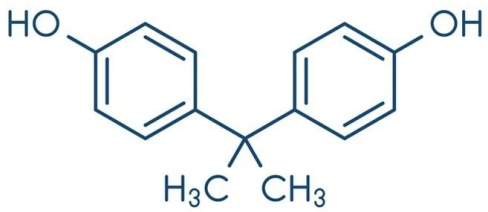
Bisphenol A Pollution from Wind Turbines

Tim Smith 13/07/2023

What is Bisphenol A?



bisphenol A

Bisphenol A (BPA) is a chemical produced in large quantities for use primarily in the production of polycarbonate plastics and epoxy resins.

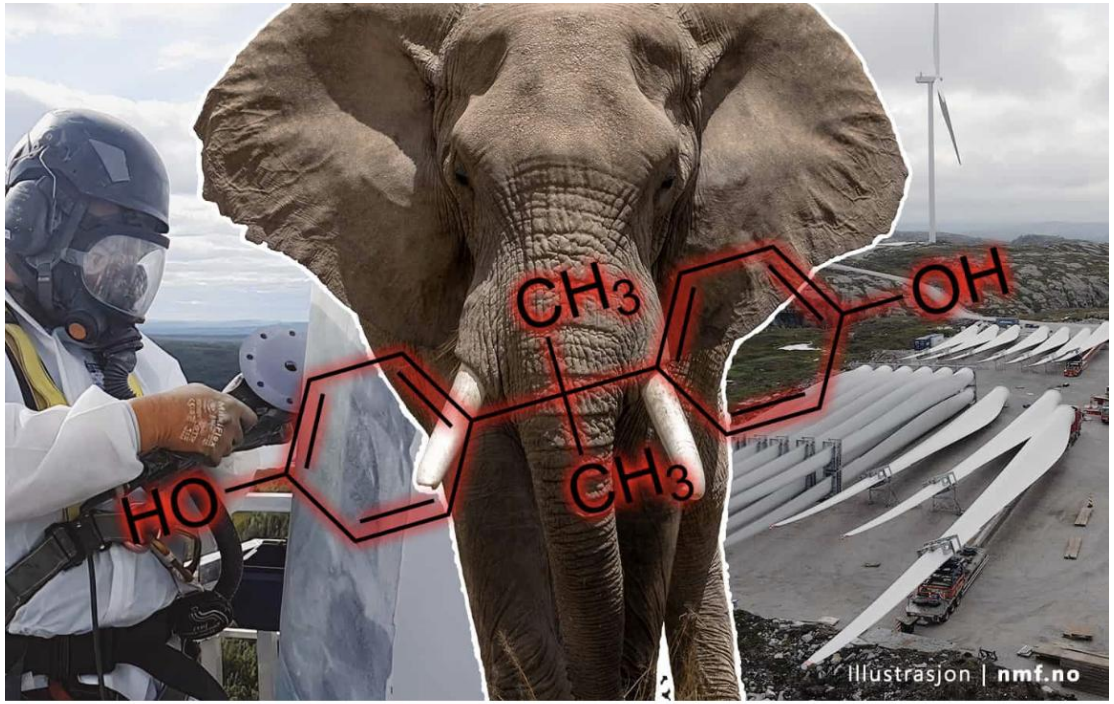
“Bisphenol A is the most toxic substance we know’

- Swedish Environmental Protection Agency

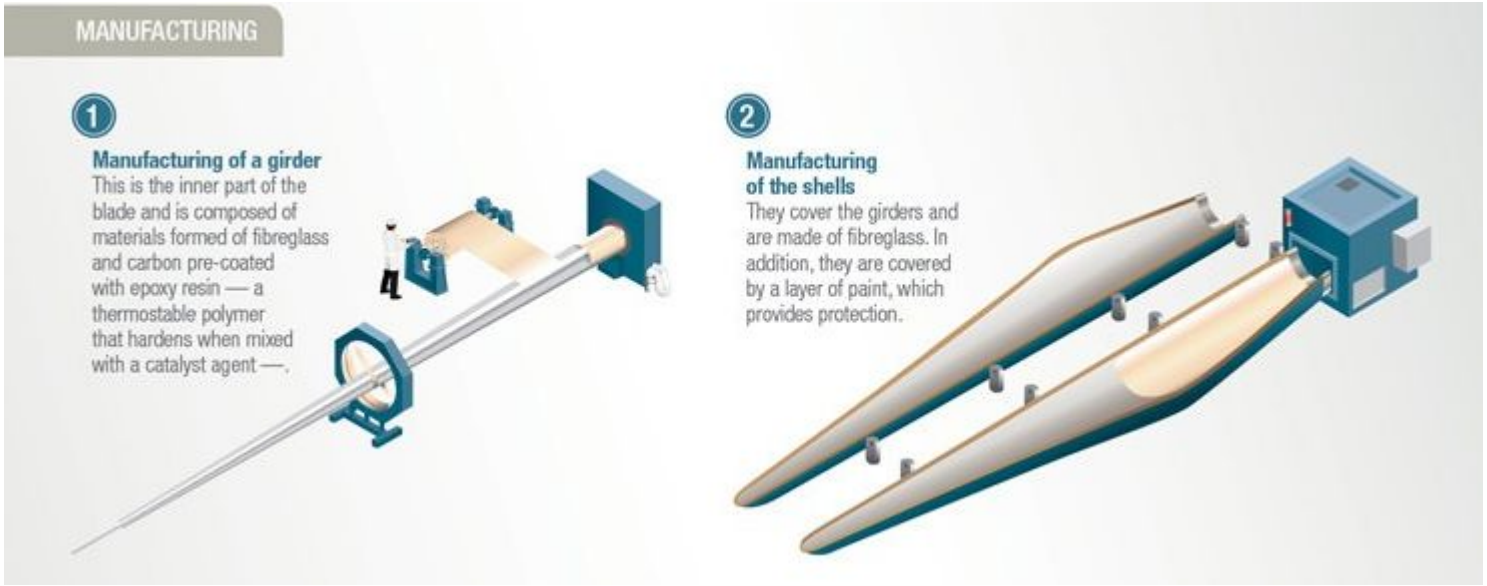
New Regulations

Avoid release to the environment!

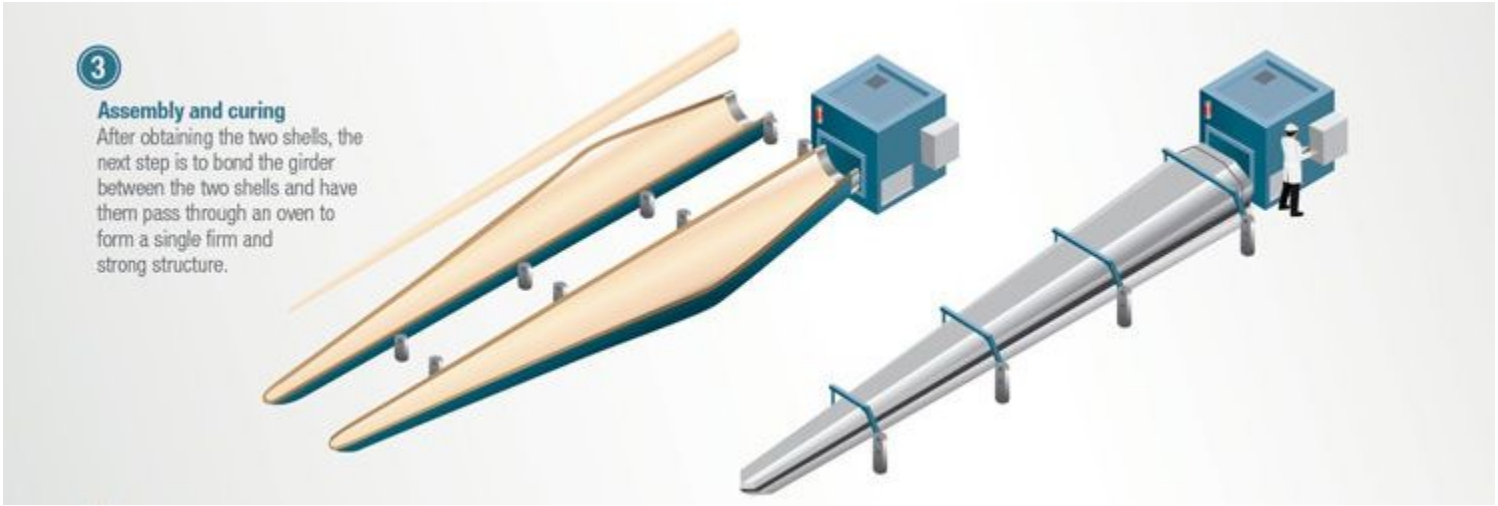
The Elephant In The Room



Wind Turbine Blade Construction



Wind Turbine Blade Construction - cont

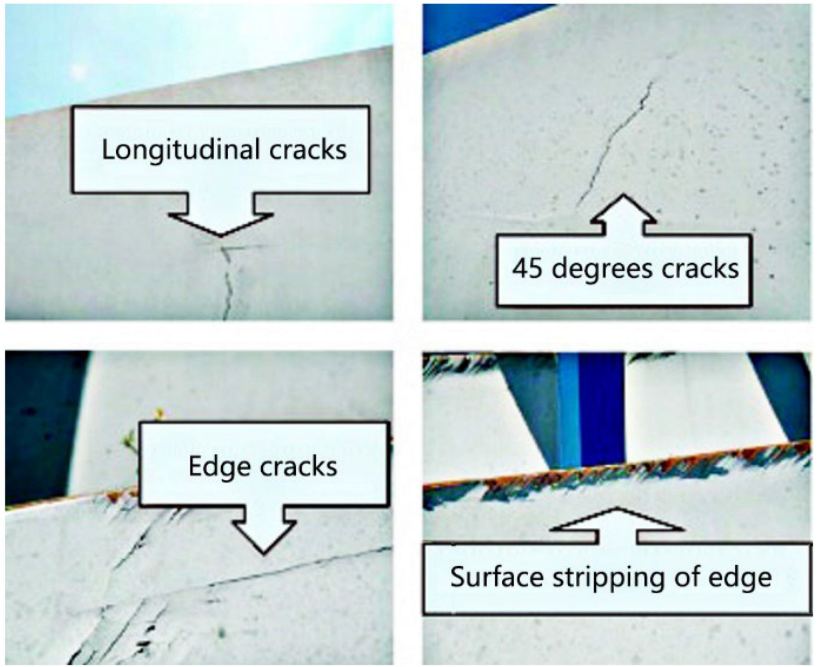


Wind Turbine Blade Construction - cont

Process: Leading Edge Erosion

A different process takes place on the trailing edge leading to cracks running a significant part of the blade length.

Process: Vibration / Cracks



Blade tip speed in excess of 200 mph on larger turbines which suffer worse vibration!

Blade Maintenance

What materials are used?

Most blades are made with fibreglass-reinforced polyester or epoxy. Carbon fibre or aramid (Kevlar) is also used as reinforcement material. Nowadays, the possible use of wood compounds, such as wood-epoxy or wood-fibre-epoxy, is being investigated.

How is maintenance carried out?

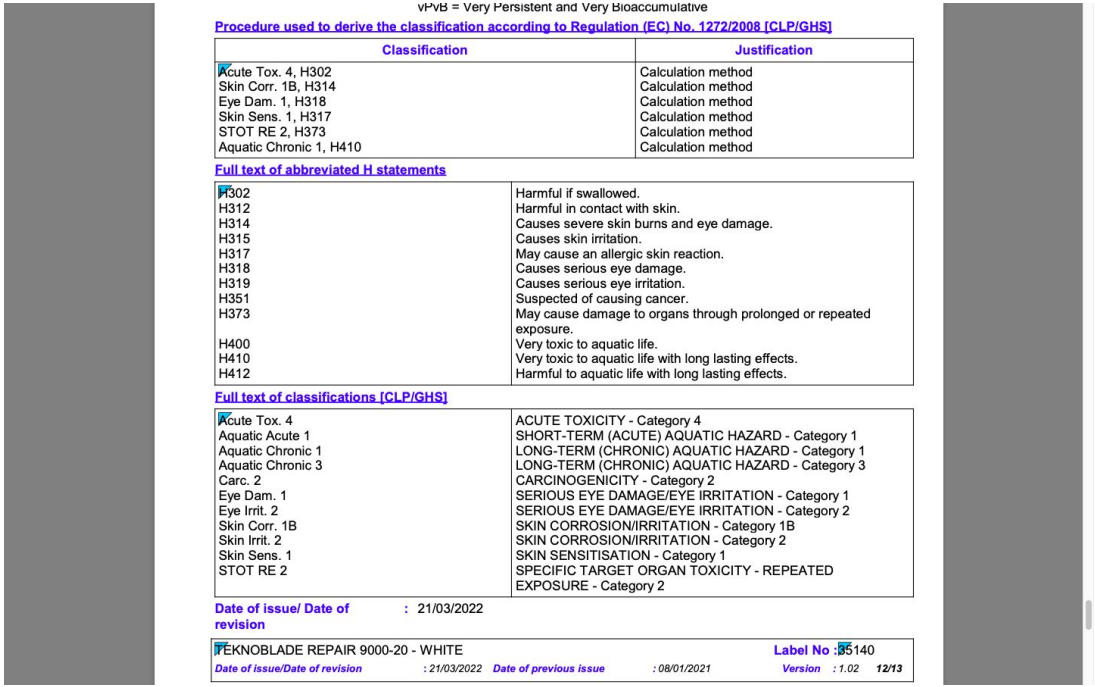
There are two types of maintenance: preventative and corrective. The former consists of periodic inspections to determine the condition of the blades and identify any damage. These checks are made using different techniques â□□ from the ground, with high-precision telephoto lenses, climbing the blades with ropes, cranes or lifting platforms and remotely, by using drones. Corrective maintenance meanwhile consists of the repair or reconstruction of the blades and *nacelles* to correct any damage that appears, both on the surface and within the structure.

How are the blades repaired?

Wind turbine blades can suffer cracks, damage caused by the impact of lightning and birds or openings in the leading or trailing edge, among other damage. The repair tasks are performed by workers at height, who hang from the blades with ropes or are lifted up to them on suspended platforms. At present, alternative repair and cleaning systems, such as drones, are being looked into to prevent operators from having to climb up to the turbines.

Process: Sanding

Repair Epoxy Datasheet



vPvB = Very Persistent and Very Bioaccumulative

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Acute Tox. 4, H302	Calculation method
Skin Corr. 1B, H314	Calculation method
Eye Dam. 1, H318	Calculation method
Skin Sens. 1, H317	Calculation method
STOT RE 2, H373	Calculation method
Aquatic Chronic 1, H410	Calculation method

Full text of abbreviated H statements

H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS]

Acute Tox. 4	ACUTE TOXICITY - Category 4
Aquatic Acute 1	SHORT-TERM (ACUTE) AQUATIC HAZARD - Category 1
Aquatic Chronic 1	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 1
Aquatic Chronic 3	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3
Carc. 2	CARCINOGENICITY - Category 2
Eye Dam. 1	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Eye Irrit. 2	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2
Skin Corr. 1B	SKIN CORROSION/IRRITATION - Category 1B
Skin Irrit. 2	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1	SKIN SENSITISATION - Category 1
STOT RE 2	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2

Date of issue/ Date of revision : 21/03/2022

Process: Disposal

While manufacturers are frantically seeking the ‘re-cycleable’ turbine blade, today the majority end up in landfill where Bisphenol A is leached out into groundwater.

Process: Fire

Nearly 120 wind turbines catch fire each year, according to research in 2014 - ten times the number reported by the industry. The figures, compiled by engineers at Imperial College London and the University of Edinburgh, make fire the second-largest cause of accidents after blade failure.4 Aug 2022

How Much Bisphenol A?

Method A: (German EPA Report - updated for 2023)

The EU produces some 347,000 tons of Bisphenol A,

15% of this goes into wind turbine blade production as epoxy resin so 52,050 tons pa, of which 12.39 tons pa is calculated as emissions.

23% of the EU fleet of turbines is in the UK (WindEurope)

2.85 tons pa Bisphenol A emissions for the UK wind turbine fleet

Method B: (Danish EPA Report based on manufacturer's figures)

4,400 wind turbines in Denmark produce .66 tons of microplastics, so 11,000 in UK produce 1.650 tons pa of which 30 to 40 % is Bispenol A

0.577 tons pa Bisphenol A emissions for UK wind turbine fleet

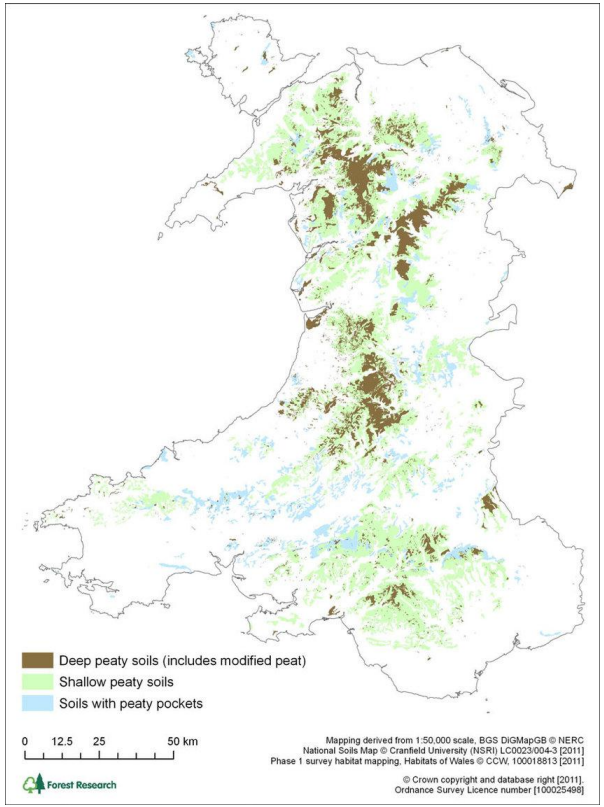
How Much Bisphenol A?

It really does not matter which method you believe:

1 kg of Bisphenol A makes 10 billion litres of water unusable!!

7 kg of Bisphenol A would make LLyn Celyn unusable!!

Environment?



CAA suggests the turbulent zone from wind turbines is 5 x the diameter of the base. That can therefore be considered the direct fall out zone ito which microplastics are carried.

The leaching of Bisphenol A from microplastics is a well known process that is dependent on pH and temperature.

Leaching is known to be accelerated in acidic conditions. This is one of the reasons it is so dangerous by ingestion.

Peat is an acidic environment!

Health & Bisphenol A

- **In April 2023, EFSA published a re-evaluation of BPA's safety, significantly reducing the tolerable daily intake (TDI) set in its previous assessment in 2015.**

- **At the time, the TDI was made temporary as EFSA's scientists identified a number of data gaps and uncertainties, which they committed to reassess when new data became available, in particular a two-year chronic study from the US National Toxicology Program research programme.**

- **Based on all the new scientific evidence assessed, EFSA's experts established a TDI of 0.2 nanograms (0.2 billionths of a gram) per kilogram of body weight per day, replacing the previous temporary level of 4 micrograms (4 millionths of a gram) per kilogram of body weight per day.**

Conclusion

While there are many other sources Bisphenol A, there is no more potent unregulated delivery system to spread toxins into the environment.

Consequences:

For farmers - Routine blood testing, quarantine, and slaughter of livestock, if recovery is not possible. (West Coast of Jutland, Denmark, confirmed by Danish EPA).

“Endocrine disruptors are chemicals that can interfere with the endocrine system, which is responsible for regulating hormones in the body. This disruption can lead to a wide range of adverse health effects, including developmental and reproductive issues, metabolic disorders, and even cancer” - EC Regulation 2023/707

Far from saving future generations, wind turbines could prevent them!