



UNIVERSITY OF ZAGREB
FACULTY OF FORESTRY
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“IMPLEMENTATION OF WOOD SCIENCE IN WOODWORKING SECTOR”

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Particleboards with Wood in Various Forms

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Mobile and Flexible Industrial Processing of Biomass

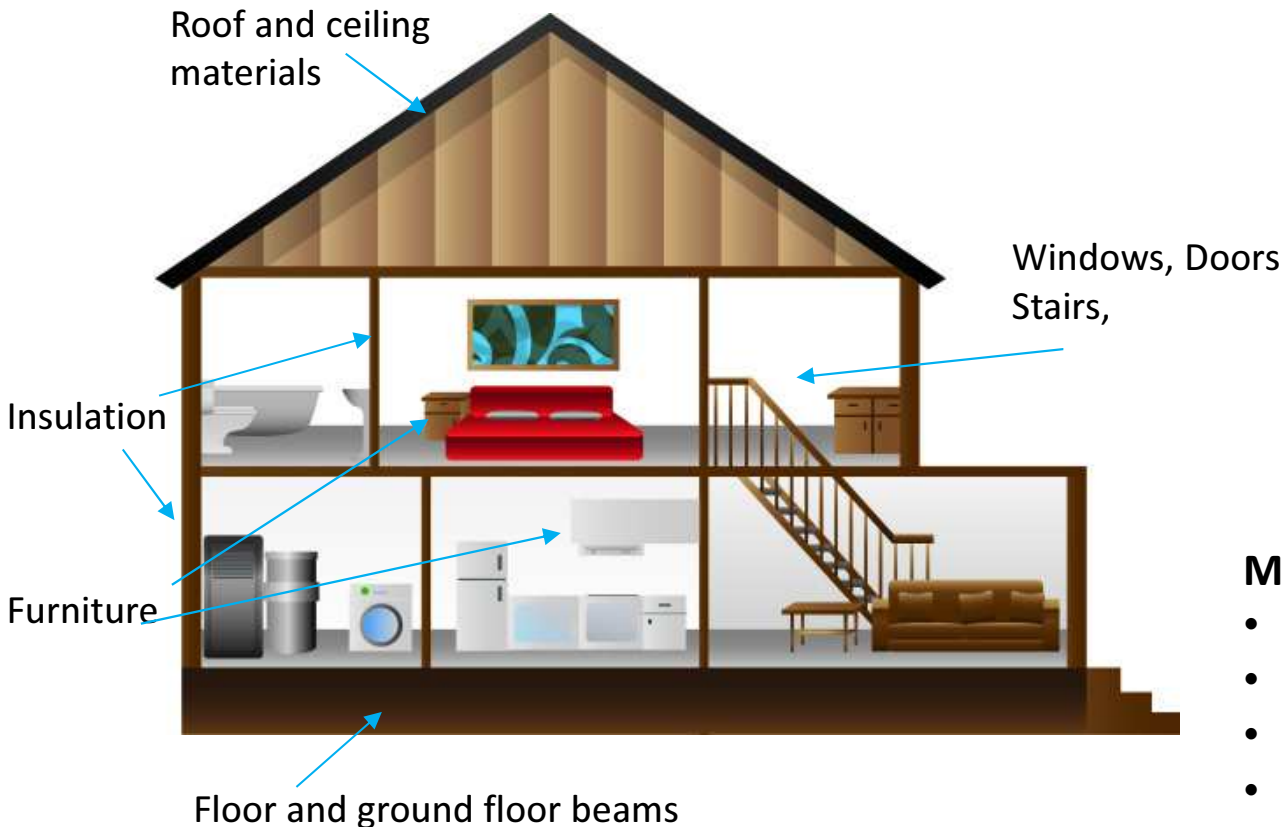


Wood-based panels: applications & market trends



Chimar Hellas S.A.

BINDING
INNOVATION



Building construction and furniture industries hold significant percentages of the global consumption of wood-based panels

According to the Pöyry market research institute's prognosis, the **demand for wood-based panels in Europe** is likely to see an average growth of **3% every year until 2020**

Market trends*:

- Formaldehyde-Free wood-based panels
- Decorative surfaces with new properties
- Lightweight panels
- Non-toxic resins
- Higher speed, **lower production cost**
- Efficient manufacturing and automation

*Source: <http://www.hbfuller.com/north-america/innovation-and-experience/blog/Interesting-trends-in-the-woodworking-industry.html#.Vtg65vmLTIU>

Mobile and Flexible Industrial Processing of Biomass

MOBILE FLIP aims at developing and demonstrating mobile processes for the treatment of underexploited agro- and forest based biomass resources into products and intermediates.

Reference:	MOBILE FLIP 637020
Budget:	9.7 million euro
Participants:	12 organisations, from five European countries
Duration:	January 2015 – December 2018
Coordinator:	Dr. Tarja Tamminen, VTT Technical Research Centre of Finland Ltd
Topic:	MOBILE FLIP relates to the topics addressed by the call for SPIRE - SUSTAINABLE PROCESS INDUSTRIES, Topic: SPIRE-02-2014 Adaptable industrial processes allowing the use of renewables as flexible feedstock for chemical and energy applications
Type of action:	Innovation Actions

Materials tested



Mixture of Scots Pine (*Pinus sylvestris*) and Norway Spruce (*Picea abies*) in the forms of:

- Sieved particles (S4, S6, S8) – the material before pelletization
- Pellets (P4, P6, P8) – the pelletized material, and
- Milled Pellets (MP4, MP6, MP8) – the material resulted from the milling of pellets

Material	Moisture content after drying, %	Buffer Capacity, % ml of acid	pH @ 25°C, []
S4, S6, S8	2.13 – 2.45	4.7	4.47
P4, P6, P8	2.45 – 3.44	4.9	4.38
MP4, MP6, MP8	2.95 – 3.02	4.9	4.4

Production of Particleboards

Target density of 650 kg/m³ and dimensions
35x35x1.0cm.

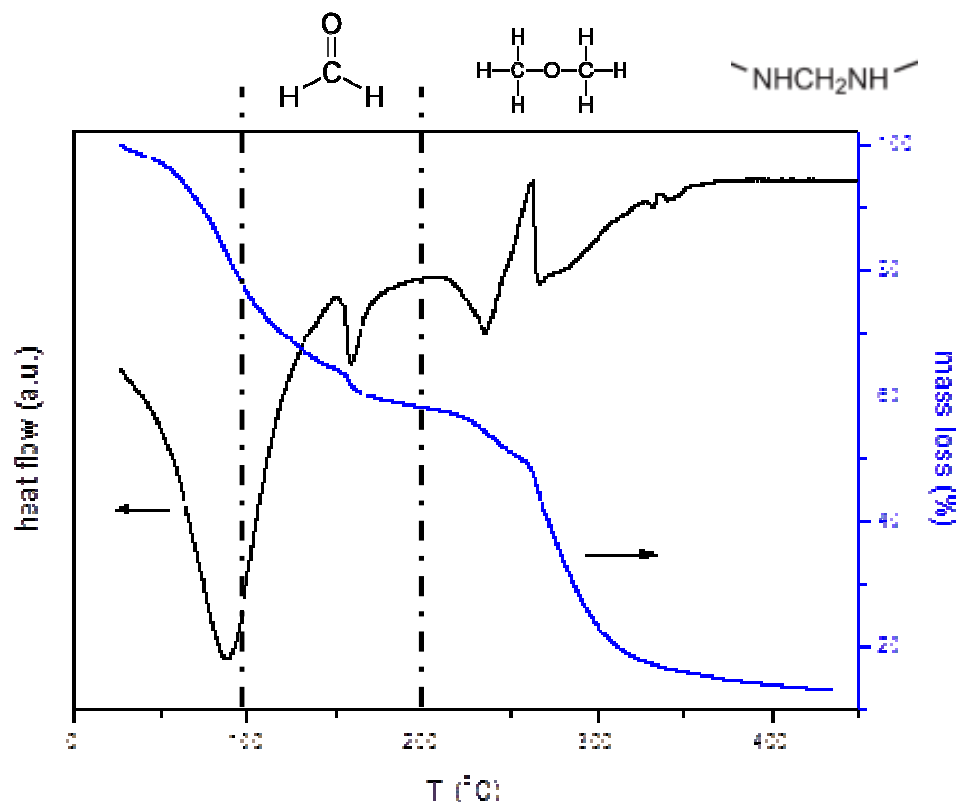


EU standards for the testing of PBs



a\ a	Properties	Unit	Test Method	Remarks
1	Internal Bond (IB)	N/mm ²	EN 319	-
2	Modulus of Rupture (MOR)	N/mm ²	EN 310	-
3	Thickness Swelling (TS)	%	EN 317	24h, 20°C
4	Formaldehyde content	mg/100g atro	EN 120	Perforator method

UF resin properties



TGA - Mass loss % and heat flow vs temperature of UF resin

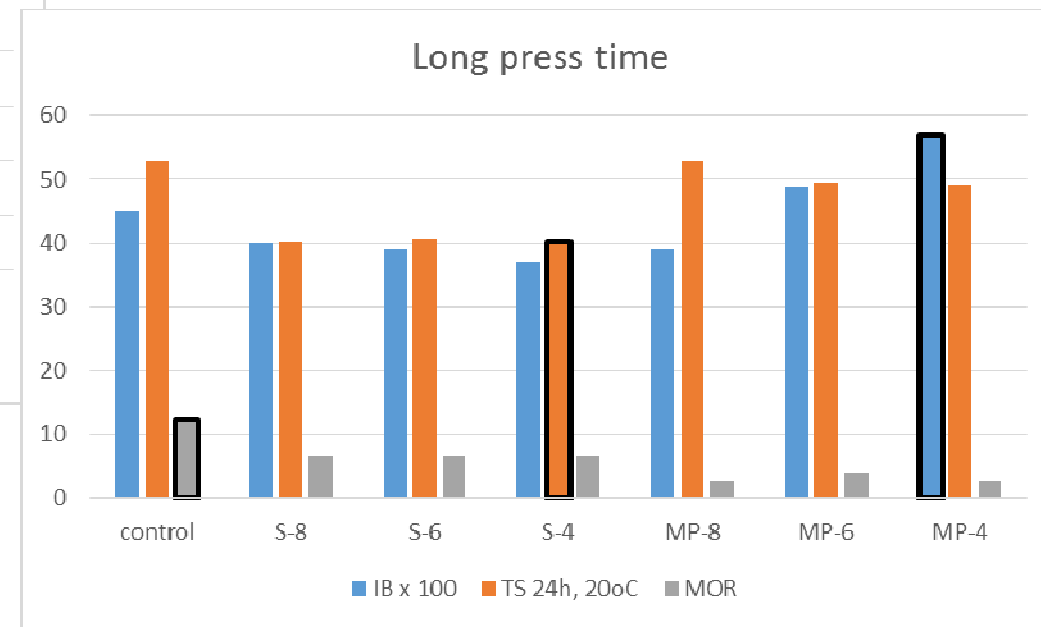
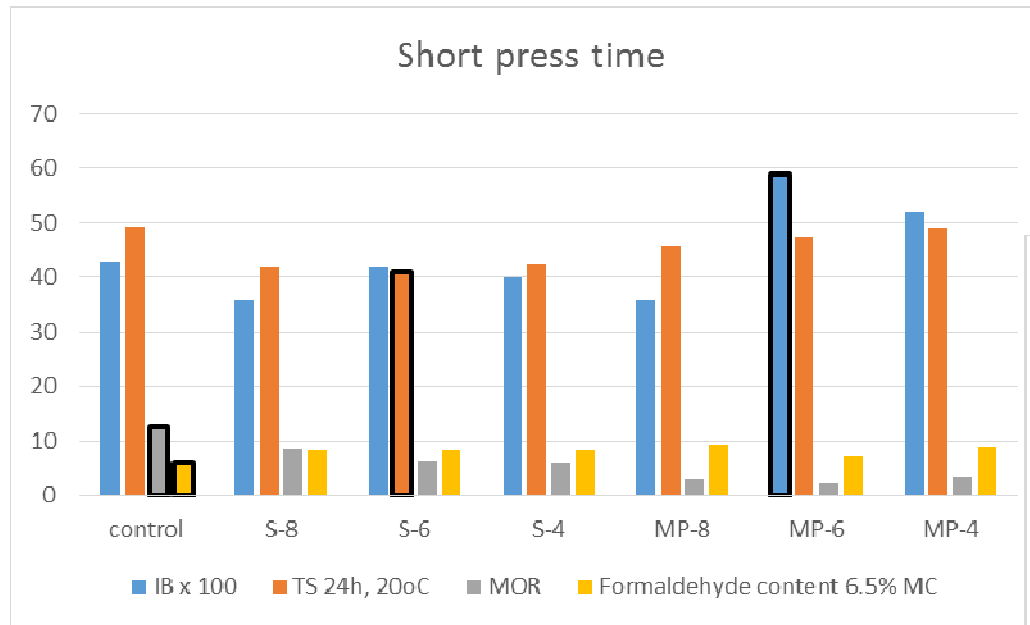
Properties of UF resin	Unit	Value
pH at 25°C	[]	8.28
Brookfield viscosity at 25°C	cP	345
Hardening time at 100°C	s	56
Water tolerance (resin/water)	mL/mL	1 / 2.5
Dry solids	% w/w	65.4
Free Formaldehyde	%	0.06
Buffer Capacity (measured with 0.1N H ₂ SO ₄)	mL	11.3
Conductivity	μS/cm	96.6
Specific Gravity @ 20°C	[]	1.286

Testing results of Particleboards



Formula			1	2	3	4	5	6	7	1	2	3	4	5	6	7
Substrate			control	S	S	S	MP	MP	MP	control	S	S	S	MP	MP	MP
Particle size, mm			-	8	6	4	8	6	4	-	8	6	4	8	6	4
	Unit	Value	Short press Time, s/mm							Long press Time, s/mm						
IB	N/mm ²	Ave	0.43	0.36	0.42	0.40	0.36	0.59	0.52	0.45	0.40	0.39	0.37	0.39	0.49	0.57
Density	Kg/m ³	Ave	619	604	629	653	770	852	822	642	629	621	632	823	806	862
TS 24h, 20°C	%	Ave	49.18	42.04	40.99	42.57	45.65	47.39	49.00	52.88	40.24	40.72	40.22	52.87	49.28	49.02
MOR	N/mm ²	Ave	12.75	8.53	6.36	6.06	3.11	2.22	3.59	12.28	6.55	6.74	6.63	2.72	3.83	2.64
Formaldehyde content 6.5% MC	mg/100 g	Ave	5.94	8.43	8.20	8.22	9.29	7.33	8.75	-	-	-	-	-	-	-

Observations - Evaluation of results



Pellets (P) as such are not suitable for PBs.

Best performed fractions : the ones received from screens of 6 mm.

Milled pellets (MP) result in panels with higher density → Improved IB and lower FF.

Material before palletization (S) has better MOR performance

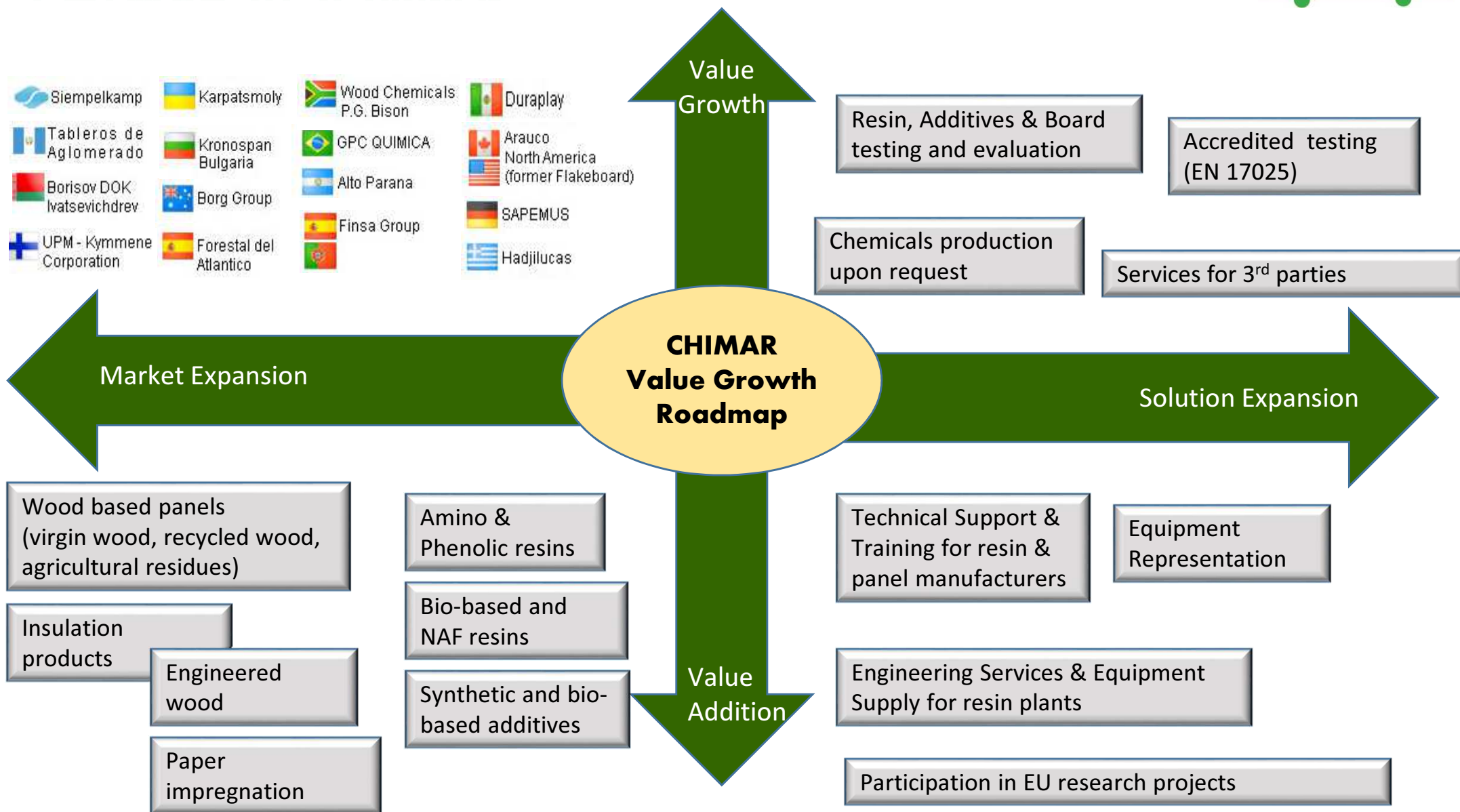
Conclusions



Wood biomass may be pelletized in order to reduce the transportation cost and milled on site.

The preferred fraction is that resulted from a sieve of 6mm. However it depends on the specific biomass used.

CHIMAR at a glance



CHIMAR in figures



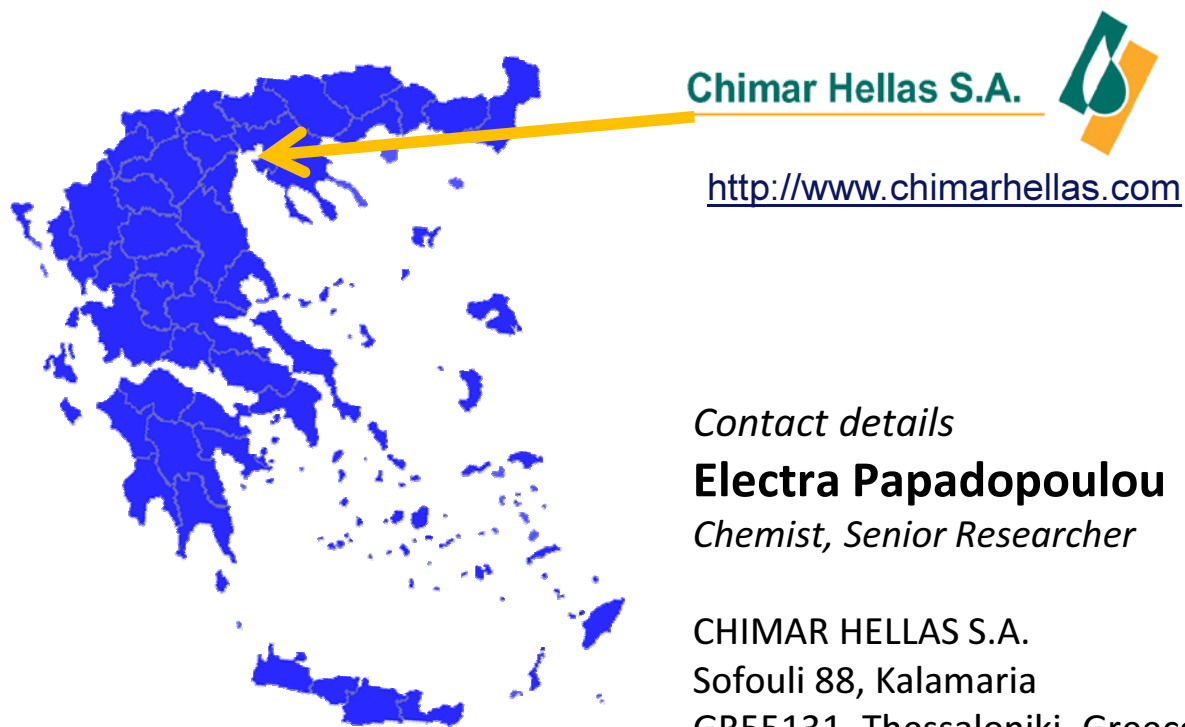
- Over 39 YEARS expertise in 40+ countries
- Know-how applied in 100+ industrial sites
- Over 1 MT resin per year is produced under CHIMAR technology
- Over 10% of global wood panel production uses our services
- Participation in 50+ EU & National funded projects & networks
- Strong team of 28 highly motivated experts

Acknowledgement



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Thank you for your attention



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<http://www.chimarhellas.com>

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