

Build a

SUSTAINABLE FUTURE WITH BDG™

BIODEGRADABLE GLOVES



- ✓ Tested for ASTM D5526
- ✓ Tested for ASTM D5511 (real-time results)
- ✓ FDA (510k) approval since August 2018
- ✓ Retain glove properties
(real-time shelf life results)

BIODEGRADABLE GLOVES

End-of-Life Solution to Nitrile Gloves

Biodegradable gloves, **BDG**, are one of the latest green initiatives in helping to create a better environment. It is our contribution to provide an end-of-life solution to nitrile gloves.

How does BDG Work?

BDG is a polymerised “food source”, specially formulated to attract microbes found especially in landfills. This biodegradation method is strictly enzymatic.

When bacteria consume the BDG material, they excrete an enzyme that dissolves and de-polymerises the polymer chain, allowing the microbes to break down the remaining polymer naturally. [Figure 1]

What is BDG Technology?

BDG drop-in technology integrates the existing manufacturing process without compromising product quality.

It comprises of an organic additive used to accelerate the biodegradation rate of gloves in biologically active landfills and anaerobic digesters.

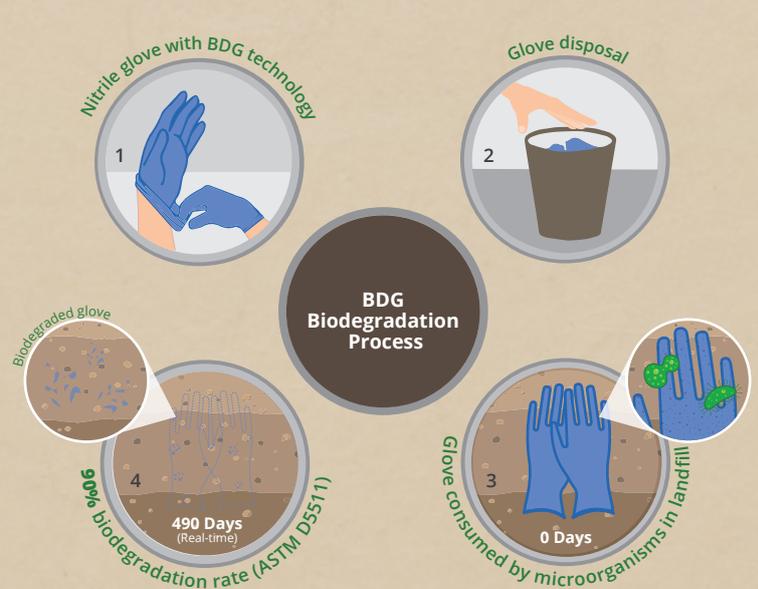


Figure 1: BDG biodegradation process

Why BDG Gloves?

1. Validated Biodegradation Rate

BDG biodegrading efficacy has been verified by an independent lab, Eden Research Laboratory, using ASTM D5526 and ASTM D5511 methods. [Table 1]

No.	Test Method	Purpose of Testing	Result Summary
1	ASTM D5526	To determine the degree and rate of anaerobic biodegradation of materials in accelerated landfill conditions. This is a long term test that replicates the landfill environment of low heat, high pressure, limited oxygen, no light and low moisture.	30% biodegradation in 202 days.*
2	ASTM D5511	To determine the degree and rate of anaerobic biodegradation of materials in high-solids anaerobic-digestion conditions, which replicates the anaerobic digester or landfill bioreactor environment.	90% biodegradation in 490 days.* <i>(Above results are based on a real-time study.)</i>

Table 1: Biodegradation test results based on ASTM D5526 & ASTM D5511.

**The actual biodegradation rates will vary depending on the landfill conditions and the biological activity of microorganisms surrounding the nitrile gloves.*

2. Retain Glove Properties

Gloves with BDG technology do not biodegrade prior to disposal. The unique formulation only allows the biodegradation process to begin when surrounded by microbes present in a landfill environment.

Real-time shelf life study results prove that the physical property BDG gloves remains unchanged up to 3 years. [Chart 1]

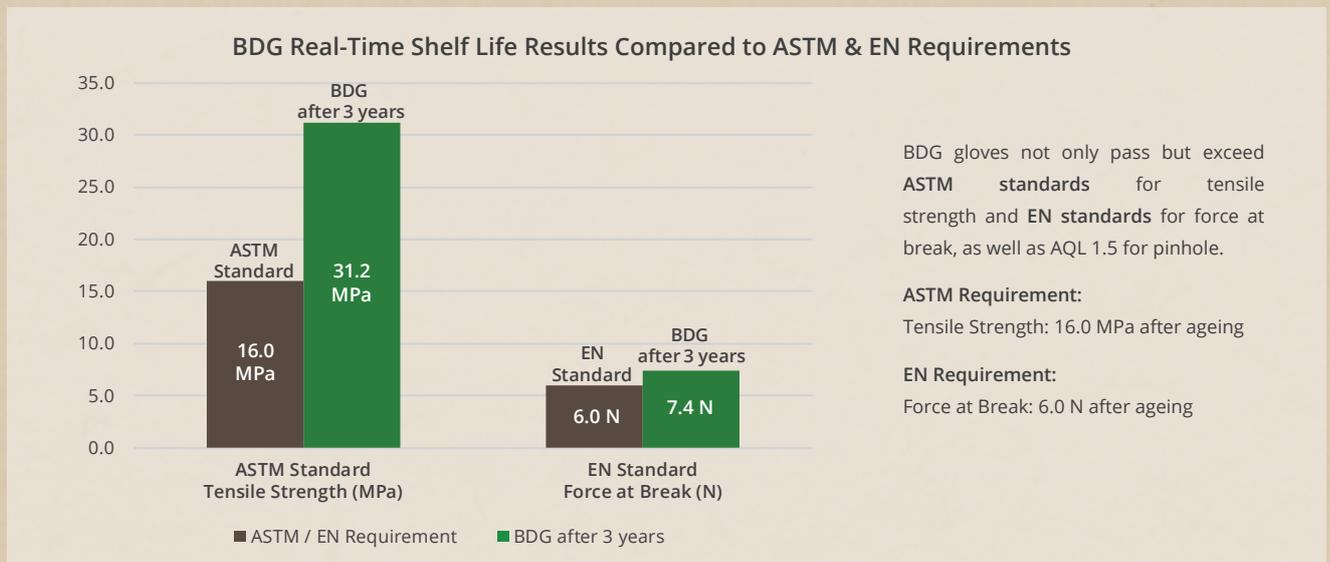


Chart 1: BDG real-time shelf life results.

3. Tested Safe for Biocompatibility & Food Contact

BDG gloves have been proven safe for use against skin according to ISO standards, as well as with food handling according to U.S. FDA, Japan Food Sanitation, European regulation (EU) No 10/2011, (EC) 1935/2004 and BfR XXI German Recommendation. [Table 2]

	ISO 10993-5	ISO 10993-10	ISO 10993-10	Food Contact	Food Contact	Food Contact
Test	Cytotoxicity Test	Primary Skin Irritation	Dermal Sensitisation Study	21 CFR 177.2600	Japan Sanitation Law	EN 1186, EN 13130 & CEN/TS 14234
Result Summary	Non-cytotoxic at 10% extract	Non-irritating	Non-sensitising	Pass	Pass	Pass
Compliance	✓	✓	✓	✓	✓	✓

Table 2: List of biocompatibility and food contact test results for BDG.

BDG Nitrile Gloves Specifications

	2.2 mil		3.0 mil	
	ASTM	EN	ASTM	EN
Features	Powder free, fingertip textured, ambidextrous, standard cuff, violet blue colour			
Physical Dimensions				
Length (mm)	≥ 230	Median ≥ 240	≥ 230	Median ≥ 240
Palm (centre of palm) (mm)	≥ 0.05	Median ≥ 0.05	0.07 ± 0.02	Median 0.07 ± 0.02
Finger (13mm ± 3mm from tip)	0.08 ± 0.03	Median 0.08 ± 0.03	0.10 ± 0.02	Median 0.10 ± 0.02
Physical Properties				
Tensile strength (MPa)				
Before ageing	≥ 18	N/A	≥ 18	N/A
After ageing	≥ 16	N/A	≥ 16	N/A
Elongation (%)				
Before ageing	≥ 500	N/A	≥ 500	N/A
After ageing	≥ 400	N/A	≥ 400	N/A
Median Force at Break (N)				
Before ageing	N/A	≥ 6	N/A	≥ 6
After ageing	N/A	≥ 6	N/A	≥ 6

Table 3: BDG product specifications.

The Benefits of BDG Gloves

- ✓ FDA (510k) approval since August 2018
- ✓ Proven to biodegrade based on ASTM D5526 (simulating landfill condition)
- ✓ Better ASTM D5511 biodegradation performance compared to other industry players
- ✓ Maintains the same glove properties and shelf life as standard nitrile gloves, proven by real-time shelf life test results
- ✓ Liable solution for proper glove disposal
- ✓ Enhances your company's environmental and green efforts
- ✓ Supports sustainability for a greener environment
- ✓ Hartalega's quality and consistency is proven