

More sustainable WB binders and coatings from



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1. Problem

Sustainability State Of The Art for wood coatings

2. Goals

What we plan to improve

3. Solution

How we planned to do it

4. Implementation

How we did it

5. Assessment

Measuring success and planning the future



1.1 Problem



- 3,3 Mtonnes wood coatings (2019)
- 60 % are solventborne (SB)
- 0,8 Mtonnes volatile organic compounds (VOC)
 - Hazardous or toxic
 - Ozone-forming
 - Need energy to be made and moved
 - Mostly non-renewable
 - Carbon Footprint (CFP) of SB = 2,1 kg CO₂/kg of paint
 - Serve no purpose in final paint
- 8 Mtonnes (non-CH₄) VOC emissions in EU (2018)
- 50 % from coatings



1.2 Problem



- Wood coatings with less VOC are waterborne (WB)
- They are mostly made with polyacrylic binders
- That is with
 - petrochemical
 - hazardous
 - high CFP materials

- Acrylic-based coatings deliver some but not all desired performance and looks



1.3 Problem



- Coatings have a large CFP
- Wood coatings as well
- VOC are a big part of that
- VOC also have other negative impacts
- Current coatings with lower VOC also have high CFP and other issues

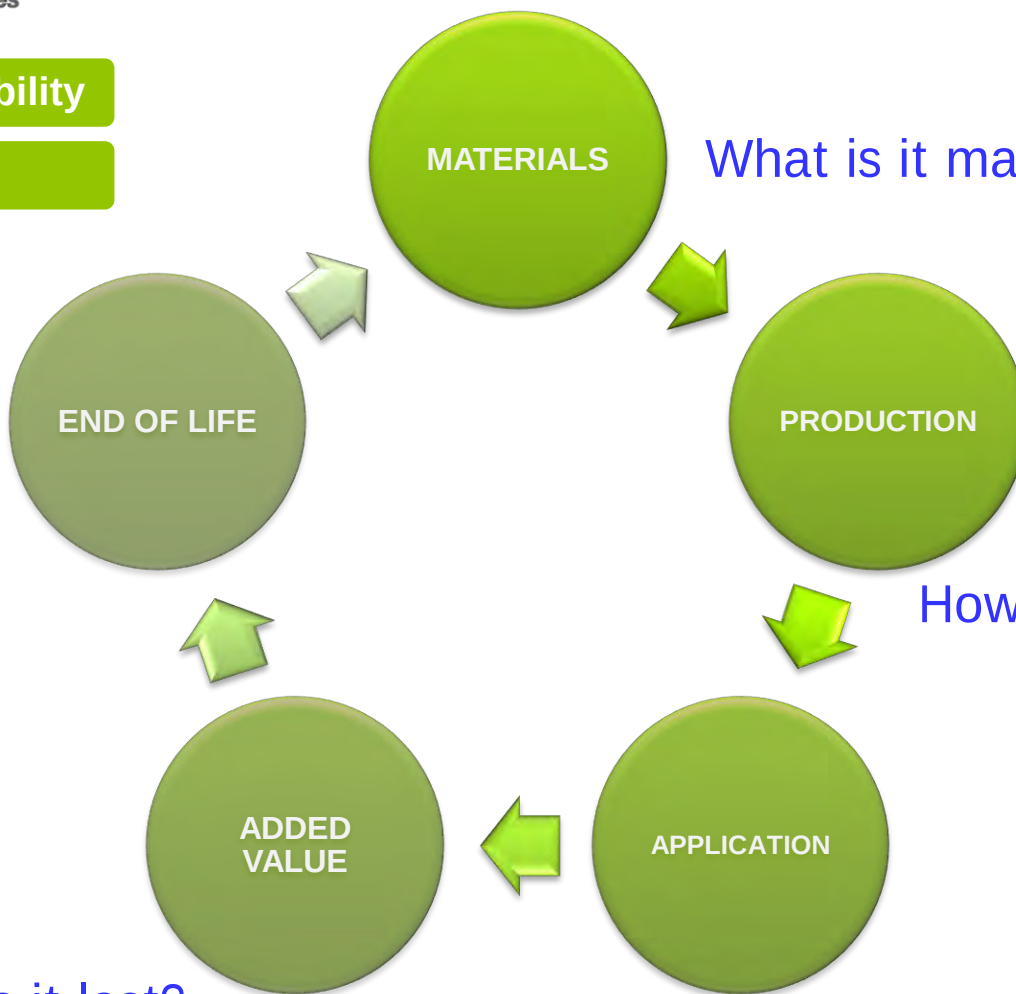


2.1 Goals

A product sustainability

depends on:

How can it be
upcycled,
recycled or
disposed of?



What is it made of?

How is it made?

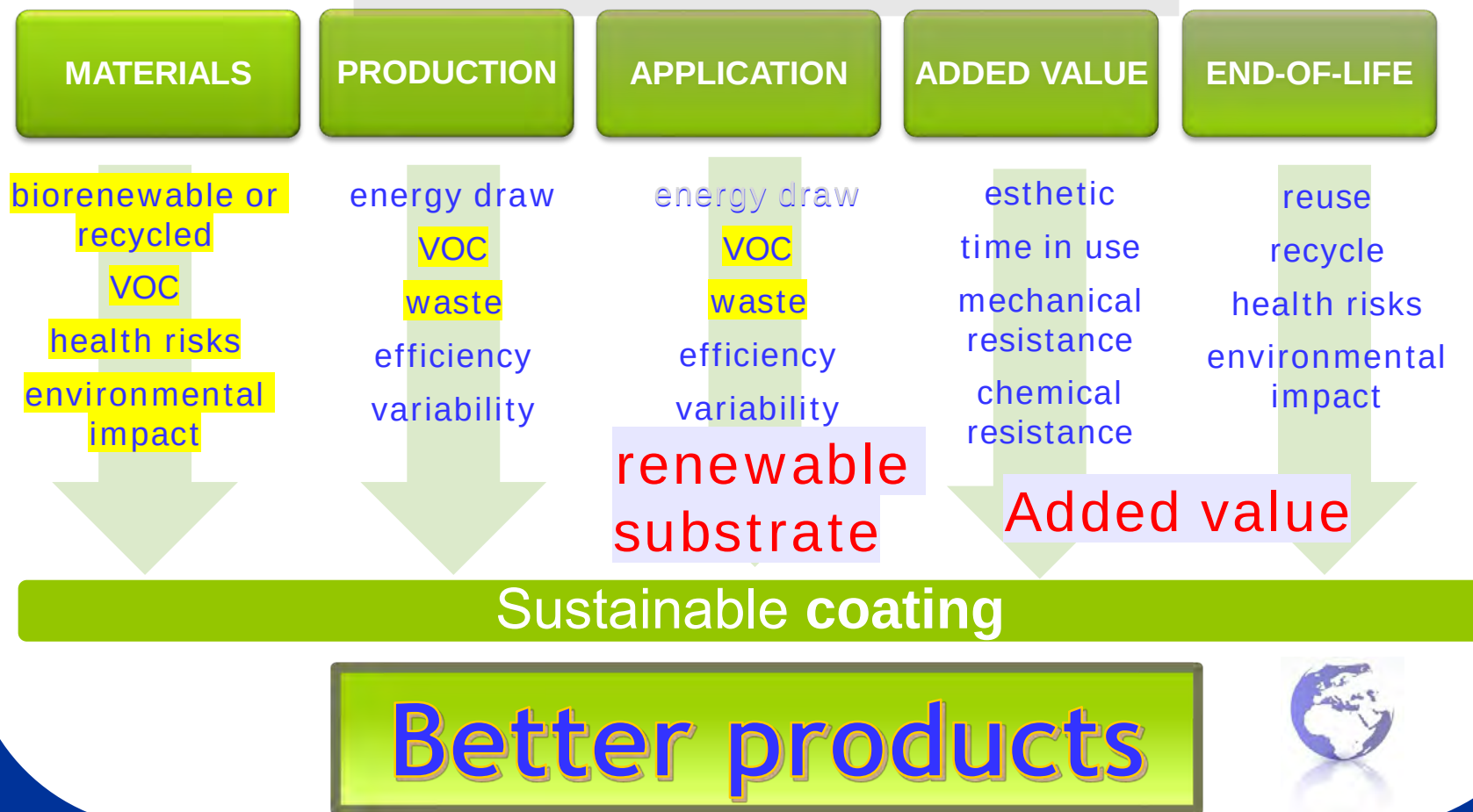
How long does it last?
How useful is it?

How is it used?



2.2 Goals

WATERBORNE COATINGS



2.3 Goals



WB coatings

- with lower VOC
- with lower CFP
- with less hazardous components
- with less petrochemical components
- that have greater physical and chemical resistance
- that can provide looks now not delivered by WB coatings



Wood coatings become sustainable solutions

IVM is uniquely placed:
it produces
both resins and coatings



NEW RESINS
FOR NEW COATINGS



from here...



....there



3.2 Solution



Process and plant innovation



MATERIALS

SCOPE 3

NEW RESINS

REPLACING

WB short oil, high Mwt alkyd polyols

Safer

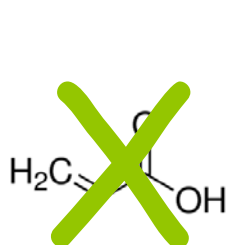
No VOC

Low climate and environmental impact (by LCA)

About 65 % biobased content on solids

components

- unsafe
- polluting
- with high GHG



SCOPE 1 **PRODUCTION**

Design and build the pilot of a novel resin production line

Extrusion emulsification

By dispersing alkyds in water rather than solvents, no VOCs are emitted

Consume less energy than current plants

Produce minimal (water) waste

Ensure maximum product quality, repeatability and reliability



3.5 Solution



The paints using such WB resins would be able to fill application niches now using:

- traditional SB 2K PU paints
reducing VOC emissions, CFP and dangerous chemicals
- UV or UPE SB paints (spray/curtain)
reducing VOC emissions, CFP and dangerous chemicals
- WB paints made from petrochemicals
increasing biorenewable content
- WB paints made from dangerous components such as acrylic acid
reducing health and environmental risks





LIFE is the main EU financing tool
for environmental and climate progress

LIFE funds projects aiming to:

- Improve environment and health
- Lower impact of human activities on environment and climate
- Enhance greater biodiversity
- Protect nature

LIFE by numbers

2021-2027 budget = **€5,4 billions**
(increasing from €3,4 billion in 2014-2020 budget)

Funding of LIFE-BioPaint certifies
IVM's technical capability
and commitment
to sustainable development



4.1 Implementation



Emulsification process within the screw extruder:

1. hot ($>100^{\circ}\text{C}$) resin input
 - already with dissolved emulsifier
2. neutralization stage:
 - basic water added
 - water-in-resin emulsion formed
 - reaction of the acid groups to emulsification pH
3. emulsion inversion stage:
 - water is added
 - viscosity peak reached and passed
 - resin-in-water emulsion forms
4. dilution:
 - more water added
 - pH adjusted and buffered for stability



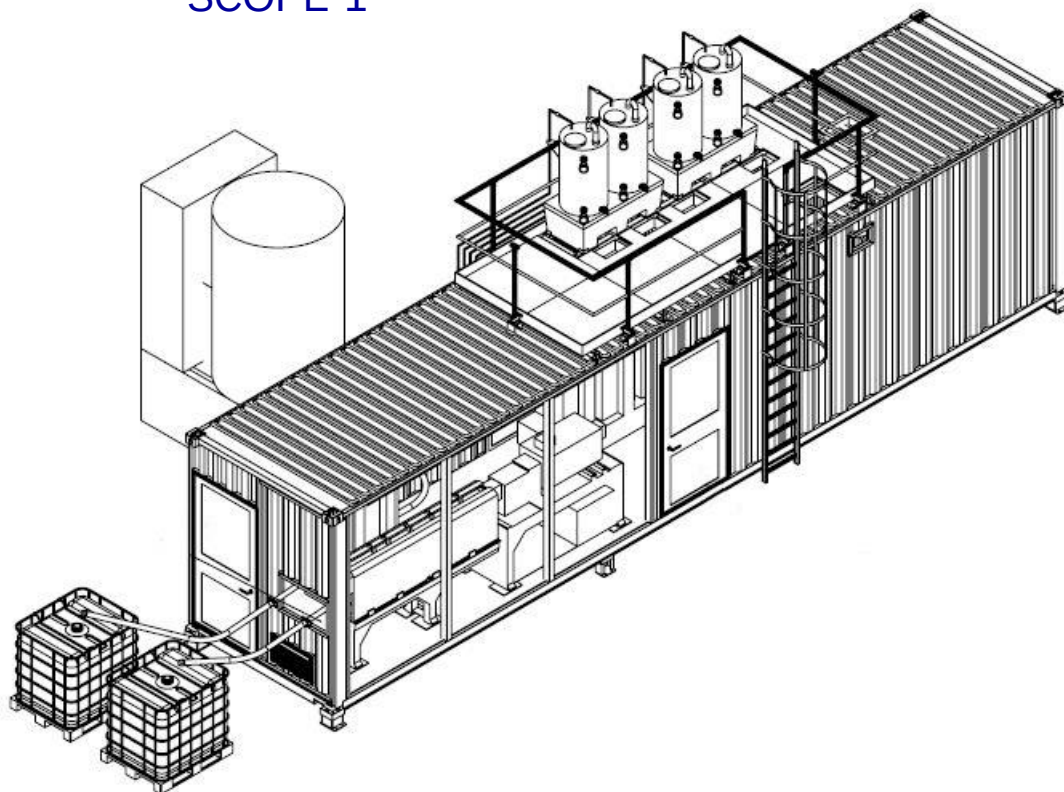
4.2 Implementation



PRODUCTION

Extrusion emulsification in a box

SCOPE 1



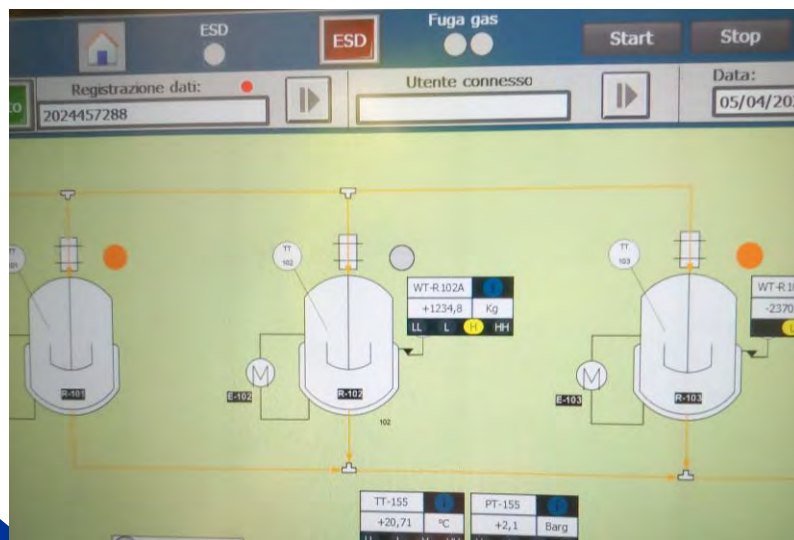
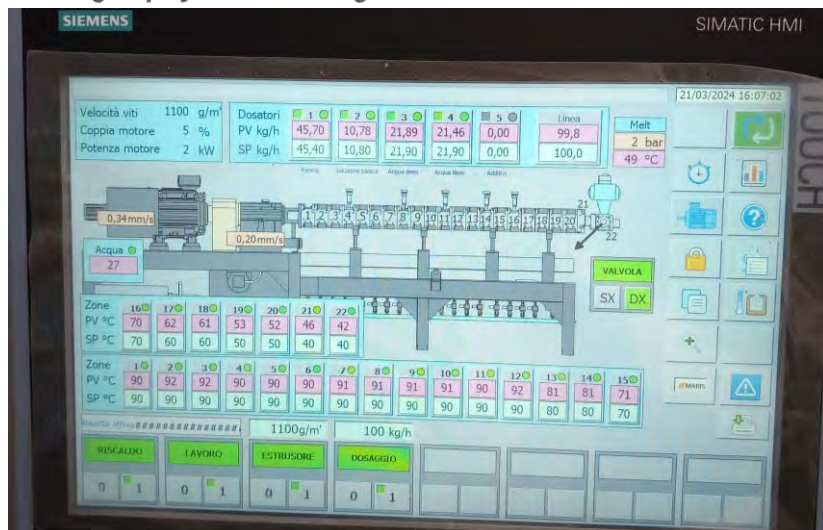
- Maximum production flexibility
- Compatible with ATEX production environment



4.3 Implementation



4.4 Implementation



5.1 Assessment



	% solids	% alkyd		drying speed	resistance to liquids	notes
		emulsion on formula	solids on tot binder			
2K clear topcoat for industry	37,03	0	0	= (in oven)	>	more glossy, less grey
	37,51	50	69			
2K white topcoat for industry	46,59	0	0	= (in oven)	=	more glossy whiter
	46,87	9	20			
2K clear self-sealer	26,96	0	0	= (at RT)	=	more glossy, less grey, fuller
	26,93	62	100			
2K clear topcoat max resistance	28,52	0	0	= (at RT)	<	similar scratch resistance
	28,35	40	71			
1K clear topcoat	31,99	0	0	< (at RT)	<	needs most work
	31,80	38	55			
2K white topcoat, minimal cost	46,59	0	0	< (at RT)	=	more glossy needs less TiO ₂
	46,54	45	100			



5.2 Assessment

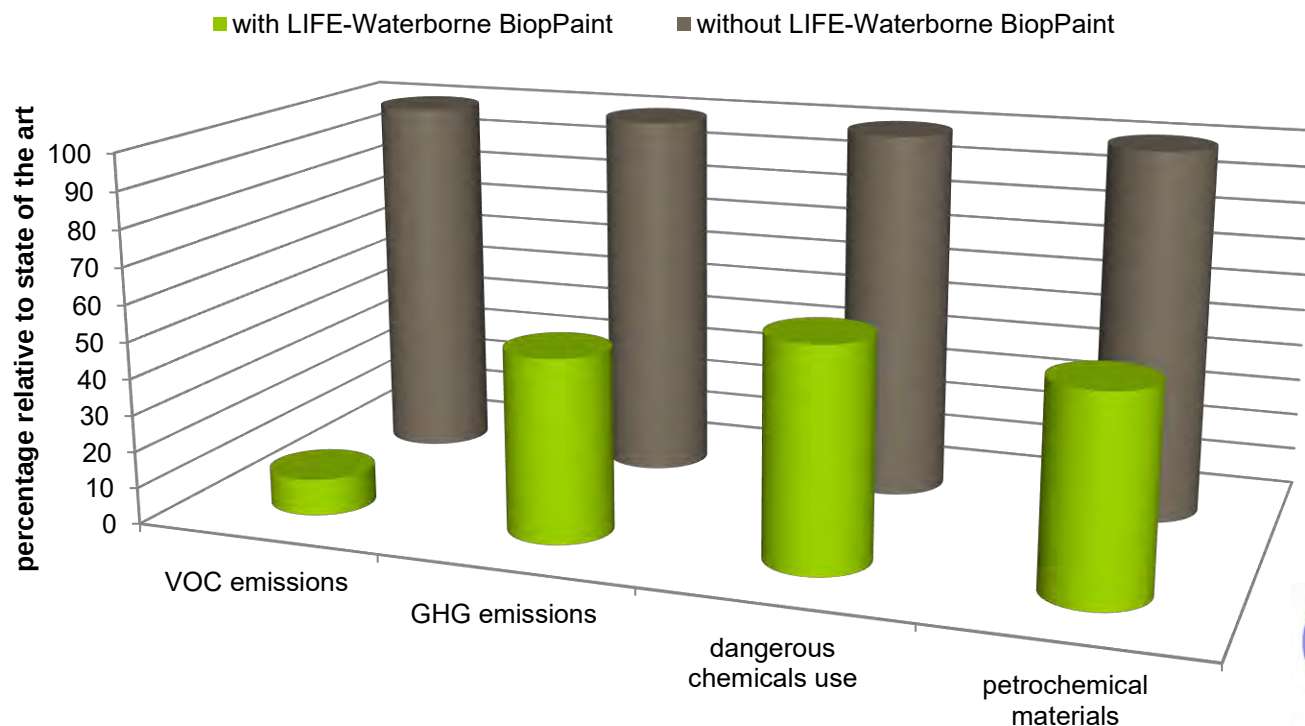


50% lower CO2 emissions

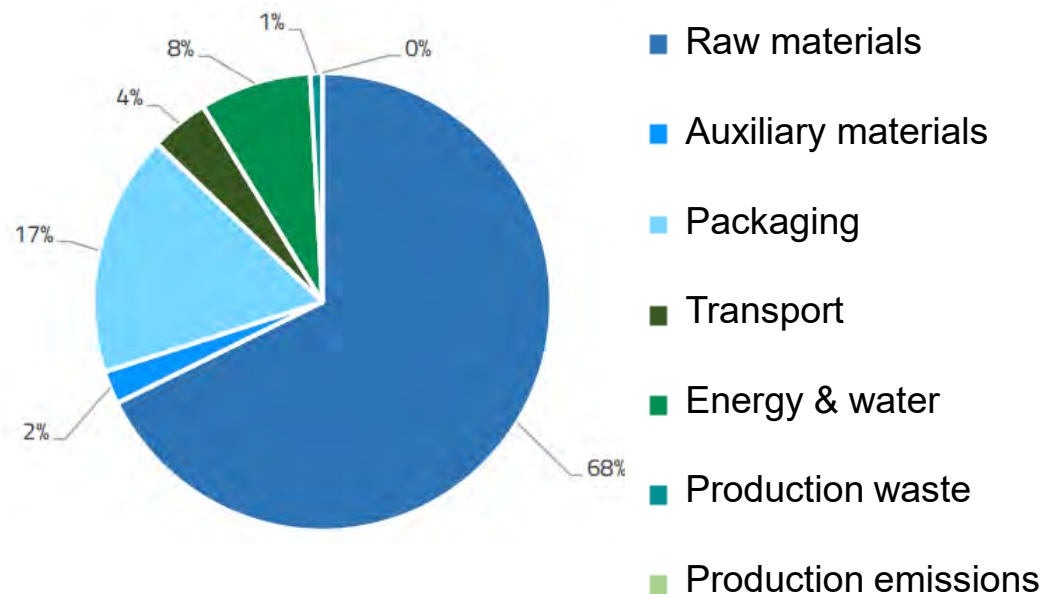
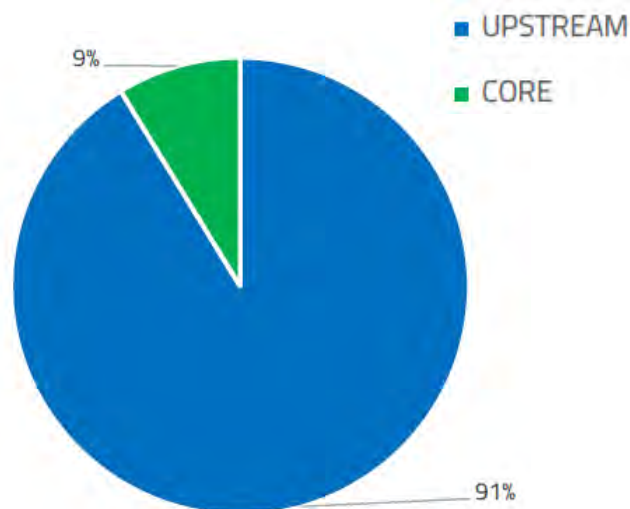
90% lower VOC emission

45% less petrochemicals

40% less dangerous materials



5.3 Assessment



CFP (kg CO ₂ / kg paint)	SB	WB	new WB
pigmented basecoat	2,1	1,7	1,6
clear topcoat	2,4	1,5	1,4

biobased resins
must come from
ISCC-certified
sources to avoid
land-use change
impact



QUESTIONS?

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