

Grazie per l'attenzione

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# CLUSTER CLUB

WP5 - Act. 5.2. ANCONA CHAMBER OF COMMERCE PILOT ACTION  
(*Cluster Animation meeting – Venice 28th November 2013*)



## WP5 - Act. 5.2. Pilot action

“Development of a nautical supply chain focused on eco-design and eco-processes for environmental impacts prevention and upgrading of waste recycling”

## Background

During the last years the Marche Region nautical industry supply chain (known at local level as “Sea District of Marche region”), with particular reference to yacht building & repairs, has been interested by an innovative process of growth and awareness focused on testing of processes and products environmentally and socially sustainable.

## General objectives

- Making more attractive this strategic process of sustainable development for the companies and suppliers in term of commercial opportunities with particular attention to the international competitiveness and international market penetration.
- Favours the introduction of new behaviors among public and private institutions and companies of the nautical supply chain and cluster referred to the items of eco-design, ecological processes for the prevention and reduction of environmental impact of production, intensification of waste recycling techniques of boats.
- Facilitating the creation of a cross boarder intersectoral cooperation networks aimed at the promotion and development of these items.

## Specific objectives

- Creating a network of public and private bodies and companies engaged in the nautical supply chain interested on the topic of the environmental and social sustainability of their production and services provision;
- Promoting new products and services provided by companies of the nautical sector, that have a low impact on the environment and that pay attention to the health of people with particular attention to innovative solutions in terms of eco-design, recycling of production wastes, and reduction of environmental impacts;
- Enhancing awareness among the companies and economic operators engaged in the nautical supply chain about the importance of issues such as eco-design and environmental and social sustainability of the productions, also as tools for improving their competitiveness in the international market.

## Activities (carried out and ongoing)

- On the basis of the WP 3 questionnaire results it has been created a data base of companies and public and private actors in the field of nautical leisure of the Marche region interested and/or involved in production of sustainable products and services provisions: it will be formally verified aptitudes, interests and availability to investments of SMEs on the specific topic of social and environmental sustainability of production and provision of services;
- It has been created a promotional Video clip on the process taking place in the Marche Region aimed at promoting a recovery and upturn of the nautical sector based on the sustainability of the production of pleasure boats and services in support of nautical leisure.
- The ongoing realization of a promotional brochure/catalogue of the Marche Regional Nautical sector developing the main sectors of the supply chain (shipbuilding, furniture, services) with a particular section related to the active Marinas and tourism port in the Marche region and another one focused on a study/research on the new perspective of these ports and their services for the next future
- It will be built a network of companies formally involved in the process of growth focused of social and environmental sustainability, to be presented in occasion of a specific seminar named “Towards a sustainable nautical supply chain” that will be held within the end of the project.

## Outputs

- n. 1 database of companies and public and private actors engaged in the field of nautical leisure of the Marche region interested and/or involved in production of sustainable products and services provisions carried out;
- n. 1 promotional video clip carried out
- n. 1 promotional brochure/catalogue of the Marche Regional Nautical sector
- n. 1 network of companies formalized and presented during a seminar “Towards a sustainable nautical supply chain” carried out

## Results

- Created a network of public and private bodies/companies engaged in the nautical supply chain interested in environmental and social sustainability of their production and services;
- Promoted new products and services provided by companies that pay attention to innovative solutions in terms of eco-design, recycling of production wastes, and reduction of environmental impacts;
- Improved the visibility of the companies members of the network in the national and international market;
- enhanced the awareness among companies of the nautical supply chain about the importance of issues such as eco-design and environmental and social sustainability of the productions.



## Duration

From 01.10.2012 to the end of the project

## Location

The pilot action will be developed in the Marche Region territory, but the tools delivered should be used during all the meetings, events and pilot actions of the project.



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TESTING



CERTIFICATION



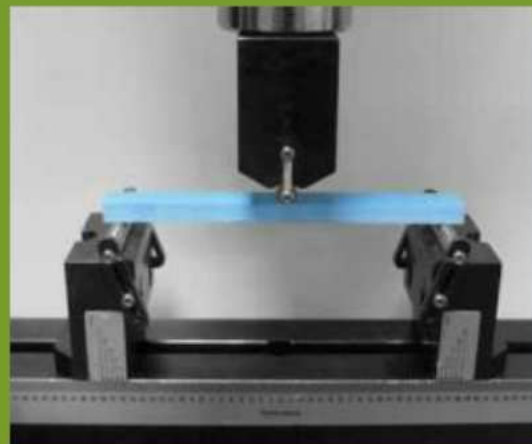
EFFICIENCY

ENGINEERING



CONSULENCE

RESEARCH



PROJECT



RINA

CERTIFICATE OF ASSESSMENT OF TESTING LABORATORY

No. 2010 CS01 2710

This is to certify that:

LINSET S.r.l.

Via Turati, 12/A - 61032 FANO (PU)

has been found in compliance with the requirements of the RINA "RULES FOR THE ASSESSMENT OF TESTING LABORATORIES" for the performance of the tests listed in the attachment to this certificate

Issued at Genova on 01/06/2011

This Certificate is valid until 31/05/2014

This Certificate consists of this sheet plus an attachment

Signature of the person responsible of the Laboratory assessment

RINA

Signature by the person responsible of the Laboratory assessment



RINA Service Spa  
Via Corsica 12 - 16128 Genova  
Tel. +39 010 53851  
Fax. +39 010 5351000



RINA

ATTACHMENT TO CERTIFICATE (pag. 2 of 2) No. 2010 CS01 2710

LIST OF TESTS		
PRODUCT	TEST	STANDARD
Materials	Density of sandwich core materials	ASTM C271
	Water absorption of core materials	ASTM C272
	Measurement of thickness of sandwich cores	ASTM C368
	Water absorption of plastics	ASTM D570
	Gel time and peak temperature of thermosetting resins	ASTM D2471
	Constituent content of composite materials	ASTM D3171
	Physical dimensions of solid plastics specimens	ASTM D5947
	Specular gloss	ASTM D523
	Abrasion resistance of coatings by the taber abraser	ASTM D4069
	Pull-off strength of coatings by portable adhesion testers	ASTM D4541
	Color and color-difference by tristimulus (filter) colorimetry	ASTM E1347
	Scratch test (Clemen)	ISO 1518

General conditions for the approval

- The initial conditions verified by RINA at the time of the assessment are to be maintained
- Any changes to the initial conditions are to be promptly communicated to RINA, which reserves the right to repeat the relevant assessment
- RINA personnel are to be allowed to witness during the performances of activities, upon their request
- The activities are to be carried out in compliance with RINA Rules and for other applicable Rules

Signature and date



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LIST OF TESTS		
PRODUCT	TEST	STANDARD
Composite materials	Shear properties of sandwich core materials	ASTM C273
	Flatwise tensile strength of sandwich constructions	ASTM C297
	Flatwise compressive properties of sandwich cores	ASTM C365
	Flexural properties of sandwich constructions	ASTM C293
	Tensile properties of plastics	ASTM D638
	Compressive properties of rigid plastics	ASTM D595
	Shear strength of plastics by punch tool	ASTM D732
	Flexural properties of unreinforced and reinforced plastics	ASTM D790
	Short-beam strength of polymer matrix composite materials	ASTM D2344
	Apparent interlaminar shear strength by short	ISO 14130
	Single lap shear adhesive joints by tension loading (plastics)	ASTM D3163
	Double lap shear adhesive joints by tension loading (metals)	ASTM D3528
	Single lap shear adhesive joints by tension loading (FRP)	ASTM D5868
	Tension testing of metallic materials	ASTM E8
Compression testing of metallic materials	ASTM E9	
Young's modulus, tangent modulus, and chord modulus	ASTM E111	
Poisson's ratio at room temperature	ASTM E132	
Determination of dynamic mechanical properties	Assignment of the glass transition temperature by DMA	ASTM E1640
	Enthalpies of fusion and crystallization of polymers by DSC	ASTM D3417
	Transition temperatures of polymers by DSC	ASTM D3418
	Linear thermal expansion of solid materials by TMA	ASTM E831
	Assignment of the glass transition temperature by TMA	ASTM E1545



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REUSE

REDUCTION

RECYCLE



minimization of consumption

reduction of toxicity

renewable resources

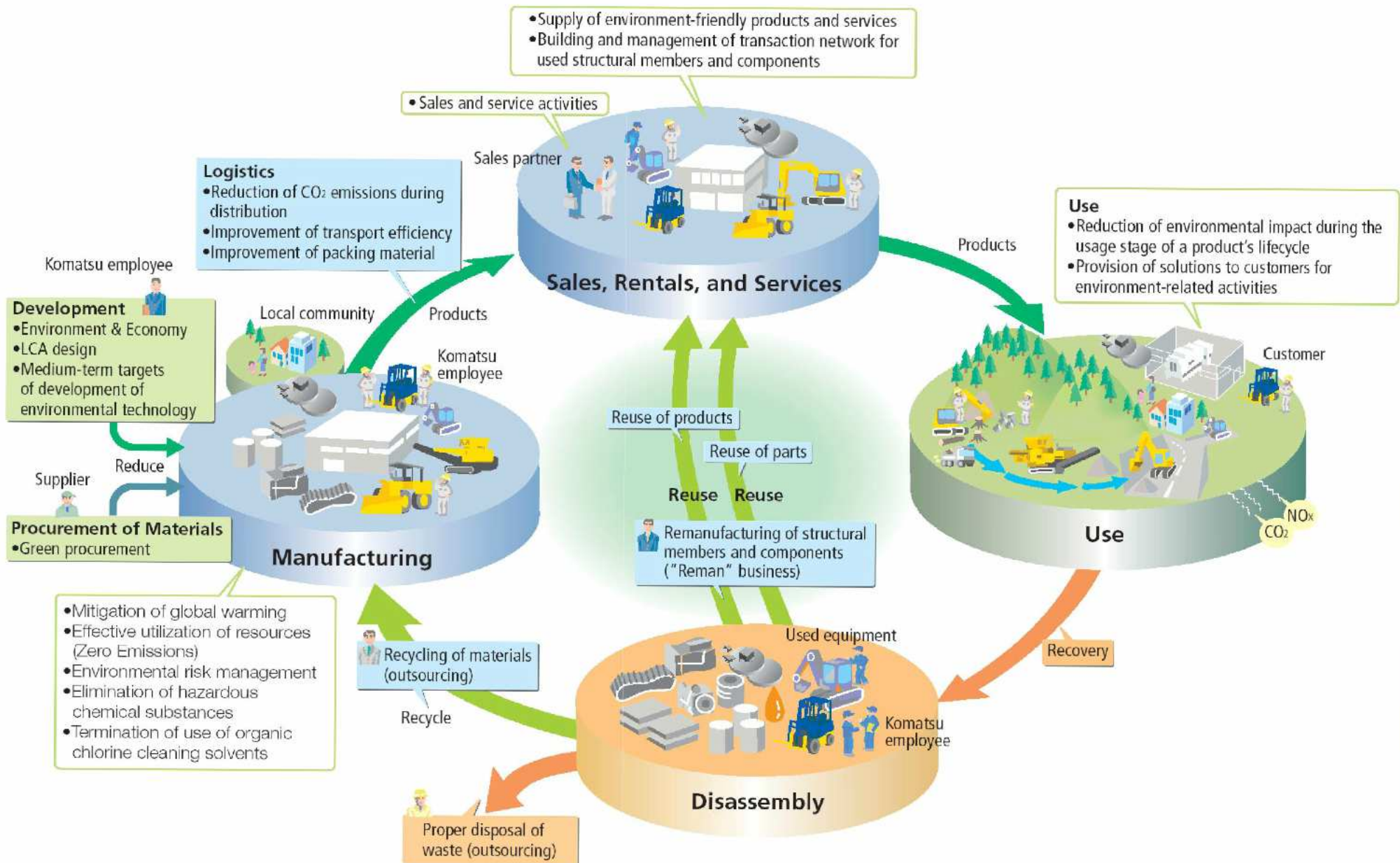
optimization of products life

extension of materials life

design for disassembly



# Life Cycle Assessment





**REDUCE  
YOUR  
CARBON  
FOOT  
PRINT**

MARKETING

ECONOMIC SAVING

CERTIFICATION

TRUST



CFP evaluation



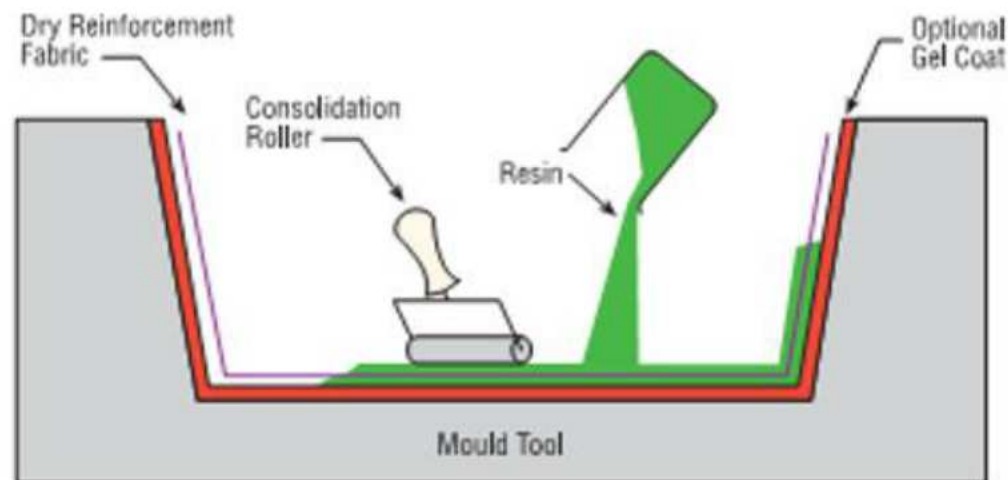
PCR development



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# Nautical Composite Materials

- Have a significant environmental impact and can not be considered a sustainable material.



- Comes the need to bring an innovation that privileges the use of fibers and resins of natural origin or recycling.

# Eco-friendly Resins

- The problem that must be addressed for the selection of an eco-friendly matrix is the level of recyclability and / or decomposition that you want to achieve.

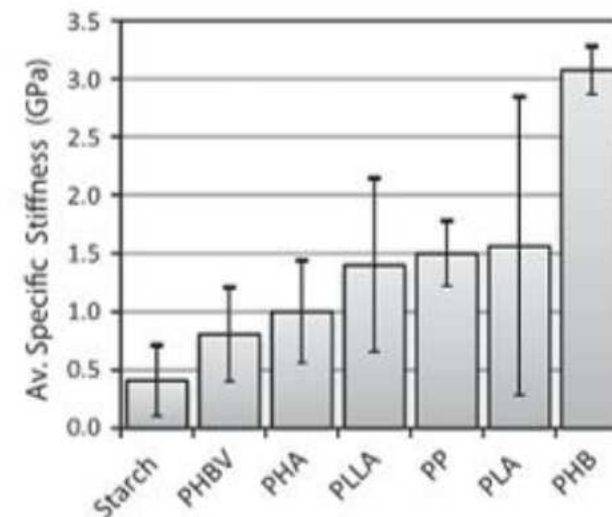
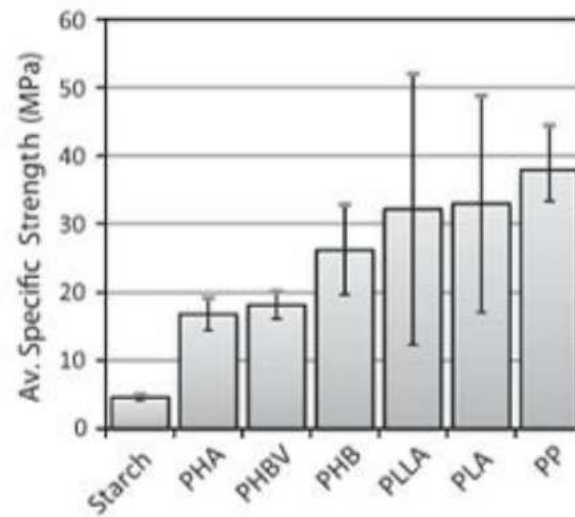
## Eco-friendly Resins

- Bio-thermosetting resins are based on vegetable oils and they are very difficult to recycle and reuse.
- From the eco-compatibility point of view the best compromise for the realization of a "green" composite is to opt for bio-thermoplastic materials.

# Eco-friendly Resins

Properties of natural polymers in relation with polypropylene. The values are adopted from other studies [7,57-64]. References inside the table are for price only.

Polymer	Density (g/cm <sup>3</sup> )	Melting point (T <sub>m</sub> °C)	Tensile strength (MPa)	Young modulus (GPa)	Elongation at brake (%)	Price (USD/kilo)
Thermoplastic starch	1-1.39	110-115	5-6	0.125-0.85	31-44	5.5 [54]
PLA	1.21-1.25	150-162	21-60	0.35-3.5	2.5-6	2.42 [54]
PLLA	1.25-1.29	170-190	15.5-65.5	0.83-2.7	3-4	4.5 [59]
PHB	1.18-1.26	168-182	24-40	3.5-4	5-8	4 [65]
PHBV	1.23-1.25	144-172	20-25	0.5-1.5	17.5-25	3.5 [66]
PP	0.9-1.16	161-170	30-40	1.1-1.6	20-400	1.65 [54]





# Eco-friendly Resins

There is a big ethical debate about the fact that the bio resins represent a real sustainable alternative to synthetic ones.

# Organic Fibers

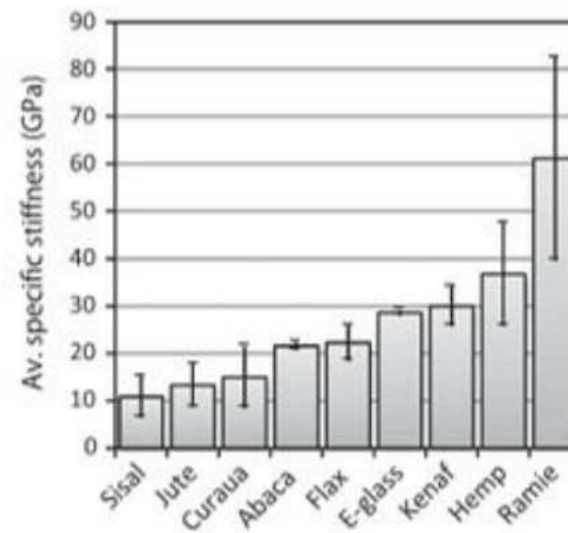
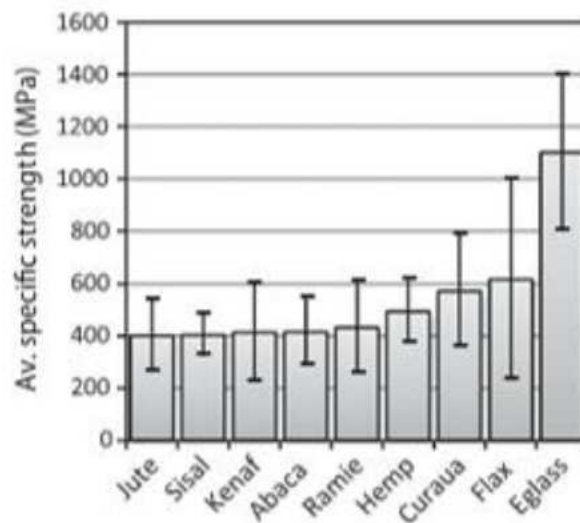
The interest for vegetable fibers in the production of composite materials has grown considerably in recent years for a variety of issues:

- Enviromental
- Good mechanical properties
- Low density
- Low costs

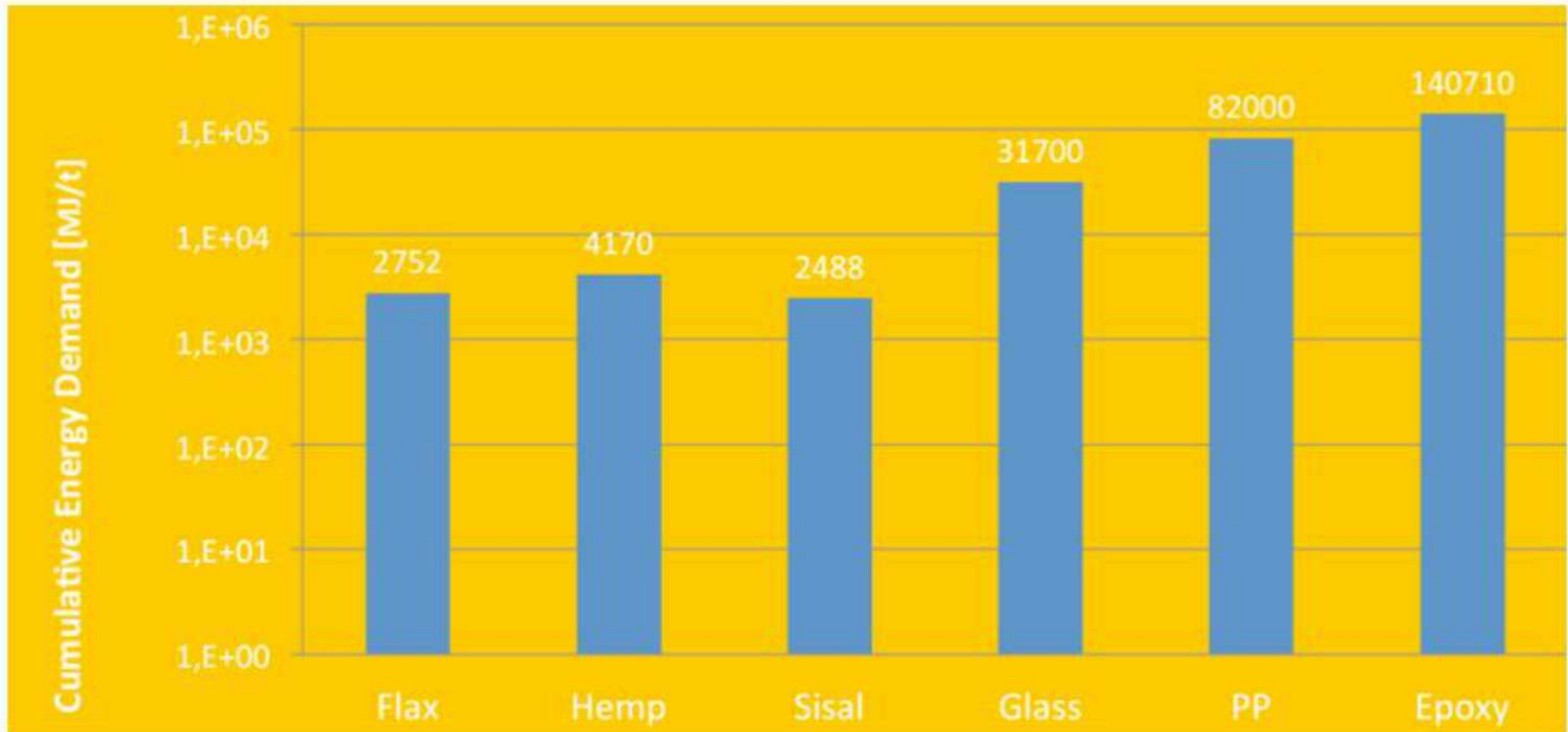
# Organic Fibers

Properties of several natural fibers and E-glass. The values are adopted from the studies and database of [7,19,47–53]. References inside the table are for price only.

Fibers	Density (g/cm <sup>3</sup> )	Diameter (mm)	Tensile strength (MPa)	Young modulus (GPa)	Elongation at brake (%)	Price (USD/kilo)
Flax	1.5	40–600	345–1500	27–39	2.7–3.2	3.11 [54]
Hemp	1.47	25–250	550–900	38–70	1.6–4	1.55 [54]
Jute	1.3–1.49	25–250	393–800	13–26.5	1.16–1.5	0.925 [54]
Kenaf	1.5–1.6	2.6–4	350–930	40–53	1.6	0.378 [54]
Ramie	1.5–1.6	0.049	400–938	61.4–128	1.2–3.8	2 [54]
Sisal	1.45	50–200	468–700	9.4–22	3–7	0.65 [54]
Curaua	1.4	7–10	500–1100	11.8–30	3.7–4.3	0.45 [55]
Abaca	1.5	10–30	430–813	31.1–33.6	2.9	0.345 [56]
E-glass	2.55	15–25	2000–3500	70–73	2.5–3.7	2 [54]



# Organic Fibers



Fonte: G.Cicala, 2011

## Organic Fibers

The vegetable fibers are obtained from certain types of plants and according to the part of the plant from which they are derived, are divided into:

# FIBERS from SEEDS

Cotton



Kapok



# FIBERS from the STEM

Hemp



Nettl



Broom



Jute



Flax



Ramie



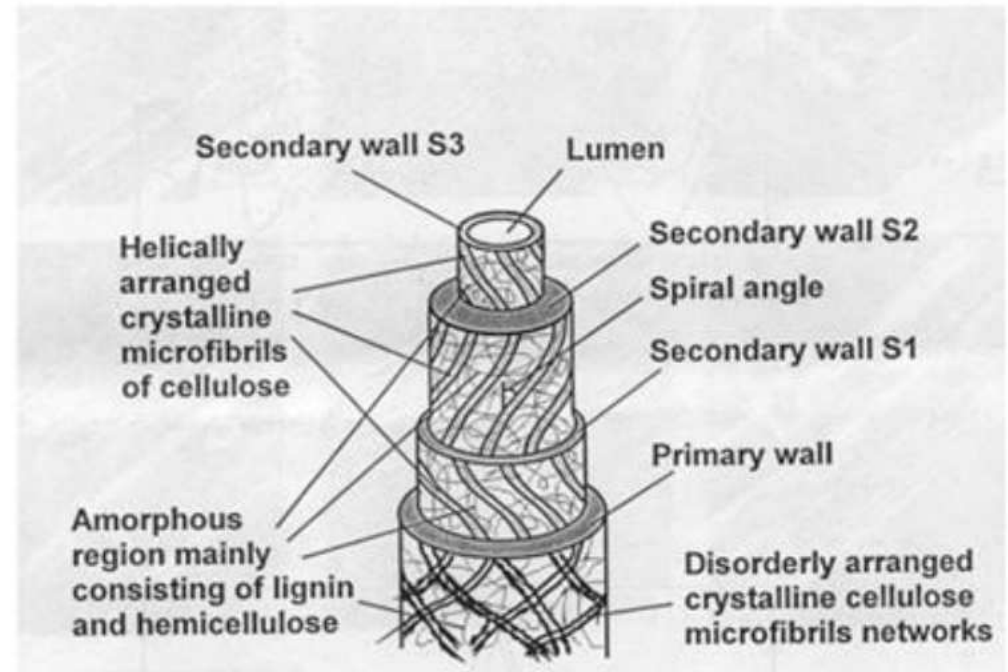
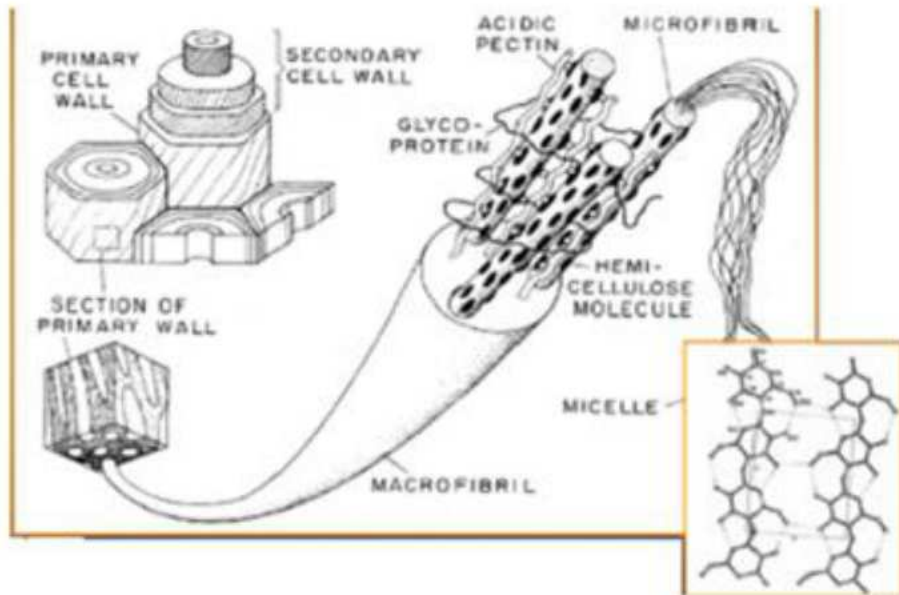
# FIBERS from the LEAF



Sisal



# Organic Fibers



%	Agave	Juta	Lino	Canapa	Palma da olio	Cocco	Legno duro (es. Pioppo)
Cellulosa	78	64	64	70	65	43	45
Eemicellulosa	10	12	17	18	~ 0	45	20
Lignina	8	12	2	4	19	~ 0	30
Altro	4	12	17	8	16	12	5

# Organic Fibers

The composition of the fibers depends on several factors:

- Geographical origin and biological maturity
- Weather conditions (especially as regards the moisture content)
- Mode and efficiency of extraction (retting)

# Organic Fibers

The extraction is the process that allows the removal of pectin from the fibers.

- Natural extraction
- Enzymatic extraction



Green jute



Retted jute



Jute fibres (decorticated)

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