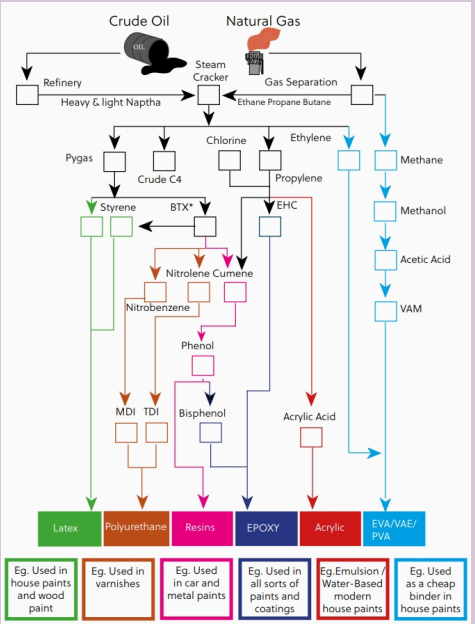
The protective role of paint

Presentation for ASBP Healthy Buildings Conference 2026

What even is paint?

Paint is something we have been making for 80,000 years. Until 100 years ago its constituents , like those of buildings, were naturally occurring materials used in raw or processed form.

- Since the development of hydro-carbon or fossil fuels, paint ingredients have increasingly been sourced from the petro-chemical supply chain.

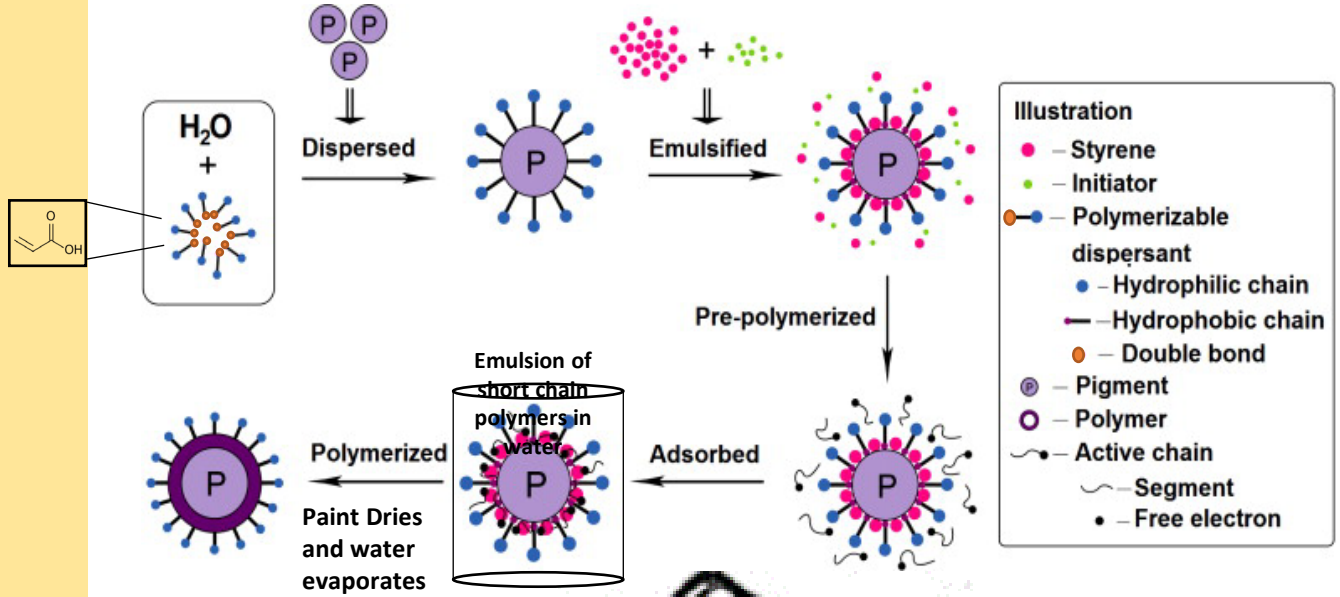


- Modern paints are water based with few exceptions – those with low/no VOCs are euphemistically called ‘Eco paints’

- They are resin dispersion paints or ‘emulsions’, though we know them according to their sheen, from matt to gloss. Their binders are polymer chains that rely on carbon molecules bonding together – the water ‘base’ is 1/5 of the paint.

So what?
This is called progress

- Modern polymer chains are generally made up of monomers, which in turn are derived from a high intensity process known as steam cracking.
- The polymers we most recognise today are probably Acrylic or Vinyl or anything starting with Poly…!
- Because these polymers can transform from a liquid to a solid state and can be mouldable they have become known as plastic.
- Plastic therefore, is a descriptor that we all now recognise as a material derived from fossil fuels – oil or gas.
- Paint has 'progressed' into plastic



Sherwin Williams 1905 & still the world's largest paint maker with the same sad ambition

Paint's protective role

Building Health

- Surfaces and substrates are in constant reaction with atmospheric and environmental conditions – notably water vapour
- Coatings on the internal and external faces need to facilitate this

Human health

- Poor air quality, emissions and damp result in dangerous living conditions

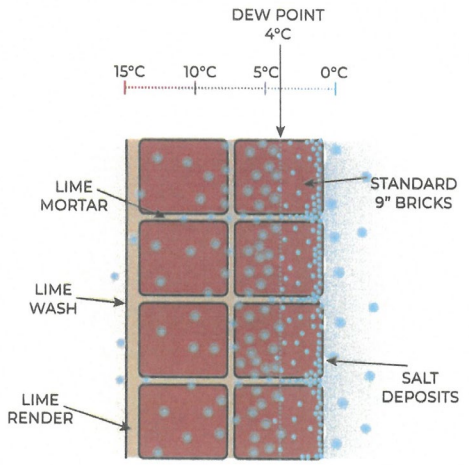
Planetary health

- Manufacturing and supplying paints causes pollution and so can the product's end of life.

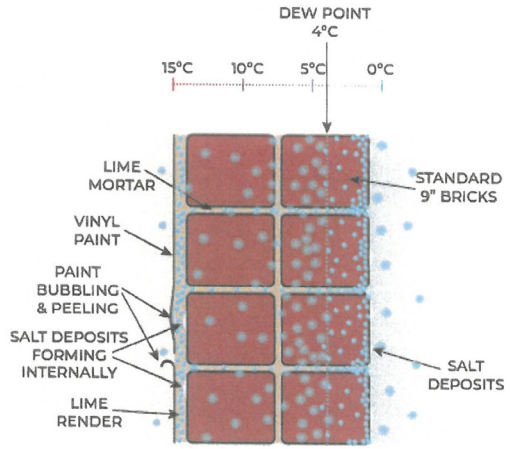
Building health

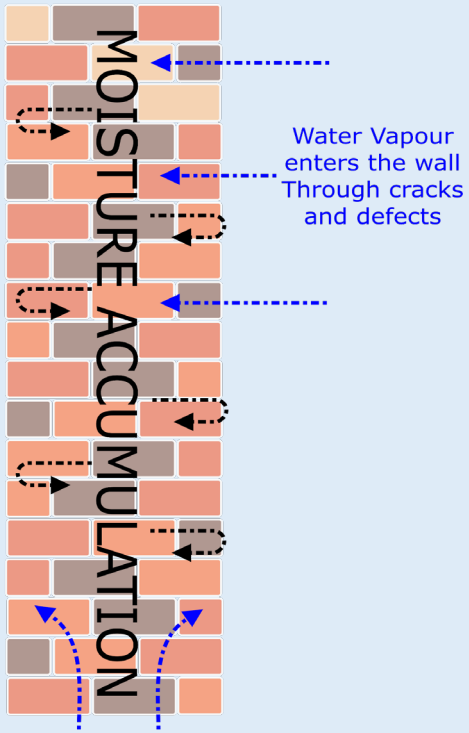
- Traditional materials like stone, lime and timber are 'dynamic' – constantly exchanging moisture with the air in the form of water vapour and droplets.
- When this is not managed well damp can reside –leading to mould and deterioration.
- Only breathable materials can achieve this – whether in construction or in decorating.

THE PERFECT 'BREATHABLE' WALL



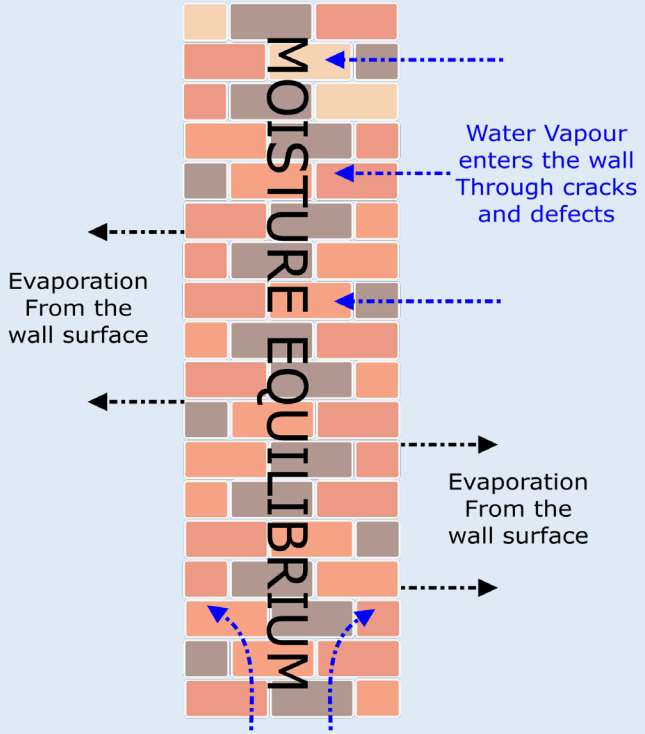
THE PERFECT WALL THAT IS PAINTED WITH A MODERN PLASTIC EMULSION PAINT





Non-breathable **paint**

Sd value > 1 m



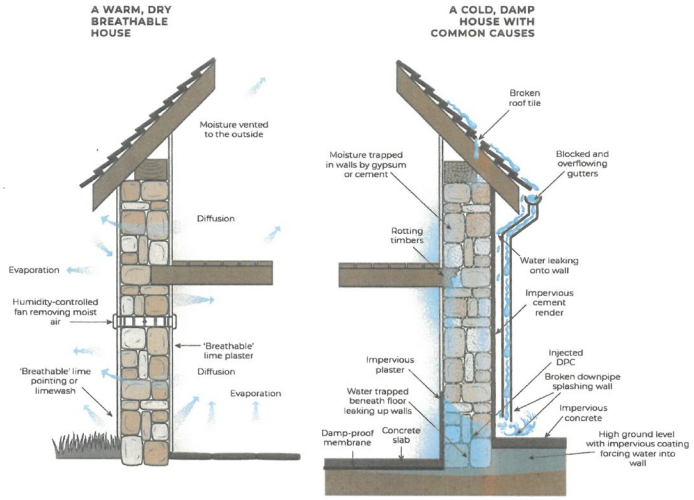
Breathable **paint**

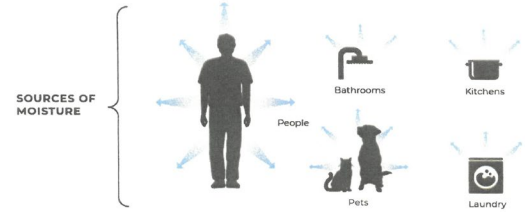
Sd value < 0.1 m

The Sd Value measures Steam Diffusion through a meter of air, where air is 0 m

Human health

- The effects of damp in buildings is not just on the building itself.
- The same lack of breathability that leads to the dew point will also lead to the formation of black mound
- Mould spores can prove fatal as in the case of 2 year old Awaab Ishak who died in 2020 after living all of his short life in a home covered in mould
- His case has given rise to a new law to that enables the prosecution of landlords who allow the conditions that allow mould and damp





DEW POINT INDEX

ROOM TEMPERATURE (°C)	RELATIVE HUMIDITY (%)													
	30	35	40	45	50	55	60	65	70	75	80	85	90	95
30	10.5	12.9	14.9	16.8	18.4	20.0	21.4	22.7	23.9	25.1	26.2	27.2	28.2	29.1
29	9.7	12.0	14.0	15.9	17.5	19.0	20.4	21.7	23.0	24.1	25.2	26.2	27.2	28.1
28	8.8	11.1	13.1	15.0	16.6	18.1	19.5	20.8	22.0	23.2	24.2	25.2	26.2	27.1
27	8.0	10.2	12.2	14.1	15.7	17.2	18.6	19.9	21.1	22.2	23.3	24.3	25.2	26.1
26	7.1	9.4	11.4	13.2	14.8	16.3	17.6	18.9	20.1	21.2	22.3	23.3	24.2	25.1
25	6.2	8.5	10.5	12.2	13.9	15.3	16.7	18.0	19.1	20.3	21.3	22.3	23.2	24.1
24	5.4	7.6	9.6	11.3	12.9	14.4	15.8	17.0	18.2	19.3	20.3	21.3	22.3	23.2
23	4.5	6.7	8.7	10.4	12.0	13.5	14.8	16.1	17.2	18.3	19.4	20.3	21.3	22.2
22	3.6	5.9	7.8	9.5	11.1	12.5	13.9	15.1	16.3	17.4	18.4	19.4	20.3	21.2
21	2.8	5.0	6.9	8.6	10.2	11.6	12.9	14.2	15.3	16.4	17.4	18.4	19.3	20.2
20	1.9	4.1	6.0	7.7	9.3	10.7	12.0	13.2	14.4	15.4	16.5	17.4	18.3	19.2
19	1.0	3.2	5.1	6.8	8.3	9.8	11.1	12.3	13.4	14.5	15.5	16.4	17.3	18.2
18	0.2	2.3	4.2	5.9	7.4	8.8	10.1	11.3	12.5	13.5	14.5	15.4	16.3	17.2
17	-0.6	1.4	3.3	5.0	6.5	7.9	9.2	10.4	11.5	12.5	13.5	14.5	15.4	16.2
16	-1.4	0.3	2.4	4.1	5.6	7.0	8.3	9.4	10.5	11.6	12.6	13.5	14.4	15.2

Very high risk of condensation and mould.

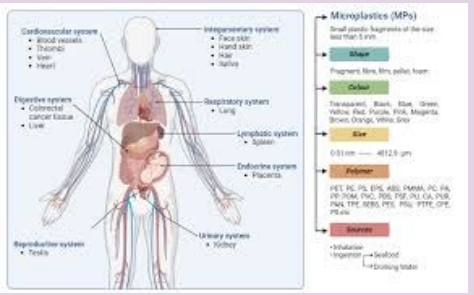
Moderate risk. Damp will occur if action isn't taken.

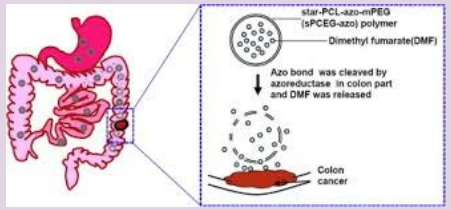
Little to no risk of condensation.

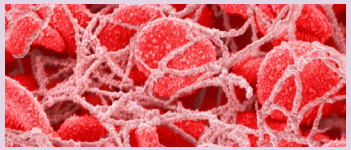
Room Temperature = 21°C
Relative Humidity = 60%
Dew Point = 12.9°C
Therefore interstitial condensation and mould will occur when building fabric (walls, windows, reveals etc) are colder than 12.9°C.

Human health

PFAS
APEs (Alkyphenol ethoxylates)
Residual monomers
Azo pigments
Co-solvents
Phthalates
Solvents







Volatile Organic Compounds – VOCs

- VOCs, are organic chemicals that evaporate into the atmosphere at room temperature.
- All organic compounds contain the element carbon.
- Benzene and Toluene, used in paint making are hydrocarbons.
- They have both short-term and long-term effects on health and cause indoor and outdoor air quality to decline.

'TRACE' =
VOC CONTENT
<0.1%

'MINIMAL' =
VOC CONTENT
0.1 - 0.29%

'LOW' =
VOC CONTENT
0.30 – 7.99%

'MEDIUM' =
VOC CONTENT
8 – 24.99%

'HIGH' =
VOC CONTENT
25 – 50%

'VERY HIGH' =
VOC CONTENT
more than 50%

BCF

'We do not require VOC confirmations and we will not test your products, we trust that you will choose the correct Globe to display on your products.'
BCF response to enquiry August 2022

The British Coatings Federation represents companies supplying 98% of the UK paint market. This is their **voluntary** code for VOC identification.

Human health

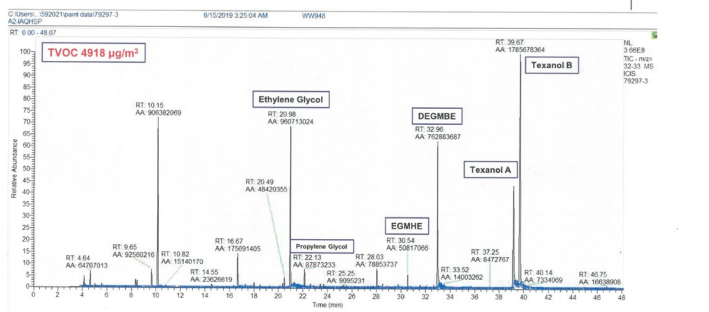
Volatile & persistent

- VOCs are naturally occurring
- The VOC's we now regulate were created with the adoption of petro-chemistry to create fuels initially and now household products.
- They are dangerous because they are novel and persist. They can directly cause reactions to some who are sensitive – usually raspatory – but are also contributing to poor internal air quality

Study by
Tim Robinson of
Waverton Analytics
with
Enthalpy Analytical
2019

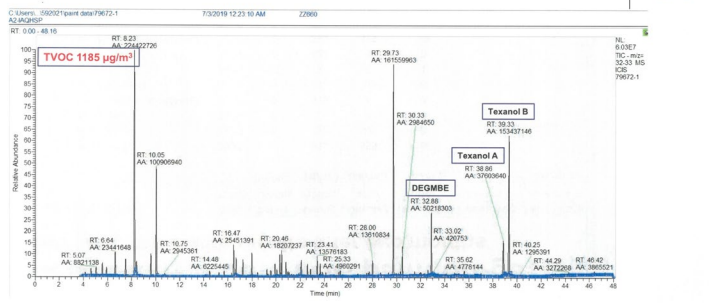
Case study – Low VOC paint off-gassing

One day after painting



Case study – Low VOC paint off-gassing

Two weeks after painting



Case study – Low VOC paint off-gassing

Summary table with results after two months

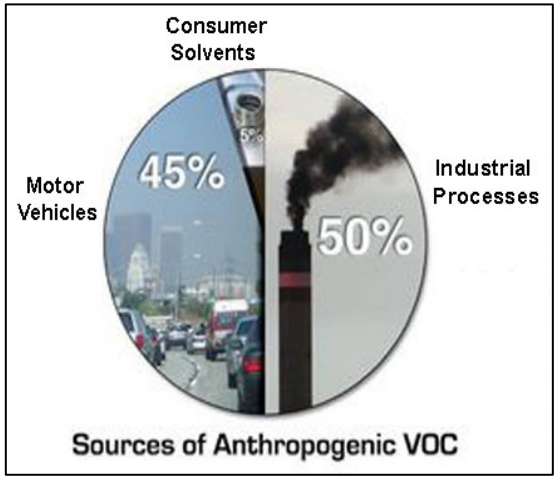
List of paint VOCs	GC RT (mins)	Before painting (µg/m³)	During painting (µg/m³)	One day after (µg/m³)	Two weeks after (µg/m³)	Two months after Loc A (µg/m³)	Two months after Loc B (µg/m³)
Ethylene glycol	20.95	0	313	559	6	-	-
Propylene glycol	22.12	0	24	48	3	-	-
n-Butyl ether	23.46	0	13	3	0	-	-
1-Butoxy-2-propanol (PGMBE)	26.23	0	319	4	0	-	-
DPGME (3 isomers)	28.04	0	112	18	0	-	-
2-Ethyl-1-hexanol	28.71	31	7	0	1	-	-
n-Hexylcellosolve (EGMHE)	30.73	0	121	3	0	-	-
Butoxyethoxyethanol (DEGMBE)	32.95	0	299	419	29	-	-
Texanol A	39.15	0	529	434	21	-	-
Texanol B	39.66	0	958	979	85	13	19
TVOC (µg/m³)		438	4095	4918	1185	610	520
Sum of 10 paint VOCs (µg/m³)		31	2695	2467	145		
Paint VOCs as % of TVOC		7.08	65.81	50.16	12.24		

Planetary health

- VOC's are a significant cause of atmospheric pollution. Emissions are now disrupting global temperatures and creating dangerous local weather patterns from smogs, to storms.

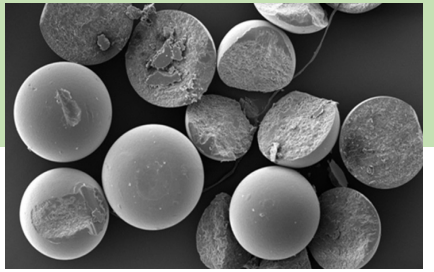
Global warming

- So endemic are fossil fuels now that almost our entire industrial system is producing greenhouse gases that warm the planet.
- Some businesses calculate their Scope 1 – energy use, Scope 2 – energy source, and Scope 3 – all other emissions (c.95% in paint making)
- Reporting emissions is only mandatory for businesses with a turnover of £500m
- Only 3 companies in the premium paint sector do this and it is on a voluntary basis
- Lifecycle Analysis (LCA) counts all 3 scopes from supply chain to manufacture
- The most helpful to measure for the consumer and specifier is GHGe kg/litre of paint and a recent comparison in the premium sector showed a saving of 2.53 kg by using a plant-based binder.
- CO2 PPM today 427 safe upper limit 350 pre-industrial 280



'be afraid – be very afraid'

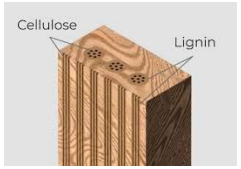
Planetary health



- Wet Form Polymers (WFPs) used for binders will ‘set’ when exposed to the air to become a hard plastic film.
- The binders in paint may be augmented with added microbeads and polyfluorinated alkyl substances (PFAS known as ‘Forever Chemicals’), as well as a wide range of undisclosed synthetic additives.
- As paint degrades and when it is abraded or a building demolished the resulting plastic dust becomes waste in the form of microplastics that can be readily absorbed into water courses and the soil.
- When WFPs are washed off into the drains - when tools are cleaned for instance, the same thing happens.
- There are no naturally occurring organisms to process this in the way plant material can be ‘composted’ in nature. This is becoming particularly apparent in the oceans.

Maize straw

Castor bean oil



Wood cellulose

Rapeseed oil

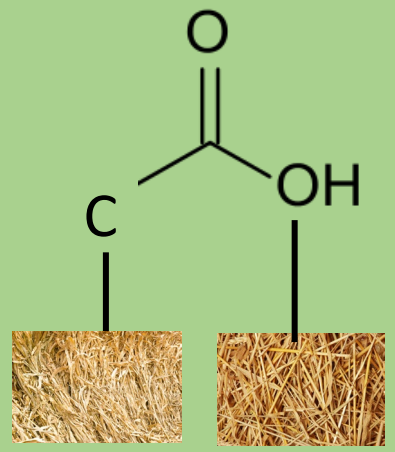
Chalk

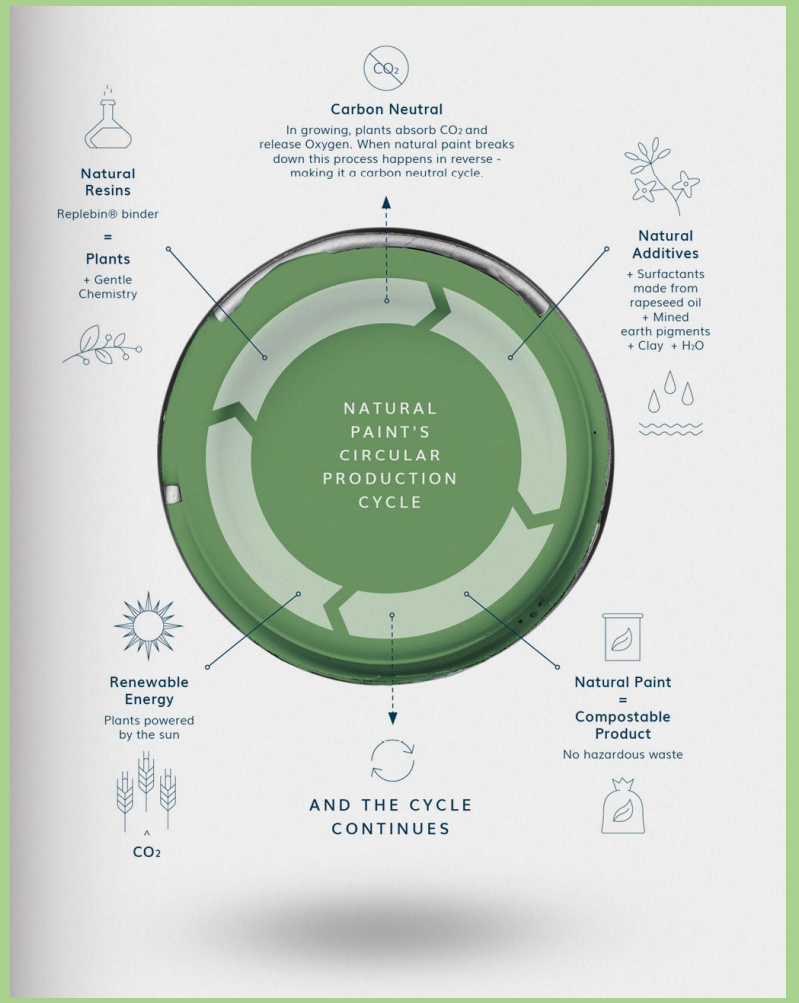
Kaolin

Mineral pigments

Rutile (Tio2)

What if paint was made the old way again?





Examples of eco paints

*'**do** try these at home'*

Premium acrylic emulsions and eggshells

Hybrid Lime Paints

Lime Paints

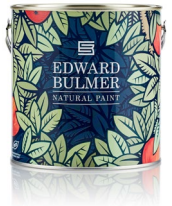
Limewashes

Silicate paints

Clay Paints

Linseed Oil Paints

Casein Paints



Natural Paints

Fossil *based*

Non fossil based