

With the contribution of the LIFE
Programme of the European Union



BioPAINT

W A T E R B O R N E

ivm Chemicals
coatings & polymers technologies

Layman's Report



**VOLATILE
ORGANIC
SOLVENTS
IN PAINTS
ARE A
PROBLEM!**

flammable



wasted resources
they do not contribute
to final coating

high Carbon FootPrint
they are GHG

polluting

**low altitude
ozone forming**

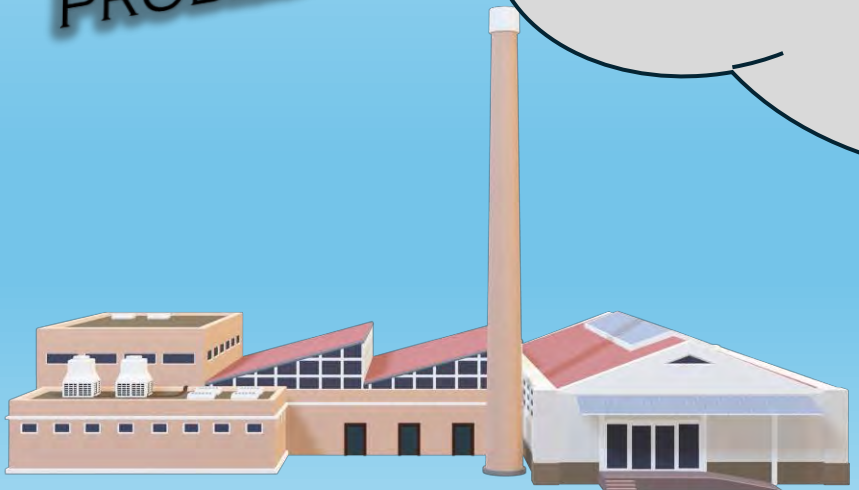


dangerous

**non-renewable
petrochemicals**

high Carbon FootPrint
their oxidation products
are GHG

**4 million
tonnes emitted
in EU (2018)**
(EU emission inventory
report –EEA 05/2020)



*Yes, we know they are invisible gases,
but leave us a little artistic license*



Because waterborne
paints are just not good
enough for every use

The polymeric network
formed by their binders
is weaker, and they are
less bright

Maybe, the same binders
used in solvent-based
paints can also be used
in waterborne paints

But there are
already waterborne
paints: why are
solvents still used?

And, why is that?

Can't we do
something to make
them better?

Great idea! Let's go and
try. Good thing we make
both wood coatings and
their binders



Short oil, high-molecular weight (i.e. big) alkyd polyols with isocyanate crosslinking are the gold standard for solventborne wood coatings

They are also already 30-50% biobased, and this percentage will increase as more biobased components become available

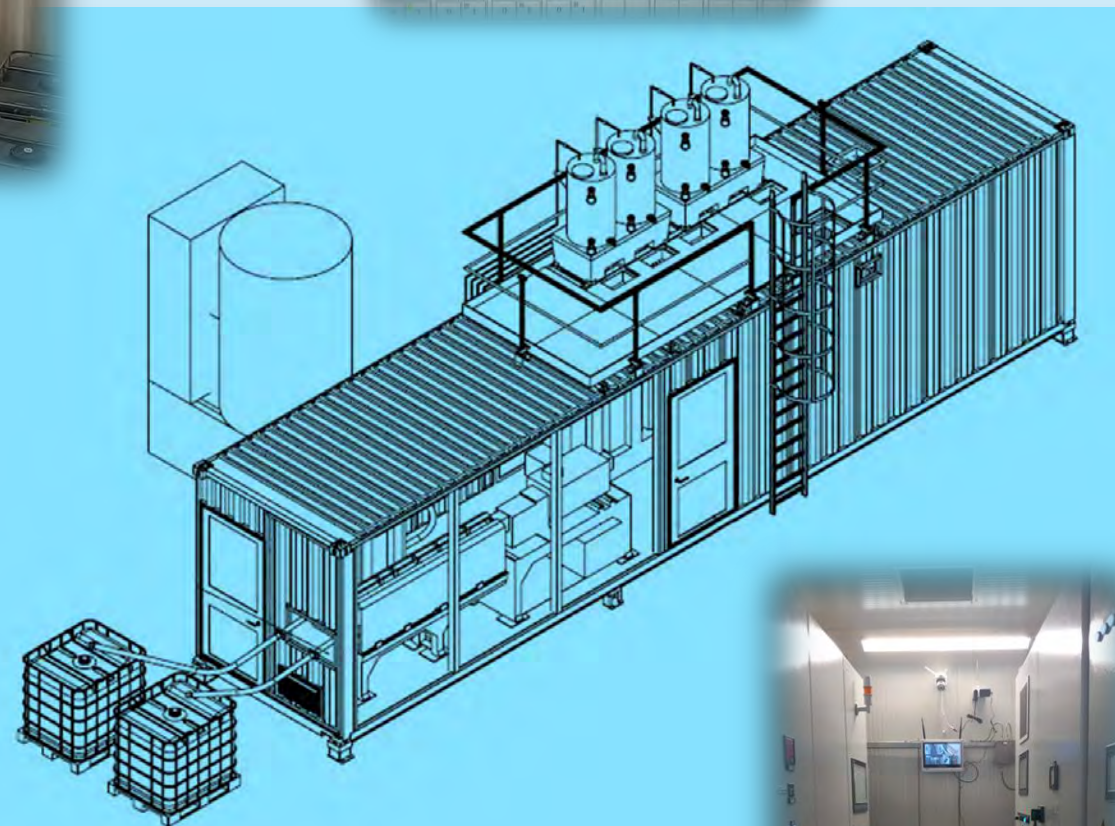
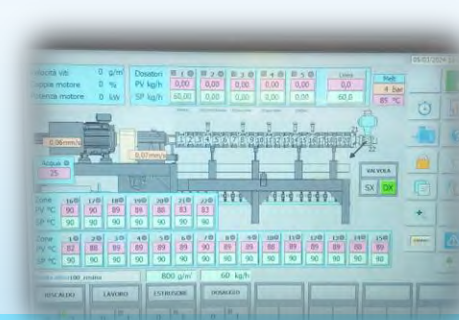
IVM Chemicals produces both these binders and the wood coatings in which they are used, in the same modern, low-emission and integrated plant in Parona, Italy

For ten long years, IVM's researchers tried to obtain stable emulsions of these resins in water, but they are too hydrophobic and too viscous!

Then, finally, the solution: extrusion emulsification!

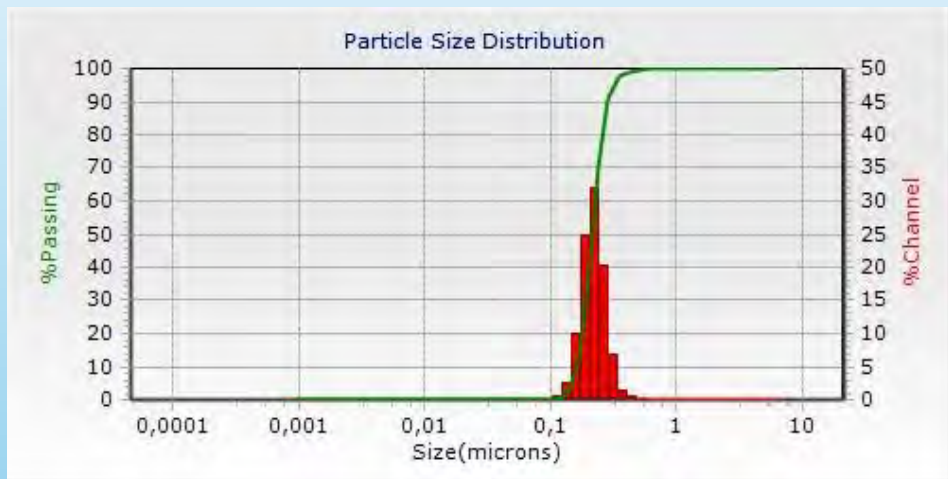
1. Hot resin with emulsifier can be dosed in a twin-screw extruder
2. it can be neutralized with base dissolved in water, forming a water-in-resin emulsion
3. more water can be added gradually: the extruder handles easily the high viscosity maximum reached near the emulsion inversion point
4. once the resin-in-water emulsion forms, it can be diluted, cooled and pH-adjusted before being collected





The extrusion emulsification pilot line was designed and built as part of the LIFE-WB BioPaint project and integrated within the synthetic resin production unit where the alkyds are made

In the pilot line, we are obtaining stable alkyd emulsions containing the highest quality polyols we produce



Waterborne alkyd emulsion characterization

- pH = 6,5 – 7,5
- particle size 0,2 – 0,3 μm
- polymer content in water = 40% - 50%
- stability checked by centrifugation test

	% solid alkyd on total binder	vs. current WB	vs. solventborne
2K clear topcoat for industry	71	higher gloss, more wood warming , longer pot life, no VOC	similar gloss and wood warming, longer potlife, no VOC!
2K clear topcoat max resistance	68	lower scratch resistance, more wood warming, longer pot life, lower VOC	lower scratch resistance, similar wood warming, longer pot life, much lower VOC
2K white topcoat for industry	35	higher gloss, brighter white, lower VOC	very similar, much lower VOC
2K white topcoat, minimal cost	100	higher gloss, less TiO_2 , no VOC	slower drying, similar gloss, no VOC
1K clear topcoat	58	slower drying, higher gloss, more wood warming, no VOC	no existing analogue!
UV WB clear topcoat	42	higher gloss, more wood warming , much fuller, no VOC	very similar, no VOC
2K clear self-sealer	100	higher gloss, more wood warming, longer pot life, much fuller, no VOC	similar gloss and wood warming, longer potlife, no VOC
1K/2K white basecoat, max bio	55	whiter, needs less TiO_2 , fuller, no VOC, 60% bio	as 1K, no existing analogue! as 2K, very similar, no VOC, 60% bio
1K/2K white basecoat, general use	55	whiter, needs less TiO_2 , fuller no VOC	as 1K, no existing analogue! as 2K, very similar, no VOC

Using these new resins, we formulated several waterborne paints with properties similar to current solventborne paints and zero or very low VOC



We sure did, and they are working great!

We just started, but we plan to make 10.000 tonnes of these paints per year after 5 years

We are going to use 4.900 fewer tonnes/yr of volatile solvents, and save over 11.000 tonnes/yr of CO₂ eq.

Or, if you like graphs better...

How did the project go?
Were we able to use in waterborne paints the same binders used in solvent?

Wow! How much of those paints are we going to make?

Excellent! What are going to be the environmental benefits of these new paints?

