



WB Durapaint : Formulation automatisée pour développement accéléré de peintures plus durables

Journée thématique Promosurf

Les Peintures de Demain : Vers le zéro émission de CO2 et la digitalisation 4.0

08/02/2022



Summary

- Flamac
- WB Durapaint project
- Automated formulation
 - Strategy
 - Screening on paints



Introduction Flamac

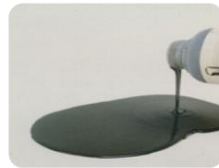
Your partner in high-throughput experimentation to accelerate your R&D

FLAMAC in a nutshell

<http://www.flamac.be/>



- ❖ Research Technology Organization
- ❖ Customized high-throughput experimentation
- ❖ Accelerator of Chemistry & Material R&D
- ❖ Contract R&D services & funded projects

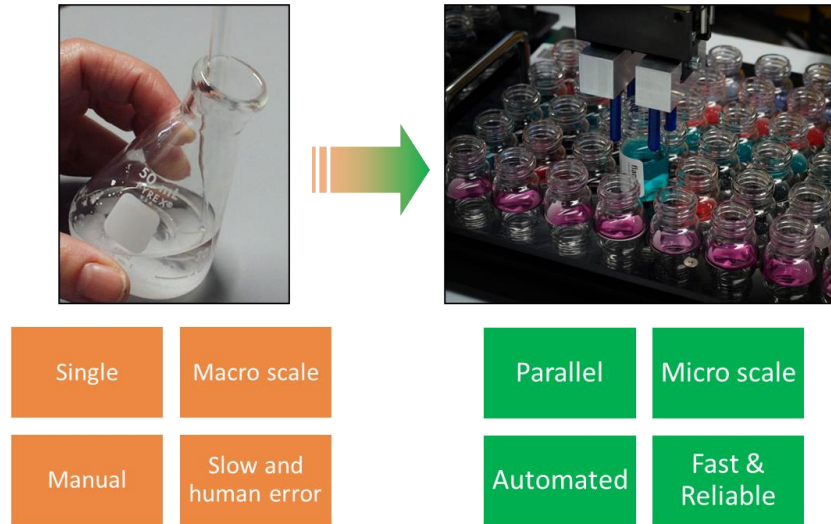


more than
15
years of experience

participation in
25+
collaborative projects

bilateral cooperation with
80+
industrial partners

R&D acceleration via high-throughput experimentation



Main benefits :

- ☐ Improve reproducibility
- ☐ Speed up development
- ☐ Shorten time-to-market



USP Flamac:

- ☐ **Flexible** automated test **platforms** & characterization **tools**
- ☐ **Leverage know-how** across applications
- ☐ **Customized automated** experimentation **solutions**



WB Durapaint project

Your partner in high-throughput experimentation to accelerate your R&D

WB Durapaint

Interreg

France-Wallonie-Vlaanderen

WBDURAPAIN



UNION EUROPÉENNE
EUROPESE UNIE

 **MateriaNova**
MATERIALS R&D CENTRE

 **flamac**
a division of SIM



UMET



Pôle bio-économie



Association belge des
traitements de surface



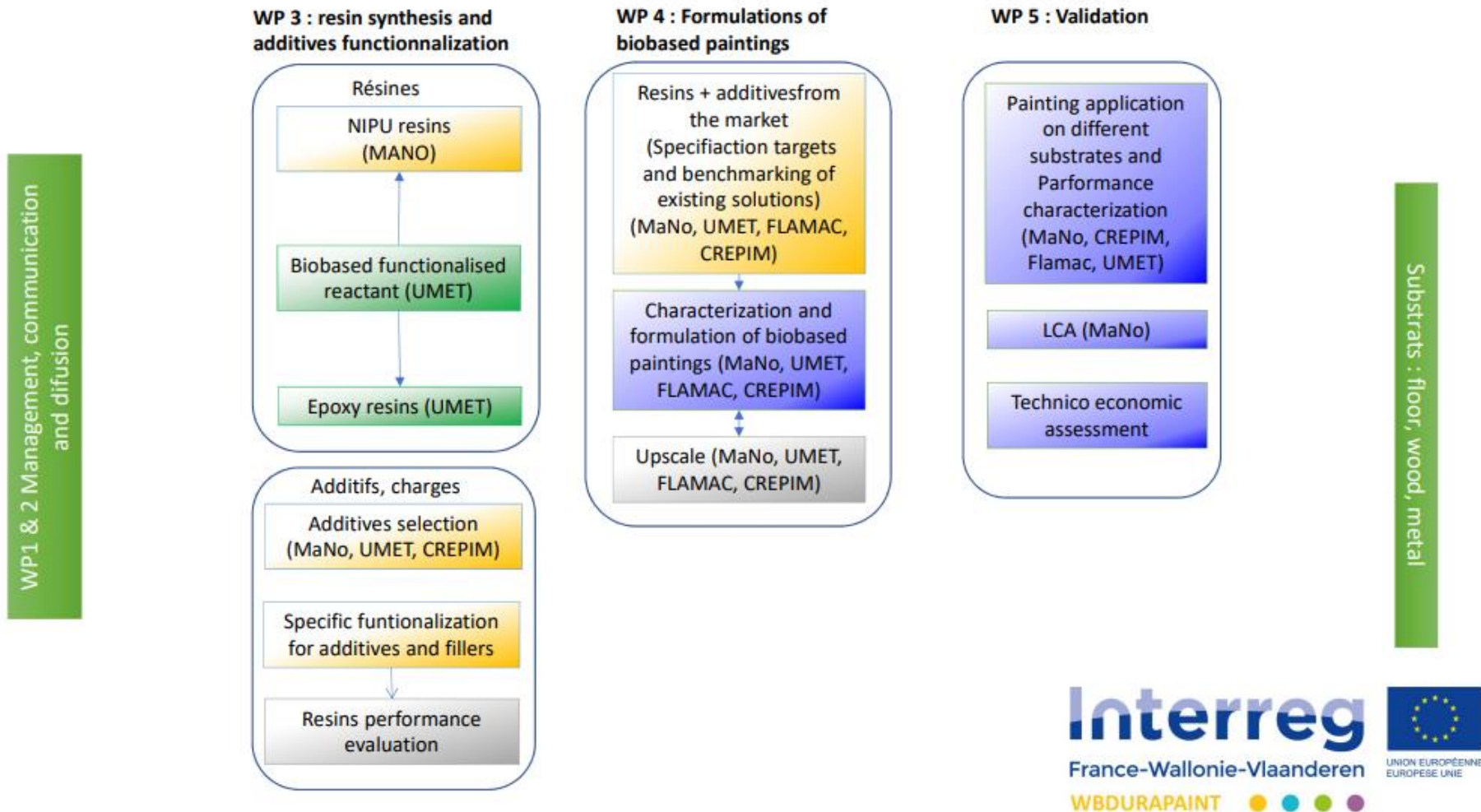
62.000 km²
10.800.000 habitants/inwoners



WB Durapaint

- More restricted regulation for painting VOC
 - Reduce VOC related to organic solvent
- REACH standards
- REVORGREEN conclusions
 - Low amount of biobased products (20-30%)
 - Waterbone products do not fullfill specifications
 - Toxicity of PU paintings (isocyanate)

WB Durapaint



WP4 Formulation of Biobased paint

- Strategy
 - Choose a reference paint to be modified
 - Observe manual formulation
 - Transfer formulation on the automated formulation robot
 - Validate the automated formulation
- Look for point of improvements
 - Based on manufacturer input
 - Based on LCA analysis
- Design formulation campaign

=> SCREEN

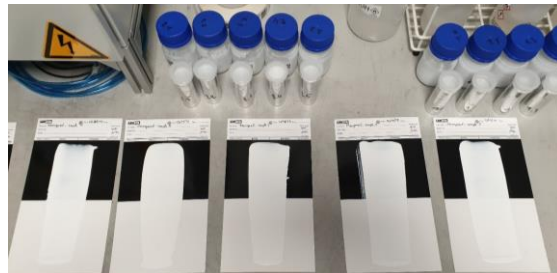
WP4 Formulation of Biobased paint

- Strategy
 - Choose a reference paint to be modified => found a Belgium partner (2 ref selected)
 - Observe manual formulation => Visit on site
 - Transfer formulation on the automated formulation robot => Main robot used in Flamac



Throughput X12
vs manual

- Validate the automated formulation => Shipment back to producer for verification

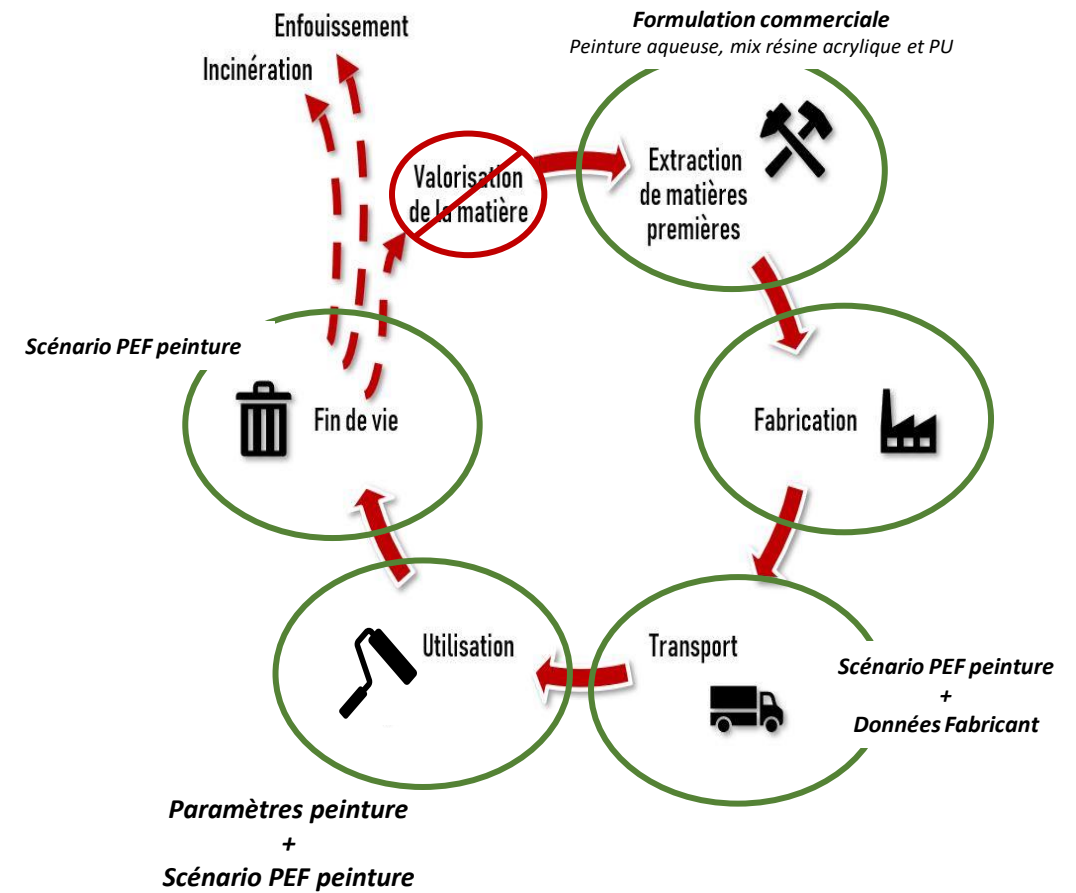
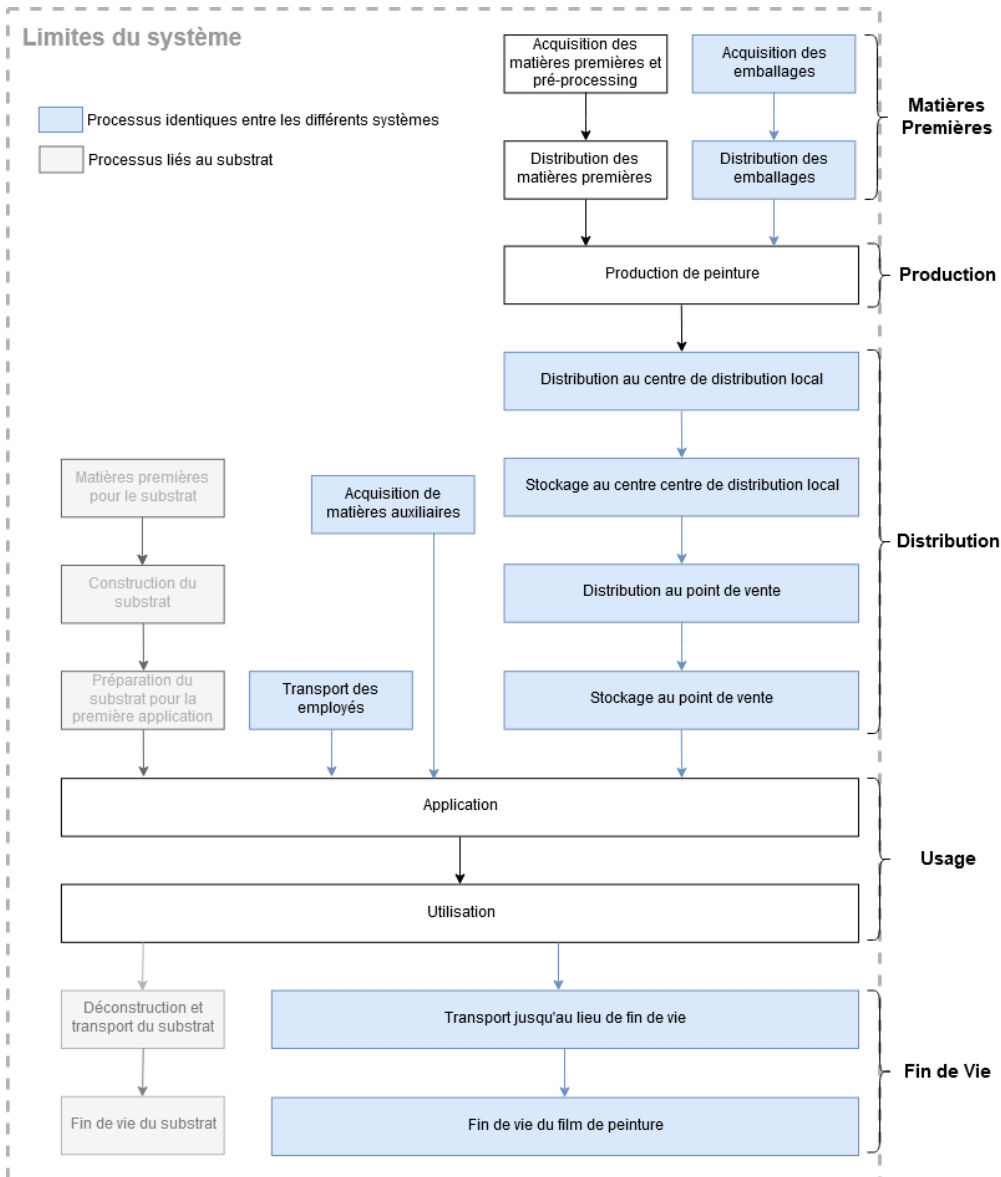


One Ref is selected / 15 components to be
combined with several mixing steps/Timing

WP4 Formulation of Biobased paint

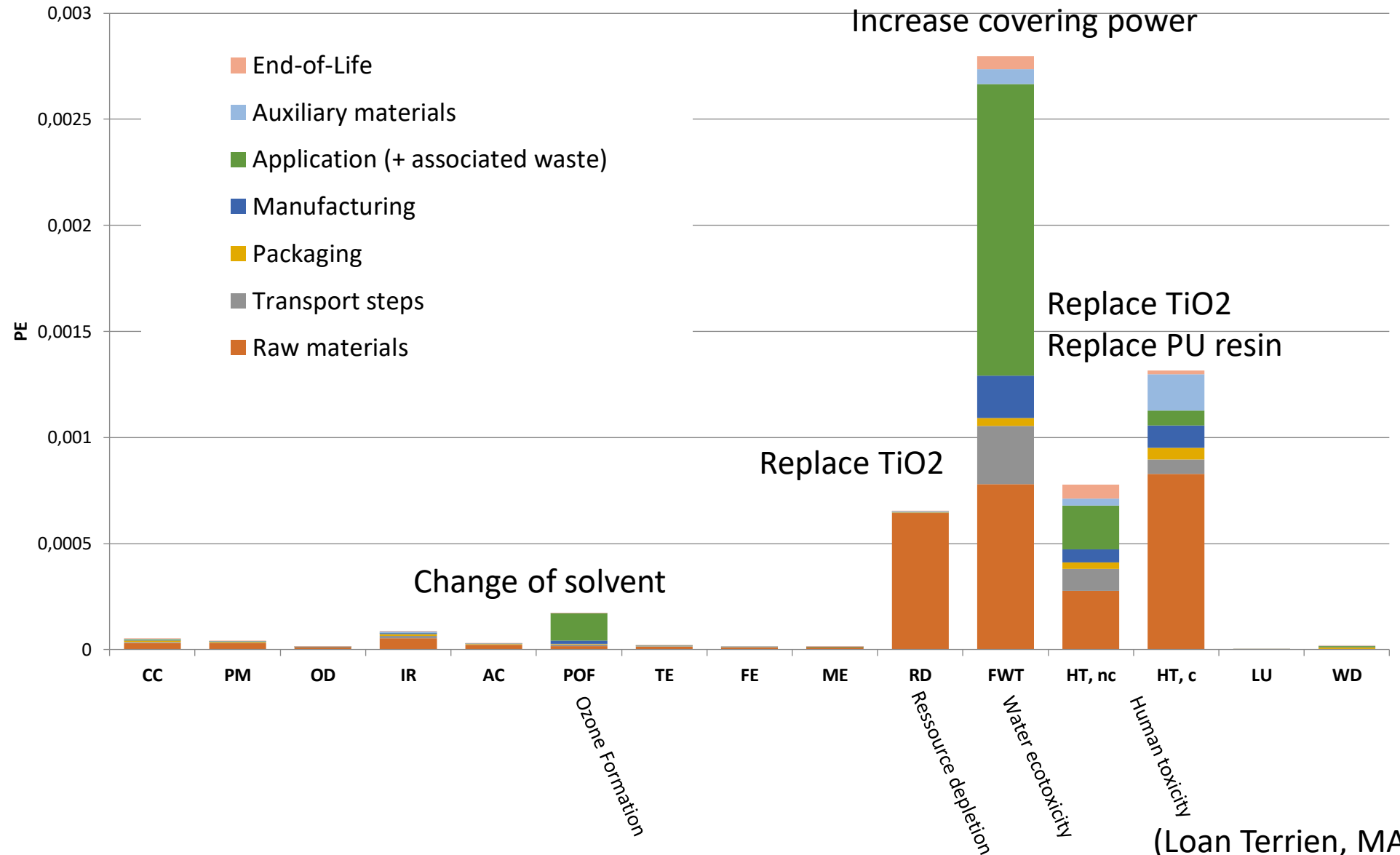
- Strategy
 - Look for point of improvements
 - Based on manufacturer input => An alternative to anti-co mix to simplify process?
(MANO clay candidates for anti-co)
 - **Based on LCA analysis => Done at MANO**
 - Design formulation campaign
- => SCREEN

LCA paint



(Loan Terrien, MANO)

LCA reference paint

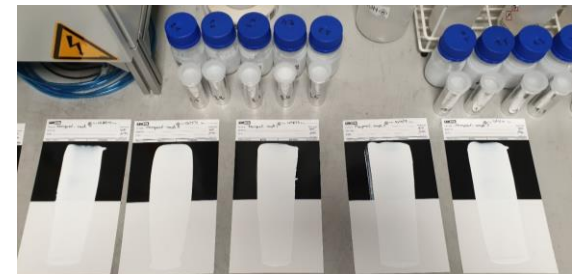


WP4 Formulation of Biobased paint

- Strategy
 - Look for point of improvements
 - Based on manufacturer input => Need to suppress anti-co mix to simplify process (MANO clay candidate for anti-co)
 - Based on LCA analysis => Done at MANO
 - Design formulation campaign => reduce TiO₂ / add clay (5 candidates)
=> suppress anti-co
- => SCREEN: Formulation / Rheology / Coating

Formulation screening

- 1st screening campaign
 - Screened clays: 4 clays
 - TiO_2 + clay = Cste
- 2nd screening campaign
 - Remove anti-co
 - Decrease TiO_2 /Increase clay concentration
 - 2 clays tested (could be modified with anti co properties later)
 - Vary mixing speed



Formulation screening



Rheology

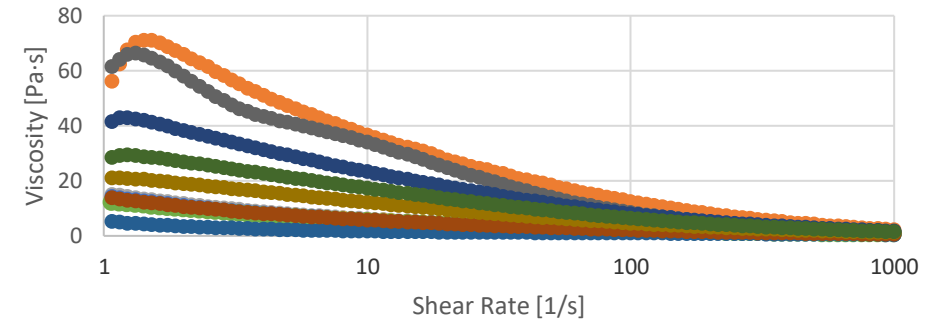
3 levels 4 levels 4 levels

	Barcode	Speed (1/s)	Clay 1 (g)	TiO2 (g)
1-PT1	10EWY	1000	1	13.05
1-PT1	10EYT	1500	1	13.05
1-PT1	10EYX	2000	1	13.05
1-PT2	10EZ4	1000	2	11.1
1-PT2	10EYU	1500	2	11.1
1-PT2	10EYY	2000	2	11.1
1-PT3	10EX3	1000	3	9.2
1-PT3	10EYV	1500	3	9.2
1-PT3	10EYZ	2000	3	9.2
1-PT4	10EX4	1000	4	7.5
1-PT4	10EYW	1500	4	7.5
1-PT4	10EZ0	2000	4	7.5

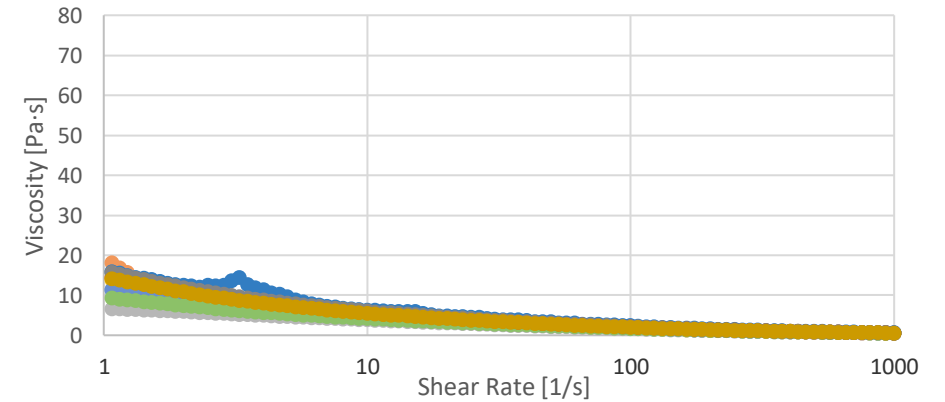
2 levels 5 levels 5 levels

SampleName	Barcode	Speed (1/s)	Clay 2 (g)	TiO2 (g)
1-HT1	10EZ5	1000	1	13,40
1-HT1	10EZA	2000	1	13,40
1-HT2	10EZ6	1000	2	11,85
1-HT2	10EZB	2000	2	11,85
1-HT3	10EZ7	1000	3	10,25
1-HT3	10EYC	2000	3	10,25
1-HT4	10EZ8	1000	4	8,7
1-HT4	10EZD	2000	4	8,7
1-HT5	10EZ9	1000	4,75	7,5
1-HT5	10EZE	2000	4,75	7,5

Rheology profile



- 1-PT1 @1000rpm 1-PT2 @1000rpm 1-PT3 @1000rpm 1-PT4 @1000rpm
- 1-PT1 @1500rpm 1-PT2 @1500rpm 1-PT3 @1500rpm 1-PT4 @1500rpm
- 1-PT1 @2000rpm 1-PT2 @2000rpm 1-PT3 @2000rpm 1-PT4 @2000rpm



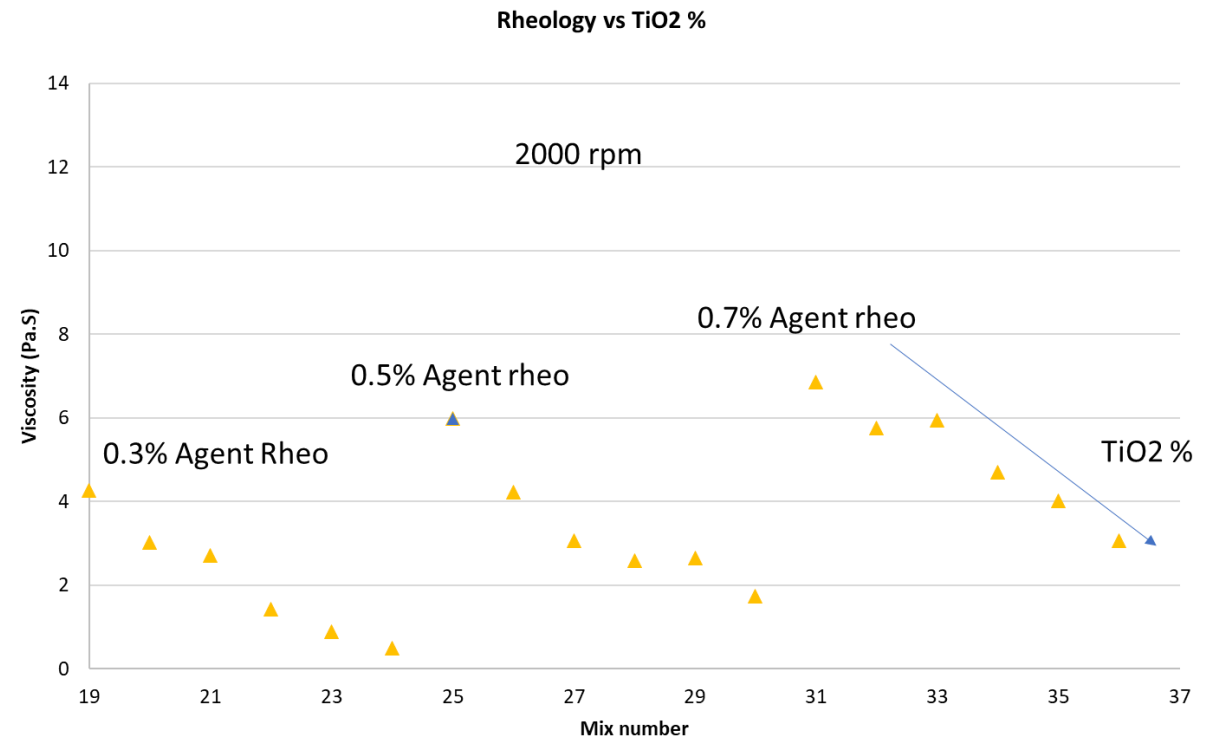
- 1-HT1 @1000rpm 1-HT2 @1000rpm 1-HT3 @1000rpm
- 1-HT4 @1000rpm 1-HT5 @1000rpm 1-HT1 @1000rpm
- 1-HT2 @1000rpm 1-HT3 @1000rpm 1-HT4 @1000rpm
- 1-HT5 @1000rpm

Formulation screening

- 3rd screening campaign
 - Reduction of TiO₂ down to minimum (LCA learnings)
 - Replacement by Clay 2
 - Rheology adaptation (pb on coating in previous campaign)

Formulation screening

- 3rd screening campaign
 - Reduction of TiO₂ down to minimum (LCA learnings)
15 | 10.25 | 8.7 | 4.7 | 2.33 | 0 |
 - Replacement by Clay 2
 - Rheology adaptation (pb on coating in previous campaign)



Formulation screening

- Coating of 0,7% Rheo adaptor
- Decreasing TiO₂

15

| 10.25

| 8.7

| 4.7

| 2.33

| 0



Formulation screening

- Coating test 2 layers Rheo adaptation 0,3%/ TiO₂ (g) 15 – 10,25 - 8,7
=> Decrease of gloss/ looking for a replacement...

15

| 10.25

| 8.7



Conclusions and role of Flamac in the project

- Project results related to HTP implementation
 - Automate the formulation (*12 in throughput)
 - Reduce TiO₂ content by 2
 - Screening for “green” strategy (replacement of TiO₂/”green antico”)
=> Replace TiO₂ : 2 components to cover & add gloss
- Questions
 - Looking for a replacement of TiO₂
 - How to improve gloss in paint?

Looking forward to collaborate



Flamac

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Formation photochimique d'ozone

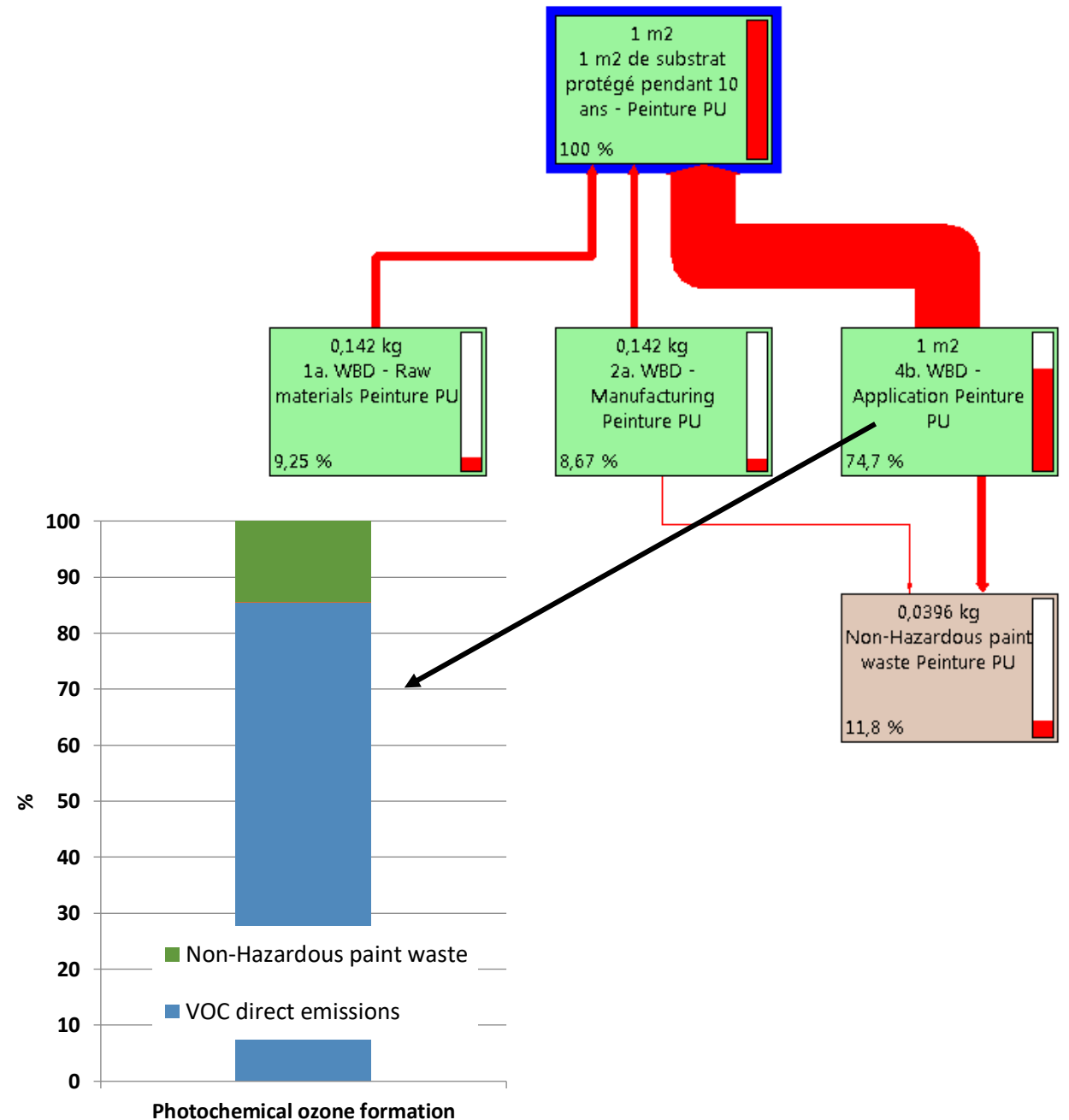
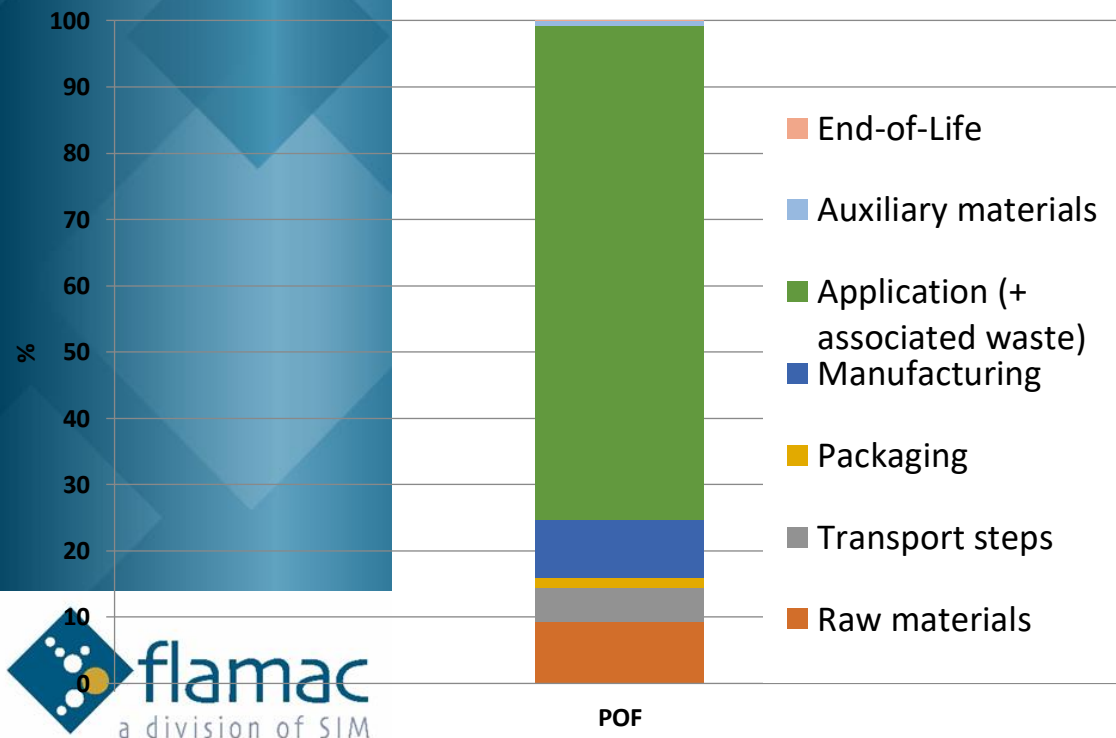
Principal contributeur

Emissions de COV lors de l'application

Leviers WBDurapaint

Solvants utilisés

Traces restantes post-synthèses résines



Ecotoxicité de l'eau

Principaux contributeurs

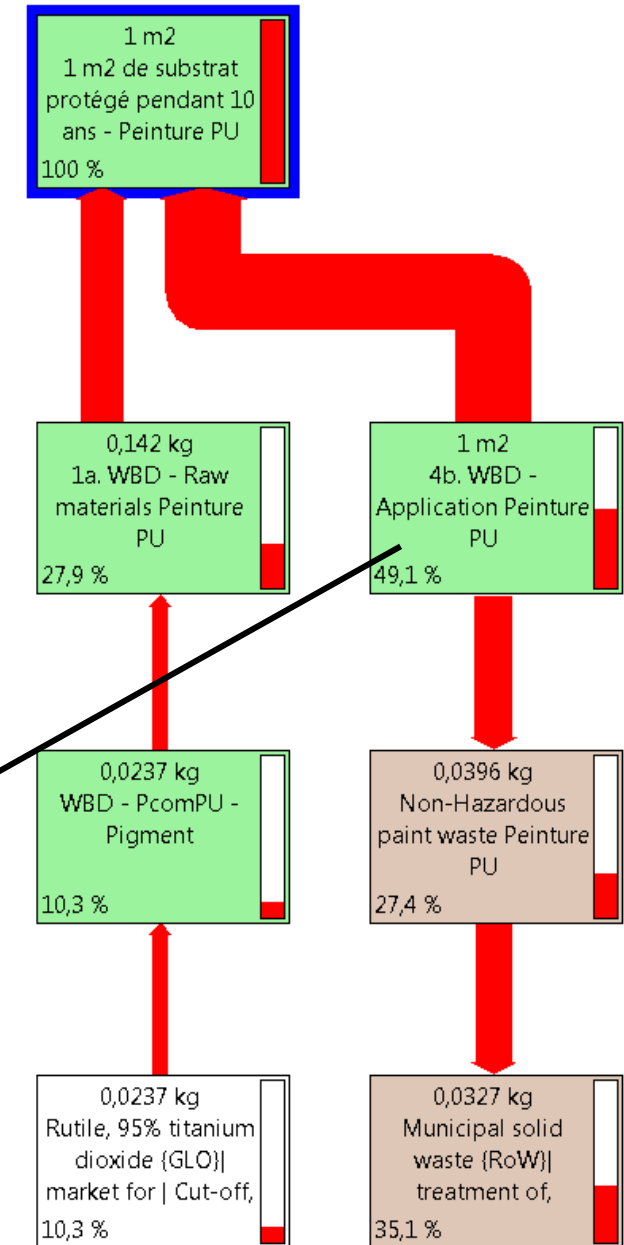
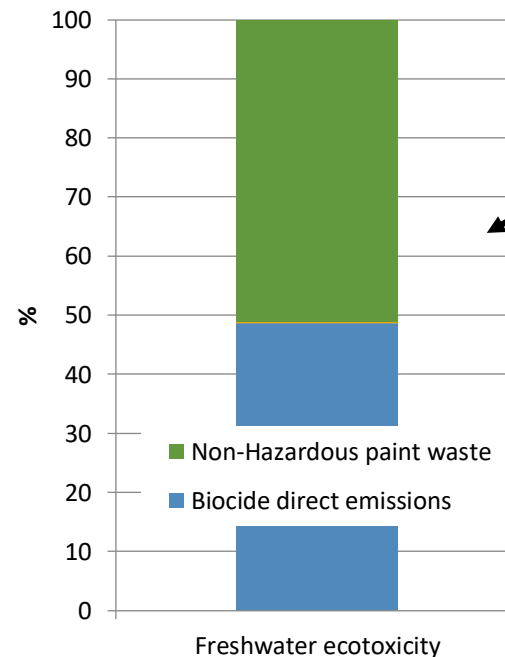
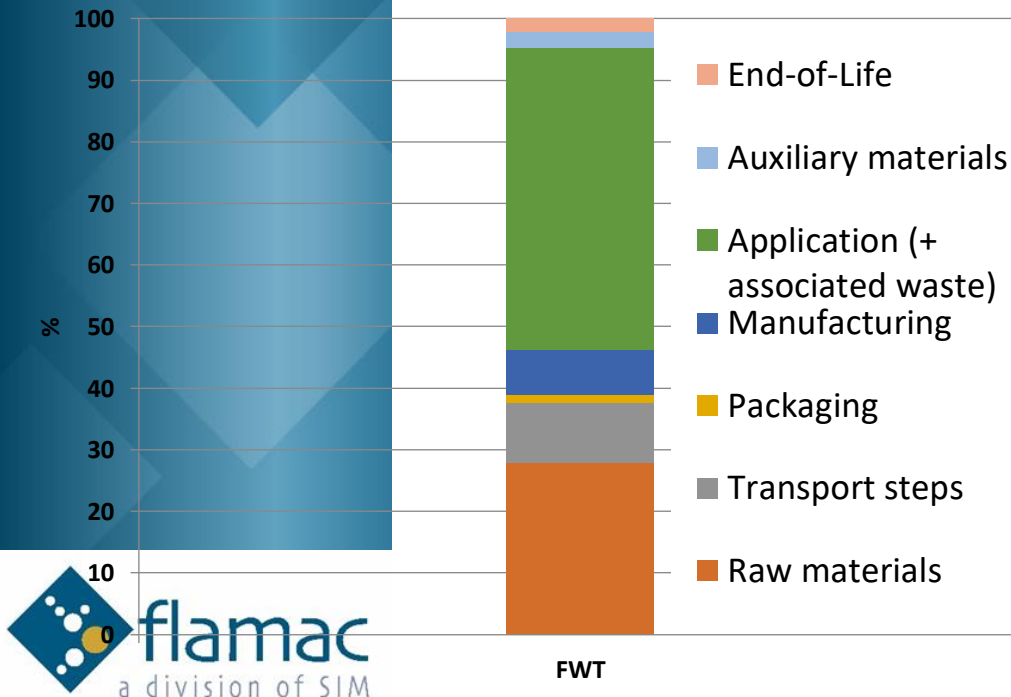
Emissions de biocides lors de l'utilisation

Traitement déchets post-application (emballages souillés)

Levier WBDurapaint

Hors du champ d'application du projet

→ Peinture avec un plus grand pouvoir couvrant = moins de déchets



Déplétion des ressources minérales et fossiles

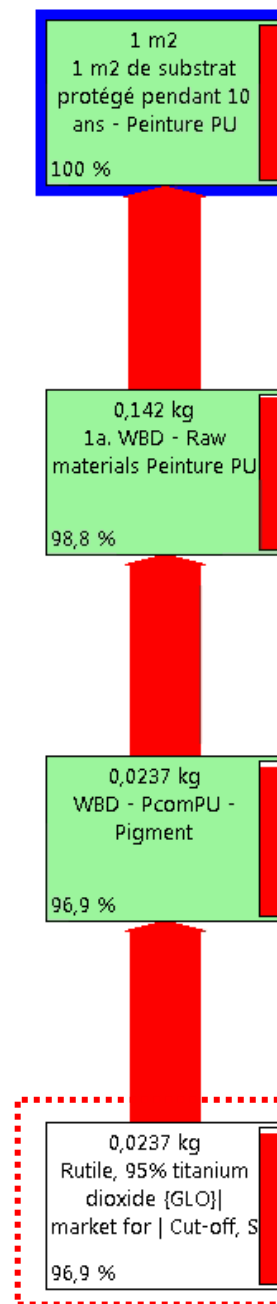
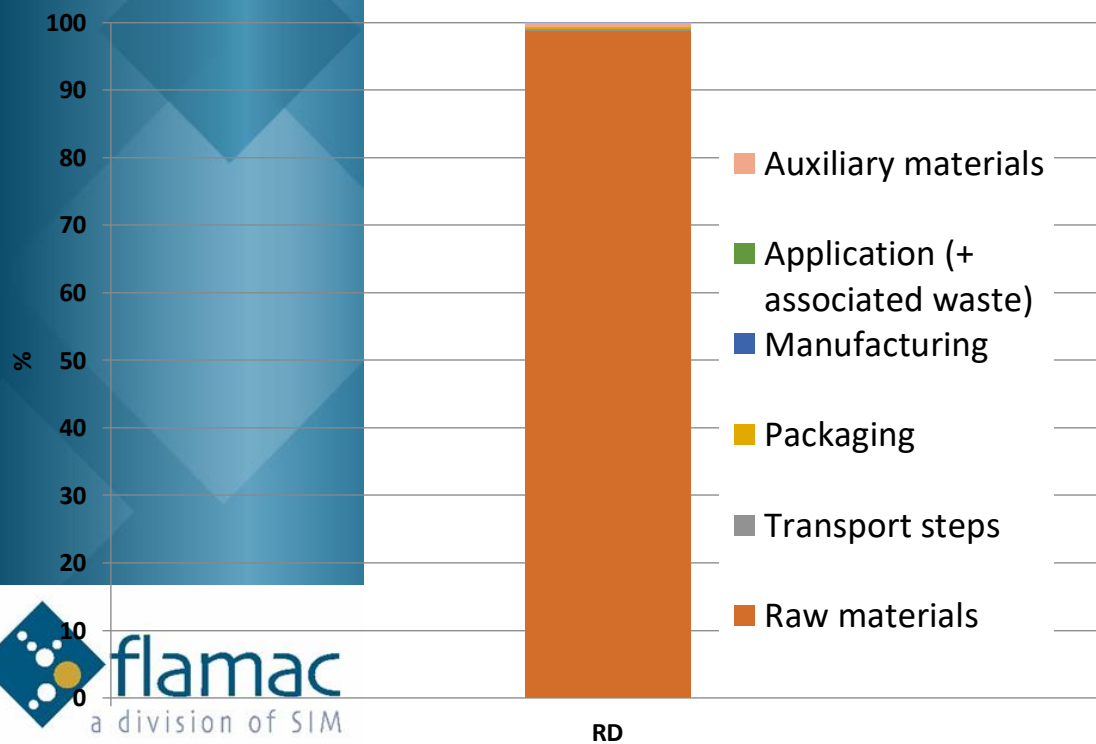
Principal contributeur

TiO₂ du pigment

Levier WBDurapaint

Hors du champs d'application du projet

→ Remplacement d'une faible part de TiO₂ par une charge (talc,...)



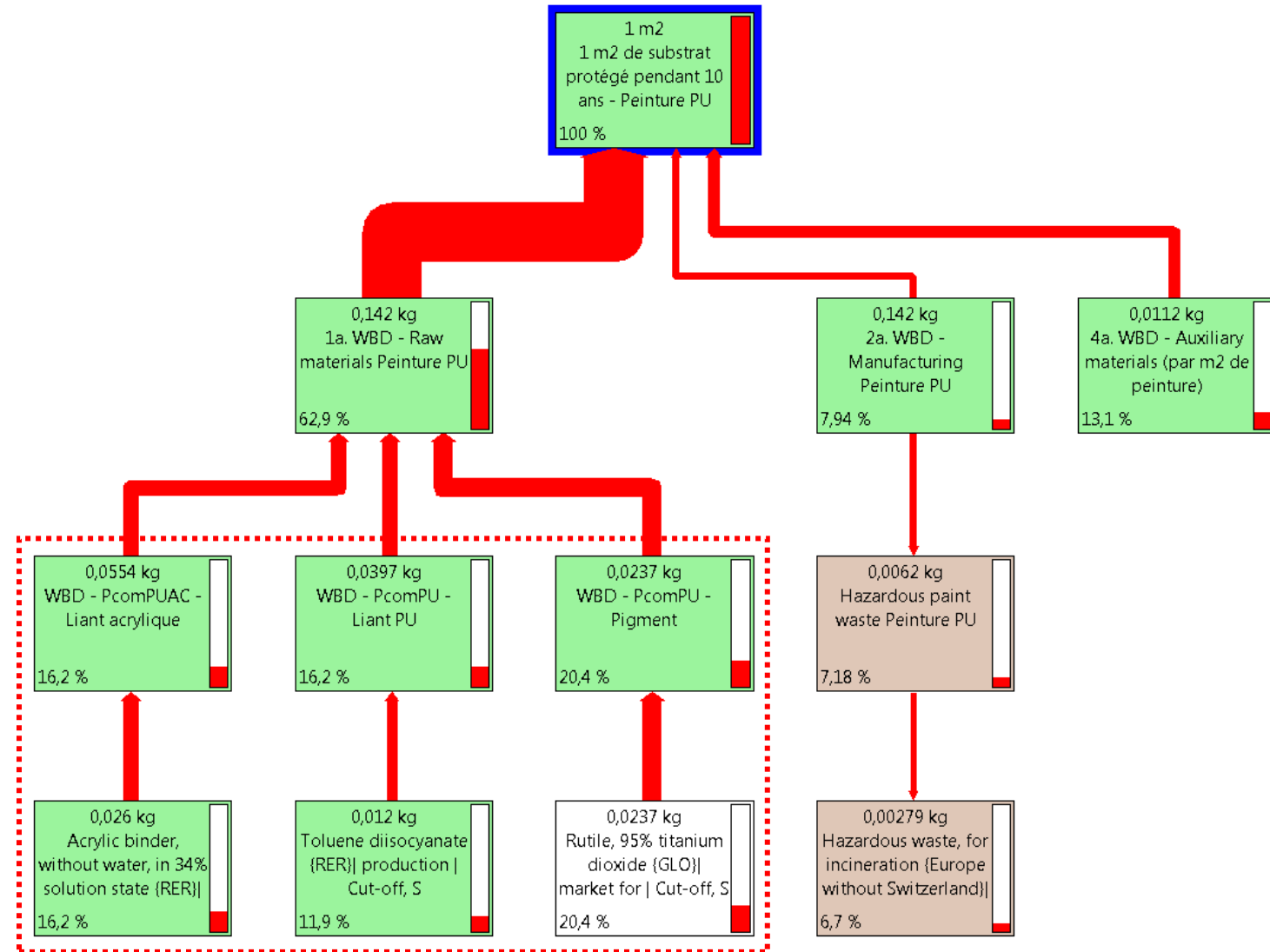
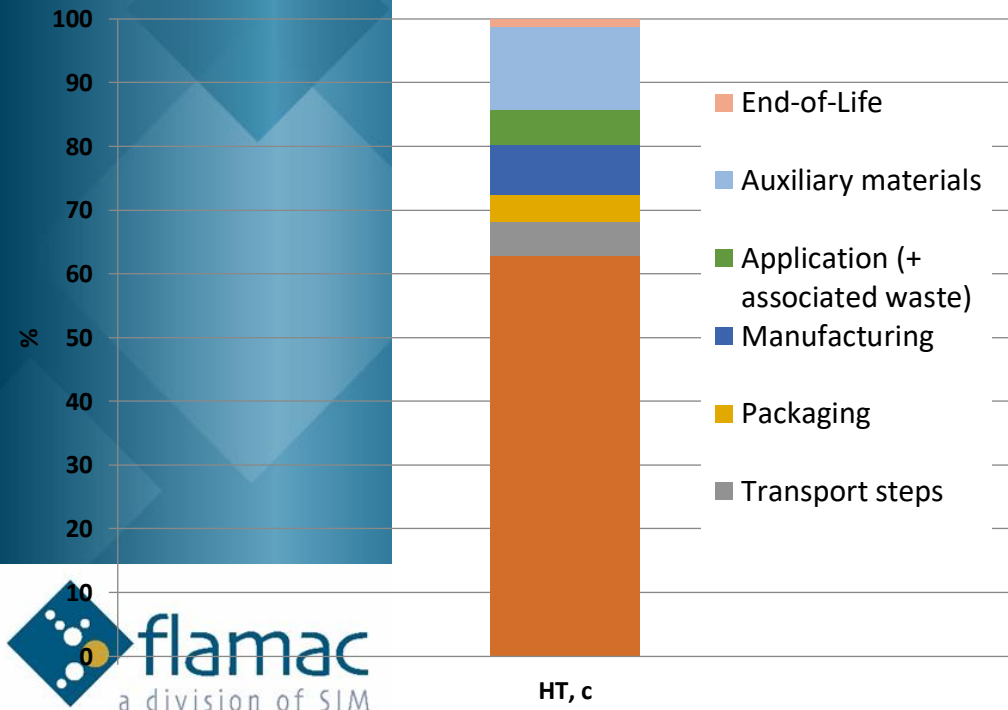
Toxicité humaine, effets cancérigènes

Principaux contributeurs

TiO2 du pigment
Liant acrylique
Liant polyuréthane

Levier WBDurapaint

Remplacement résine PU



Toxicité humaine, effets non-cancérigènes

Principaux contributeurs

TiO2 du pigment et liant acrylique (+ liant PU 3^{ème} contributeur)
Traitement déchets post-application (emballages souillés)

Leviers WBDurapaint

Remplacement résine PU

