POLYFLOR™
COVERING THE WORLD

Vinyl & Linoleum LCA Comparison

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Vinyl flooring provides a high performance, cost effective, low maintenance, long-life solution which is why it is so widely used, with an 85% market share across Europe for resilient flooring. Polyflor flooring is 100% fit for purpose in all internal environments not just specific areas.

Polyflor vinyl flooring also performs well environmentally and when compared to linoleum the results are favourable. This document provides a comparative overview of both types of resilient flooring, for the different stages of the products' life cycle. This is the fairest way to make comparisons, as everything has an environmental impact one way or another – even vinyl and linoleum! BRE and EPD assessments cover the entire product's life cycle, from cradle to grave, helping ever discerning specifiers evaluate and compare on a like for like basis.

1

Materials

Vinyl consists of 57% salt (chlorine) and 43% oil (ethylene), salt being one of the world's most abundant natural resources.

- Chlorine has an established place in the natural world: The sea, plants and animals all contain and produce vast quantities of chlorinated molecules.
- In the human body, chlorinated compounds are indispensable to the functioning of the vital organs (NB hydrochloric acid in the digestive process).
- 4,000+ naturally-occurring organohalogens have been identified. It is a fact that natural organohalogens are a normal part of the chlorine cycle in the environment.
- 85% of medicines either contain chlorine or use chlorine in their production process. It is also an essential intermediate in the production of certain materials used for making medical equipment, including blood bags.
- In the manufacture of vinyl any excess chlorine would be used to make bleach. Chlorine is sometimes pressurised, liquified and put into cylinders. Chlorine is widely used by potable water companies to disinfect water against harmful bacteria.
- During the manufacture of Polyflor flooring no chlorine is emitted during the production stage. Chlorine is chemically bound within vinyl and remains chemically bound during the process and during the life of the flooring. Another example of this is salt which contains chlorine and remains chemically bound when the food is cooked.
- Ethylene comes mainly from gas or oil, but ethylene from biomass is also used. Ethylene is also a natural product, given off by ripening fruit.
- Only 4% of barrel oil is used for all plastics and vinyl uses only a fraction of this. Most oil is used for heating and travel consumption.

Filler content comprises a sustainable chalk and plasticisers are added to enhance the product performance characteristics through a range of operational temperatures. This enables Polyflor vinyl to be easily installed and coved, its flexibility prevents cracking. Ortho phthalates and non-phthalate options are used and are both proven to be safe when used as intended (there is no scientific evidence to demonstrate that any harm to human health will arise when used in vinyl flooring). Polyflor vinyl does not contain lead, mercury, organic tin and cadmium compounds or formaldehyde in the stabiliser formation and can therefore declare E1, also confirmed on all CE Marking.
All Polyflor products are REACH (Registration, Evaluation, Authorisation & restriction of Chemicals) compliant, ensuring total safety for human use and the environment.

Linoleum is also derived from natural ingredients and, like vinyl, is a processed material with an environmental impact. The surface is sealed to help with maintenance. The jute carrier is chemically treated – usually with formaldehyde, which must be declared on packaging via the CE Marking - to help prevent rotting. If jute is not used an inert polyester scrim is used on the back of linoleum tiles to try to prevent it expanding if wet. Flax, which is a key ingredient of linoleum, is intensively harvested in areas which could be better served growing crops of food types for human consumption. Chemical fertilisers are often used on the flax crops, including phosphates and nitrates, together with pesticides. All of which contribute to eutrophication potential of rivers. It is important to thoroughly check resource stewardship of this phase.

Materials Summery

All ingredients used in the manufacture of Polyflor vinyl flooring are responsibly sourced and follow the strictest industry regulation. No harmful substances are included, such as lead, mercury, organic tin or cadmium compounds and formaldehyde. Our products are environmentally sound and safe for human use. Linoleum can also include chemical treatments for longevity including formaldehyde, which must now be transparently communicated via CE marks. Flax is also intensively harvested, with problems occurring from pesticides used, causing eutrophication potential.

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Manufacture

With regards to Polyflor's manufacturing facilities and processes, the amount of energy required per m^2 of material produced has continued to fall year on year down to 2.70KwHr per m^2, representing a 46% drop since 2000. From this time, carbon emissions as audited by the Carbon Trust have been reduced by 18,426 tonnes. This reduction is due to the environmental targets set by ourselves in accordance with ISO 14001. Furthermore, around 15% less energy is required to produce vinyl than linoleum because of the intensive 'cooking' process (it is cured in ovens over 14-21 days).

As a natural part of the manufacturing process, Polyflor has been recycling vinyl since the 1950s, when it pioneered the production of homogeneous vinyl flooring. Additionally, 85% less energy is required to manufacture vinyl which uses recycled vinyl rather than virgin material.

Manufacture Summery

Less energy is typically used to produce vinyl than linoleum – the embedded energy is reduced by using recycled vinyl in the manufacturing process.

3

Performance & Maintenance

Vinyl and linoleum are both extremely durable and can last up to 25 years (and even longer as it has been proven). However Polyflor vinyl is 100% fit for purpose and compromises do not have to be made to obtain a sustainable product.

CLEANING

The in-use phase of resilient flooring is up to 80% of its environmental impact. All Polyflor ranges are designed with low maintenance features in mind where energy intensive cleaning is not required. Polyflor PU and PUR ranges are the easiest to clean, ensuring that use of water, polish, strippers and chemical cleansers are significantly reduced. Our PUR ranges can be maintained without polish for life and also use up to 55% less water and therefore have better maintenance characteristics than linoleum, also achieving greater cost savings of up to 60%. Vinyl also has a much better resistance to stains and will performing well in hospitals, for instance, where hand gel spillages and drips can cause some damage.

"The major difference – then and now – between vinyl and linoleum is that vinyl is easier to clean. Depending on the foot traffic in the room where you want to install your linoleum floor, you may have to do more maintenance to keep your floor looking and performing at its best."
Armstrong Flooring

According to Palmer Market Research in 2012, the report's findings clearly stated that Polyflor was the leading resilient floorcovering for low maintenance:

"Specifiers preferred Polyflor for its easy maintenance."

"Polyflor is much more durable due to its cleaning qualities."

USE AREA & USEABILITY

The majority of Polyflor 2.0mm floorcoverings obtain the highest Use Area Certification of 23/34/43, making them suitable for heavy domestic, very heavy commercial and heavy-light industrial use. In comparison, a greater thickness is required for linoleum to achieve a similar recommendation, but even at 2.5mm thick it is not recommended for 43 areas. Under the Agrément (UPEC) system only 3.2mm thick linoleum had the same wearability as most of the accredited Polyflor products.

Another of vinyl's strengths against linoleum is its much greater resistance to water. Linoleum is not suitable for use in areas where there can be the extensive contact with water as it tends to be porous with the water affecting its composition. Vinyl is impervious and can be thermally welded with the joints actually fused together. Linoleum cannot be welded in this way. Where the joints need to be filled, a hot melt adhesive must be used. Regarding welded seams, vinyl has better dimensional stability than linoleum. Linoleum has the tendency to expand, especially when in contact with moisture or with wet cleaning methods. This can again be highlighted by the fact that most linoleum tiles are supplied on an inert polyester scrim rather than the jute backing.

Vinyl is inherently more flexible and is easily self coved, whereas linoleum is less flexible and therefore prone to cracking when coved. This flexibility also means that vinyl has much better recovery from indentation than linoleum.

The combination of these properties and sustainable wet slip resistance of vinyl flooring means that it can be used throughout the entirety of hospitals and schools, rather than specific and limited locations. Vinyl flooring can also be used in conjunction with vinyl wall cladding systems to provide clean room facilities to very rigid requirements, classed as non shedding materials.

Performance & Maintenance

FIRE PERFORMANCE

Many of the constituents used in the manufacture of linoleum are wood based, which means that the fire characteristics are in line with that of burning wood. Vinyl is engineered to provide the best fire performance characteristics of all resilient flooring materials. Compared to other materials vinyl flooring is slow to ignite in a fire – chlorine content is flame retardant. Furthermore, a fire which is large enough to ignite vinyl would have already produced fatal levels of carbon monoxide from other burning materials before any danger from burning vinyl flooring. Vinyl flooring typically outperforms linoleum, achieving class Bfl to EN 13501-1 (8kw/m or greater) with linoleum achieving class Cfl to EN 13501-1 (4.5kw/m or greater).

VOCs

Independent studies have shown that linoleum does off-gas. It has a very strong odour and the substances produced from off-gassing linoleum are generally a range of volatile organic chemicals known as aldehydes.

The VOC emissions on Polyflor products are all below the strictly set, accepted levels. Products have been tested by independent laboratories, passing the most stringent VOC emissions' tests with no negative contribution to indoor air quality. Polyflor has VOC Approval certificates from (Eurofins) Indoor Air Comfort Gold, AgBB / DiBT, FloorScore®, Finland M1 test, Swedish B.P.D (FLEC test), Afsset and GreenTag.

Performance & Maintenance Summery

Vinyl and linoleum are both extremely durable and can last up to 25 years (and even longer as it has been proven). However, compared with linoleum, Polyflor vinyl is exceptionally low maintenance and offers significant cost savings. It can be used in all use areas, given its market leading slip resistance properties and boasts greater aesthetic benefits or choice. Another safety issue is that vinyl flooring also outperforms linoleum with regards to fire performance.

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Recycling

Vinyl is most suitable for recycling, unlike many alternative materials, as it does not weaken or lose performance and functionality. This is particularly significant for temporary construction projects, where recycling is crucial at the end of the project.

Polyflor is the largest vinyl flooring manufacturer in the UK, producing a wide variety of ranges. Recycling of post production waste is high and in 2013, 9,570 tonnes were recycled.

We are a founding and funding member of Recofloor, the UK industry's leading vinyl take-back scheme, operating throughout the UK, Ireland and Australia. Running such a scheme individually would create too many logistical problems and (environmental) inefficiencies, hence the success and importance of Recofloor. In 2013, 800 tonnes of vinyl waste flooring was returned to Polyflor for recycling back into new product. Where it is not possible to be recycled back into new flooring (too many contaminants such as screed) it is recycled into other useful items, namely traffic cones and road barriers. The Recofloor scheme collects direct from live sites, contractors and a network of 68 distributors, so nobody is excluded from using the scheme. Forbo is the only linoleum manufacturer to offer a recycling service, but it will only take back Forbo waste and is limited to large projects, with only 2 distributors acting as drop-off sites.

On average (if considering Armstrong, Forbo and Tarkett' 'up to' figures), recycled content is 37% for linoleum. Polyflor vinyl comprises up to 40% recycled content and this is typically made up of post production and post consumer waste vinyl.

End of Life Summery

Vinyl is the most suitable material for recycling. It is 100% recyclable and it can be recycled many times over, without losing any of its performance properties. Post production waste vinyl is automatically recycled with an increase of post consumer waste being reclaimed and recycled back into flooring and non-flooring products. The Recofloor scheme has been set up to promote and facilitate the easy reclaim and recycling of waste vinyl flooring. Generally, recycled content for vinyl is higher than that of linoleum flooring and the recycling schemes do not compare favourably for the linoleum manufacturing industry.

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LCA & BRE Global Ratings

For the reasons given, Polyflor vinyl flooring performs well within an LCA. Polyflor's homogeneous, LVT, heterogeneous and safety ranges have been individually assessed by BRE Global to measure their environmental 'cradle to grave' impact. Depending on the outcome of this A+ to E ratings are assigned accordingly, with an A+ rated product being least impactful on the environment. Polyflor's ranges achieve A+ ratings which can also contribute to maximising a building's BREEAM score (note, further waste credits may be achieved by using Recofloor with BRE's SMARTWaste programme).

HOMOGENEOUS	Certificate	Health	Education	Retail (fashion)	Retail (durability)	Office	Domestic
Polysafe Astral PUR	ENP472	A+	A+	A+	A+	A	A
Polysafe Mosaic PUR	ENP472	A+	A+	A+	A+	A	A
Polysafe Corona PUR	ENP472	A+	A+	A+	A+	A	A
Polysafe Vogue Ultra PUR	ENP472	A+	A+	A+	A+	A	A
Polysafe Standard PUR	ENP472	A+	A+	A+	A+	A	A
Polysafe Wood fx PUR	ENP415	A+	A+	A+	A	B	B
Polysafe Wood fx Acoustix PUR	ENP415	A+	A+	A+	A	B	B
Polysafe Hydro	ENP472	A+	A+	A+	A+	A	A
Polysafe Strata	ENP472	A+	A+	A+	A+	A	A
Polysafe Ultima	ENP472	A+	A+	A+	A+	A	A
HOMOGENEOUS							
Pearlazzo PUR	ENP472	A+	A+	A+	A+	A	A
2000 PUR	ENP472	A+	A+	A+	A+	A	A
Classic Mystique PUR	ENP472	A+	A+	A+	A+	A	A
Mystique PUR	ENP472	A+	A+	A+	A+	A	A
Prestige PUR	ENP472	A+	A+	A+	A+	A	A
Standard XL	ENP472	A+	A+	A+	A+	A	A
XL PU	ENP472	A+	A+	A+	A+	A	A
HETEROGENEOUS							
Harmony fx PUR	ENP415	A+	A+	A+	A+	A	A
Forest fx PUR	ENP415	A+	A+	A+	A+	A	A
Mineral fx PUR	ENP415	A+	A+	A+	A+	A	A
Acoustix Harmony fx PUR	ENP415	A+	A+	A+	A	A	B
Acoustix Forest fx PUR	ENP415	A+	A+	A+	A	A	B
Acoustix Gallery fx PUR	ENP415	A+	A+	A+	A+	A	A
LVT							
Expona Commercial PUR	ENP429	A+	A+	A+	A+	A	B
Expona Design PUR	ENP429	A+	A+	A+	A	B	B
Bevel Line PUR	ENP429	A+	A+	A+	A	A	A
Camaro PUR	ENP429	*	*	A+	*	A	A
Colonia PUR	ENP429	*	*	*	*	*	A

* Product not suitable for use area and has therefore not been rated for the particular use area.

LCA & BRE Global Ratings

Where Polyflor products have not been individually certificated by BRE Global, generic ratings are also available.
These generic ratings apply to specific categories of flooring installed into defined use areas. For example, homogeneous flooring, to EN649 standard, rated 34/43 for use area and installed in a healthcare environment. Vinyl flooring achieves on average a generic BRE Global A+ rating for most vinyl varieties across the categories shown below. Linoleum also achieves BRE A+ ratings and is comparable therefore with vinyl.

Standard	Homogeneous EN 649	Heterogeneous EN 649	Acoustic EN 651	LVT EN 649	Safety EN 13845	Rubber (smooth) EN 1817	Rubber (profiled) EN 12199	LVS EN 653
Health	A+	A+	A+	A+	A+	A+	A+	-
Element	821570038	821570039	821570053	821570054	821570055	821570056	821570057	
Education	A+	A+	A+	A+	A+	A+	A+	-
Element	821570065	821570066	821570010	821570013	921570010	821570014	821570015	
Commercial	A	A	A	A	A	A	A	-
Element	821570038	821570039	821570041	821570042	821570043	821570044	821570045	
Retail	A+/A+	A+/A+	A+/A	A+/A	A+/A	A+/A+	A+/A+	-
Element	821570038	821570039	821570053	821570054	821570055	821570056	821570057	
Domestic	A	A	A	A	B	A	A	A
Element	821570065	821570066	821570010	821570013	921570010	821570014	821570015	821570002

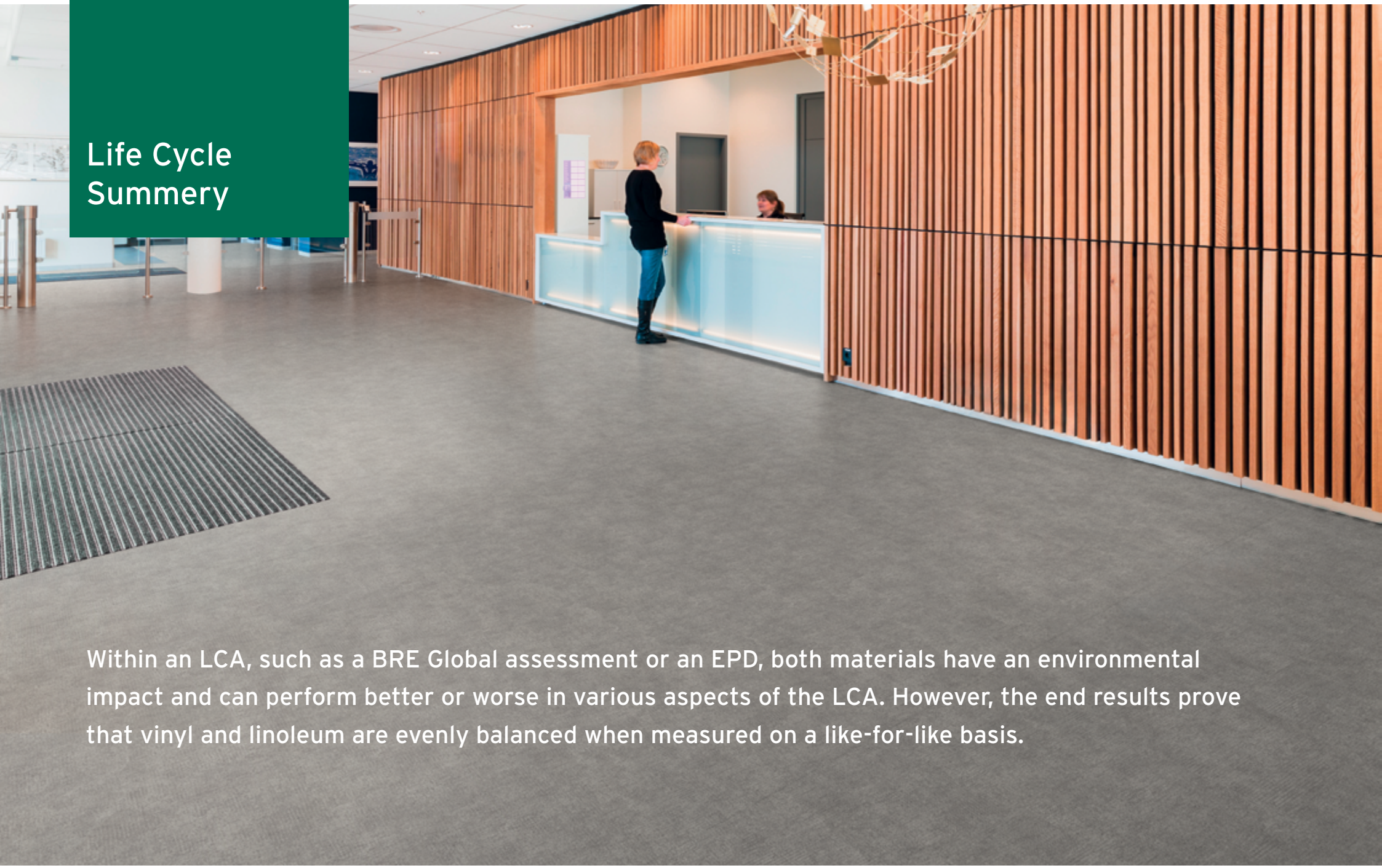
For more detail about how these ratings are arrived at by BRE Global visit www.bre.co.uk/greenguide.

Polyflor ranges not individually assessed by BRE Global can be included within the appropriate generic ratings, shown below:

Safety	Homogeneous	Rubber (smooth)	Rubber (profiled)	LVT	LVS
Modena PUR	**Polyflor SD**	**Diamant**	**Noppe Stud Tile**	**SimpLay**	**Secura**
Hydro Evolve	**Finesse SD**				
Ecomax	**Finesse EC**				
Arena PUR	**Polyflor EC**				
Expona Control PUR	**Polyflor ROF**				
Verona PUR	**Polyflex Plus PU**				
Apex					

Furthermore, EPDs are now available and offer similar life cycle analysis from cradle to grave, allowing the specifier to disseminate the individual environmental impacts and make an informed decision. 3rd party verified EN 15804 compliant EPDs are available for Polyflor products.

Life Cycle Summery



Within an LCA, such as a BRE Global assessment or an EPD, both materials have an environmental impact and can perform better or worse in various aspects of the LCA. However, the end results prove that vinyl and linoleum are evenly balanced when measured on a like-for-like basis.

Conclusion

No resilient flooring is completely sustainable or without environmental impact and both vinyl and linoleum floorcoverings are processed, manufactured products with environmental impacts.
It is now acknowledged that the most proficient way to evaluate overall environmental performance is to address the whole ‘cradle to grave’ approach, using an LCA, as determined by 3rd party audits, including BRE Global assessments. On the basis of this, vinyl is very much comparable with linoleum but further comparisons must be accounted for including aforementioned fire safety, maintenance, increased use areas and slip resistance, choice of styles and feature designs as well as cost (initial outlay and on going cost of maintenance and subsequent replacement) – all of which, Polyflor vinyl has to be preferential to linoleum.