NewWave WEBINAR SERIES

ENGINEERED WOOD PRODUCTS:

What's the way forward?

With Luis Otero Vazquez (Foresa Tech)

4th SEPTEMBER - 11:00 (CEST)

ONLINE (Zoom)

Funded by
the European Union

Our history

FORESA
TECHNOLOGIES

- **1964** Foundation of FORESA
- **1975** FORESA acquired 25% Of Bresfor in Portugal
- **1996** FORESA acquired 100% Of Bresfor in Portugal
- **2000** Maritime terminal in Vilagarcia
- **2005** Foundation of FORESA
- **2006** FORESA acquired a plant in France
- **2016-2017** FORGLUE (México)
- **2019** Foundation of Technology Division

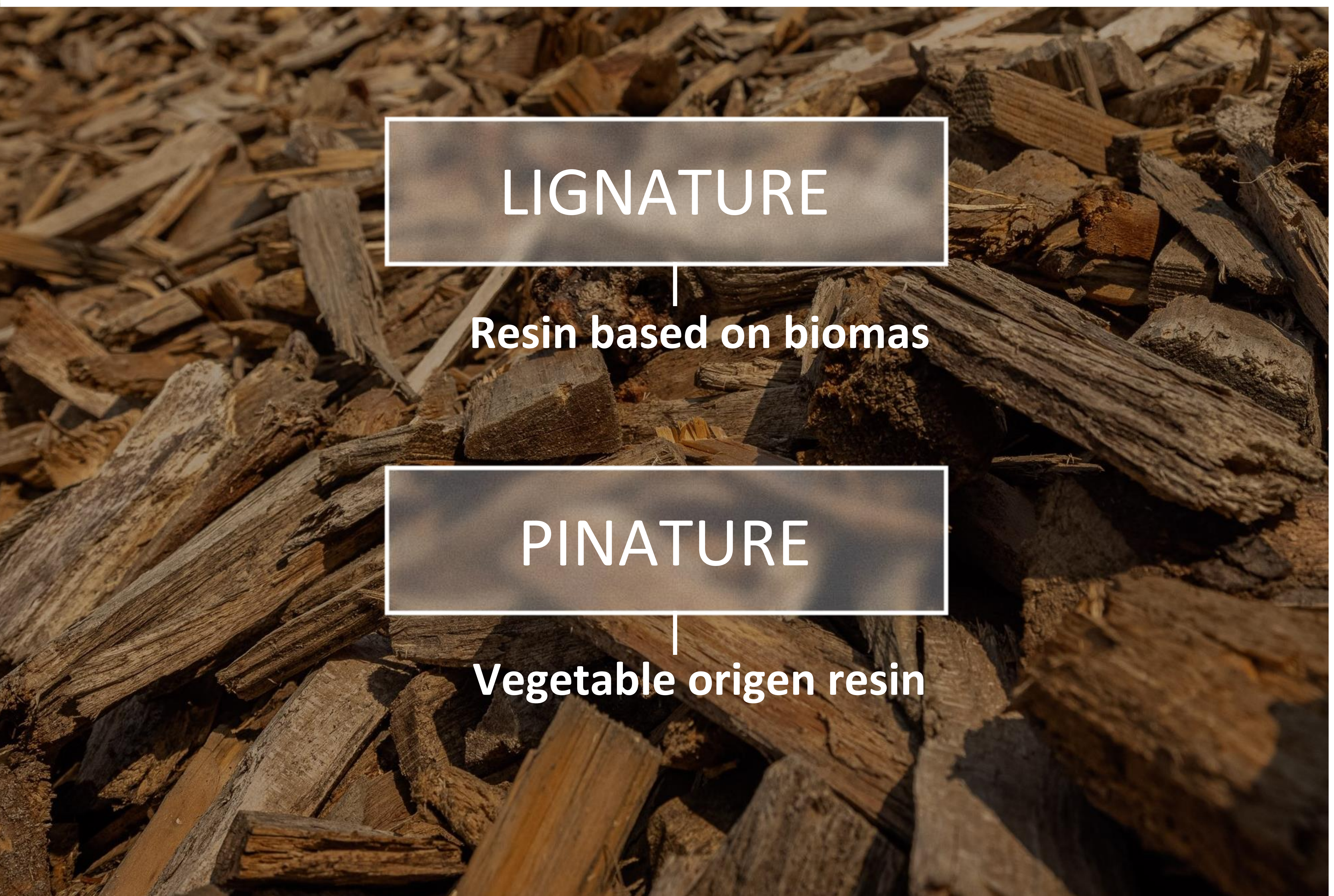
Our background

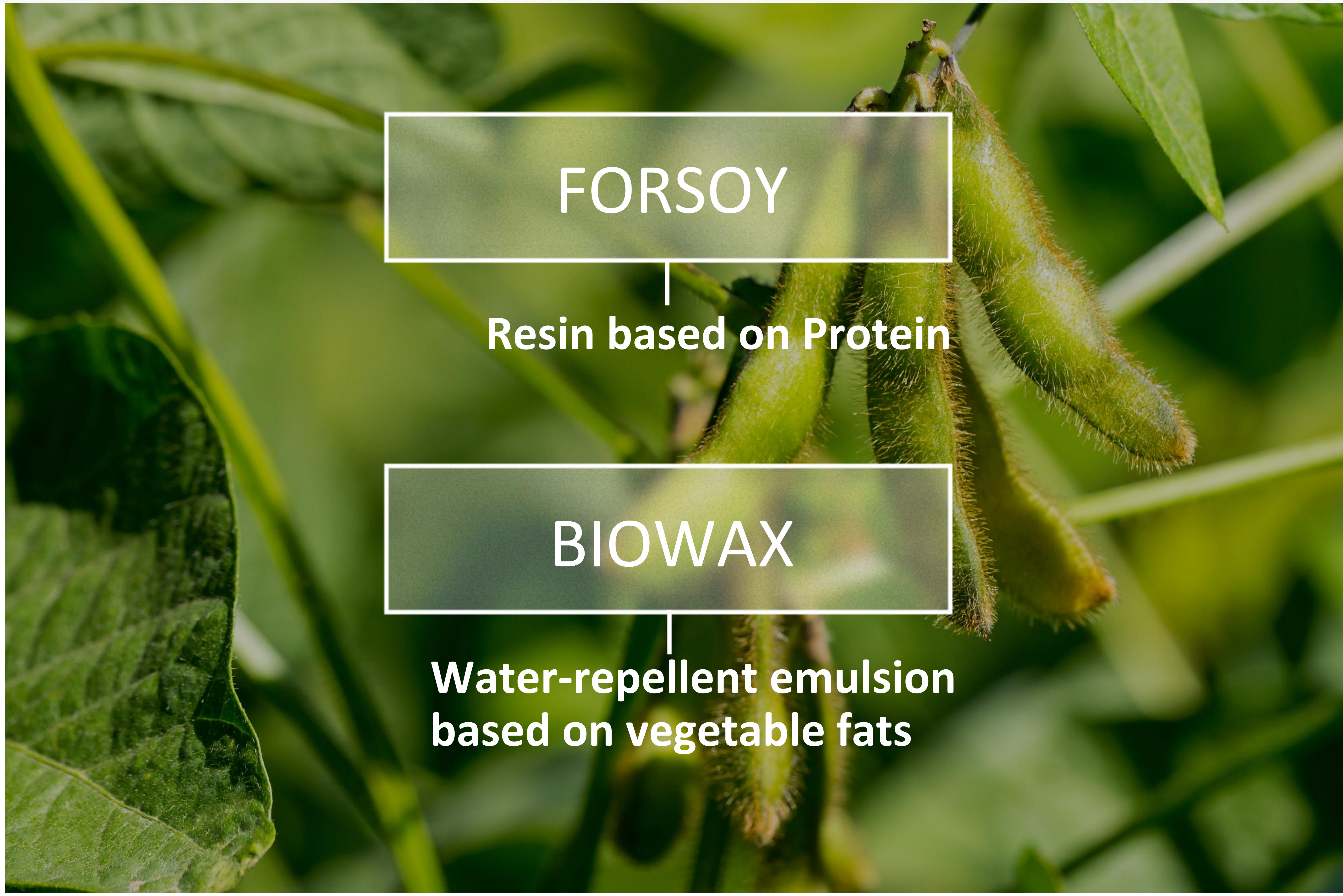
Methanol	Formaldehyde	UF Concentrated	Pharmaceutical industry and varnishes
			Resin producers
Urea	Solutions Urea	Adblue	Environmental applications
		NOX scavenger	
Melamine		UF+MF+UFM Resins	Board sector, Paper, Cork, Casting, varnishes
Phenol		PF concentrated	Resin producers
		Resinas PF+PUF	Board sector, Casting, Isolation,
VAM		Vynilic emulsion	Dust & Erosion Control, Soil & Slope Stabilization
		Resina de PVAc	Honeycomb, Furniture, Decoration
Paraffin / Oil		Emulsión Parafina / aceite	Board sector, construction, isolation
Natural raw material		BIO-Emulsion	Isolation, Board sector
		BIO-Adhesives	
Other raw material		Aditives	Isolation, Board sector

NATURALLY ORIGINATED SOLUTIONS

Objetive: Obtain products in a sustainable way, replacing raw materials of fossil origin with other renewable natural resources and different sources of Waste Materials.

From waste from the Agroforestry Sector





From Biomass, Proteins, Fats and Sugars

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FORESA
TECHNOLOGIES

ENGINEERED WOOD PRODUCTS: What´s the way forward?

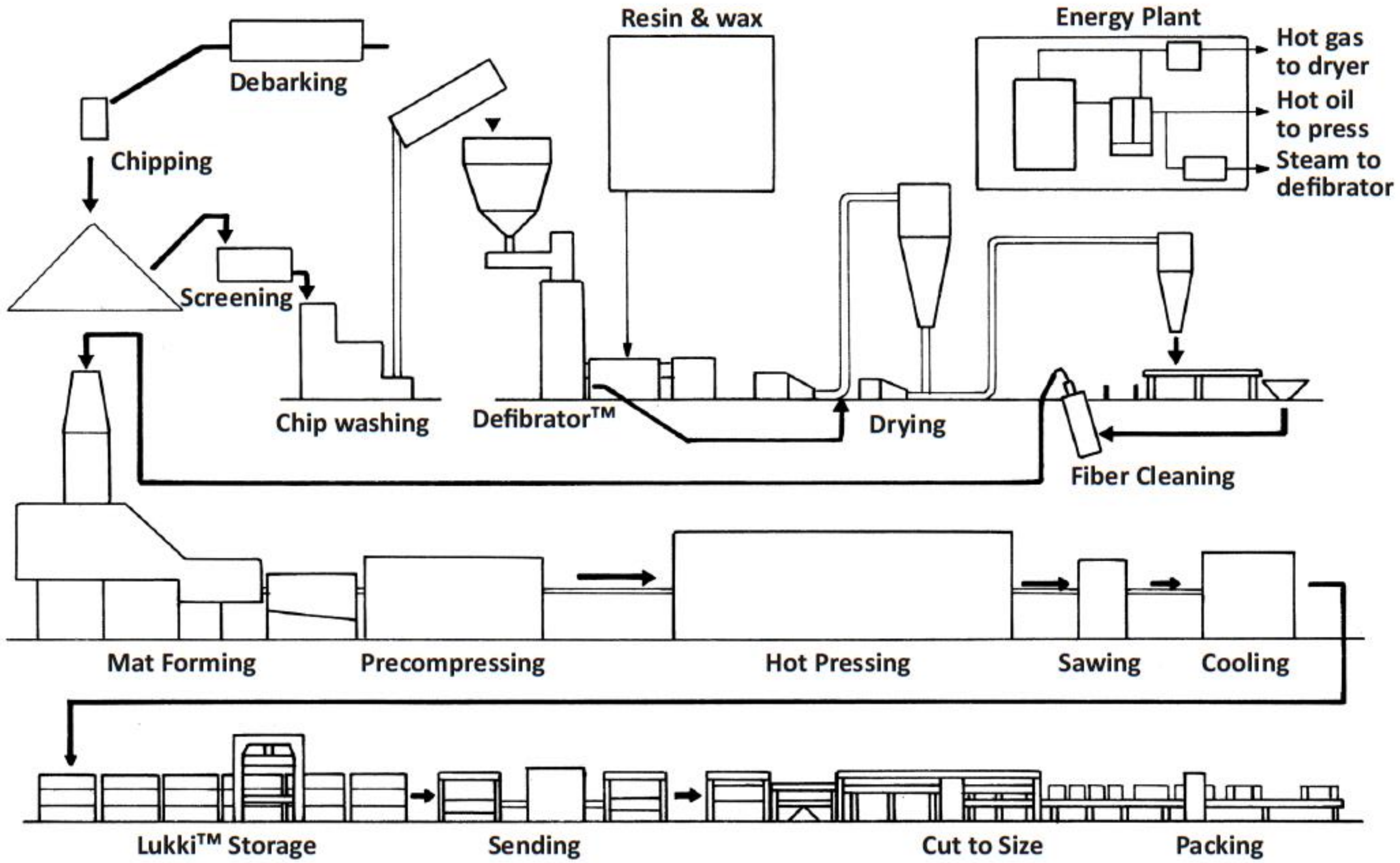
04 September 2024

Luis Alberto Otero Vázquez

This project has received funding from the European Union’s Horizon 2020 Research and Innovation Programme under Grant Agreement No. 101058369.

THE ENGINEERED WOOD SECTOR. TECHNICAL CHALLENGES. MEDIUM DENSITY FIBERBOARD (MDF).

- Biobased resins and additives
- VOCs reduction
- MDF recycling
- Water use reduction
- Energy efficiency
- Downcycling and upcycling



Flow diagram for Medium Density Fibreboard production

Fig. 2

THE ENGINEERED WOOD SECTOR. SUSTAINABILITY CHALLENGES

- Decarbonization: reducing carbon footprint
- Water use reduction and energy Efficiency
- Certification
- Production processes and products that are safe and sustainable by design
- Circular economy
- GHG avoidance

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FORESA TECHNOLOGIES

WP5: Manufacturing for engineered Wood panels

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No. 101058369.

Project overview

- PERIOD: 01.04.2022-31.03.2026
- BUDGET: 5,057,580.00
- FINANCING: HORIZON EUROPE-RIA
- COORDINATOR: B.T.G. Biomass technology group BV (The Netherlands)
- 11 PARTNERS FROM 6 COUNTRIES (Netherlands, Belgium, Italy, Spain, Slovenia, Switzerland)

Project overview

Residual biomass and end of line products

Fast pyroliss bio-oil from thermo-chemical fractionation

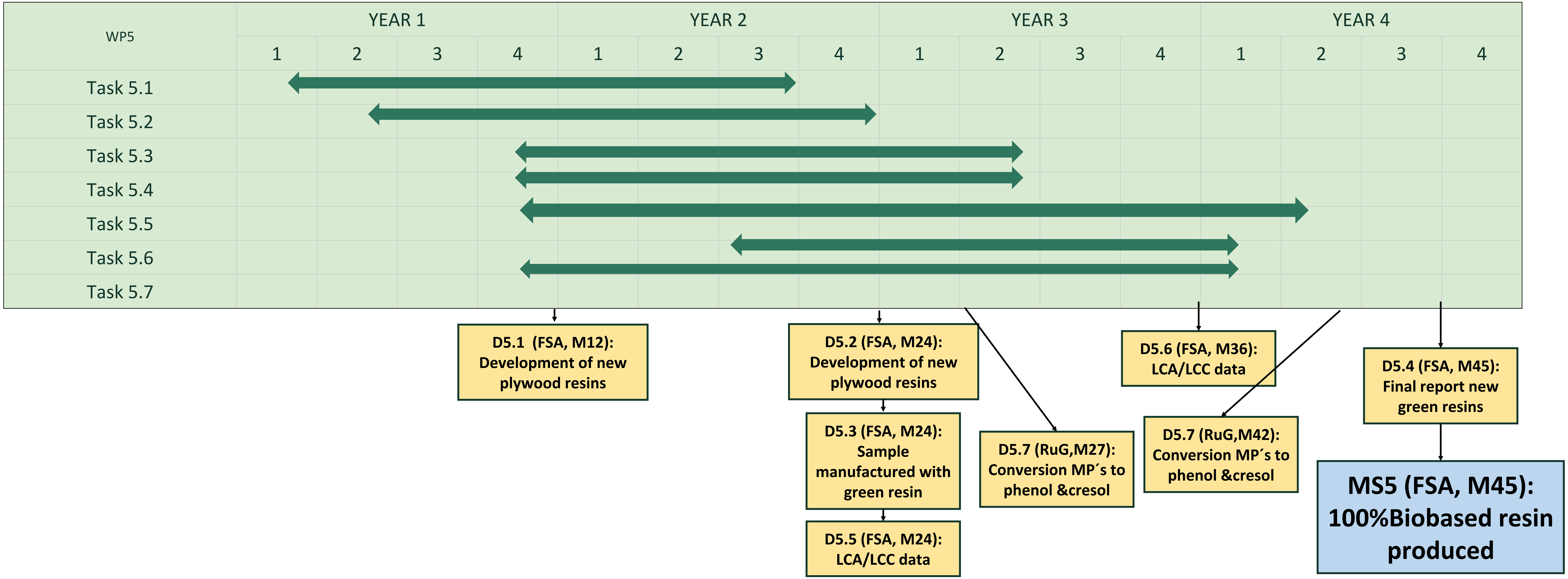
Adaptation of a manufacturing line to produce engineered wood panels using the new raw material achieving similar or improved properties compared to the fossil-derived products.

Work package 5

ML3- Manufacturing line for engineered wood panels

WP5 overview

- Involved partners: BTG, FSA, RUG, INNO
- Timeline: Start M3, end M45
- PM effort: BTG 11.2; FSA 90; RUG 22; INNO 5



WP5 objectives

Design, production, testing up-scaling green of added value green plywood and MDF resins based on pyrolytic lignin

Application of (high content) the modified lignin fraction in plywood, MDF

Development a fully sustainable plywood and/or MDF products

Production of large quantities of selected material for demonstration activities and as feed for TCF to demonstrate circularity

Schema of the workflow

Lignin characterization

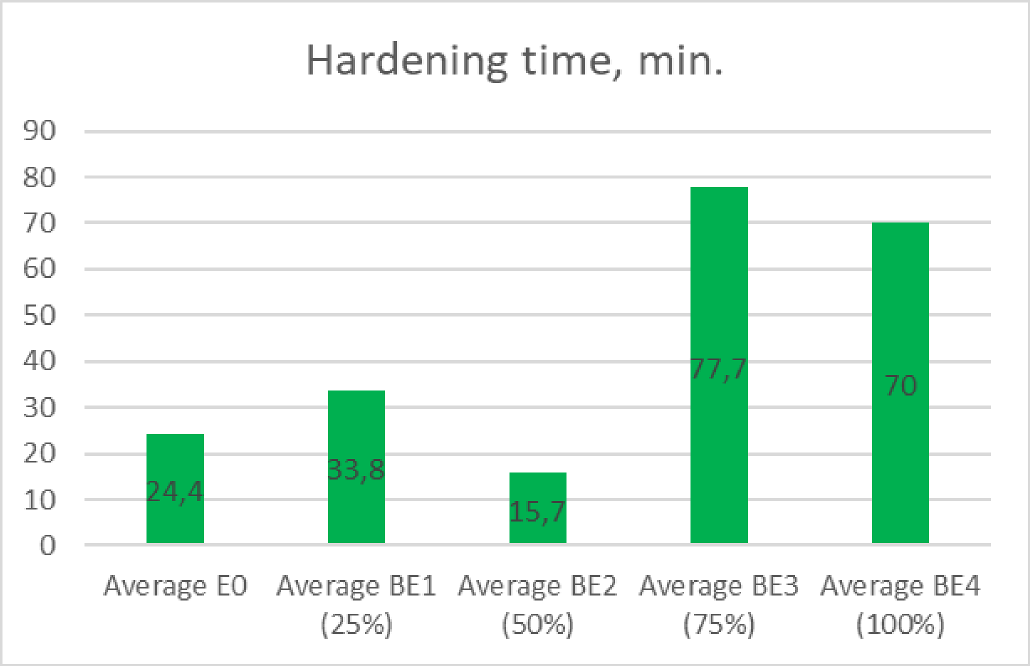
Screening test

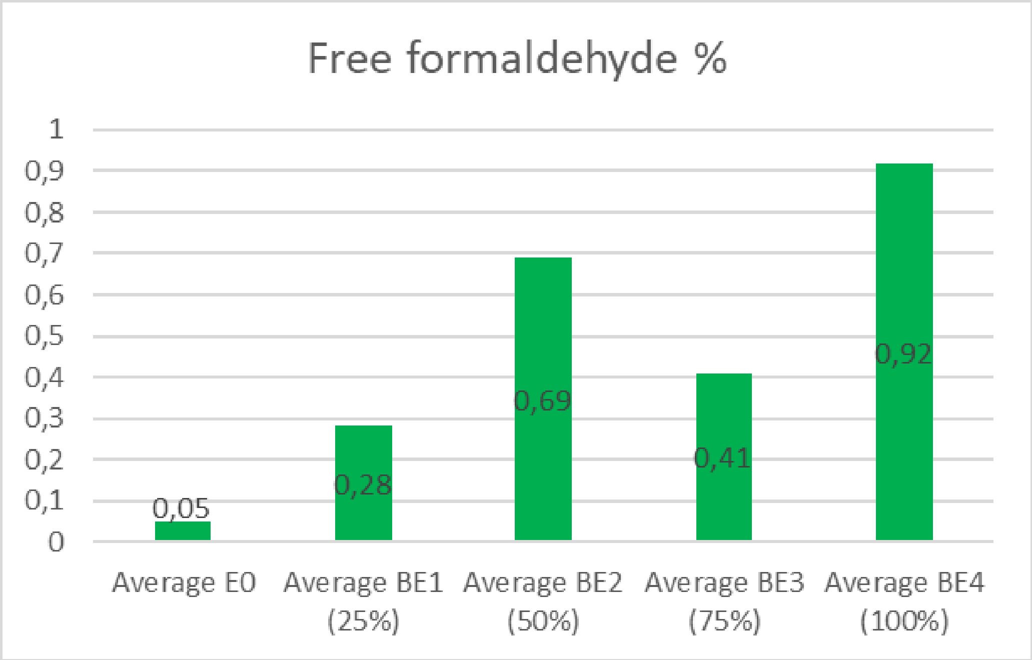
Resin application tests and up-scaling

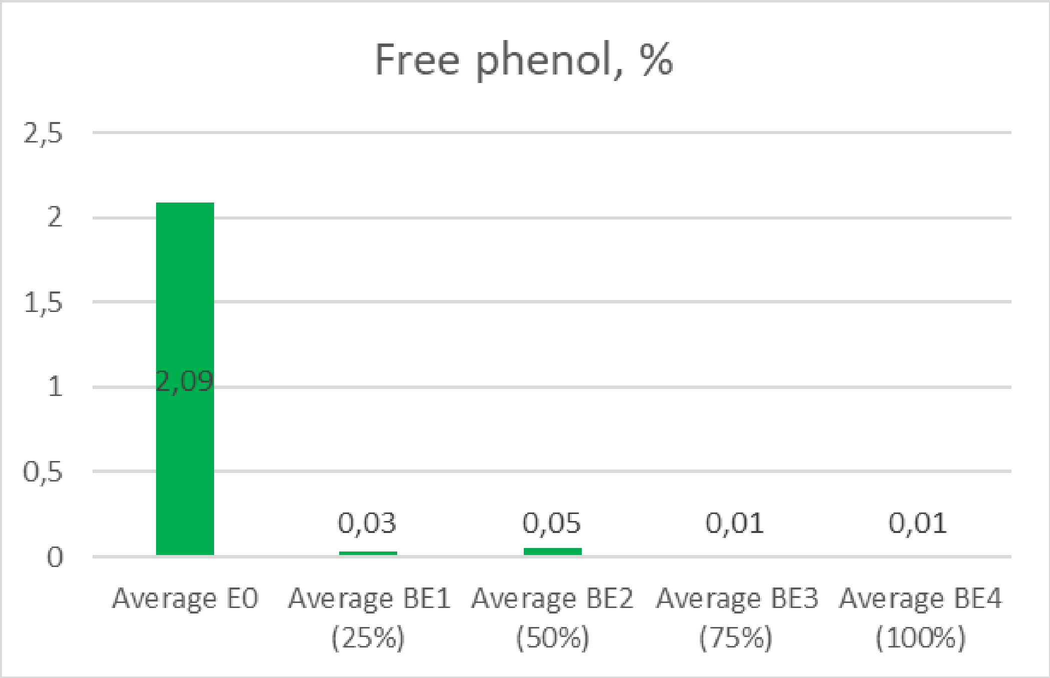
Development of Plywood and MDF

WP5: Manufacturing line for engineered wood panels

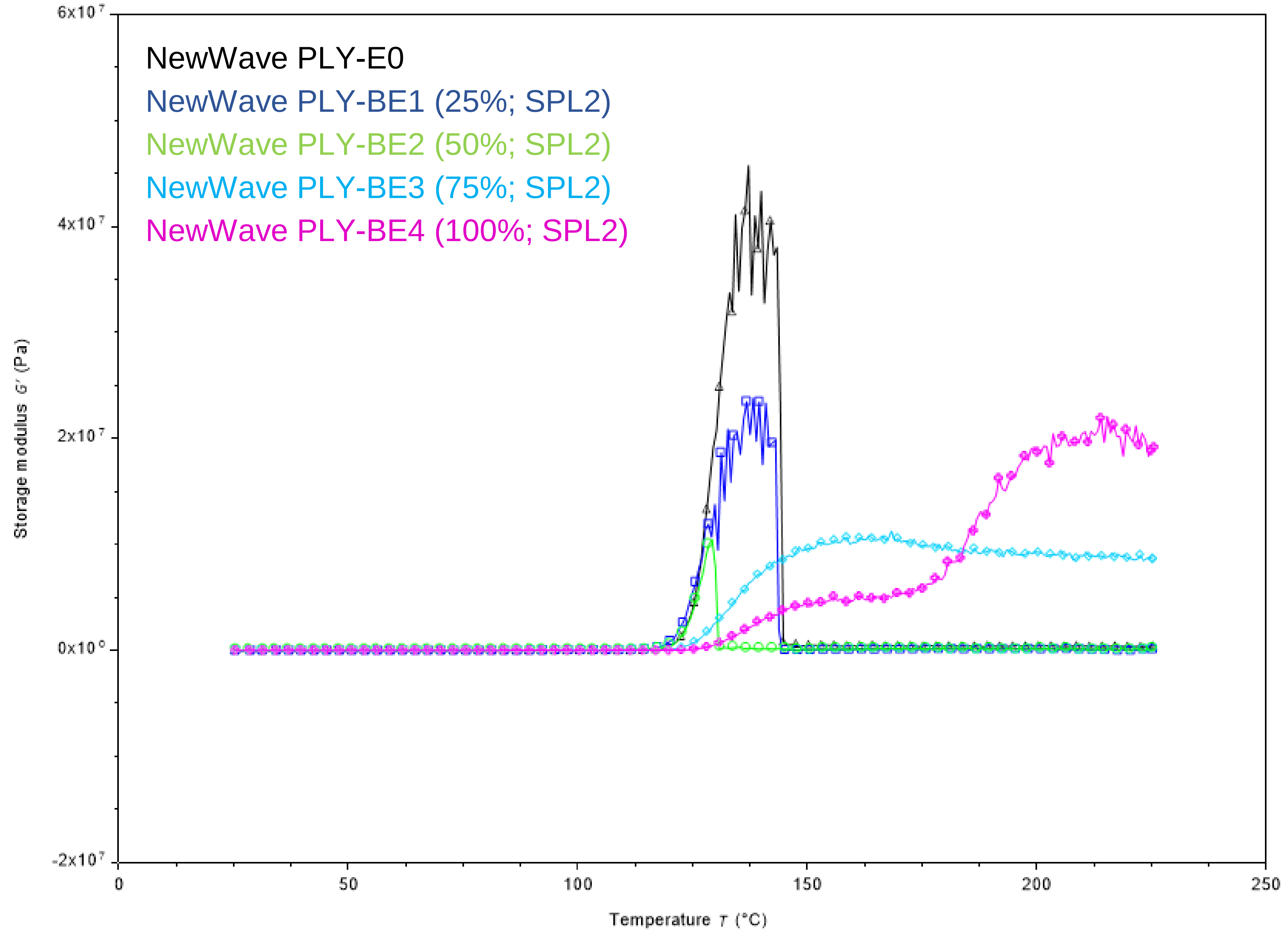
Task 5.3: Resin application testing for PLY and up-scaling



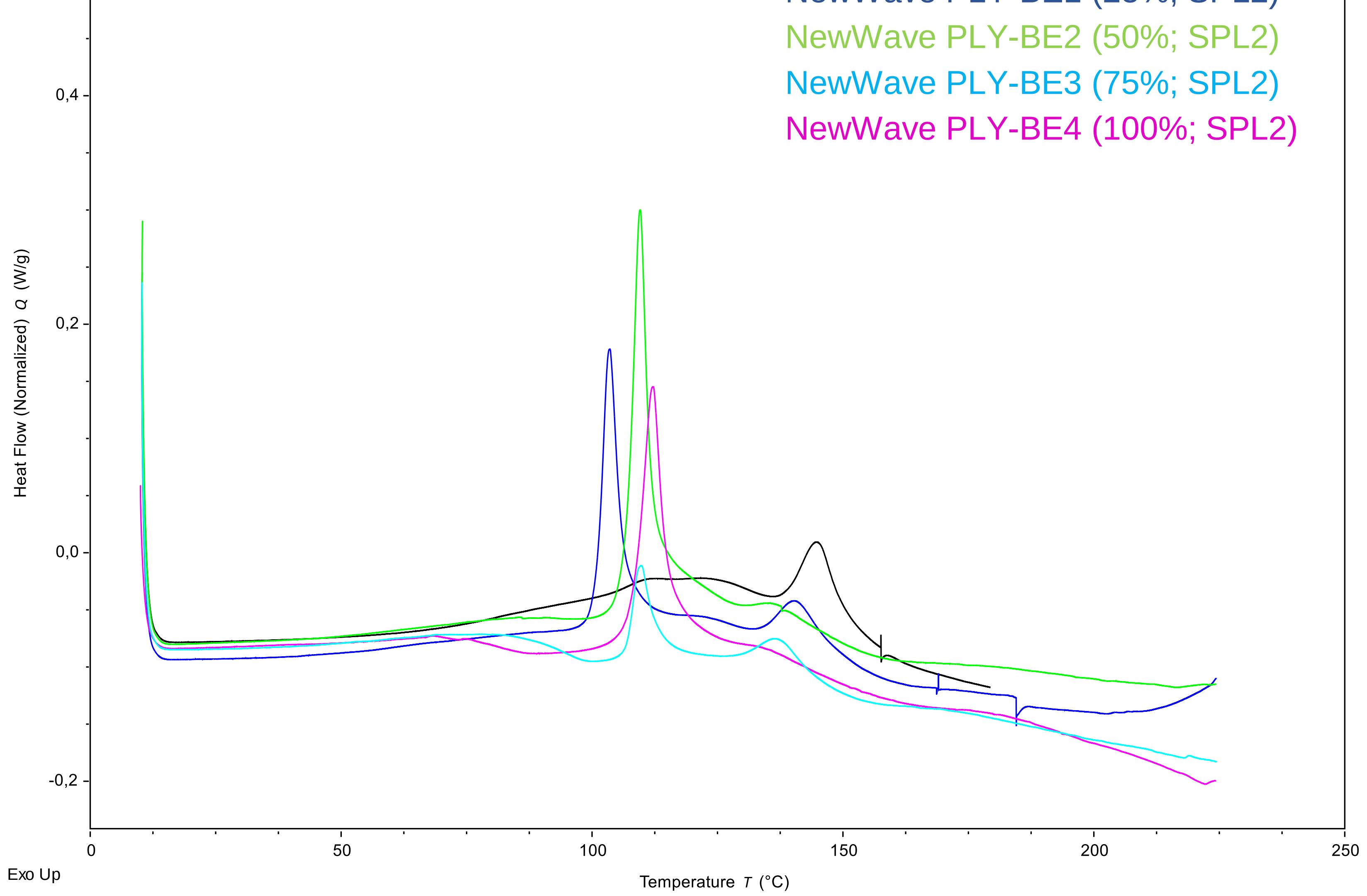




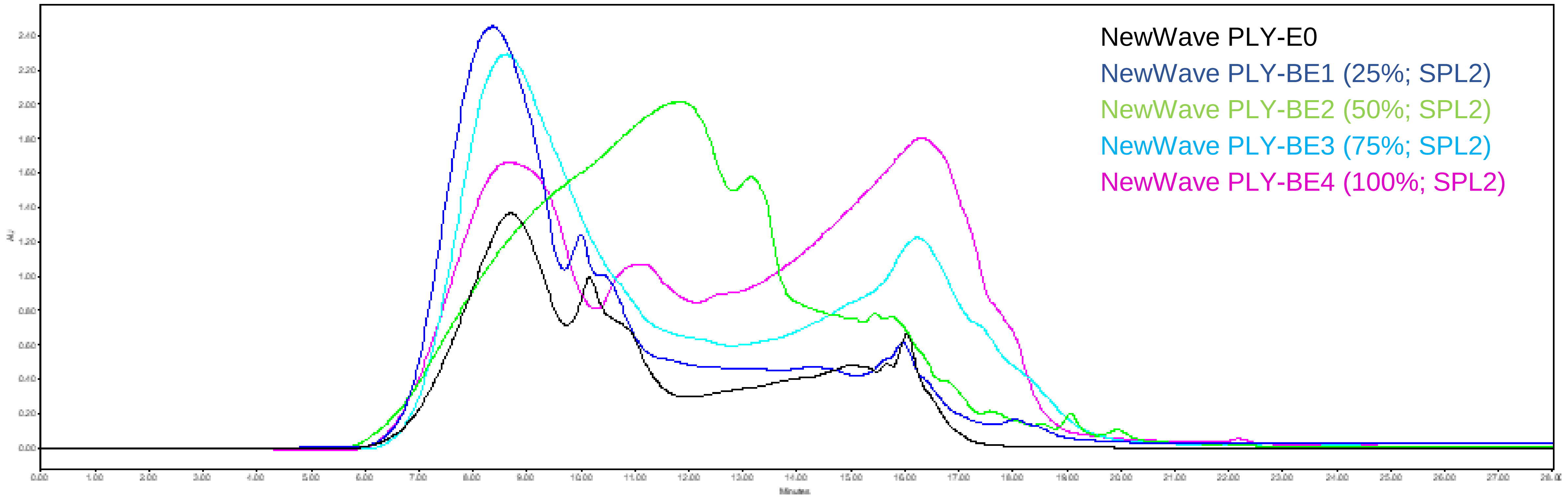
Rheometer



DSC



Gel permeation chromatography (GPC)



WP5: Manufacturing line for engineered wood panels

Task 5.4: Development and characterization **plywood**

CONDITIONS

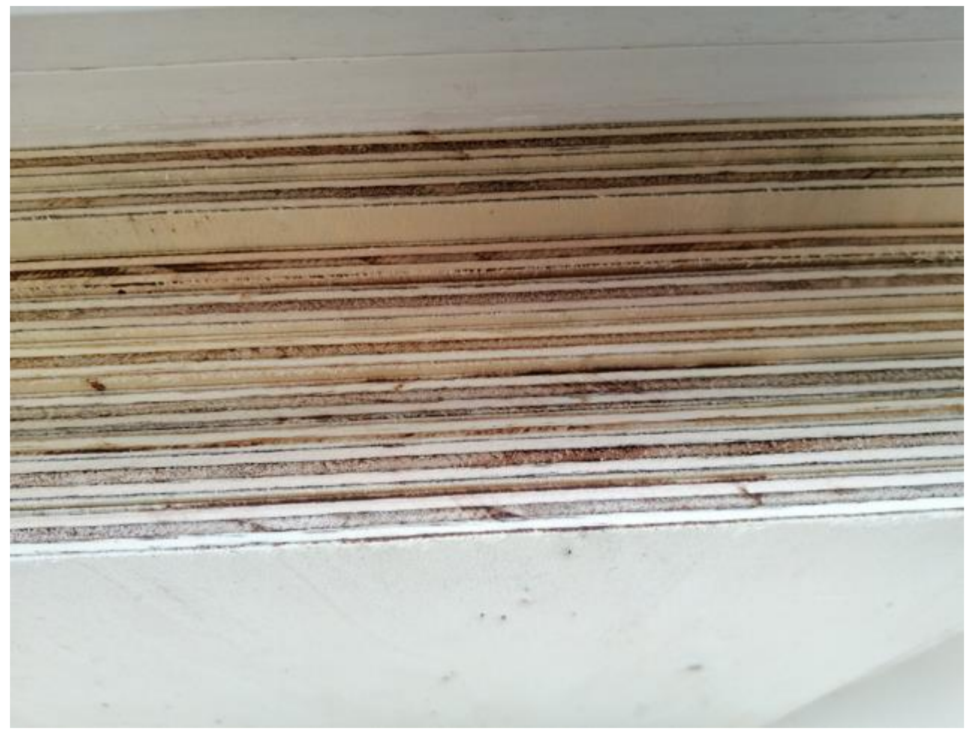
- Press Temperature: 100 ºC and 120 ºC
- Cure factor: → 1.5 min/mm
  → 1.0 min/mm
  → 0.5 min/mm
- Dosage: 160 g/m2 and 200 g/m2

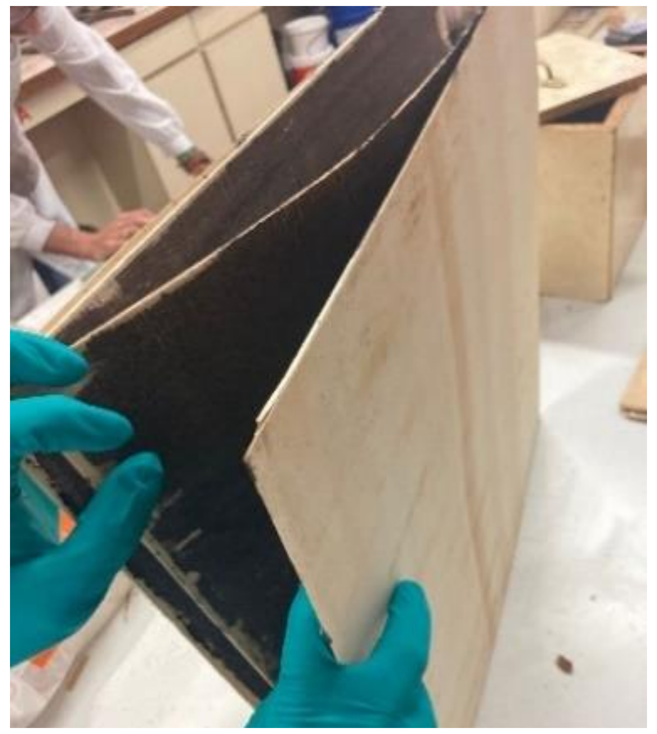
GLUING QUALITY

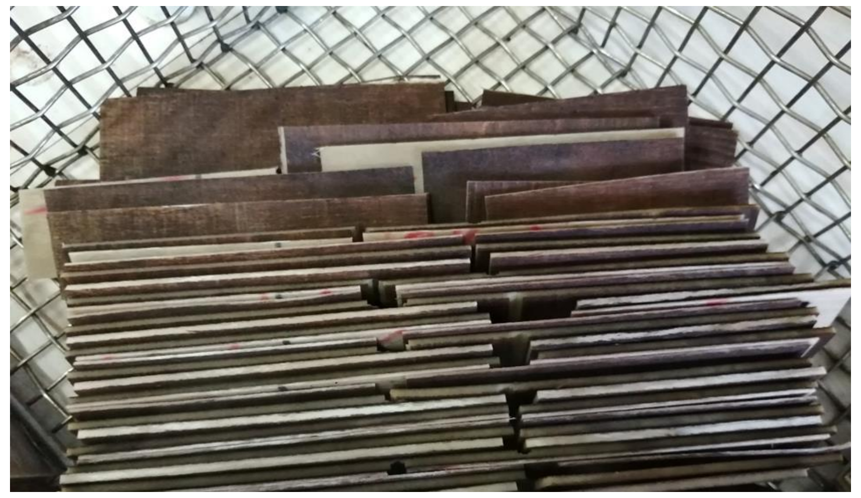
- Class 1: Dry indoor environment
- Class 2: Covered outdoor environment
- Class 3: Outdoor conditions

TREATMENT-EN 314-1

- Class 1: Immersion for **24h in water at (20±3)ºC**
- Class 2: Immersion for **6 h in boiling water** followed by **cooling in water** at (20±3)ºC, for at least **1 h**
- Class 3: Immersion for **4h in boiling water**, then **drying** in the ventilated drying oven for **16-20h** at (60±3)ºC, then immersion **in boiling water for 4h**, followed by **cooling in water** at (20±3)ºC







Development and characterization of Plywood

- Plywood → resins with 75% and 100% of four different lignins
  - **Plywood manufactured do not reach the requirements of Standard** for after Class 3 treatment
  - The **best lignin for Plywood** manufactured is with **Lignin SPL2**

- Different alternatives to improve the plywood process were carried out
  - Resin and pressing process conditions modification using resin with lignin SPL2
  - **Plywood with 50% of lignin reach values for Class 1 of gluing quality.**
  - **Plywood with 75% of lignin** and **50% of lignin** wit **values close** to the standard for Class 1 and Class 2 respectively.

WP5: Manufacturing line for engineered wood panels

Task 5.3: Resin application testing for MDF and up-scaling

RESULTS

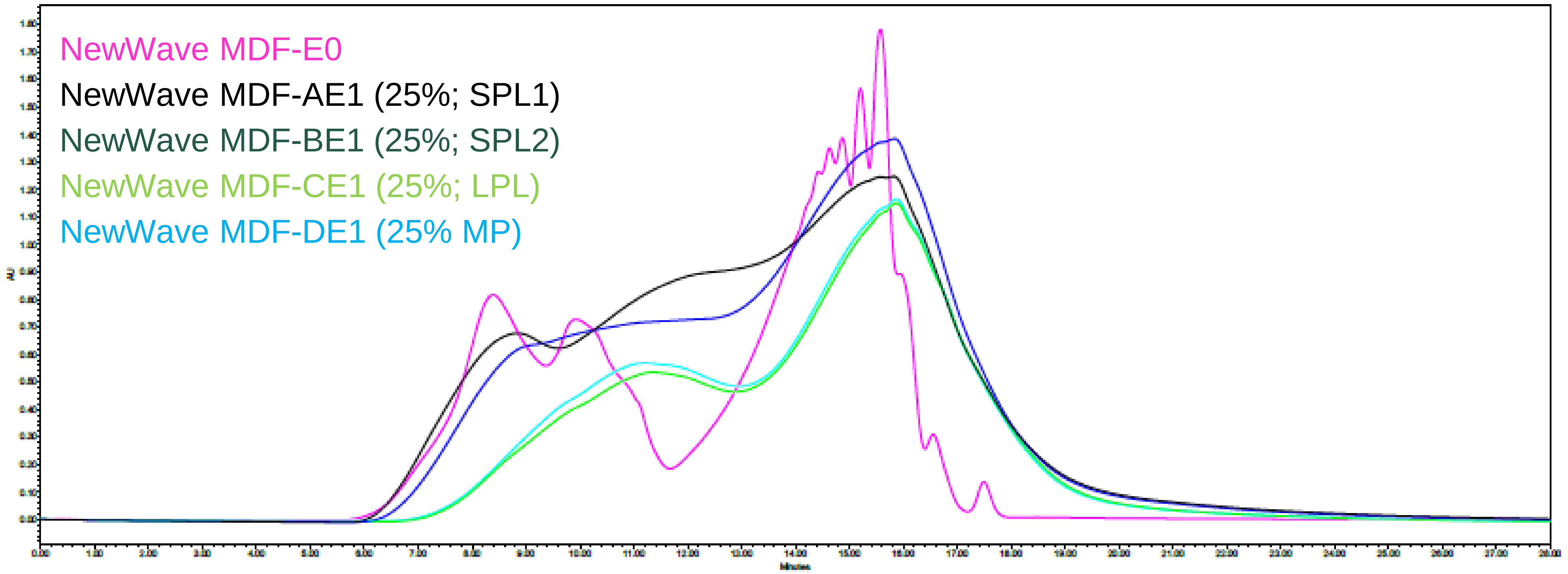
- First MDF resins development with 25% phenol substitution with different lignins
- No significant differences between the samples

RESULTS	Lignin	Replaced	η, cP (25ºC)	ρ, g/cm3 (25ºC)	pH (25°C)	H t, min	SC, %	Miscibility	FF, %	FP, %
x̄ (E0)		0%	267	1,198	10,55	19	49,8	1000	0.12	0,0
x̄ (AE1)	BTG NW SPL1	25%	380	1,201	10,68	13,2	49,8	1000	1.30	0,0
x̄ (BE1)	BTG NW SPL2	25%	298	1,250	10,5	15,1	50,9	1000	1.31	0,0
x̄ (CE1)	BTG NW MP	25%	280	1,248	10,8	15,7	51,0	1000	1.33	0,0
x̄ (DE1)	BTG NW LPL	25%	258	1,197	10,56	14,8	51,0	1000	0.68	0,0

WP5: Manufacturing line for engineered wood panels

Task 5.3: Resin application testing for MDF and up-scaling

Gel permeation chromatography (GPC)



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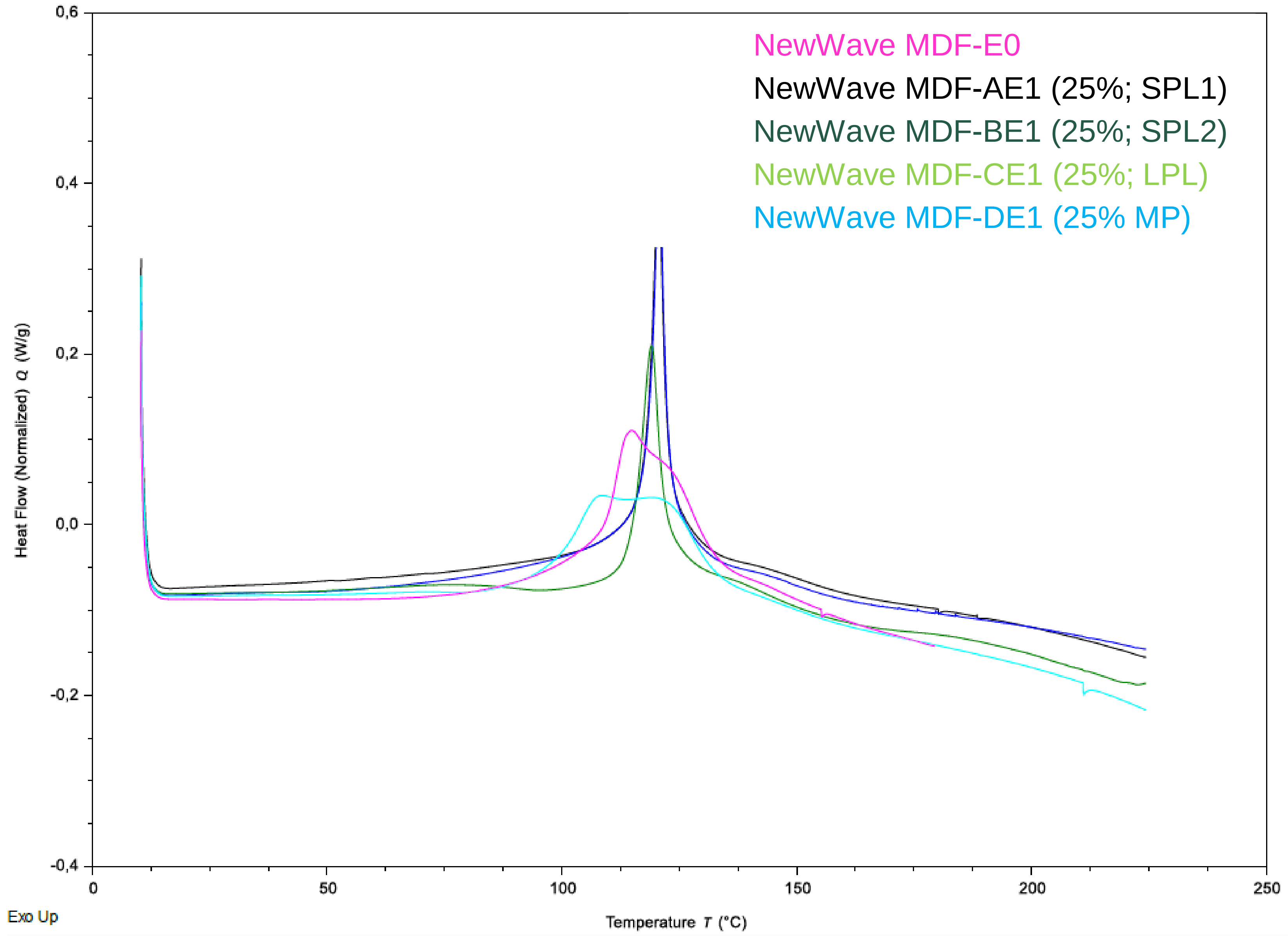
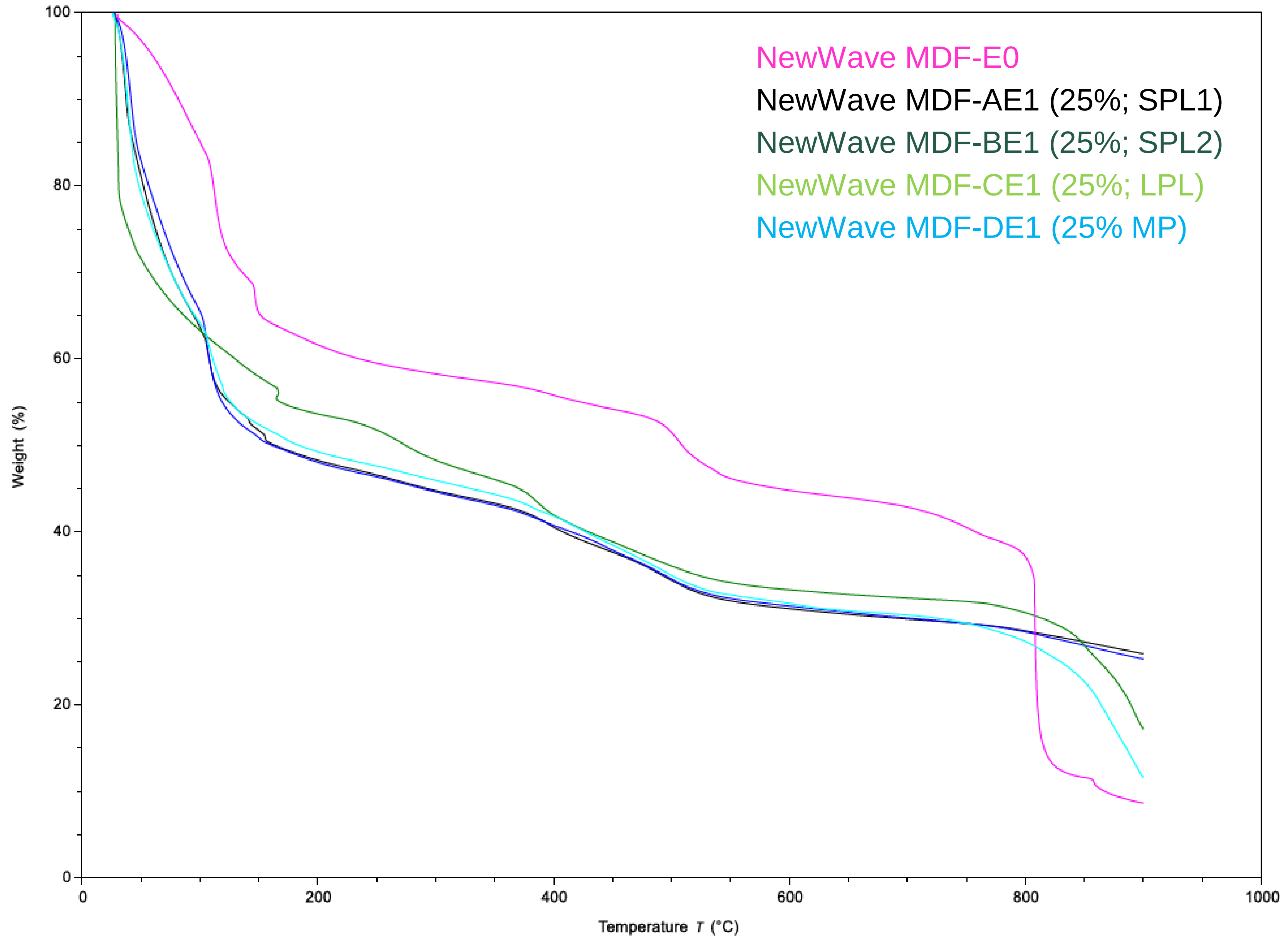


TGA



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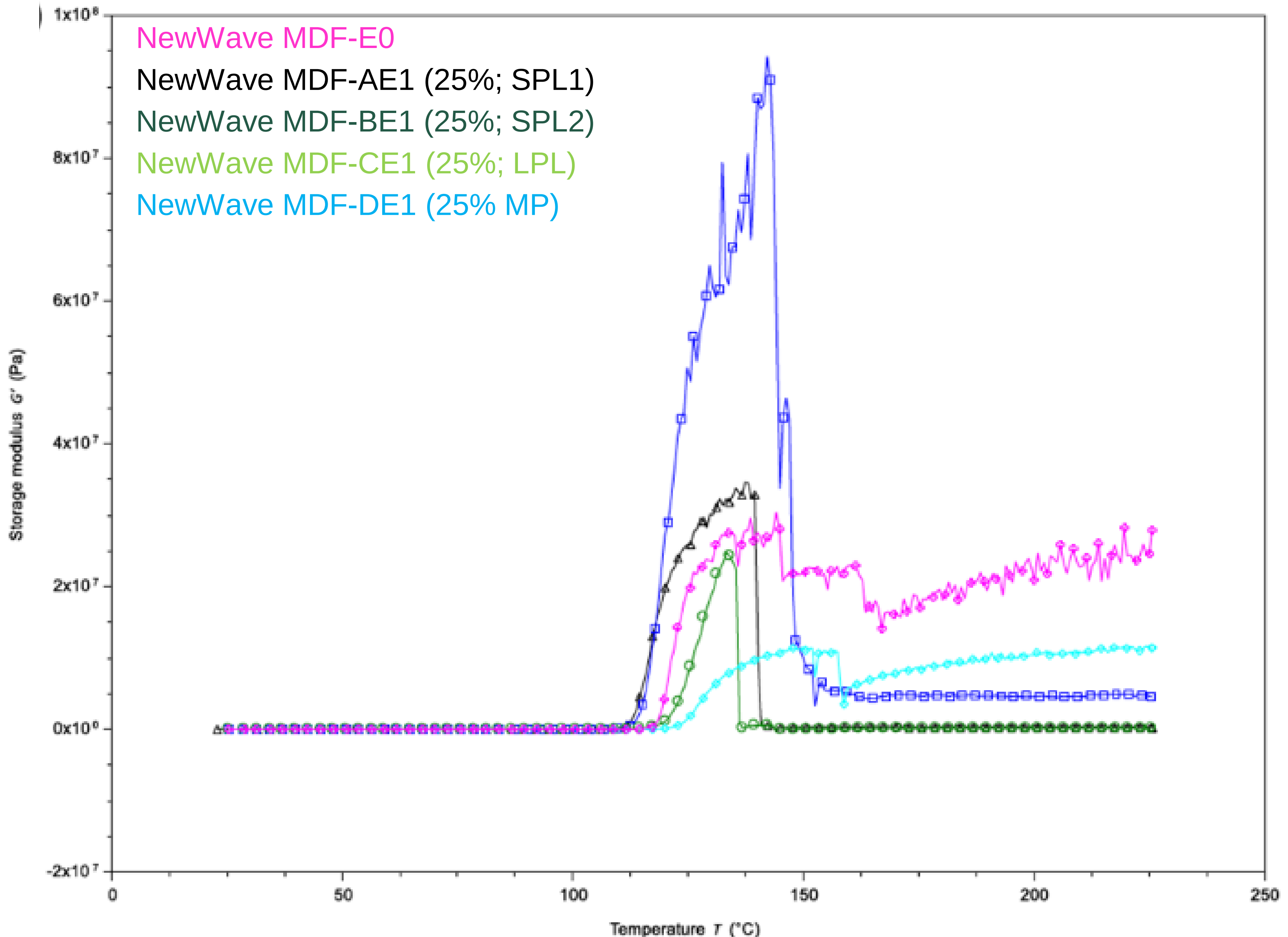
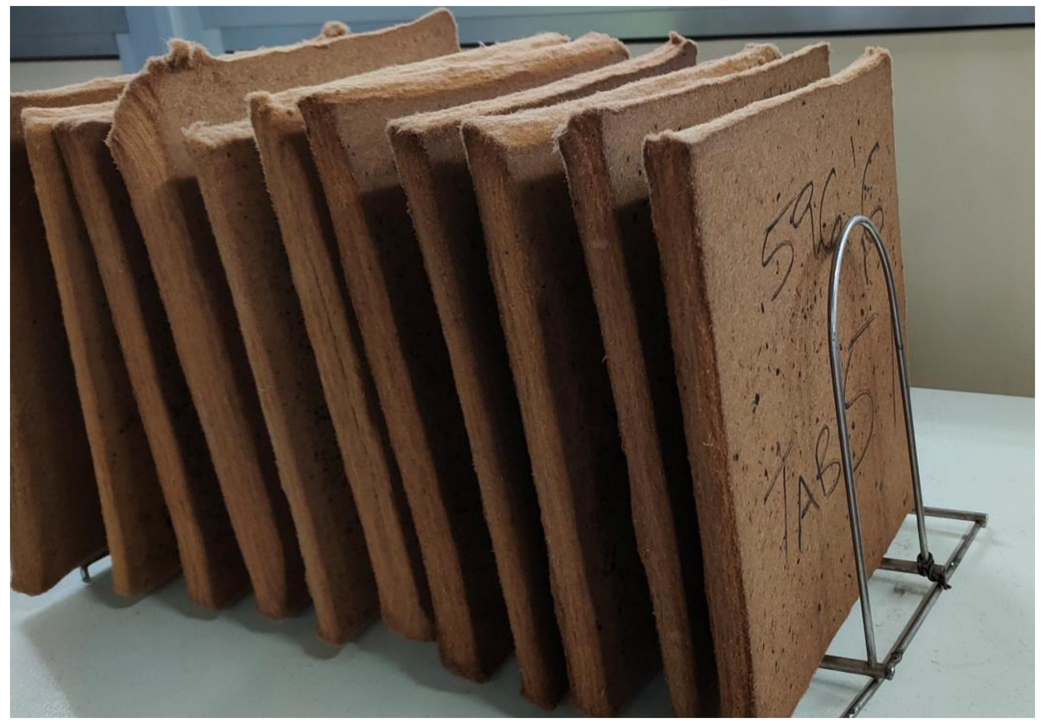
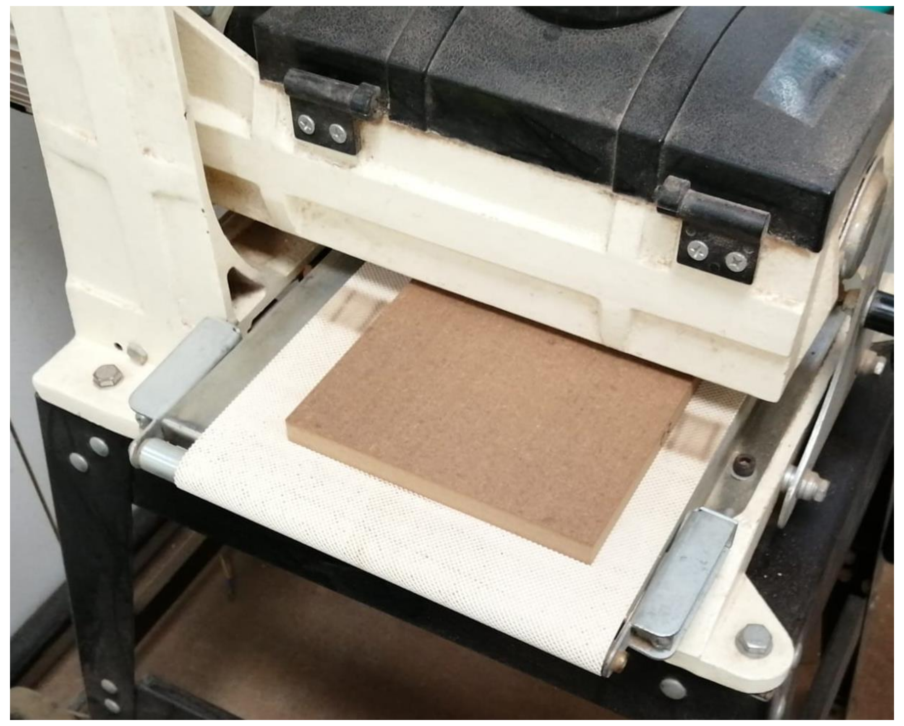


WP5: Manufacturing line for engineered wood panels

Task 5.4: Development and characterization of <u>MDF</u>

CONDICTIONS

- **TEMPERATURE:** 220ºC
- **PERCENTAGE OF RESIN USED:** 15%.
- **CURE FACTOR:** 20 s/mm


Development and characterization of MDF

- MDF ⟶ resins with 25% of four different lignin
- Dry conditions :
  - MDF manufactured **do not reach the requirements of Standard**
- Wet conditions:
  - Swelling percentage and IB values **reached the requirements of Standard** for 4 different resins
  - **High formaldehyde release**
- Development and characterization of MDF⟶ resins 50% ; 75% and 100% phenol substitution

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Thank you!

New Wave Project

newwave-horizon.eu

info@newwave-horizon.eu