



FIBERLINE

BUILDING PROFILES



The founders

THE BEGINNING OF FIBERLINE

It was in 1979 that Dorthe and Henrik Thorning laid the foundations for Fiberline in the village of Nr. Bjert near Kolding, Denmark.



Pultruded FRP profiles

CONVERSION PROCESS



A unique material

MATRIX (injection)	REINFORCEMENT (mats and rovings)		
	Glass fibre	Carbon fibre	Aramid fibre
Polyester	X	X	X
Vinylester	X	X	X
Phenol	X	X	X
Epoxy	X	X	X
PUR	X	X	X





Roving types

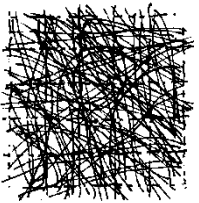




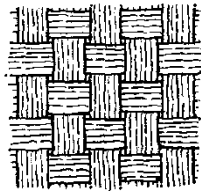
Matt types

Continuous matt

Random fibre
orientation

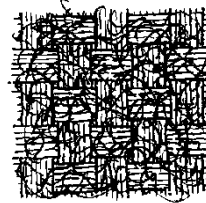


Weave $0^{\circ}/90^{\circ}$



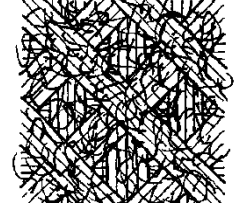
Complex matt

$0^{\circ}/90^{\circ}$ membrane
+ random fibre
orientation



Bi-directional complex matt

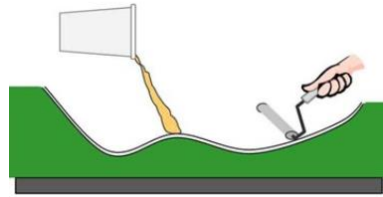
$0^{\circ}/\pm 45^{\circ}/90^{\circ}$
membrane
+ random fibre
orientation



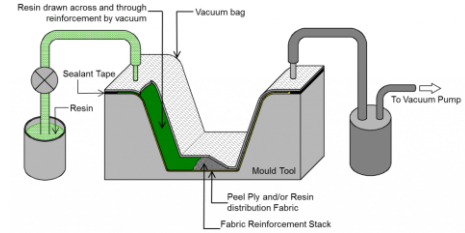


Conversion process

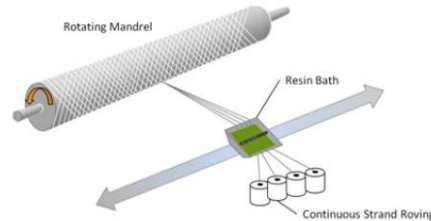
- Different energy consumption compared to output
- Not all geometries can be produced by all production methods



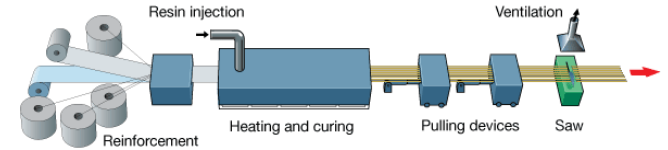
Hand Lay-up



Resin transfer molding



Filament winding



Pultrusion



Conversion process

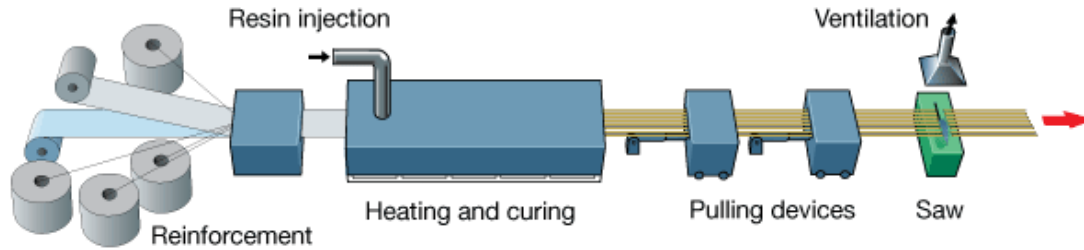
Resin-injection pultrusion

Resin injection

Resin mixed additives is being injected under high pressure into the tool. Parameters like temperature, pressure, line speed and flow-rate are being monitored to ensure full wetting of fibres.

Pulling devices

Pultrusion is a continuous process therefore, the machine must pull the profile constantly. Depending on the geometry of the profile, either belt type or reciprocating puller can be used. Pulling forces up to 50 tons are possible.



Reinforcement

Rovings' and woven fabrics are stored on shelves and have unique placement in each product to enhance the properties and optimize the production.

Heating and curing

Curing process is initiated by applying gradually heat through the entire length of the die. Depending on the resin mixture the temperature can range from 80-250°C.

Saw

Flying CNC-based saw with a diamond-tipped blade. Saw assembly is housed in closed container to reduce the noise and dust formation from cutting.



FIBERLINE
BUILDING PROFILES

Building material

APPLICATION AREAS



Low weight



CE marking



Corrosion-free

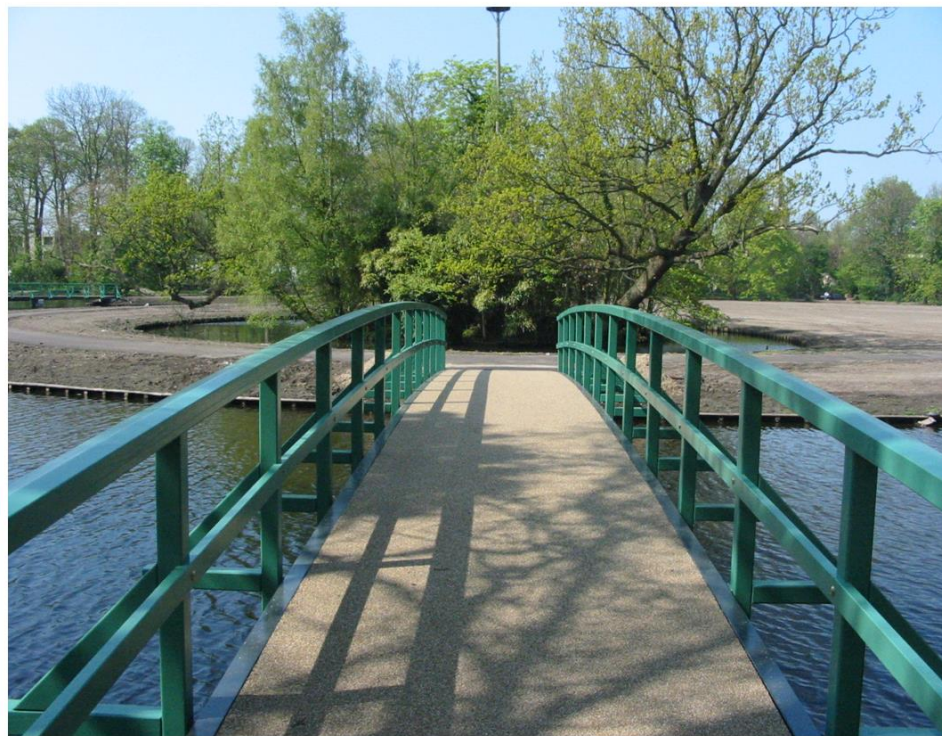


Minimal
maintenance



Sustainable
manufacturing process

Bridges





Low weight



CE marking



Corrosion-free



Minimal
maintenance



Sustainable
manufacturing process

Roads and parks





Low weight



CE marking



Corrosion-free



Minimal
maintenance



Sustainable
manufacturing process

Durability





Low weight



CE marking



Corrosion-free

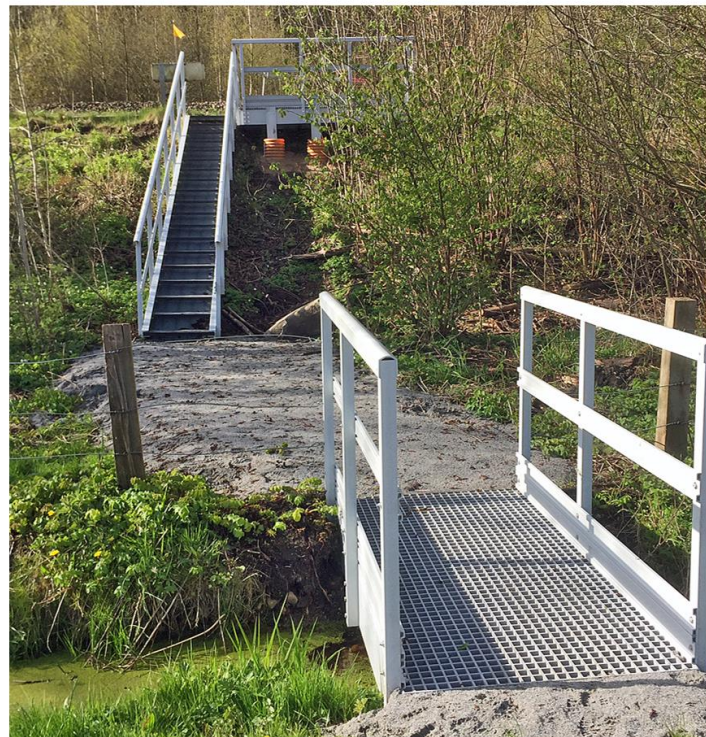


Minimal
maintenance



Sustainable
manufacturing process

Railways





Low weight



CE marking



Corrosion-free



Minimal
maintenance



Sustainable
manufacturing process

Construction





Low weight



CE marking



Corrosion-free



Minimal
maintenance



Sustainable
manufacturing process

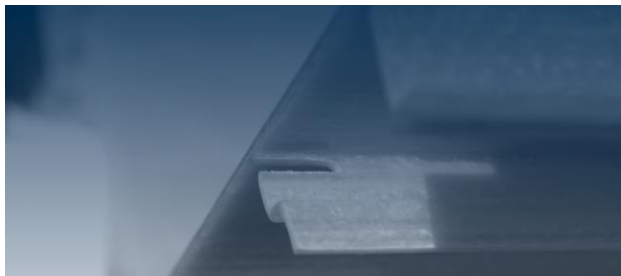
Water





Architecture

FACADES





Architecture

PAVILION

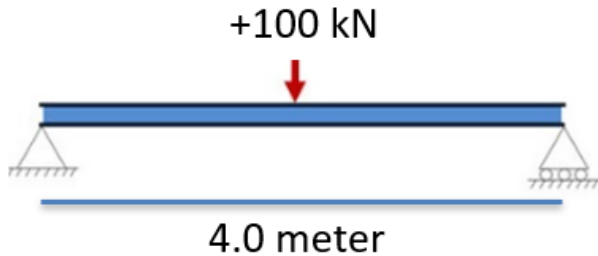




The profile

I200X120X12

Weight;	6,98 kg/m
Production speed;	0,40 m/min
UD rovings:	630 psc
Matts:	8 psc
Resin:	Polyester





The profile





FIBERLINE
BUILDING PROFILES

Future construction

A STRONG ELEMENT



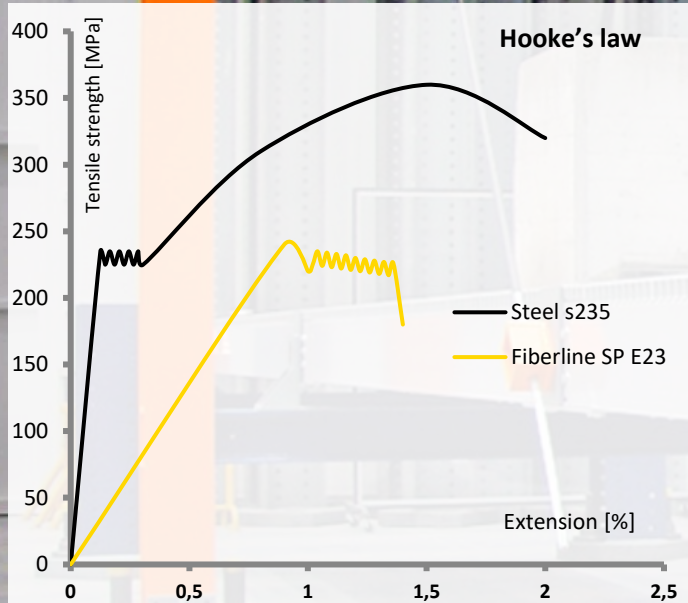


Material properties

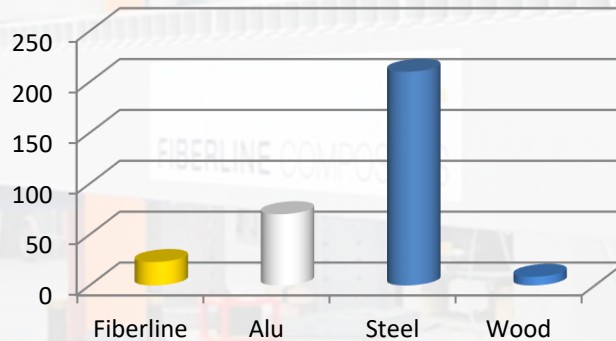




Material properties



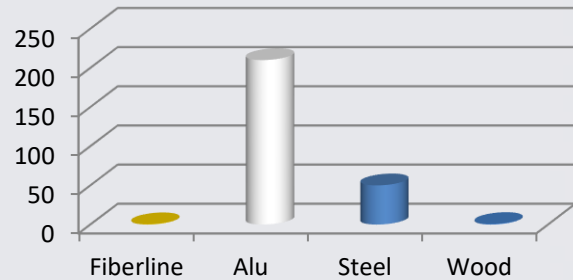
E-modulus of elasticity 10^3 MPa



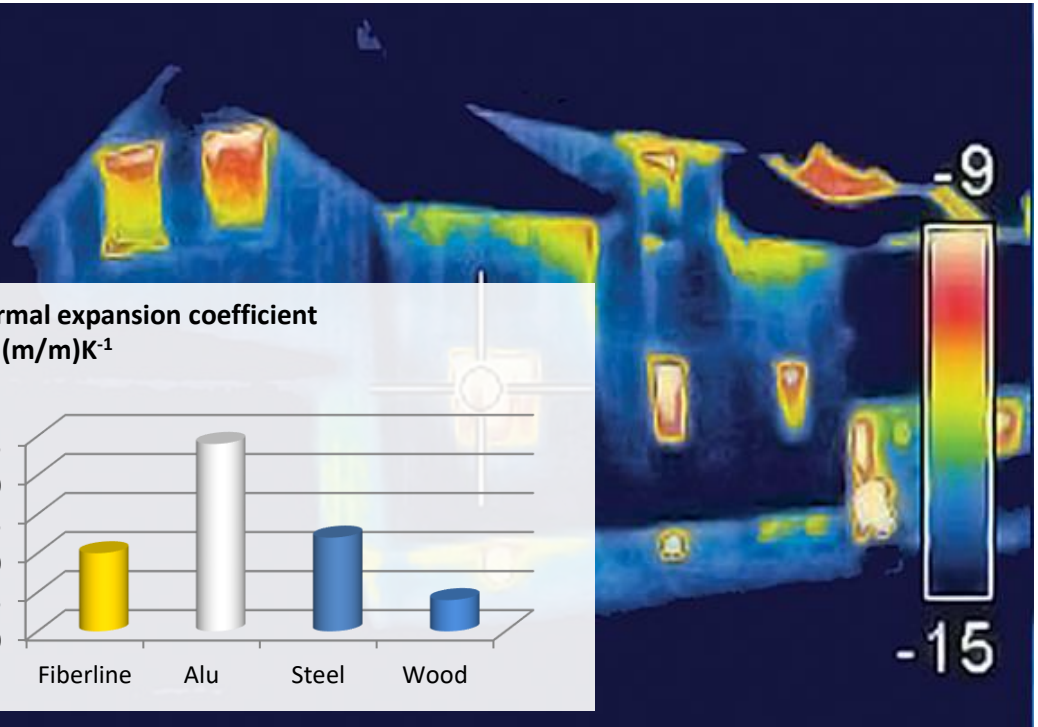
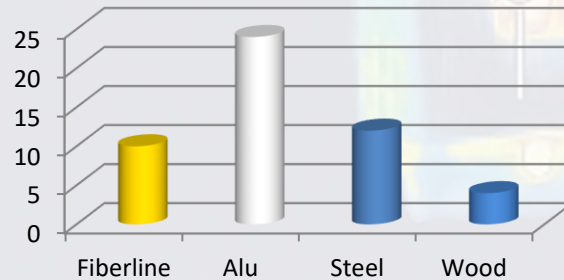


Material properties

Thermal conductivity
 $W/^{\circ}K\cdot m$



Thermal expansion coefficient
 $10^{-6} (m/m)K^{-1}$





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+ 40 years' experience

MATERIAL KNOW-HOW





Certified quality

Prof. Dr.-Ing. G. Sedbeck, Institute of Steel Construction, RWTH Aachen COPY

Certificate of Conformity of the Material Grade E23 for Fibreline Construction Profiles made of Pultruded Glass-Fibre-Reinforced Polymers according to EN 13706-3:2002

With a view to obtaining a certificate of European Technical Approval, an ETA, extensive testing has been performed in order to determine whether the material properties of pultruded fibre reinforced profiles produced by Fibreline Composites AS are in accordance with the EN 13706-3:2002. In table 1 the design values and in table 2 the nominal values are listed and compared to the required values.
We hereby confirm that the tested charges are in accordance with the quality E23 specified in the EN 13706-3:2002.

Table 1: Confirmation of the material grade for design values according to EN 13706-3

Property	Unit	Test method	Required design values as specified in EN 13706-3:2002	Design values achieved from tests according to EN 13706-3:2002
1.1 Pull resistance $F_{t,R}$	N/mm ²	EN 13706-3:2002	23000	29746
1.2 Tension modulus $E_{t,R}$	N/mm ²	EN 1301327.4	23000	31232
1.3 Tension modulus $E_{t,R}$	N/mm ²	EN 1301327.4	7000	87966

Table 2: Confirmation of the material grade for nominal values according to EN 13706-3

Property	Unit	Test method	Required design values as minimum properties for E23 according to EN 13706-3:2002	Nominal values achieved from tests according to EN 13706-3:2002
1.4 Tension strength $F_{t,R}$	N/mm ²	EN 1301327.4	230	276
1.5 Tension strength $F_{t,R}$	N/mm ²	EN 1301327.4	30	31
1.6 Flex heating strength $F_{t,R}$	N/mm ²	EN 13706-3:2002	150	153
1.7 Flex heating strength $F_{t,R}$	N/mm ²	EN 13706-3:2002	70	144
1.8 Flexional strength $F_{t,R}$	N/mm ²	EN 130134225	240	300
1.9 Flexional strength $F_{t,R}$	N/mm ²	EN 130134225	100	120
1.10 Interlaminar shear strength $F_{t,R}$	N/mm ²	EN 130134430	25	31

Aachen - August, 2013

Prof. Dr.-Ing. Gerhard Sedbeck *G. Sedbeck* Dipl.-Ing. H. Trampf *H. Trampf* Dipl.-Ing. M. Oppe *M. Oppe*

RWTH AACHEN Institute of Steel Construction

EN 13706

The German university RWTH documents that the structural profiles from Fibreline meet the European standard EN 13706.

Deutsches Institut für Bautechnik DIBt

Allgemeine Bauartgenehmigung

Zulassung für Bauprodukte und Bauelemente
Bautechnische Prüfung
Ereignis nach dem Landesgesetz zur Zulassung von Bauprodukten
Mithilfe der DIBt, der DIBt-Arzt und der DIBt-Prüfung

Datum: 08.05.2018
Rechtsbehörden: 171-1-10-20-791/1

Nummer: **Z-10.39-791**
Gefährdungsstufe: **III B, IIIa 2018**
III A, IIIa 2023

Antragsteller: **Fibreline Composites AS**
Barmstoft AS 5
5500 MIDDELFART
DANMARK

Gegenstand des Bescheides:
Trapezoid Konstruktionsprofile aus glasfaserverstärkten Kunststoffen nach ETA-16/09/1;
Doppel-T-Profile, U-Profile, Winkelprofile, Vertikalschubprofile, Flachprofile und Handlaufprofile

Der oben genannte Regelungsgegenstand wird hiermit allgemein bauarttechnisch genehmigt.
Dieser Bescheid enthält eine Erläuterung der Bedingungen.
Der Gegenstand ist seit dem 22. Dezember 2017 allgemein bauarttechnisch zugelassen worden.

DIBt

8083 Fachverfahren 01 81 01 9800 Berlin T +49 30 910701-7 Fax +49 30 910701-10 E-Mail: info@dibt.de www.dibt.de

Allgemeine Bauartgenehmigung

The Bauartgenehmigung is issued by the German technical authority Deutsches Institut für Bautechnik (DIBt) and is an approval of the use of our products in the German construction sector.

IMA DRESDEN

CERTIFICATE OF CONSTANCY OF PERFORMANCE

No. 2457-CPR-0006

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction Products Regulation) or CPR, this certificate applies to the construction product:

Fibreline Structural profiles
Structural sections made from fibre reinforced polymers (FRP/Glassfibre Composite)

placed on the market under the name or trade mark of: **Fibreline Composites AS**
and produced in the manufacturing plants: **Barmstoft AS 5, 5500 Middelfart**

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in **ETA-16/09/1** dated from **02.06.2017** under system 1 for the performance use in this certificate are applied and that the factory production control conducted by the manufacturer is essential to ensure the constancy of performance of the construction product.

This certificate was first issued on 14.05.2018 and will remain valid as long as neither the harmonized standard, the construction product, the test methods nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

Dresden, 16.05.2018
Prof. Dr. rer. (Techn.) Ralf Beyer
Head of Certificate Body

IMA Materialprüfung und Anwesenheitsprüfung Center Dresden, is accredited certificate body by DAkkS ac. no. 020205 (DIN EN 9142). The accreditation is valid for the scope listed in the area of the accreditation certificate (01-20-10119-01). The accreditation can be found on the IMA website.

IMA Materialprüfung und Anwesenheitsprüfung Center Dresden
Wilschstraße 100, 81025 Dresden
T +49 (0)351 8827-4210
E-Mail: info@ima-dresden.de
www.ima-dresden.de

CE Mark

Fibreline is the only manufacturer in the world who holds a CE certificate for our structural GRP-profiles.

DNV-GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No.: 2015-0001-0001-0001
Issue date: 12. November 2015
Valid until: 12. November 2018

This is to certify that the management system of **Fibreline Composites A/S** Barmstoft AS 5, 5500, Middelfart, Denmark and the sites as mentioned in the appendix accompanying this certificate has been found to conform to the Quality Management System standard: **ISO 9001:2015**

This certificate is valid for the following scope: **Development, production and sales of profiles, systems and related components of plastic-based composite materials**

DNV GL
MANAGEMENT SYSTEM CERTIFICATE

Prof. Dr. rer. (Techn.) Ralf Beyer
Head of Certificate Body

DNV GL
MANAGEMENT SYSTEM CERTIFICATE

Prof. Dr. rer. (Techn.) Ralf Beyer
Head of Certificate Body

ISO 9001

Fibreline is certified according to ISO 9001, version 2015.



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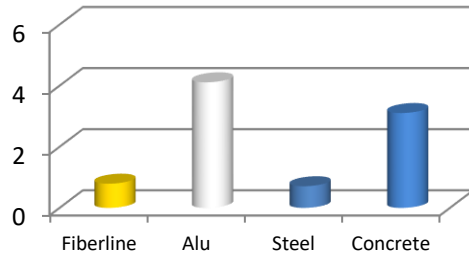
Challenge conventional construction

FOR A MORE SUSTAINABLE FUTURE

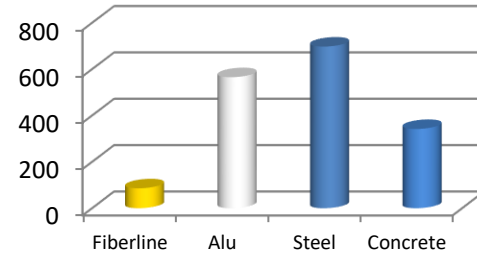


Energy efficient process

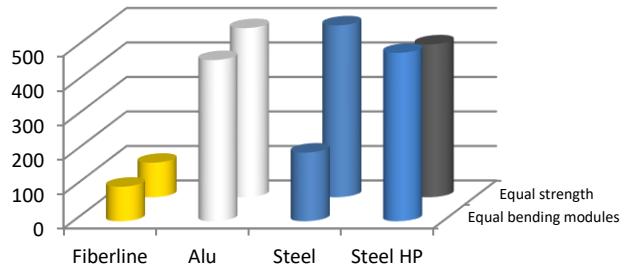
Air Pollution E 10^6 m³



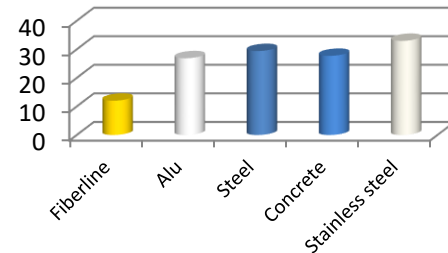
Water Pollution m³



CO2 discharge at equal performance %

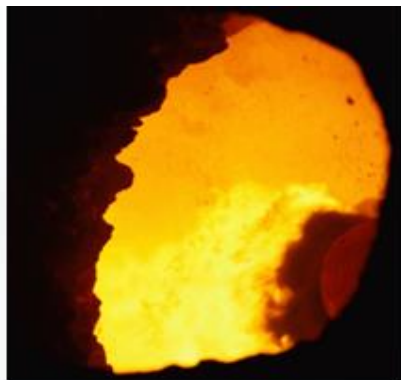


Energy Consumption 10^4 MJ



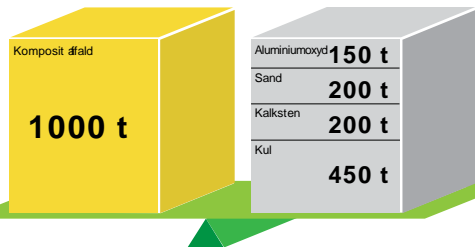


Fiberline waste management



A grinding mill at the plant reduces the composite to granulate

The calorific value of the granulate is adjusted by blending with other recycled materials in a patented process



When recycling 1000 tons of Fiberline profiles in cement manufacture, You save 1000 tons of fuel and raw material



Composite Recycling



FIBERLINE

FUTURE OF COMPOSITES



Future of composites

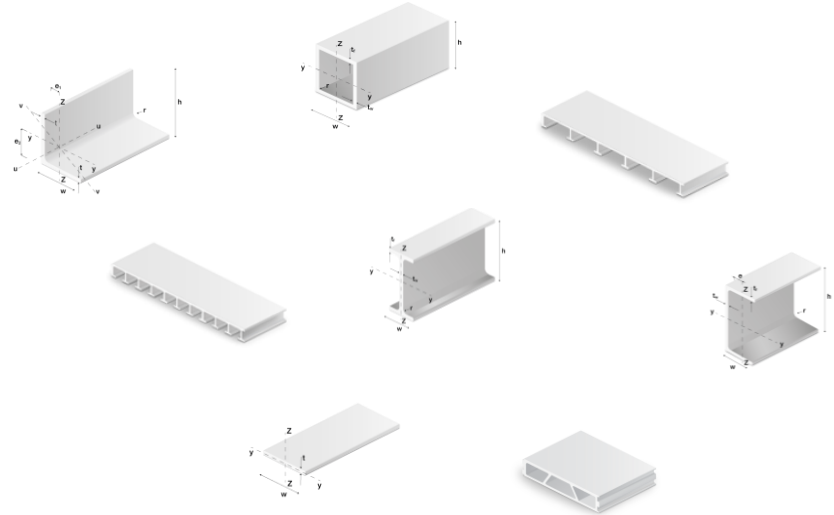
Better understanding of materials and process



More optimized cross sections



Less use of material - greater load capacity





Future of composites

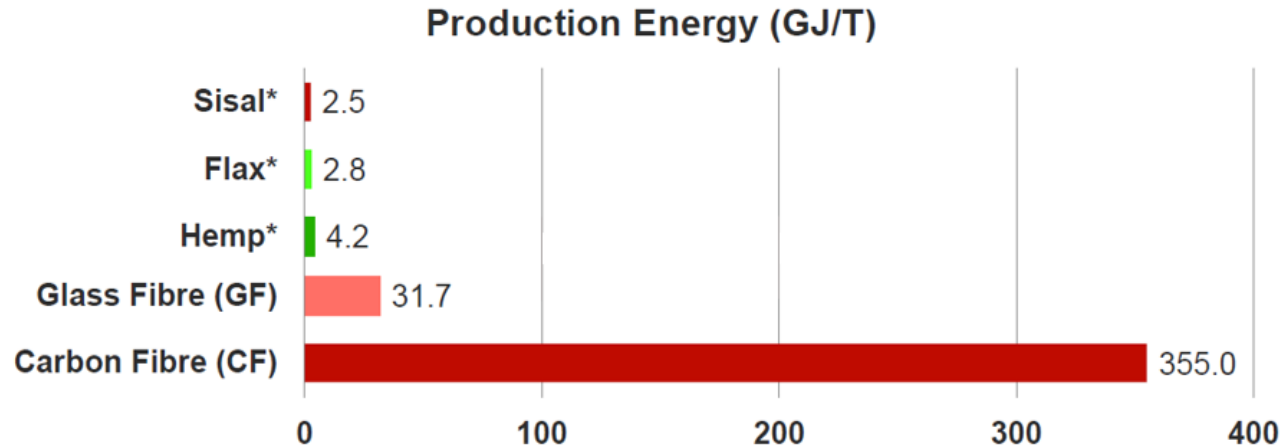
Fibres

- Fiber production based on renewables energies sources
- Focus on natural fibers
- Focus on reused/recycled fibers





Future of composites



* Non-bleached



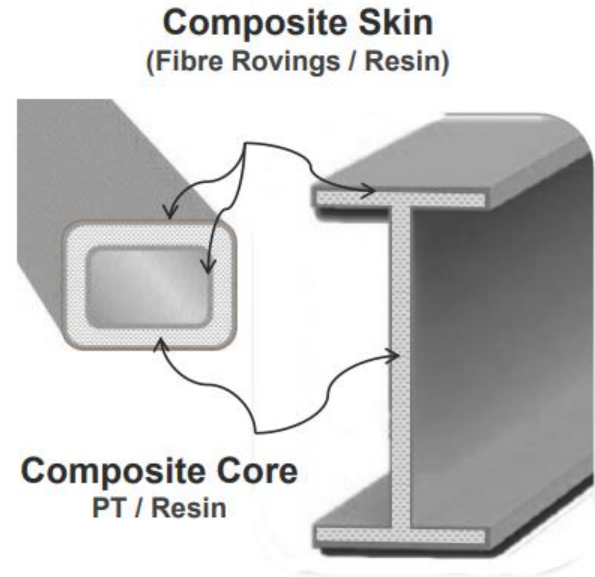
Future of composites

Fiber	Density (g/cm ³)	Strength (MPa)	Stiffness (Gpa)	Specifik strength (MPa/g cm ³)	Specifik stiffness (GPa/g cm ³)	Elongation (%)
Flax	1,45	800-1500	55-75	550-1030	38-52	1.5-2.0
Hemp	1,48	550-900	40-65	370-600	27-44	1.6
Jute	1,46	400-800	15-35	275-600	7-21	1.8
E-Glass	2,55	2000-2400	70-74	780-940	27-29	3
Carbon (T300-T700)	1,8	3500-4900	230	1900-2700	128	1.5-2.1



Future of composites

Patented sandwich pultrusion



Credit; : FPInnovations , Pointe - Claire (CA)



Future of composites

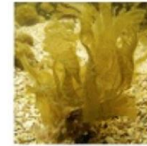
1) Adding non-recyclable polyethylene terephthalate (PET) waste to thermosetting resins

2) Thermoplastic resins

3) Bio based resin systems



Wood Dust



Algae





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