OnSite Support Research Team

Best Practices in Recycling PPE

Helping towards a truly circular economy

This and other White Papers have been developed by the OnSite Support Research Team
in collaboration with leading independent bodies and other partners

BY TAKING A MORE RESPONSIBLE APPROACH TO THE LIFECYCLE MANAGEMENT OF PPE WE WILL MINIMISE THE IMPACT ON THE PLANET, CREATING VALUE AND BENEFIT FOR ALL STAKEHOLDERS

As early as In 1987, the United Nations (UN) Brundtland Commission defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

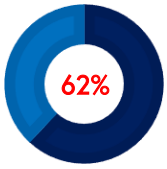
The challenge we face isn't just about the avoidance of landfill but according to the UN Sustainable development is our most urgent priority and the core aim of the 2030 Development Agenda for sustainable development.

According to the UN the three pillars of sustainable development are economic, social and environmental.

Now more than ever we all have a responsibility to all our stakeholders to be more considered in the procurement of, use and end of life treatment of the resources we use.

An OnSite Research Team Study found that

UK sends 350,000 tonnes of textiles to landfill every year



62% of all UK waste in 2018 was attributed to the Construction, Demolition and Excavation (CDE) industry

PPE often has a high plastic content as does it's protective packaging

40% of all plastic generated on a construction site ends up in landfill

Background

Many organisations are considering how best to deal with and recycle their corporate uniforms, PPE and apparel and introducing requirements to do so as part of their procurement process. A secure destruction and recycling service protects intellectual property, improves security, and has environmental and sustainability benefits too. The fact is that all PPE/work wear and corporate apparel can be recycled if you are committed to doing so.

Typical Process

A secure destruction and recycling service protects intellectual property, improves security, and has environmental and sustainability benefits too.

Consumer Disposal

Single bin for all types of PPE

Collection

- On backloads wherever possible
- Fully traceable from individual site location
- Waste carrier licensed

Processing

- Secure certified destruction of company and project logos/names
- ZERO waste to landfill
- Evidence of working towards a circular economy
- Not just a waste to energy scheme
- Evidenced end of life solutions with fully auditable reporting on waste streams

Reporting

Not just waste transfer notes but a full Power BI style web based platform identifying

Best Practice Approach to Processing

Hundreds of tons of defective / returned product, corporate branded clothing, apparel and PPE are processed each month. Typically items are shredded to a particle size of 15mm (max) which ensures the destruction of all logo's, names, branding etc.

Use a dedicated non paper secure destruction & recycling company here in the UK, who also have contracts with multiple public & private sector organisations. To ensure the service you choose is well scrutinised ideally these should include Blue Light Services such as UK Police forces, Fire & Rescue services and NHS trusts. Also leading private sector customers that use well run services include Asda, Ikea, Tesco, Sainsbury, John Lewis Group, Royal Mail, Network Rail, Johnsons Apparelmaster, BT, British Gas, Aldi, Wilko, B&M, British Airways, FedEx and many more.

Well run services ensure that only a small percentage of material is treated as Solid Recovered Fuel (SRF) and a much larger percentage is reprocessed into Waste Processed Fibre (WPF).

Industrial PPE & Clothing

This is the sort of mix that typically comes from industrial users which traditionally have the lowest recycling to recovery rates because of the types of PPE used and the levels of contamination therein. Some industries use a lot of safety gloves which are considered more difficult to recycle. Gloves are designed to be robust and long lasting. These safety gloves can be chrome leather, are PU coated or made with rubber / composite materials. The normal recycling industry is some way from being able to recycle these items of PPE as it's so hard to remove things like PU coatings from textile backings, it can be achieved through a process of chemical separation but it's prohibitively expensive and the environmental benefits unproven so it's best to assume these items can be recovered but not recycled. Also in this category would be other items like hair nets from food industry users, foam ear plugs, rope, lifting slings, climbing kit or harnesses. The recycling percentage for this sort of waste is often around 70% with 30% being recovered.

The difference between recovery and recycling is that to recycle something you are required to produce a fibre that will be used in a new commodity. In the case of waste which can't be cost effectively recycled it is normally shredded it into a 15mm particle size. This is used for incineration in industrial applications via a product called Solid Recovered Fuel or SRF. Much of the UK's post-consumer and post-industrial general waste also goes into SRF which is essentially energy from waste. It's not ideal but it's better than landfill and is often considered to be the only practical, cost-effective option at the current time. In this category would be items like baseball caps which have a plastic lining in the peak, bakery & catering hats that have a metallic interlining, pilots' caps, cabin bags and unserviceable footwear.

After processing a smaller percentage is SRF and a much larger percentage of Waste Processed Fibre (WPF) remains. SRF to a 15mm particle size, is shipped to processors like Lancashire Recovered Fuels where it's made into fuel pellets:

http://www.lancashirewasterecyclingltd.co.uk/index.htm

Typically WPF mills who can use this fibre are based in the UK or Western Europe.

End uses

WPF uses after processing depends on the '3 C's':

Composition

Basically, anything with a natural fibre content is easier to recycle. End uses such as mattress insulator pads and upholstery fillings need to be inherently fire retardant (wool) or fibres that are absorbent that can be treated with fire inhibitors (cotton/polycotton). Polyester fibres are best suited to industrial applications like thermo moulded insulation in the automotive industry as blends with a higher Polyester content retain shape when heat is applied.

Colour

Lighter colours are more in demand as most end users likes a 'jazzy' look to their blend, a lot of corporate (bank) suiting, funeral wear and airline uniforms are dark colours like navy, black and grey so things like orange boilersuits from the rail industry or Hi-Viz trousers from road maintenance and construction can be used to lift the colour of the blend. Some retail clothing like the green used by Asda, or the red worn by Wilko and lighter pastel shades from healthcare can also be blended with these darker fibres.

Contamination

The end use of the fibre is often dictated by the amount and type of contamination on the garment. For example fibre used in mattress insulator pads or upholstery fillings must be

clean with no residual smell so laundered clothing is best. Items with heavier levels of contamination often also have the highest man-made fibre content as they are designed to be hard wearing and robust, this may include items from the engineering and construction industries and other industrial uses.

As a rule, primary contamination is fine (i.e., contamination from its primary use) its secondary contamination that needs to be avoided so keeping the waste dry and away from other waste streams like domestic waste is crucial to achieving high rates of recycling.

The higher-grade fibre (from workwear for example) is mostly used in the UK whereas WPF with a higher Polyester content generally goes to industrial users on the continent.

Demand for fibre is seasonal, for example in late winter fibre is supplied to end users who manufacture hanging basket liners and weed control mats for gardens and landscaping. That market will come to an end probably in late April or early May and their demand won't return until the following January. Demand for mattresses and upholstery products is highest in late Autumn (in the run up to Christmas) so most of the higher fibre grades will go into upholstery fillings and mattress insulator pads (the pad between the springs and the outer cover). There are several bed manufacturers and several companies making mattress pads and upholstery fillings that use this material.

Garden Liner

Insulation

Examples of Consumers of WPF

Built Environment

https://www.edwardclay.co.uk/

Edward Clay make a product called Regarm which is a substrate used in green roof installations. It sits under the grass or lichen on top of the roofing material. It's a very particular blend of fibre as it must be robust and in periods of wet weather allowing the excess water to drain through the product into drainage channels whilst in drier weather retaining moisture which can be returned to the grass/lichen to stop it becoming too dry. WPF processed by us goes to Yorkshire where Regarm is made by Edward Clay for the end user:

https://www.grasscrete.com/docs/greenroof/index.html

Automotive

Many of the industrial applications are in the automotive insulation industry. Here WPF is used for heat and sound insulation. Grades with a higher polyester content can be used in thermo-moulded products, widely used in areas like transmission tunnels and around areas inside the vehicle subjected to heat from exhaust gasses like the rear passenger foot wells.

Several manufactures including Autoneum in the UK (again in West Yorkshire) manufacture for Toyota, Nissan, and Vauxhall. If you look at Prime Light, Ultra-Light and IFP-R2 in the following link you can see how the WPF fibre is integrated into their products:

https://www.autoneum.com/products-technologies/interior/

One of the largest users of this fibre outside the UK is Suroflex in Germany who supply VW, BMW & Mercedes:

https://www.suroflex.de/de_DE/

Other Applications

WPF is even used as an anti-vibration and sound insulation pad in Miele washing machines.

There are lots of other end uses for WPF, including the use in sewer linings, void fillers in large format injection mouldings like plastic pallets and even a range of recycled lamp shades sold in Ikea stores, there's no single market for the fibre and no single solution to fit every customer.

Relief Blankets

Substrate

It's almost impossible to say what a customer's garments will ultimately be used in as that will depend on market demand, fabric composition, colour and season and it's impossible to say that X garment will be used in Y application, we can tell you the likely end use based on composition and contamination but in the same way as your local council recycling site can't tell you what your old microwave will be made into, we can't say for sure exactly which product a particular garment will be either.

Alternative Approaches to Repurposing Clothing

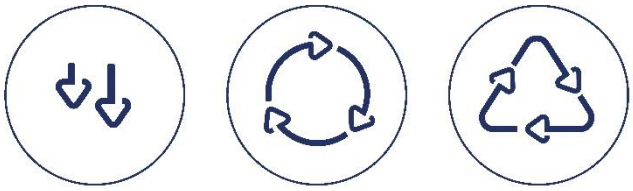
Main competitors to reprocessing are in the charity clothing sector. The largest being LMB, JMP Wilcox, Oxfam Wastesaver and The Salvation Army.

These companies and charities process thousands of tons a week of clothing donated to charity shops and placed in clothing banks.

Around 60% of what they collect is either sold in charity shops or exported to developing countries as used clothing and textiles but that still leaves thousands of tons a week of textiles that need to be recycled.

For example, the main markets for export clothing are Africa (where lighter weight clothing and especially cotton garments are preferred) and Asia where countries like Kazakhstan, Pakistan and Uzbekistan prefer heaver weight clothing.

There is however a very limited market for some garments like worn out clothing, very large sizes, some suiting, overcoats and denim all of which end up in competition with WPF.



Reduce Reuse Recycle

Non-textile items

Non-textile items are processed for recycling too including helmets, eyewear, footwear, gloves, and trouser belts. Generally these items form a smaller percentage of what is collected.

If they are serviceable (paired, less worn footwear for example), they are exported to developing countries. However unserviceable items, odd or worn-out shoes go into the SRF waste stream.

So they are either

- exported to developing countries for reuse
- turned into Post Industrial Regrind (PIR). This essentially describes the process of recapturing scrap plastics and resins from any manufacturing process. The grade of plastic will dictate the final use of the regrind

Footwear

- 40% of footwear is processed into PIR. Both steel and composite safety footwear (including wellingtons have the toecap removed and are either turned into PIR along with the rest of the material or have the steel recycled.

Eyewear

- Identified eyeglasses from manufacturers like Bolle or Uvex are chipped an returned to them for use in new frames
- Unidentifiable eyewear is processed into PIR

Helmets

- 95% of each helmet can be recycled into PIR
- 5% comprising the helmet liner is turned into SRF

Your Responsibilities

According to the UK Government: You must keep waste to a minimum by doing everything you reasonably can to prevent, reuse, recycle or recover waste.

Any waste that comes from a commercial activity is business waste.

Business waste also includes any waste that comes from:

- construction
- demolition
- industry
- agriculture

https://www.gov.uk/dispose-business-commercial-waste

Cost of Disposal

Whether sent to landfill or reprocessed there is a cost for end of life treatment of PPE. It might not be the first thing that springs to mind when considering your business overheads, but you might be surprised by how much it actually costs to get rid of waste.

Landfill

A Landfill Tax applies to all waste disposed of by way of landfill. The tax is charged by weight. Landfills rates are increasing to encourage a more responsible approach with the Government continually increasing the rate. For example the cost of landfill continue to rise by around 20% per annum in the UK and by similar rates in the EU.

Businesses also pay "gate fees" to local authorities to dispose of waste.

HM Revenue & Customs suggest that the high cost of burying commercial waste is encouraging many businesses to recycle more.

Recycling and Reprocessing

The rate for recycling and reprocessing waste covers the cost of sorting it into the correct grade and then converting the waste into SPF, WPF, PIR or if serviceable reused.

There's a further cost to deliver it to the end user all of which comes from the charges this type of PPE recycling carry.

Thinking beyond just Recycling

Best practice

Here are some of the best practices that have been adopted to as practical examples of quick wins and long-term gains to have a positive impact on your organisation and the planet

- Buy longer lasting, comfortable PPE
- Procure items that are evidenced as carbon neutral or made from recycled content
- Select items with reduced environmentally friendly packaging
- Reduce avoidable waste through premature disposal

- Recycle Responsibly with a combined service that repurposes and fully reports end of life
- Think about whole life impact and beyond PPE

Other Considerations

In addition to environmental considerations, there is now an even greater emphasis on organisations to embed both environmental and ethical practices within their processes and trading arrangements.

Through the introduction of legislation such as The Landfill Directive adopted by the European Community (EC) in 1999 and the Modern Slavery Act, investors, clients and contractors are including responsible sourcing and disposal criteria in their selection process and tender documents.

Conclusion

So it's important to reduce the impact of materials used, and address issues including:

- Lifecycle impact consideration
- Exploring the advantages of recycled or secondary materials

It is unlikely that you or your customers are generating a waste stream that the reprocessing industry haven't seen before. In this industry scale matters as in order to generate a marketable WPF blend our partners process waste from many different users, across a range of colours and fibres. Hi vis garments within WPF is attractive to consumers of recycled materials.

No matter the type of PPE; garments (workwear and high visibility), hard hats, boots, gloves, glasses, etc., the better quality the waste and whether it has been regularly laundered, the more likely it is to be recycled.