

## Natural Fibre Plastics

### Hemp Plastic

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#### The current situation

Plastic in the ocean is a massive problem that is only getting worse with time:

51 Trillion pieces of microplastics.

269,000 Tons.

400 Million tons of plastic produced each year.

40% single use.

100,000 marine creatures die each year.

1 Million sea birds die each year.

A Solution is needed to tackle this problem before we have irreversibly damaged the planet and used up or destroyed all of our resources.

#### The idea

Our Solution is to use an alternative to plastic that has far better environmental properties. This will buy more time in order to find solutions to cleaning the oceans and the rest of the planet of plastic and finding a way to deal with it.

This solution is Natural Fibre Plastics made from Hemp plants.

The case for Natural Fibre Plastic:

Sustainable

Agriculturally based

Versatile

Accelerated decomposition

Can be locally sourced

Part of an economic model that benefits the grower, manufacturer, retailer and consumer.

Seshata. (2014). How Are Hemp Plastics Made? [online] Available at: <https://sensiseeds.com/en/blog/hemp-plastics-made/> [Accessed on 20 Aug. 2019]

Leaf Science Editorial Team. (2013) Zeoform Hemp Plastic. [online photo] Available at: <https://www.leafscience.com/2013/11/19/zeoform-new-plastic-turns-hemp-almost-anything/> [Accessed on 20 Aug. 2019]

#### Manufacturing

The manufacturing process is simple, cellulose is extracted by hydrolysing the raw pulp from the stalks then when the cellulose is exposed to water it binds together without the need for any glue. Hemp contains around 70% cellulose so it is a good source leaving little waste.

Producing hemp to start with is fairly easy due to the fact that it is fast growing and does not need many pesticides compared to other common crops such as corn. The main barrier in this farming is the licencing however now that cannabis is becoming legalised this should become cheaper and more easily obtainable.

The rest of the plant can be used for a wide variety of products, for example the seeds can be used for food and the flowers can be used in pharmaceuticals so there is virtually no waste overall.

It seems that there is minimal reason for it not to have been done before. As plastic can be made as a by-product of the oil industry it is cheap however uses a lot of energy and obviously has a long running environmental impact.

#### The uses

Can be found as a 3D printing filament. Spools are compatible with most 3D printers and no technical adjustments are needed. Just "plug and play".



The other option is in pellet form where the fibre-based-plastic pellets are heated and the moulded into the required shape in exactly the same way that oil-based-plastic is done. Again, no alterations required for the injection moulding machines.

#### Material properties

The properties have been tested and found to be up to five times stiffer and two and a half times stronger than polypropylene (one of the most common forms of oil-based-plastics). It's also a lot lighter making it a more cost efficient material to transport.

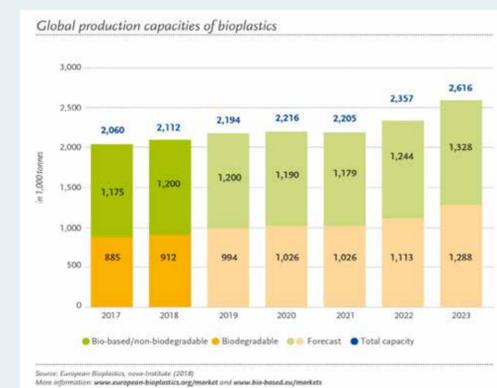
Shahzad, A. (2013). A Study in Physical and Mechanical Properties of Hemp Fibres. *Advances in Materials Science and Engineering*, 2013, pp.1-9.

EU3dfuel. (2019). Entwined v2 - Hemp Filament. [online] Available at: <https://eu.3dfuel.com/products/entwined-hemp-filament> [Accessed 31 Jul. 2019].

#### Benefits

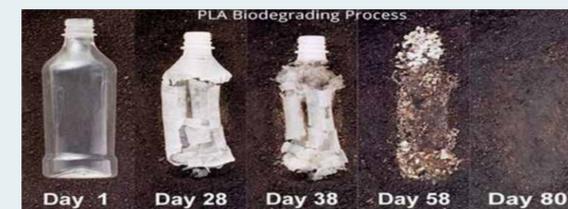
##### Manufacturing

It is a very simple manufacturing process that creates very little waste so in terms of making the product it would be highly efficient, it is only the farming of hemp plants that is hindering the process. As this forecast shows production of bioplastics is only going to grow so it would be a very lucrative market to break.



##### Degradation

Hemp plastics biodegrade at a much faster rate than conventional oil based plastics. This is because the absence of volatile hydrocarbons found in oil make the fibres easier to break down in the right circumstances and without leaking toxic substances into the soil.



Quote from Diana Johnson MP:

*"I'm very impressed to see Hull University students doing cutting edge work on greener alternatives to oil-based plastics and I hope this initiative gains recognition and is developed further as a business idea."*



Cannabis Hemp Conference. (2019). Cannabis Hemp Conference and Expo. [online] Available at: <https://www.cannabishempconference.com/> [Accessed 31 Jul. 2019]

Dianajohnson.co.uk. (2019). About Diana Johnson MP | [www.dianajohnson.co.uk](http://www.dianajohnson.co.uk). [online photo] Available at: <https://www.dianajohnson.co.uk/content/about-diana-johnson-mp> [Accessed 31 Jul. 2019].