PROGRAMME DE COOPÉRATION TRANSFRONTALIÈRE
GRENSOVERSCHRIJDEND SAMENWERKINGSPROGRAMMA

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Progrès du projet et résultats préliminaires – CTB & CETI

Projectvoortgang en voorlopige resultaten – CTB & CETI

Mélanie Monceaux and Milda Pathault - *Fran Maenhaut*
CETI CENTEXBEL

09/06/2026

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Centre de recherche collective et technique en Belgique

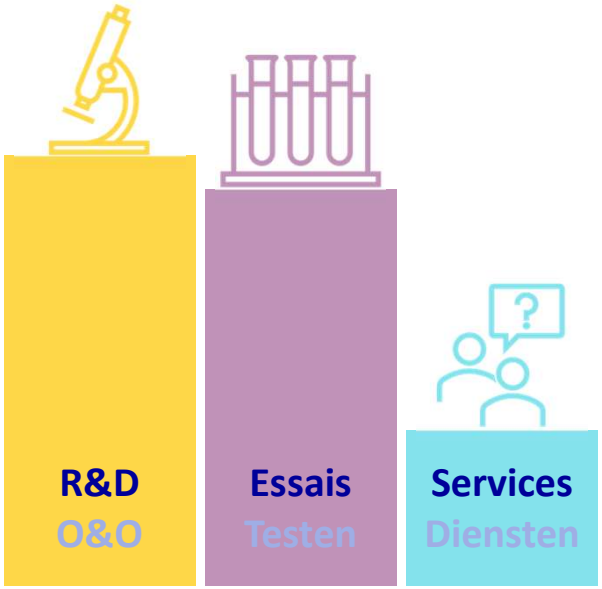
Organisation membre, au service de l'industrie de la transformation du textile et des plastiques

Collectief onderzoeks- en technisch centrum in België

Lidmaatschapsorganisatie, ten dienste van de textiel- en kunststofverwerkende industrie

Nos activités

- Recherche & Développement
- Essais
- Plateformes pour l'innovation ouverte
- Conseil & Services
- Cellule de brevets
- Cellules de normes
- Certification de produits
- Diffusion des connaissances



Onze activiteiten

- Onderzoek & Ontwikkeling
- Testen
- Platformen voor open innovatie
- Advies & Diensten
- Patentcel
- Normencel
- Productcertificering
- Kennisverspreiding

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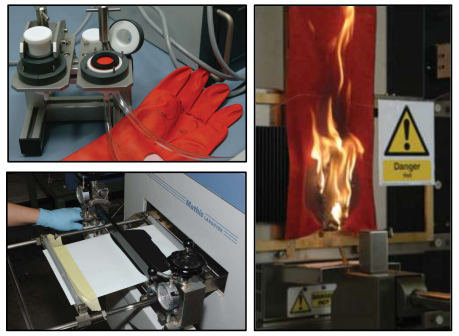
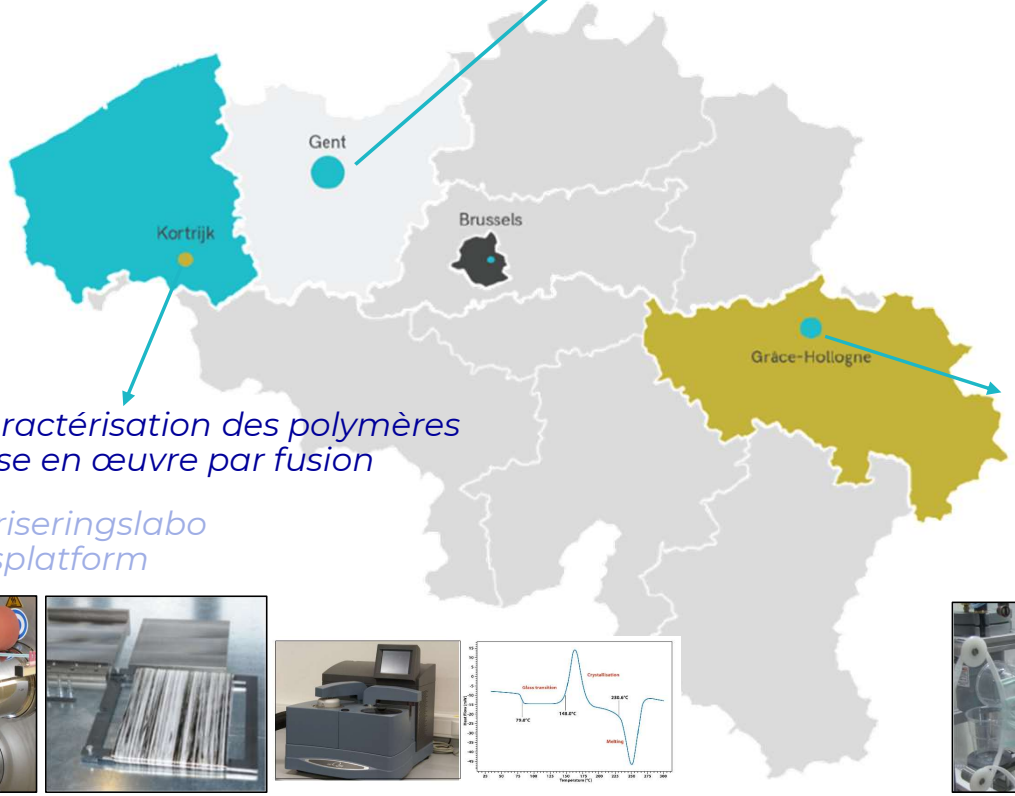
Nos laboratoires et plateformes
Onze labo's en platformen

Laboratoire d'essais physiques
Laboratoire d'analyses chimiques
Laboratoire de comportement au feu
Plateforme de coating & finition

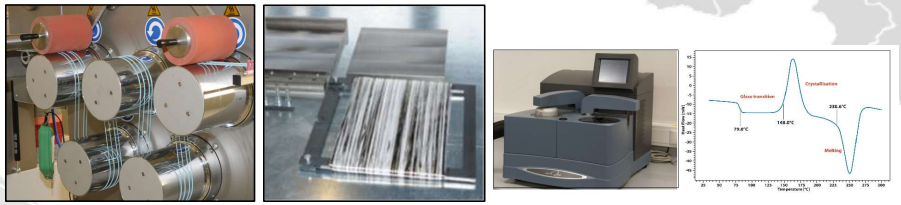
Fysisch testlabo
Chemisch testlabo
Brandgedraglabo
Coating & finishingplatform





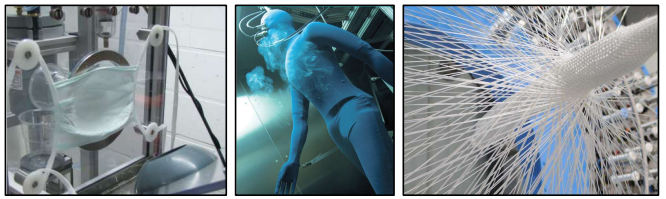
Laboratoire de caractérisation des polymères
Plateforme de mise en œuvre par fusion

Polymeerkarakteriseringslabo
Smeltverwerkingsplatform



Laboratoire d'évaluation microbiologique & confort
Plateforme des textiles techniques

Microbiologisch & comfortlabo
Platform voor technisch textiel



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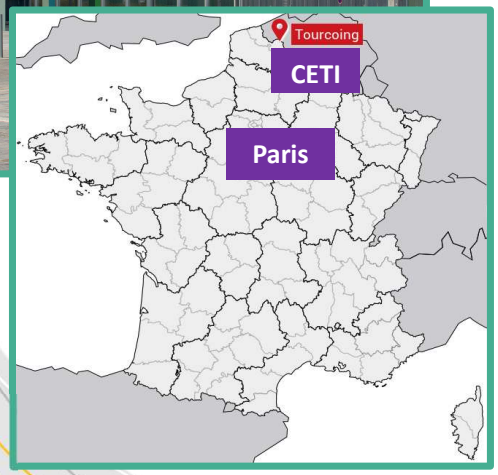

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CETI Research Center

An interface between research and industrial production at the heart of sustainable textile innovation

- **Industrial research centre** founded in 2012 in Tourcoing (Lille Metropolitan Area, Hauts-de-France)
- **~20** employees
- **4,000 m²** of offices and platforms
- **European platform** for textile **experimentation** and **industrialization**
- Centre dedicated to **innovation**, **prototyping**, **technological valorisation** and **industrial transfer**

CETI's technical platforms

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Compounding / Spinning / Fibers →

Nonwovens →

Yarn Spinning / Weaving / Knitting →

Wet Spinning →

Recycling →

Characterization & Performance Measurement →

Mechanical Recycling →

Thermomechanical Recycling →

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RE-APS activités
RE-APS activiteiten

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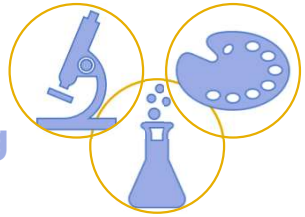
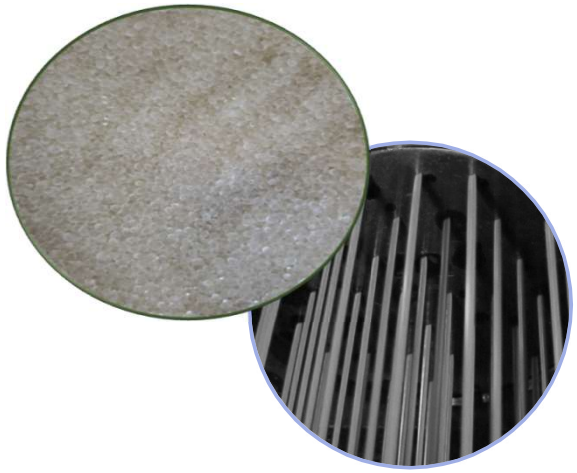
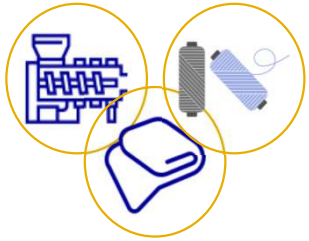
WP3: Préparation
WP3: Voorbereiding







WP4: Recyclage thermo-mécanique et transformation
WP4: Thermo-mechanische recyclage en verwerking

FROM FABRICS — TO PELLETS — TO FILAMENTS & FABRICS

RE-APS approach

Most complex

Composition	Monocomponent (100%PET)	Monocomponent with additives	Blend PET + other thermoplastic polymer : PET + PA6 others…	Blend (PET, coton,…)
Post-consumer	Pretreatment / extrusion	Pretreatment / extrusion	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion
Post-industrial	Extrusion	Pretreatment / extrusion	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion

Least complex

1.

PRÉPARATION
VOORBEREIDING

Charactérisation générale
Algemene karakterisatie

- Identification des matériaux
  Materiaalidentificatie
- Détermination du spinfinish
  Spinfinish bepaling
- Dépistage des éléments perturbateurs
  Screening storende elementen
- Propriétés thermiques
  Thermische eigenschappen
- Viscosité intrinsèque (IV), rhéologie
  Intrinsieke viscositeit (IV), rheologie

Material	T_d (°C)	T_m (°C)	T_c (°C)	T_g (°C)
Fabric 1	323.86	241.61	177.56	72.01
Fabric 2	325.5	244.25	179.89	74.56
Fabric 3	354.18	242.79	174.78	74.72

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Material	Composition	Flame retardant	Elements
FR fabric 1	100% PES	P and Br are present	P: 1.31 wt% Ca: 0.04 wt% Ti: 0.93 wt% Fe: 0.02 wt% Br: 0.04 wt%

Material	Composition	Spin finish content (%)
Mattress 1	100% PES	0.97
Mattress 2	100% PES	0.60
Mattress 3	100% PES	2.11
Mattress 4	100% PES	1.00
Mattress 5	98.7% PES 1.3% EL	1.34
Mattress 6	64.3% PES 35.7 PE	1.31

Impact de la transformation sur l'IV
Impact van de verwerking op IV

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Material	IV (dL/g)
Fabric 1	0.533
Pellets 1	0.422
Fabric 2	0.562
Pellets 2	0.453
Fabric 3	0.524
Pellets 3	0.440

Result

⚠ Reduced IV because of processing

Effet du SSP sur l'IV
Effect van SSP op IV

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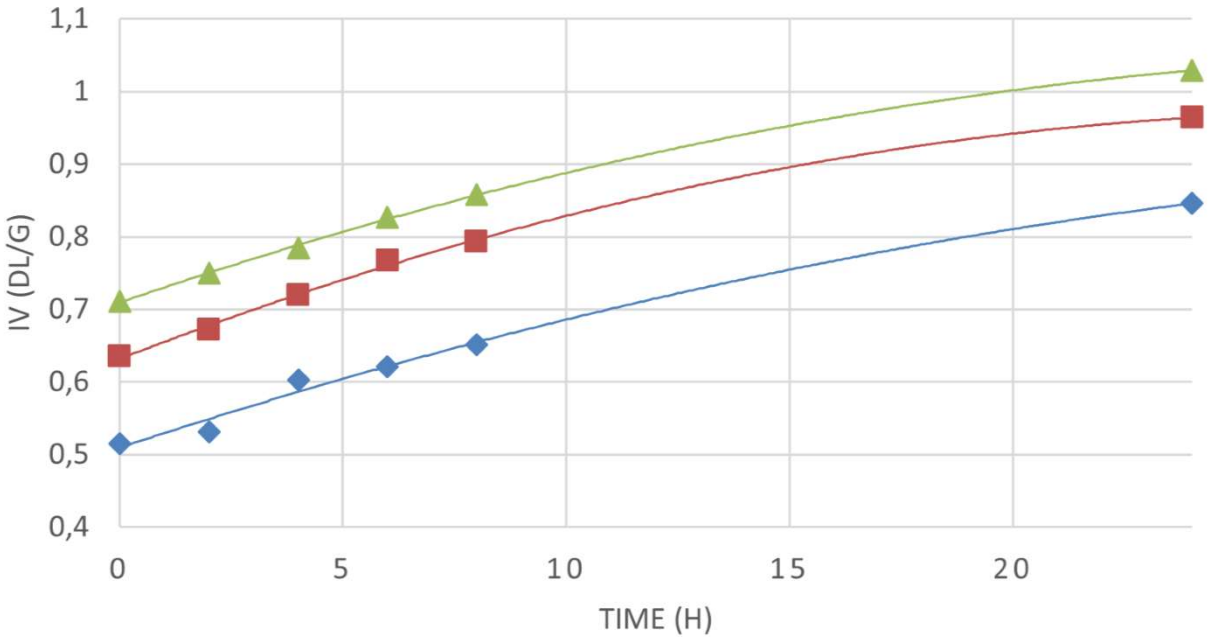
Material	IV (dL/g)	IV after +-4h SSP (dL/g)
Fabric a (white)	0.643	-
Pellets a (white)	0.608	0.623
Pellets a (green)	0.606	0.625
Pellets a (black)	0.595	0.600
Fabric b (white)	0.653	-
Pellets b (blue)	0.541	-



Result

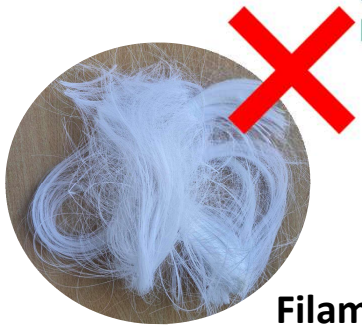
⚠ Reduced IV because of processing

⏭ SSP to boost IV

Alimentation des matériaux pour la transformation

Materiaaltoevoer voor verwerking

Tissues



Filaments

Compounding	• Proceeded fairly **smoothly** • **No significant issues** observed	• **Feeding difficulties** into the screw • Tamping: material became compacted → **poor uptake** • **Irregular feed** → **no stable strand** formation • **Strand** continuously **broke** in the water bath • Trial **stopped** (material not processable)
Spinning	• **No** major unusual **issues** • **Bobbin:** slightly more **yellow** and **glossier** than virgin PES • **Tensile strength comparable to virgin PES**	No results

Result

⚠ Processing of tissues successful, difficult feeding of filaments

⏭ Filaments will be chopped at CETI before processing

Élimination des contaminants: extraction $scCO_2$
Verwijdering contaminanten: $scCO_2$-extractie

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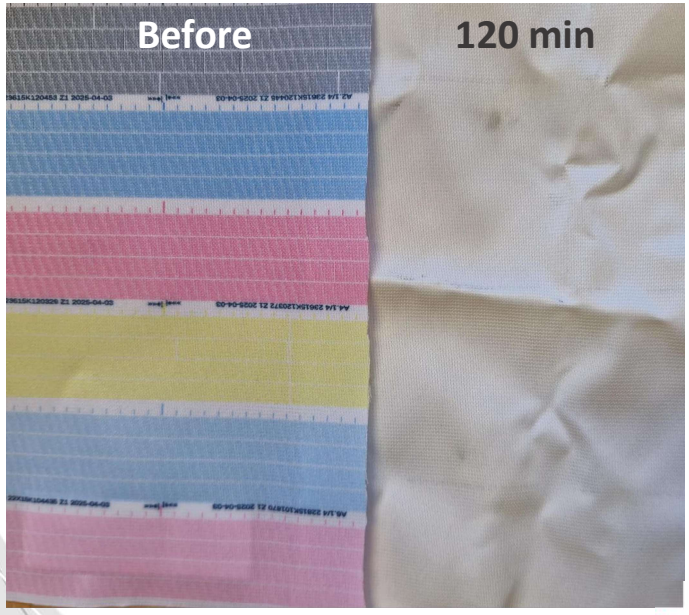
Étude de l'extraction de différents contaminants à l'échelle laboratoire (couleurs, sérigraphie vs. impression numérique, FR, …)

Studie van extractie van verschillende contaminanten op labo-schaal (kleuren, zeefdruk vs. digitale druk, FR, ...)

Soft shades

digital printing (woven)



Darker shades

Élimination des contaminants: extraction $scCO_2$
Verwijdering contaminanten: $scCO_2$-extractie

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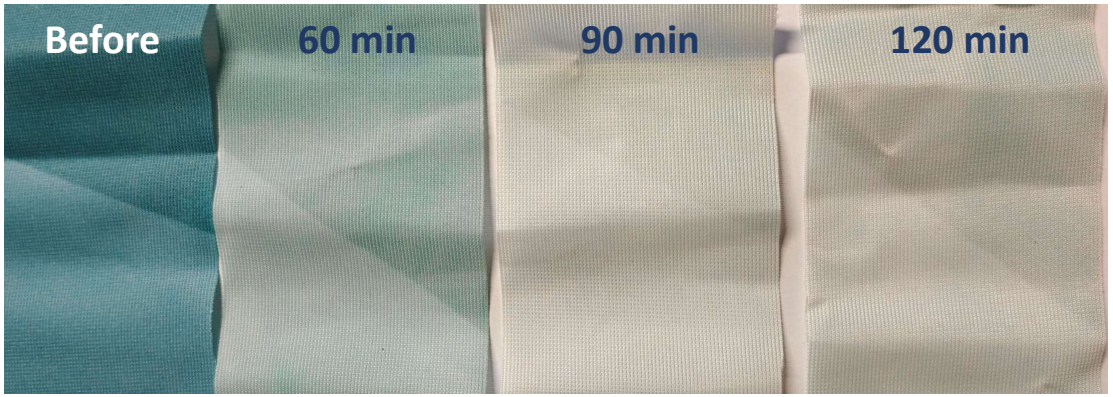
Darker blue



digital printing (woven)

20 min → 120 min

Élimination des contaminants: extraction $scCO_2$
Verwijdering contaminanten: $scCO_2$-extractie

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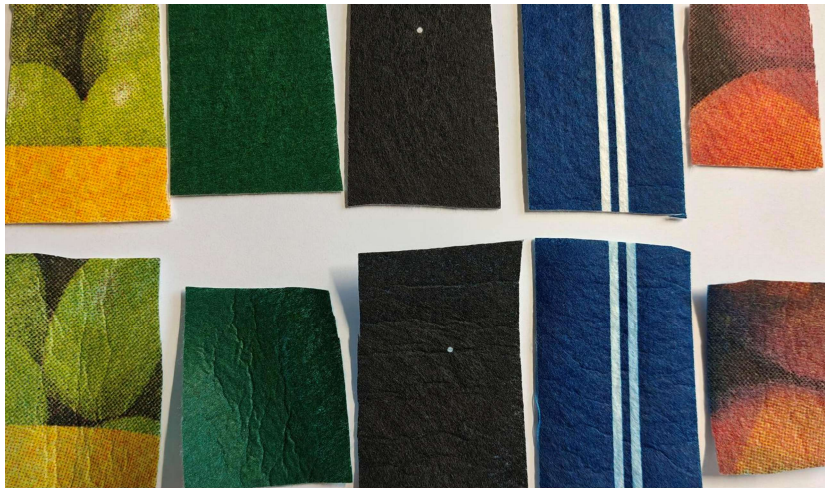
digital printing (non-woven)		*screen printing (non-woven)*
	Before	
	120 min	

Élimination des contaminants: extraction $scCO_2$
Verwijdering contaminanten: $scCO_2$-extractie

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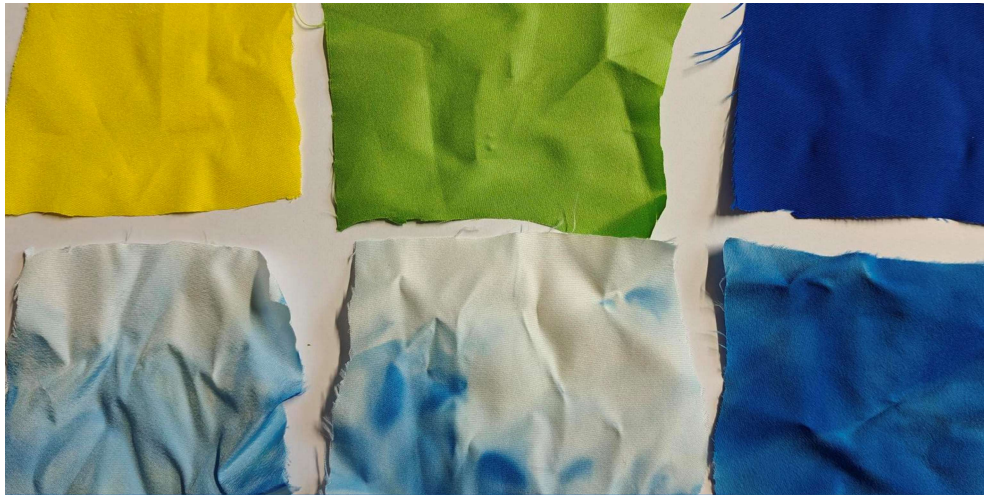
Before

120 min



solution dyed (woven)

20 min → 120 min

Flame retardants & Larger scale trials

2.

RECYCLAGE THERMO-MÉCANIQUE
THERMO-MECHANISCHE RECYCLAGE

WP 4: Thermomechanical recycling and applications in textiles and plastics industries

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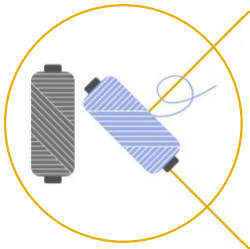
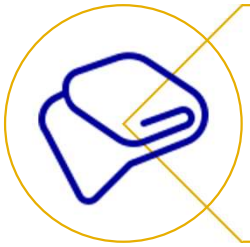
Transformation via thermomechanical recycling of the chosen samples

Thermomechanical recycling of polyester-based samples (post-production, post-consumer) to produce recycles polyester (rPET) granules



Use of the rPET for melt spinning and non-woven production

Incorporation of pellets into the **textiles and plastics industries**



Application study: use of rPET pellets and filaments to create textile prototypes

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WP 4: Thermomechanical recycling

Pilot-scale thermomechanical solutions

Compound (twin-screw)

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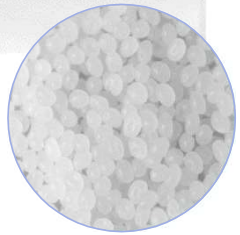
EREMA



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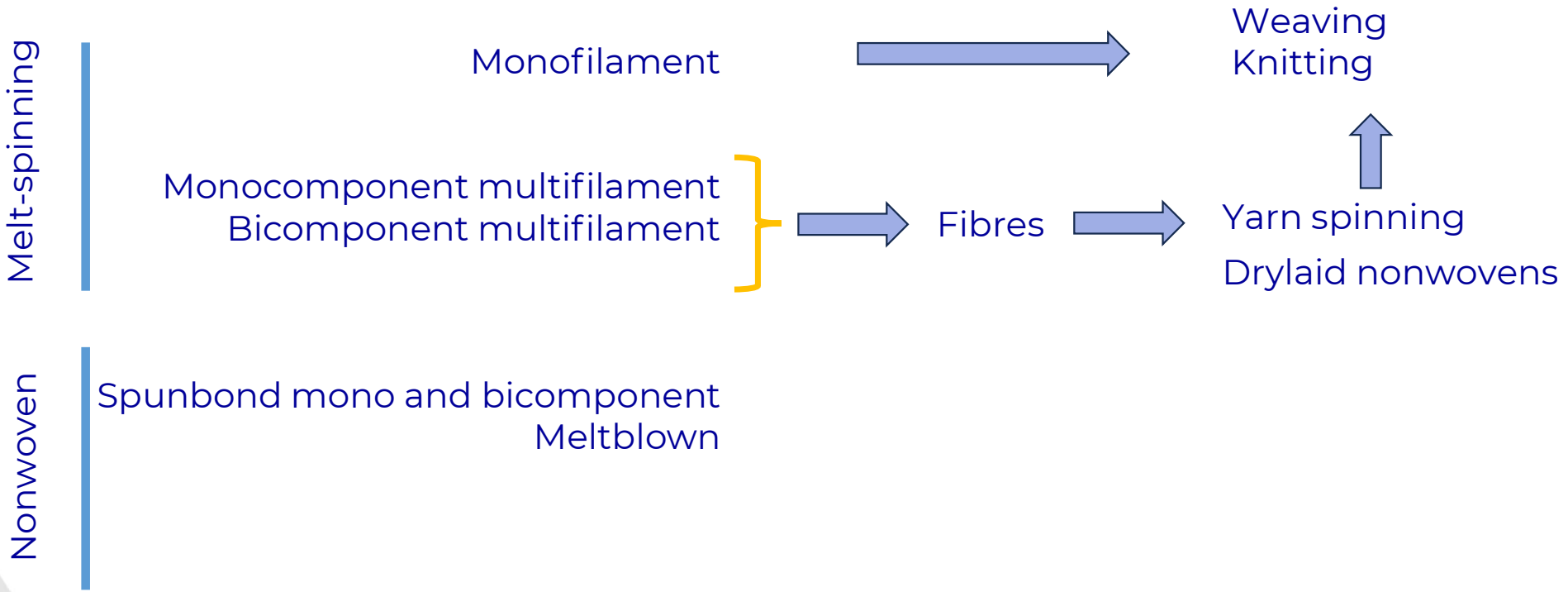
FROM FABRICS —— TO PELLETS

WP 4: Applications in textiles and plastics industries

Use of the rPET granules for:



FROM PELLETS —— TO FABRICS

What is thermomechanical recycling?

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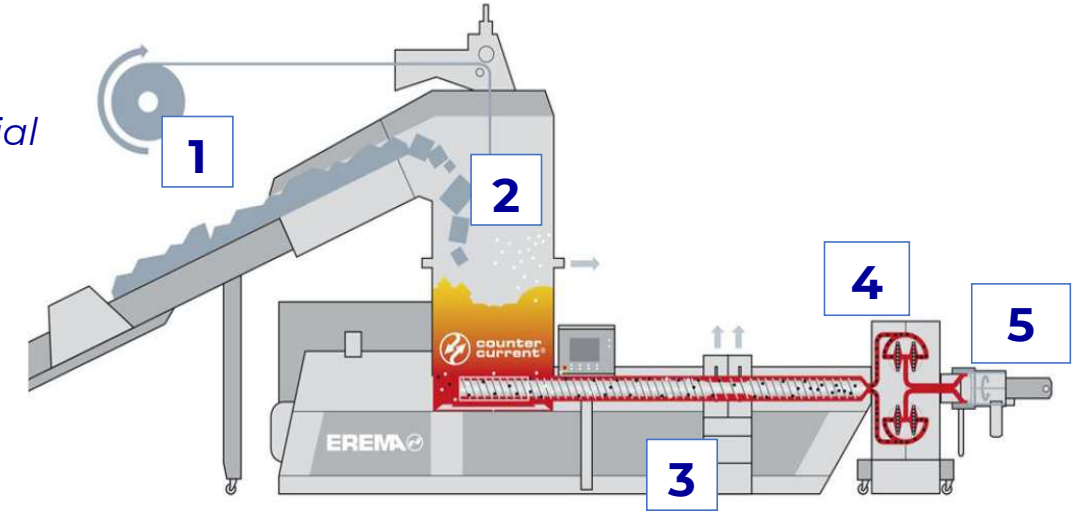
A process that uses heat to melt thermoplastic materials to obtain polymers in the form of pellets.

Starting material preparation

Sample



Obtained pellets

Melt spinning, Melt nonwovens...

Unit	Description
1	Conveyor belt and metal detector
2	Pre-conditioning unit (PCU)
3	Extrusion screw: four-zone temperature profile and fume extraction
4	Filtration system
5	Underwater pelletisation

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WP4's approach

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WP3

1. 1st Sample analysis by CTB

WP4

1. Sample analysis (capillary rheology)
2. Recycling and characterisation (capillary rheology)
3. Evaluation via meltspinning
   - 3.1 Monocomponent
   - 3.2 Bicomponent core/sheath rPET/vPET
   - 3.3 Bicomponent core/sheath vPET/rPET
4. Application for textile structures

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WP4's approach

Most complex

Composition	Monocomponent (100%PET)	Monocomponent with additives	Blend PET + other thermoplastic polymer : PET + PA6 others…	Blend (PET, coton,…)
Post-consumer	Pretreatment / extrusion	Pretreatment / extrusion	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion
Post-industrial	Extrusion	Pretreatment / extrusion	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion

Least complex

Samples studied up to now

Most complex

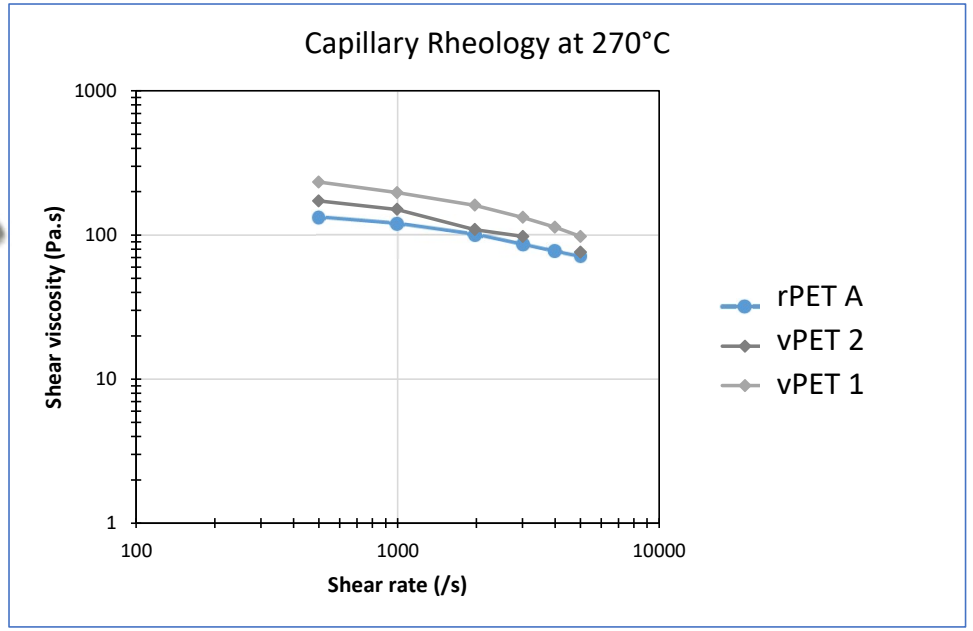
Composition	Monocomponent (100%PET)	Monocomponent with additives	Blend PET + other thermoplastic polymer : PET + PA6 others…	Blend (PET, coton,…)
Post-consumer	Pretreatment / extrusion	Pretreatment / extrusion Variable colour/treatment: Case Study C	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion
Post-industrial	Extrusion White woven fabric: Case Study A	Pretreatment / extrusion Black drylaid nonwoven: Case Study B	Pre treatment-compatibilization / extrusion	Pretreatment / extrusion

Least complex

Case study A : post industrial - 100% PET woven fabric

Sample analysis

Recycling and characterisation (capillary rheology)



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Case study A : post industrial - 100% PET woven fabric

Evaluation via melt spinning

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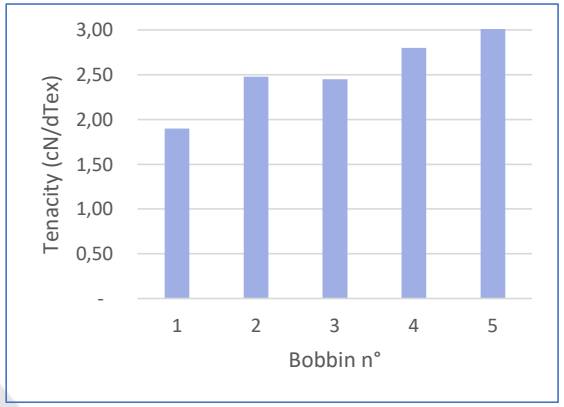
Monocomponent

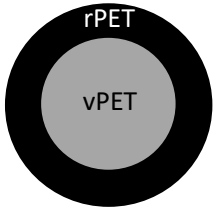
4,4 dtex/filament

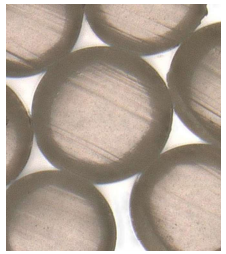


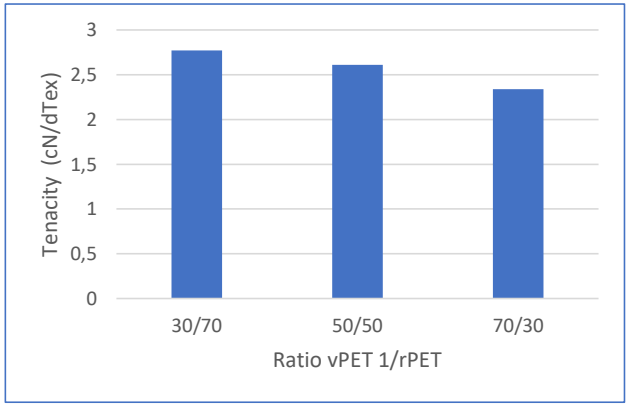
Bicomponent core/sheath

vPET/rPET

50/50 ratio



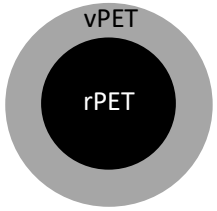


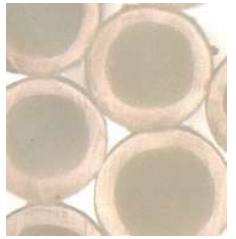


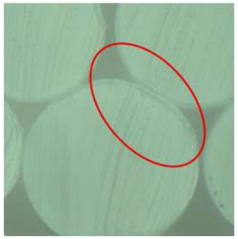
rPET/vPET

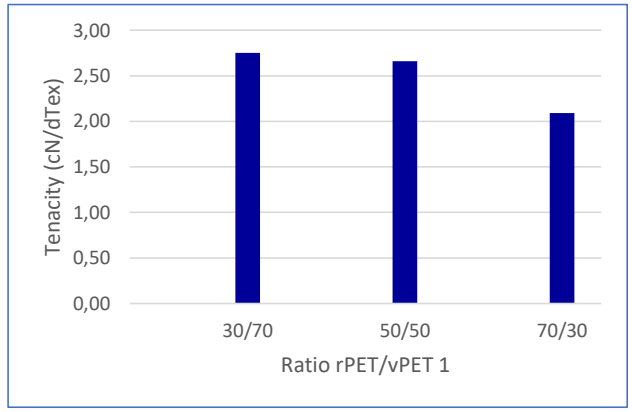
50/50 ratio

Less compatible with vPET 2









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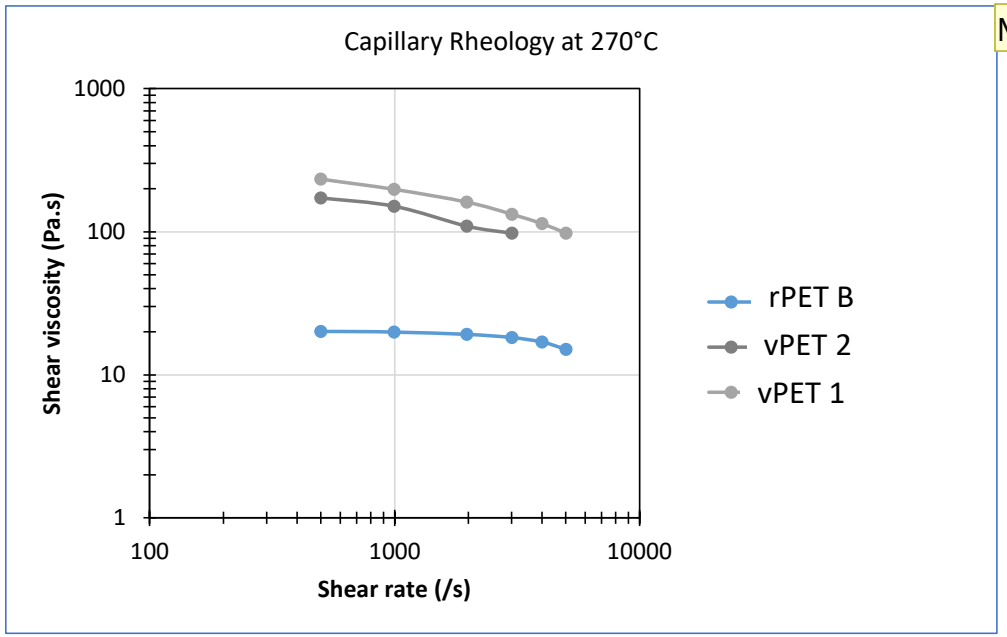
Diapositive 26

MM1 Le graph 3 n’apporte rien. As tu un graph avec des ratios d’etirage plus elevés?
Mélanie Monceaux; 2026-06-09T06:42:29.624

Case study B : post industrial - 100% PET + black - nonwoven drylaid fabric

Sample analysis

Recycling and characterisation (capillary rheology)



MM

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Diapositive 27

MM1 Reprendre les memes courbes que case study A pour le V PET, pas logique qu'il y ait une difference
Mélanie Monceaux; 2026-06-09T06:48:02.453

Case study B : post industrial - 100% PET + black - nonwoven drylaid fabric

Evaluation via melt spinning

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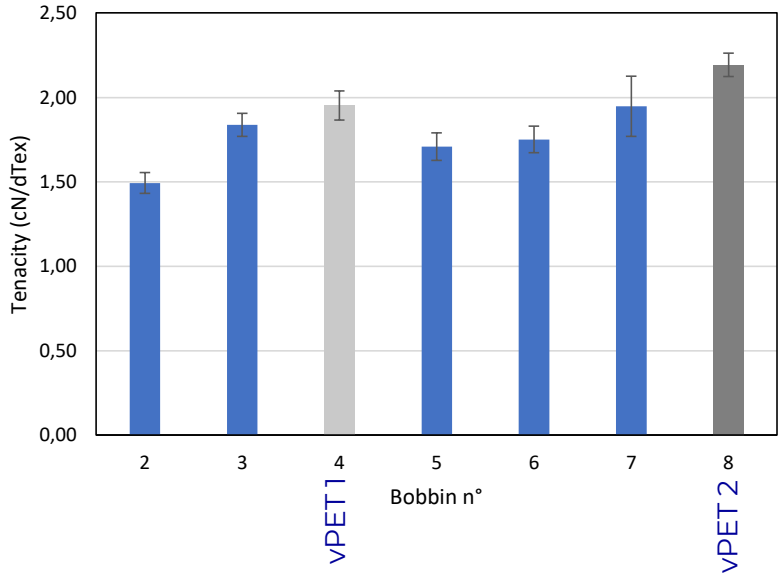
Monocomponent

5,5 dTex/filament



Bicomponent core/sheath

100% vPET — 30/70 — 50/50 — 70/30 — 100% rPET

Increasing rPET (core) content

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Case study B : post industrial - 100% PET + black - nonwoven drylaid fabric

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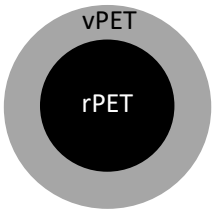
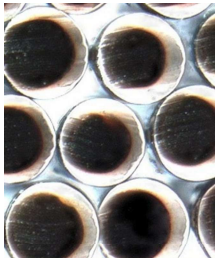
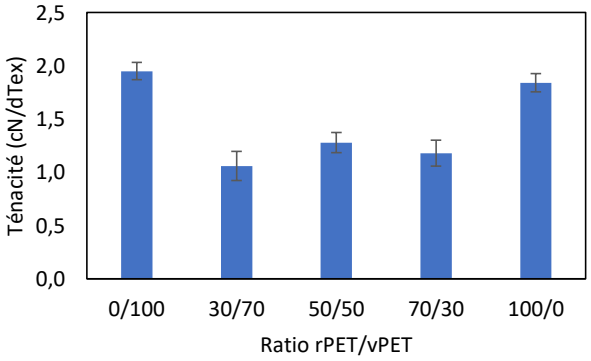
Evaluation via melt spinning

Bicomponent core/sheath

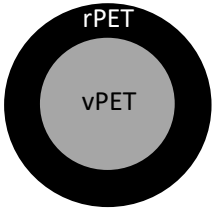
rPET/vPET

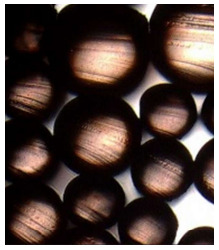


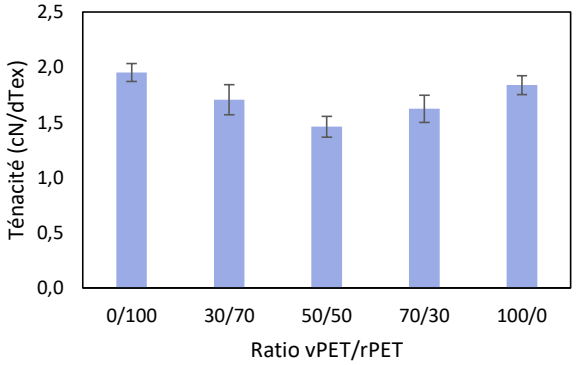




vPET/rPET







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Case study C : post consumer 100% PET + additives

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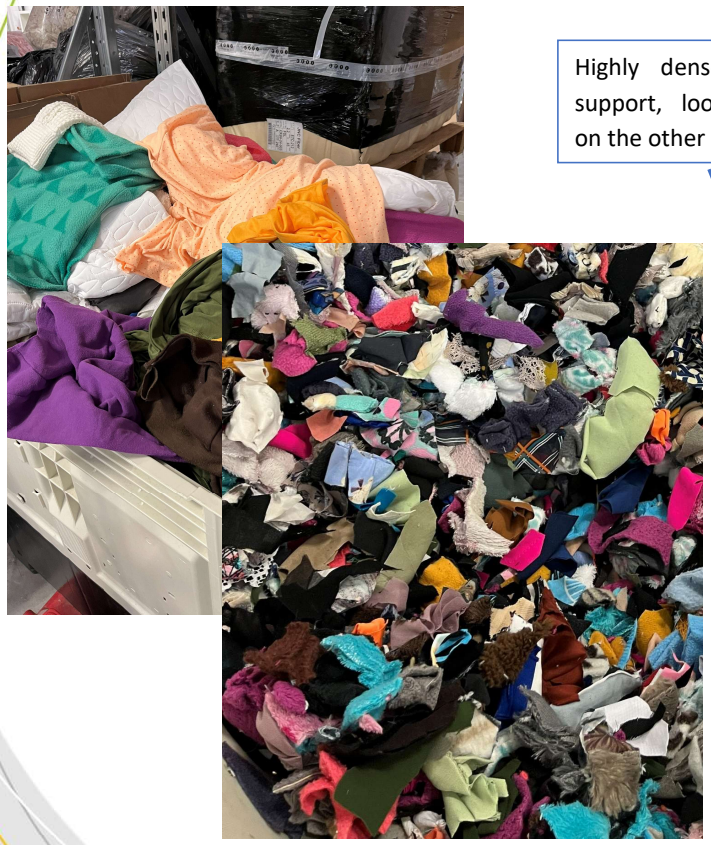
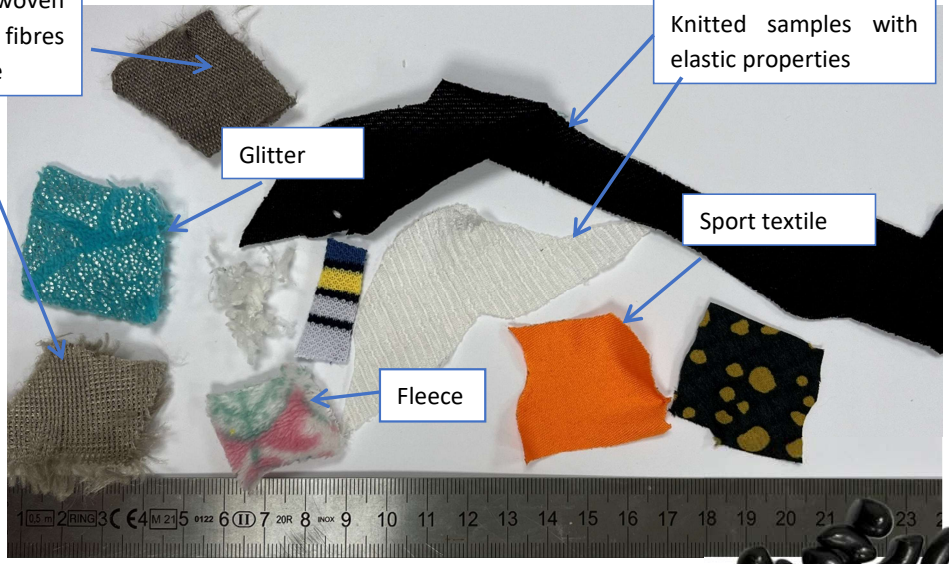
Sample analysis

Recycling and characterisation (capillary rheology)



Very heterogeneous sample

Highly dense woven support, loose fibres on the other side



Case study C : post consumer 100% PET + additives

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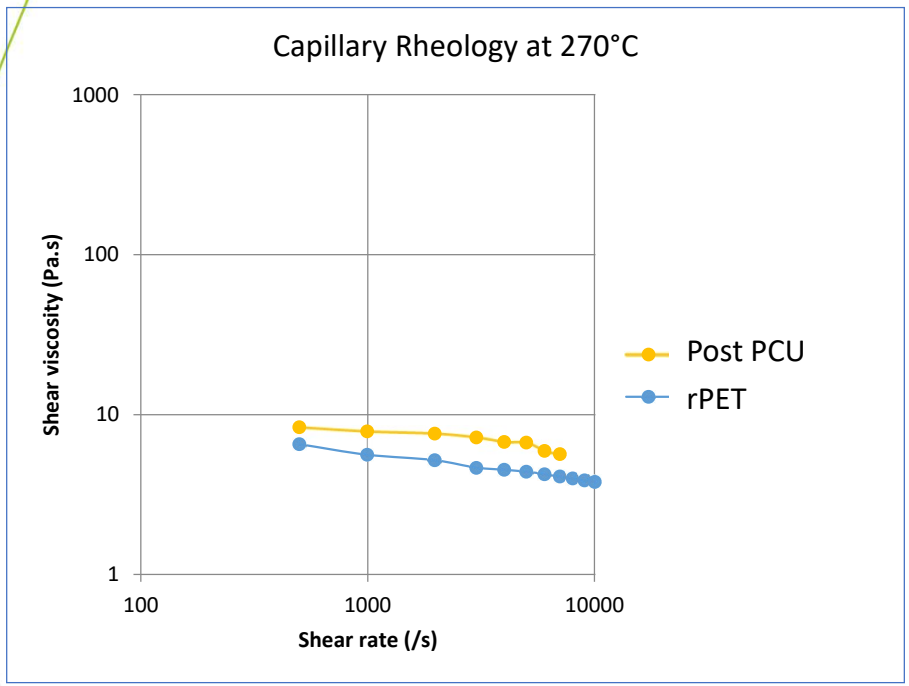
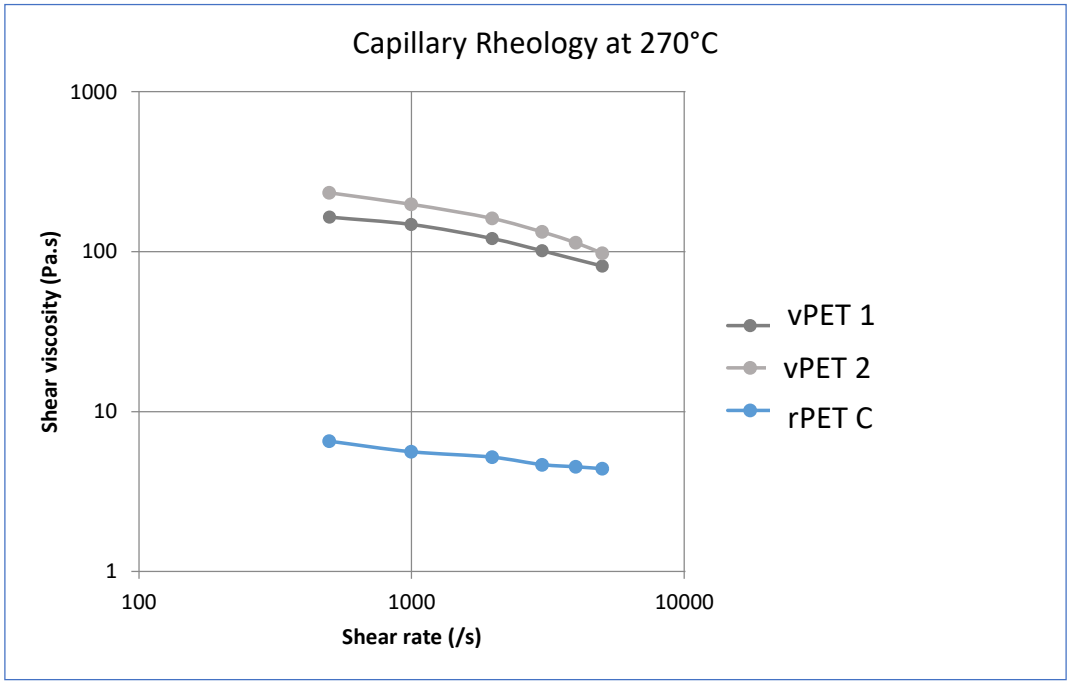
Post PCU and post EREMA comparison



Comparison of rPET C with vPET 1 and 2:



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Conclusions

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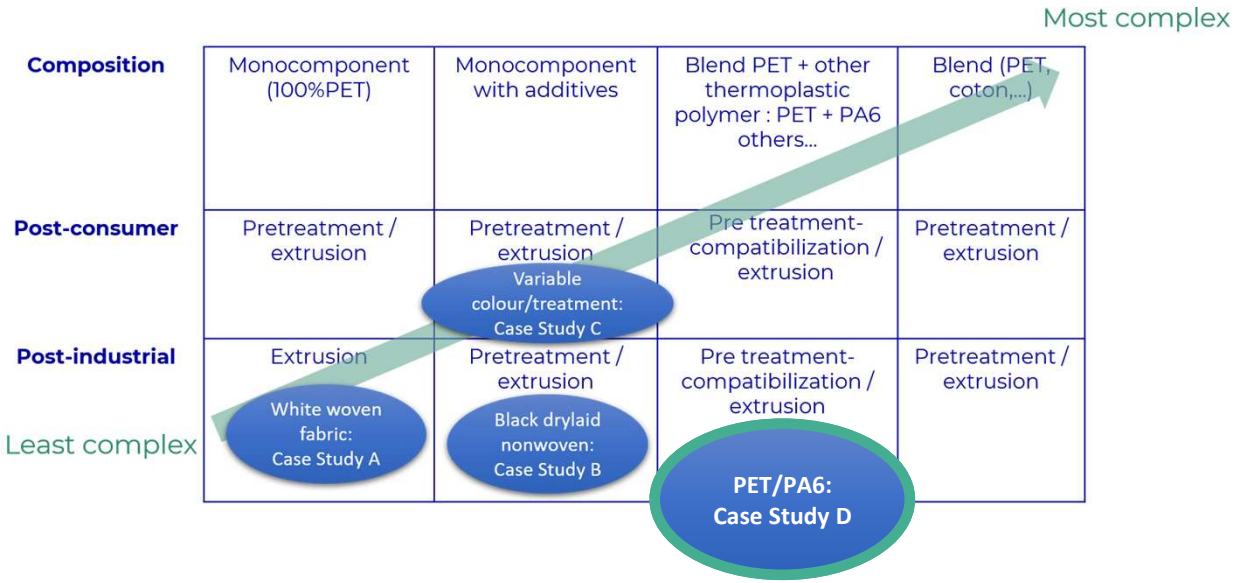
1. **Observed decrease in viscosity during thermomechanical recycling, this has an impact on processability** *Study with chain extenders*
2. **Different compatibility between rPET/vPET 1 and rPET/vPET 2 based on rPET**
3. **Incorporation of vPET boosts mechanical performance**
4. **Incorporation of rPET influences colour** *Impact on applications*
5. **Drying conditions have an impact on processability** *Aquatrac study*

Future work

- **Case study C: evaluation via melt spinning (mono/bico)**
- **Incorporation of chain extenders**
- **Case Study D: Post-industrial PET / PA 6** *Moving along in complexity*



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