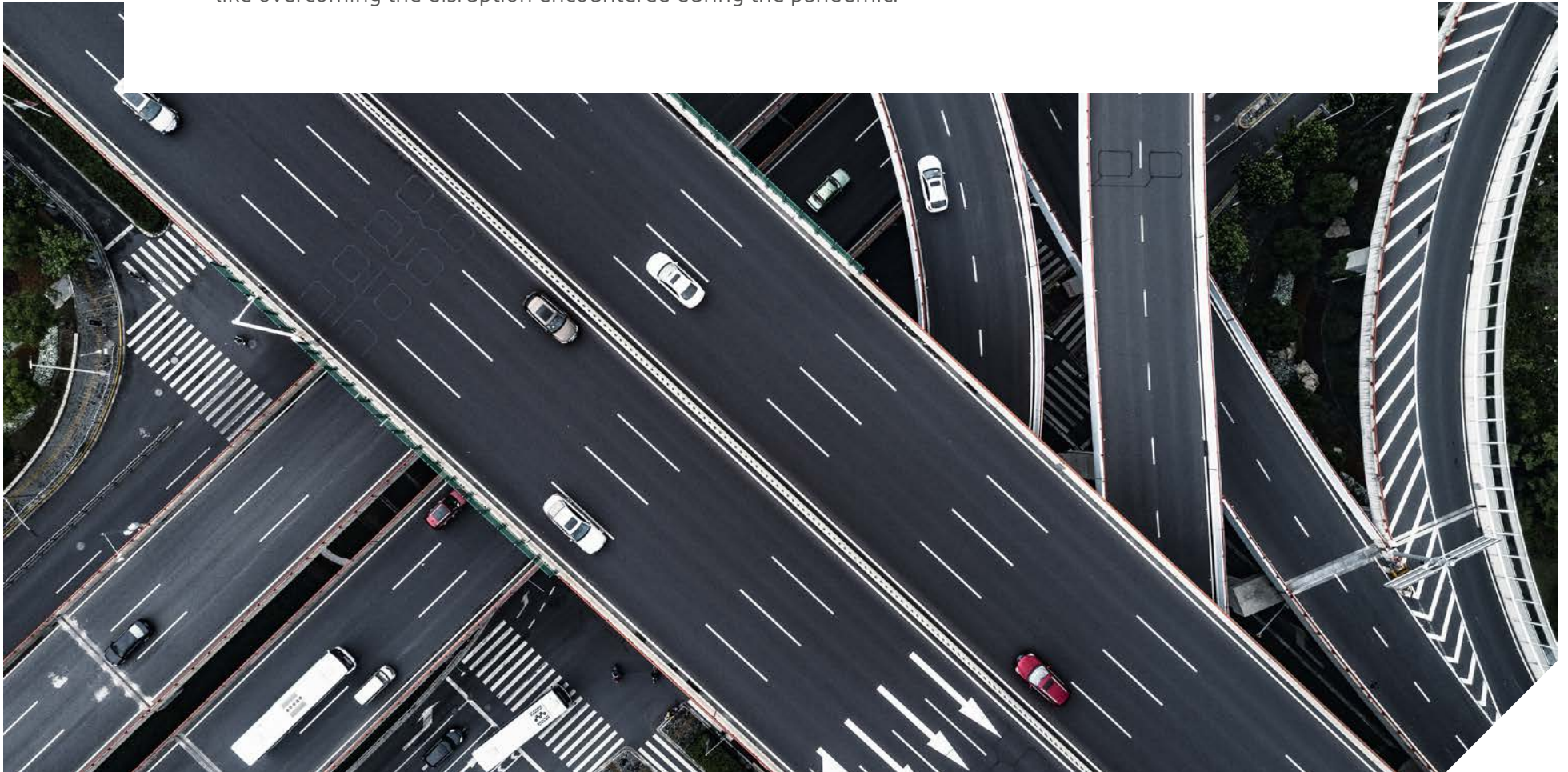
For example, the DuPont™ Tyvek® manufacturing plant in Luxemburg has adopted an innovative heat recovery system that has significantly reduced CO₂ emissions. The plant is now powered by the by-product heat derived from the steam that is generated during the polyester production process.



Case Study

Hydrochloric acid is a low-value liquid residual stream created during the production process of Nomex® fibers used in a variety of protective clothing. Traditionally, the substance is neutralized with water and then sent to an external waste water treatment plant for processing. To eliminate this step, the DuPont manufacturing plant in Asturias (Spain) teamed up with Gonvarri Industries, a leading company in the market of steel and aluminum processing, which uses hydrochloric acid in its production process. Each year, the partnership will enable DuPont to save electricity equal to powering 1,500 homes and conserve water equal to the amount consumed by 350 people.

Shortening supply routes is another key to reducing the lifecycle emissions of PPE. Suppliers like DuPont are exploring ways to increase their manufacturing footprint in areas like Europe and minimize their reliance on long transport routes. There are also other advantages to having a more decentralized and agile supply chain, like overcoming the disruption encountered during the pandemic.





5/ Protecting the Workers at the Forefront of Sustainability



Reducing the environmental footprint of PPE isn't the only way in which protective equipment can support sustainability. PPE can also play an important role in protecting the workers at the forefront of the transition to a low-carbon and circular economy.

From gigafactories through to the recycling of carbon fibre used in wind turbine blades, the growing green economy presents multiple risks to workers⁹. Some of the most common hazards are:

- Exposure to fire, explosion, and dangerous substances during the manufacturing, transportation, and use of batteries¹⁰;

- Exposure to carbon fibre and other materials used in wind turbine blades, which can cause skin irritation and abrasion¹¹;
- Exposure to arc flash, a non-contact short circuit that can reach temperatures of up to 20,000°C, which may occur in any electrical application, including solar panels, wind turbines, and battery energy storage systems;
- Exposure to various mechanical risks (e.g. cuts) and hazardous chemical and biological substances associated with waste management (recycling) and the need to repair and maintain equipment more frequently associated with the "circular economy"¹².

PPE technology is evolving to protect workers against the above risks:

- The latest double-faced fabric made of **DuPont™ Nomex®**, used in reusable protective clothing, are the optimal choice for arc flash protection, delivering enhanced heat and flame resistance without compromising on comfort;
- **DuPont™ Tyvek®** and **DuPont™ Tychem®** garments are constantly evolving to provide maximum protection against a broad range of chemical and biological hazards;
- The latest **DuPont™ Kevlar®** engineered yarns for enhanced mechanical protection cover multiple levels of cut resistance without compromising on comfort and dexterity.

6/ Conclusion

The environmental footprint of PPE is becoming a greater concern for organisations and the public alike. This guide has illustrated some of the key steps to take to make PPE more sustainable, from manufacturing through to distribution and use.

The safety of workers will always remain the number one priority for manufacturers like DuPont. We will continue to innovate and develop new solutions that, while delivering optimal protection, also improve sustainability.

To learn more about DuPont Personal Protection's commitment to sustainability through innovation visit: www.dupont.co.uk/personal-protection/dpp-sustainability.html.





Contact us

DuPont Personal Protection

DuPont de Nemours (Luxembourg) S.à r.l.
Contern - L-2984 Luxembourg

Customer Service

T. +352 3666 5111
mycustomerservice.emea@dupont.com

dpp.dupont.com



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