Forward Thinking Machinery for Lamination

ALBTTEX

Soluções Inteligentes

Dry heat Lamination – From the mud and straw bricks to the aerospace

By Wilson Oricchio
Reliant Machinery Ltd. UK

Forward Thinking Machinery for Lamination

Company Profile

- ✓ Established in 1969 – Over 22.000 machines built & delivered worldwide
- ✓ World leading manufacturer of continuous laminating, compression and fusing machinery
- ✓ Headquartered in Philadelphia – USA – Two factories in Europe; One factory in USA for special products
- ✓ R&D, Design, Assembly and operations based in Luton – UK
- ✓ Sales & technical support offices in USA, UK, India, China, Mexico & South America and world-wide sales network through agents
- ✓ Continuous development programme with recent introduction of the high pressure Laminator Powerbond HPC and HPC-RT systems

Company Profile

Testing Facilities in our Factory

Testing Line Installed in our Factory in Luton-UK

Powerbond HPC – 2200 mm width – Equipped with: Powder Scatter – Infrared Hood – Unwinders and Rewinders. Suitable for laminating roll to roll or sheets.

Company Profile

Production Range – Laminating Machines

MiniLam 450

Compact

Magnum GOS

Coolstream GOS

Powerbond and Powerbond HPC

Widths available from 450mm to 3000mm

Company Profile

Production Range – Peripherals

Light Weight Winders

Cantilevered Winders

Heavy Weight Winders

Light Weight Rewinders

Infrared Hoods

Powder Coater

Auto-stack units

Slitting & Cross Cutting Systems

Company Profile

Typical Installation

Powerbond HPC – High Pressure Compression Production Line

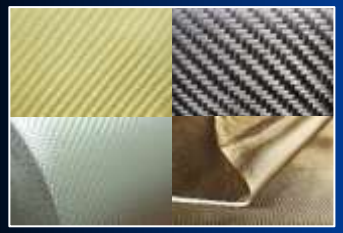
Where Reliant Equipment is Used

Automotive

Defence

Household

Prepregs



Medical

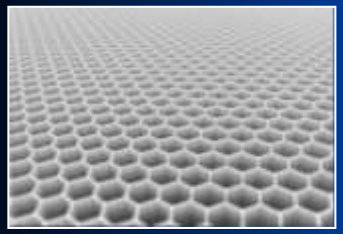
Leisure Industry

Composites

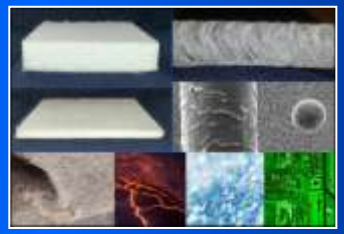
Filtration

Lingerie

Honeycomb



Nonwoven



Footwear

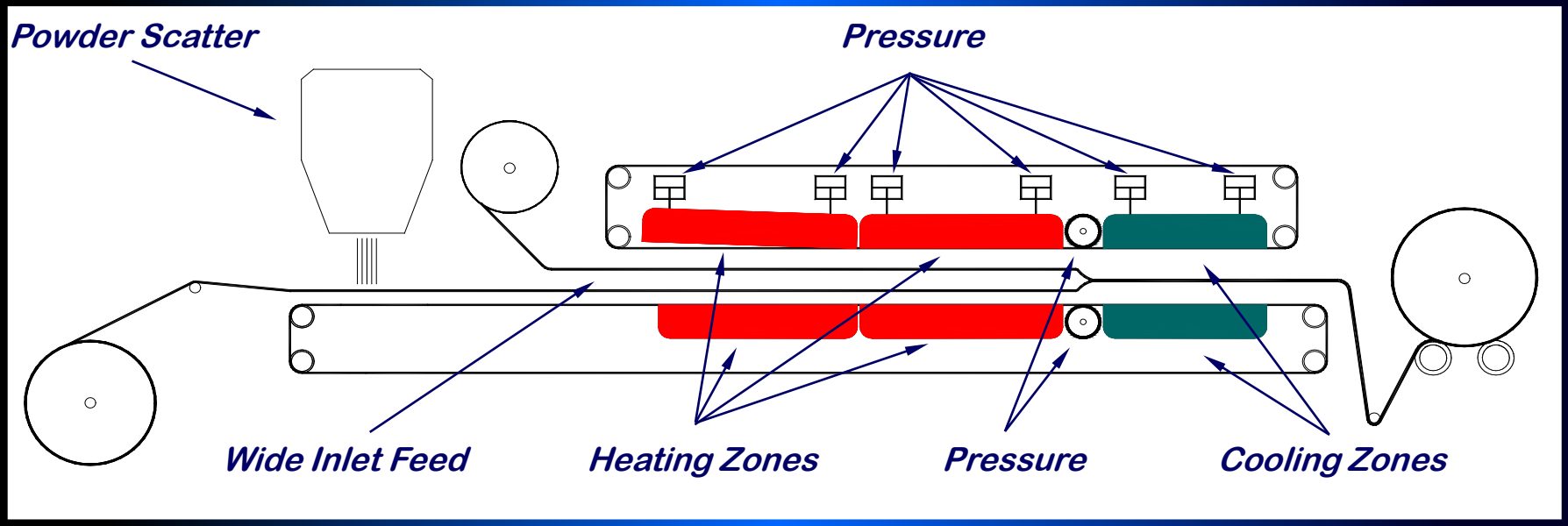
Aerospace

Technical Textiles

Office Furniture

Flexible Laminating Process

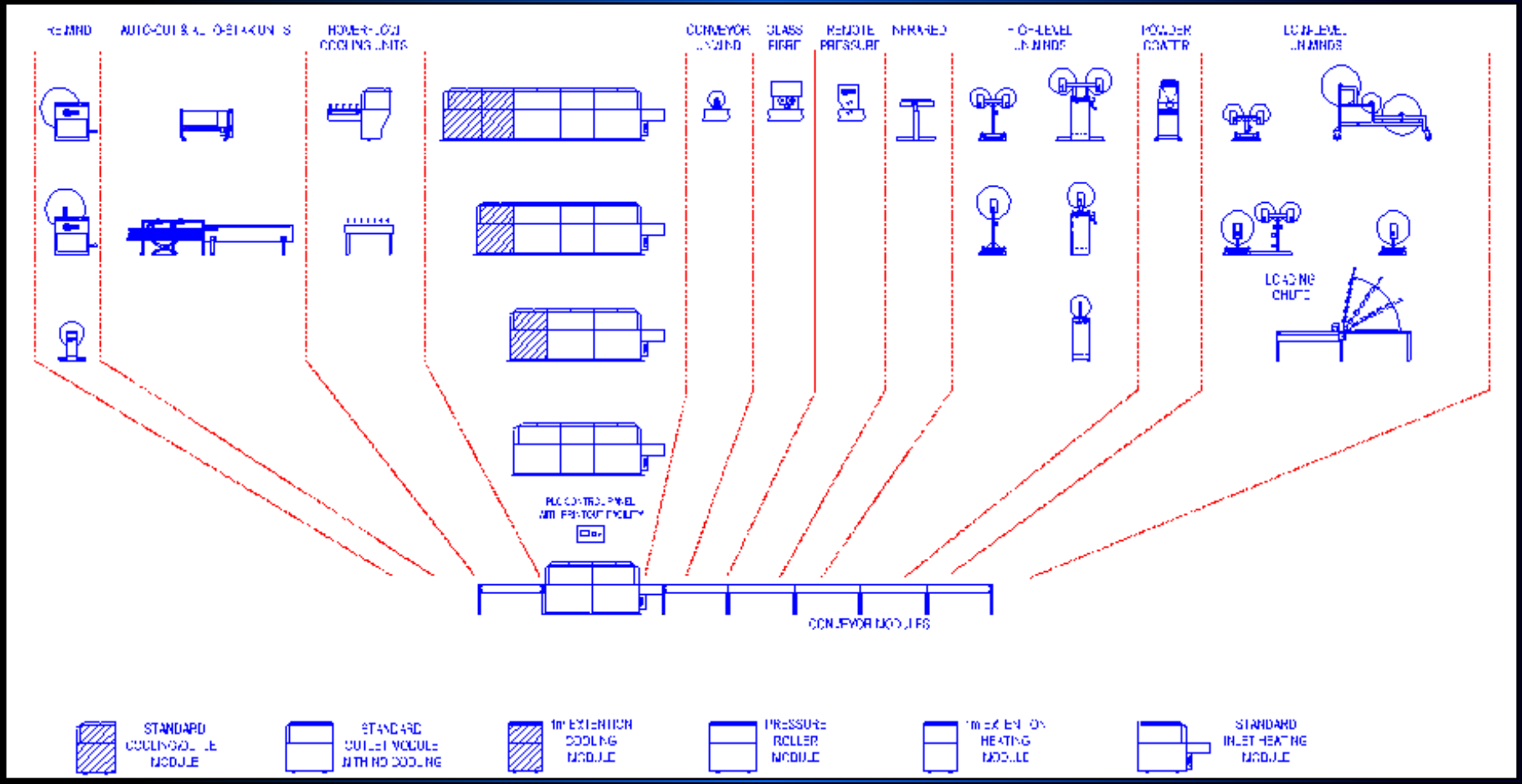
Powerbond HPC – High Pressure Compression Production Line



- ✓ Zones of heating and cooling can be individually adjusted to be controlled independently
- ✓ Pressure can be applied during the heating and cooling process if required by the material
- ✓ Thin and thick materials can be processed
- ✓ Reel to reel and cut piece processing can be handled
- ✓ Powder coating, films, webs, PSAs and other types of adhesives can be applied on continuous webs or sheets
- ✓ Single or multiple sets of pressure rollers can be installed
- ✓ Speed of processing can be varied widely

Company Profile

Reliant Unique Modular Concept

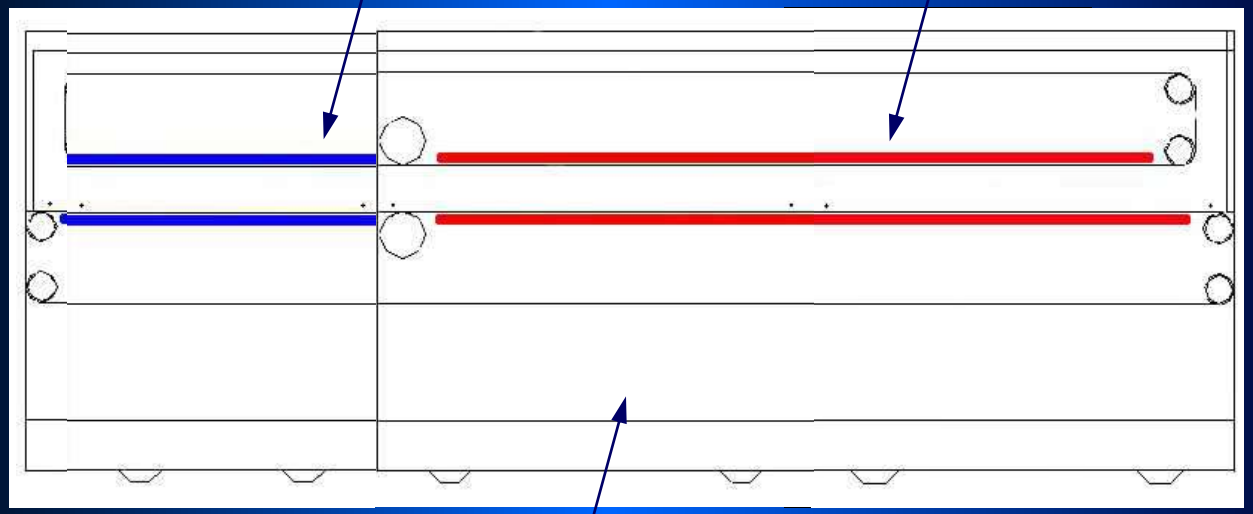


Company Profile

Reliant Unique Modular Concept

NEW
Powerbond
Cooling Module

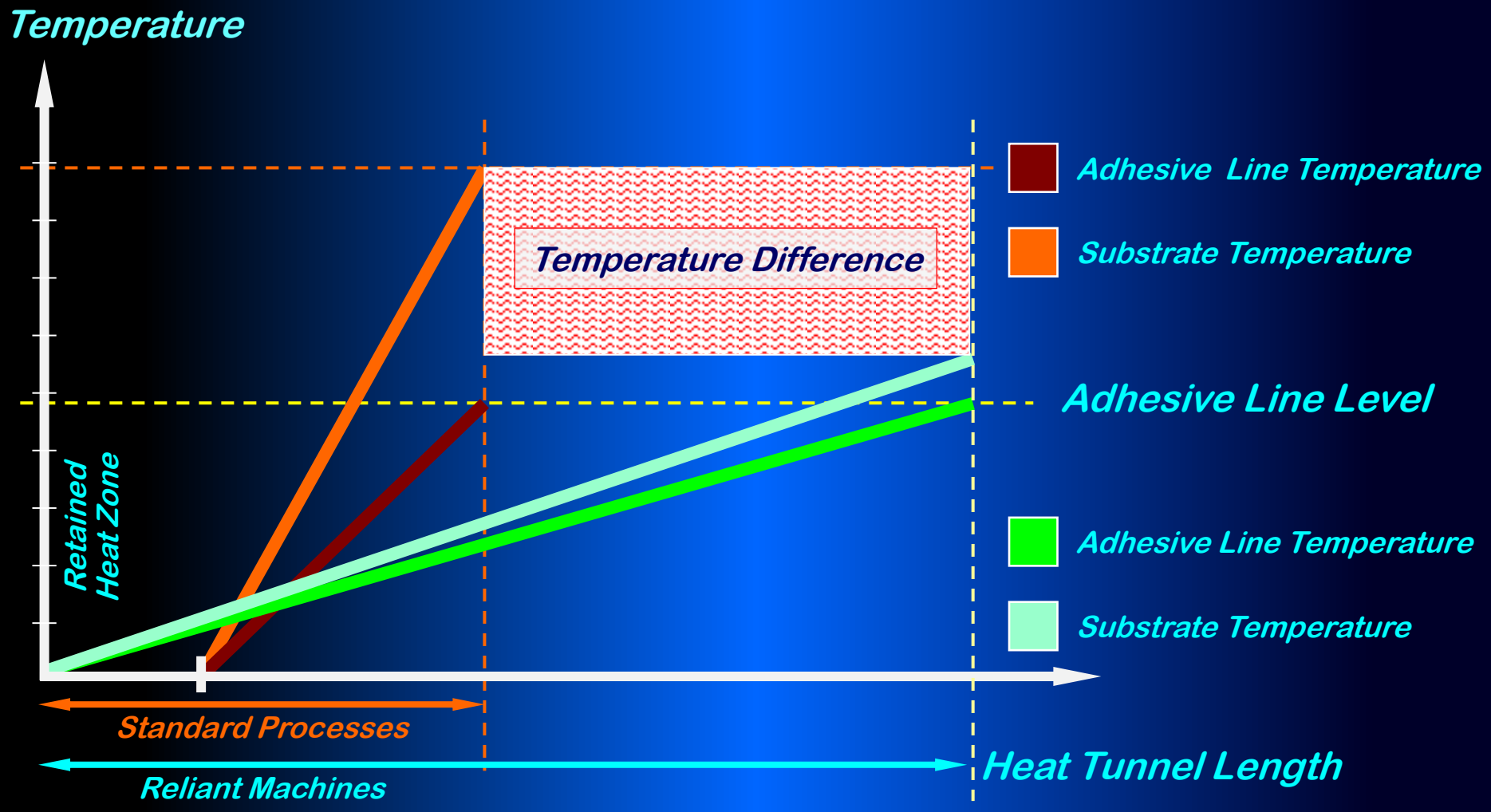
NEW
Powerbond
Heating Module



EXISTING Powerbond
Heating / Pressure
Module

Company Profile

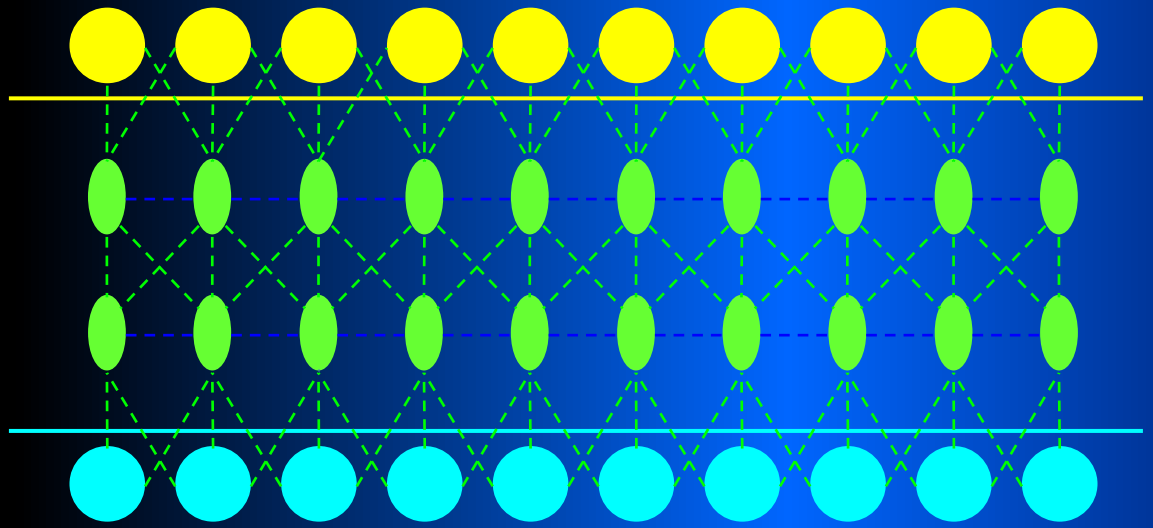
Advantages of Reliant Long Heat Tunnels



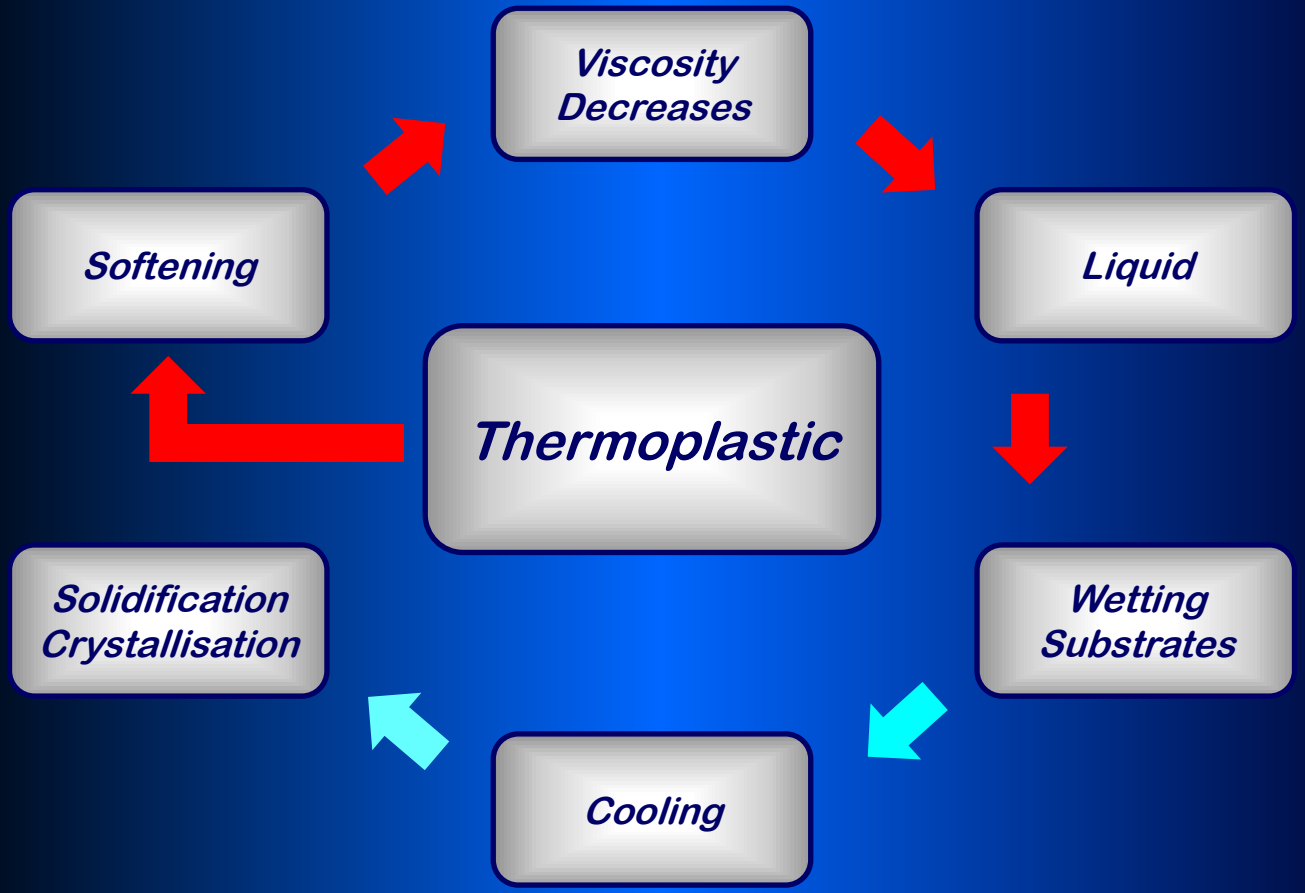
Company Profile

Laminating Technologies - Thermofilms

A thermoplastic, or thermo softening plastic, is a polymer that becomes pliable or mouldable above a specific temperature, and returns to a solid state upon cooling.
Examples of thermo softening plastics: EVA, CoPa, CoPES films and webs …



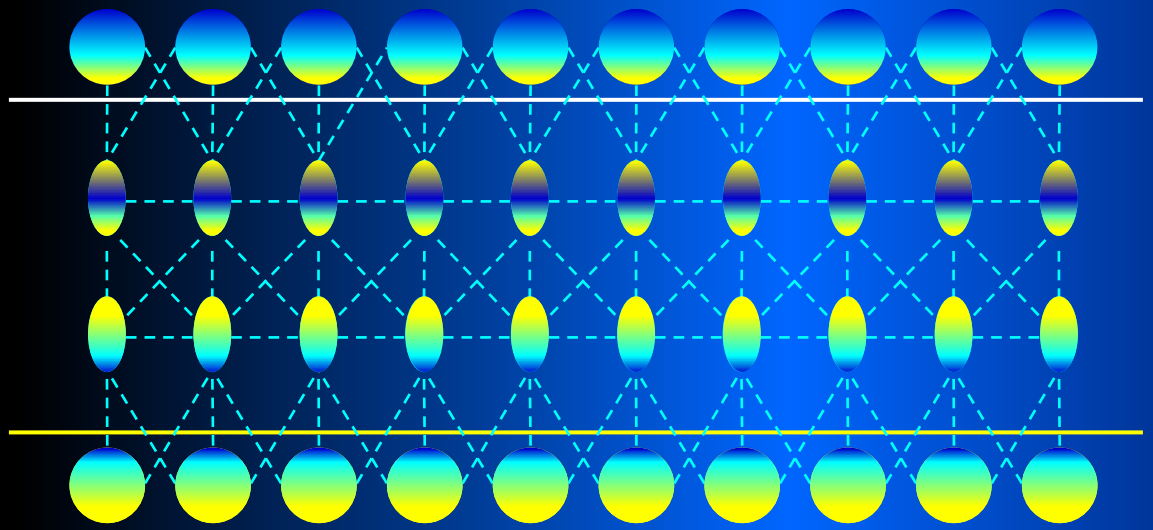
Laminating Technologies - Thermofilms



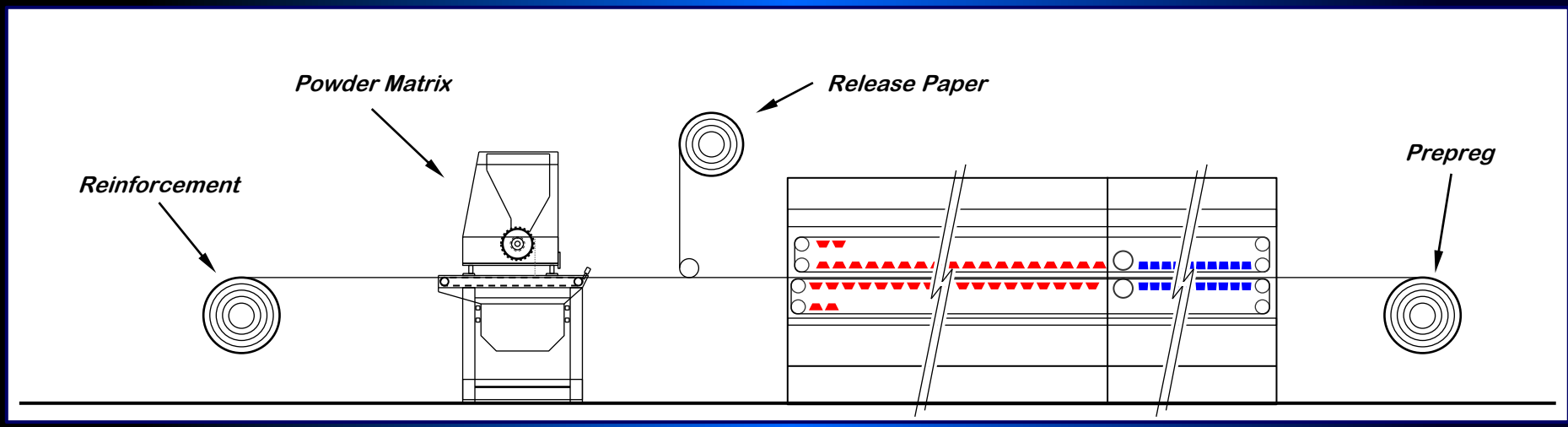
Technology – Process

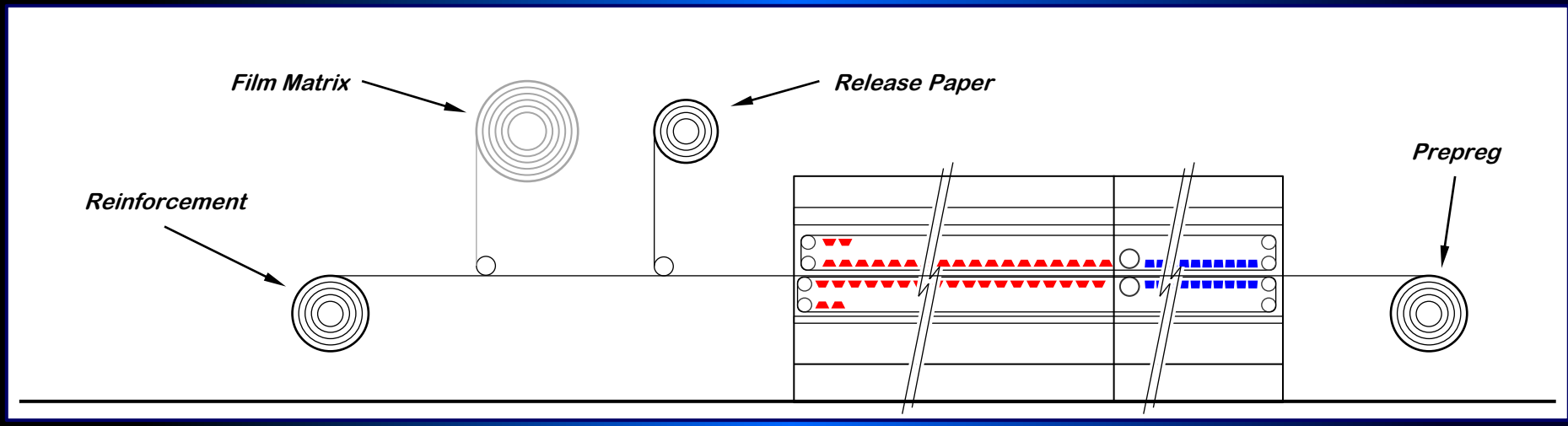
Laminating Technologies - Thermosettings

Thermosetting polymer is defined as a pre-polymer in a soft solid or viscous state that changes irreversibly into an infusible, insoluble polymer network by curing.
Also known as Crosslinking Adhesives or Thermosetting Plastic.



Prepregs Lines





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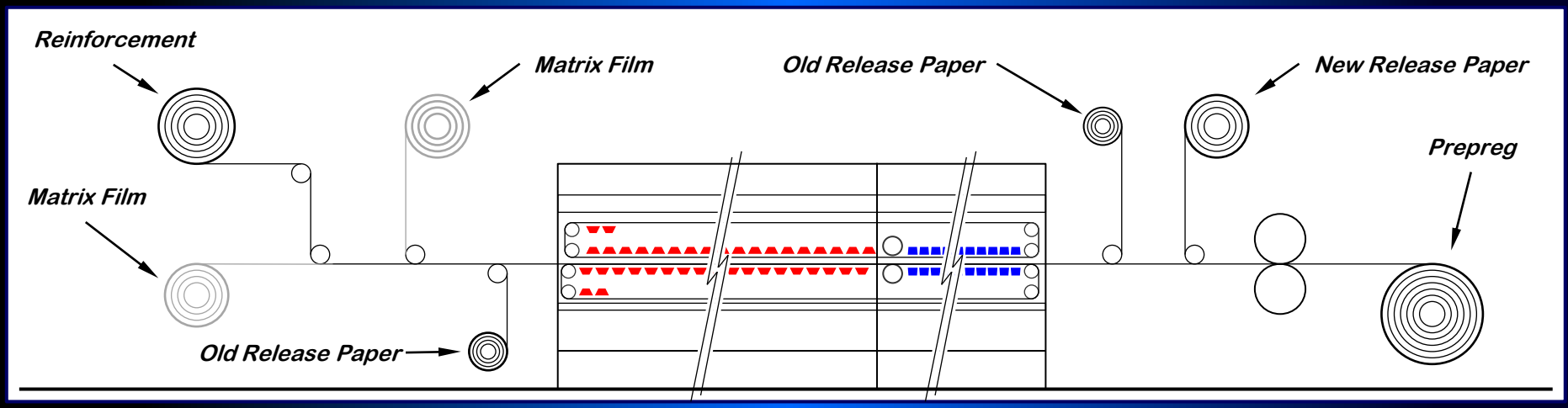
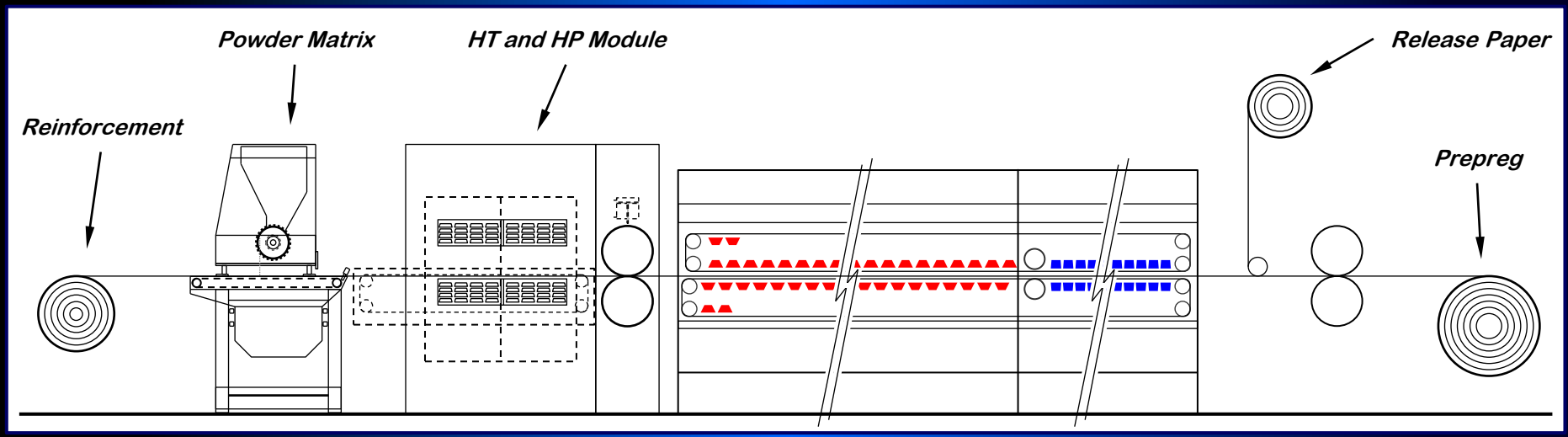


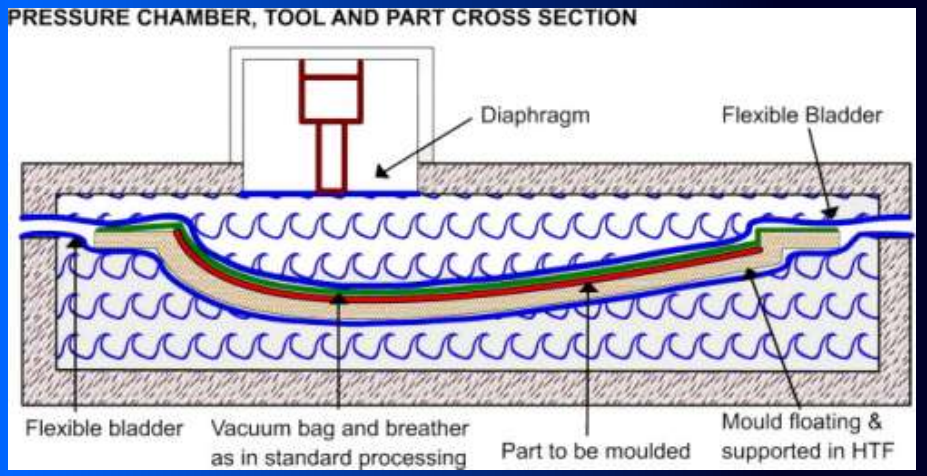


Technology – Process

Curing Processes – Autoclaves

Fuji Heavy Industries - Nagoya, Japan) 7m by 7m autoclave required to cure the centre wing box capable of 139 psi/9.6 bar pressure and temperatures up to 400° F/204° C during the eight-to nine-hour cure cycle.

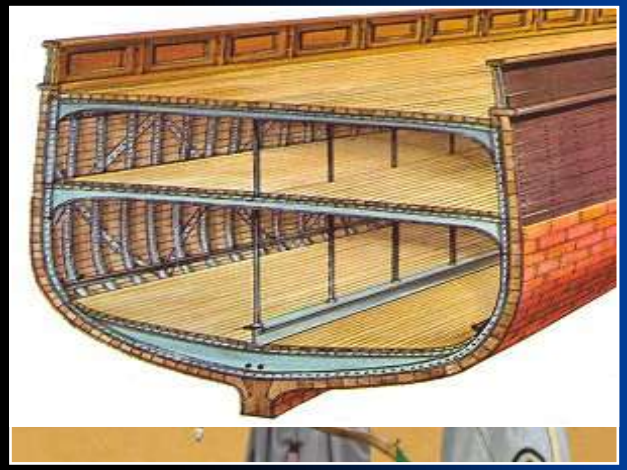
Curing Processes - OOA



The Quick Step Curing Chamber
www.quickstep.com.au - Australia

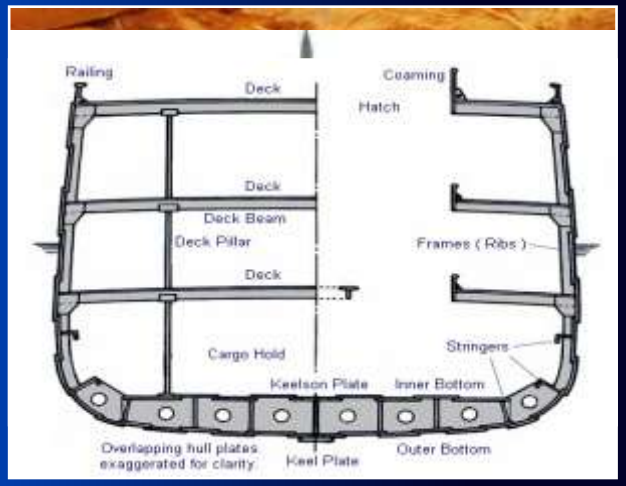
- ✓ Rapidly applying heat to the laminate, placed between a rigid or semi rigid mould
- ✓ Mould and laminate separated from the circulation HTF by a flexible membrane
- ✓ Use of balanced pressure and vacuum on the laminate to cure the part
- ✓ Economical construction due to low pressure in both chambers (up to 0.8 bar)

Where Reliant Equipment is Used - Composites



Genghis Khan

Bow and Arrow



History – Composites

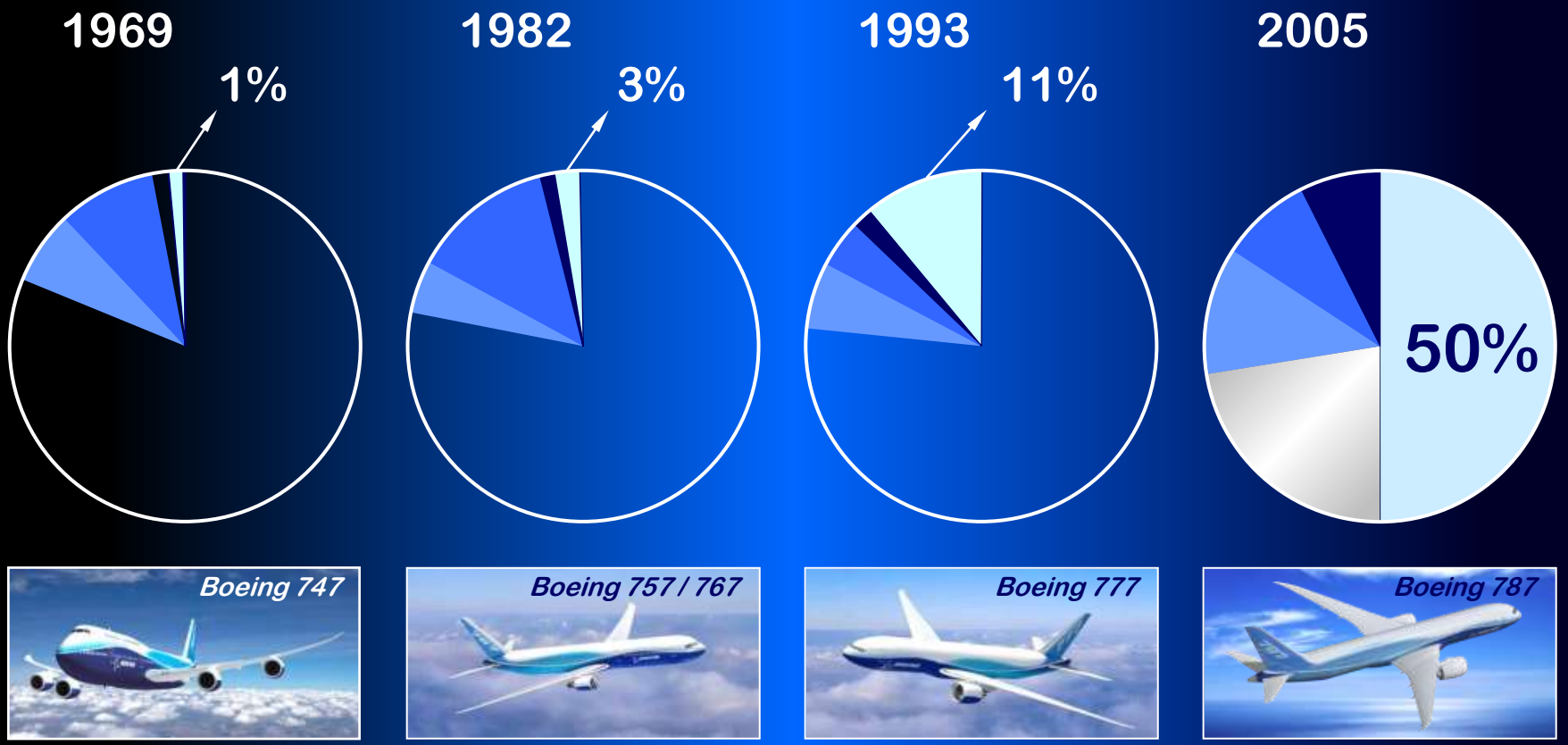
Aerospace Industry Over the Years

Composite materials maximise weight reduction – as they typically are 20 per cent lighter than aluminium – and are known to be more reliable than other traditional metallic materials, leading to reduced aircraft maintenance costs, and a lower number of inspections during service. Additional benefits of composite technologies include added strength and superior durability for a longer lifespan.

Aerospace Industry Over the Years

Aerospace Industry Over the Years

Miscellaneous | Steel | Titanium | Aluminium | Composites



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Aerospace Industry Over the Years

Aerospace Industry Over the Years

Carbon Laminate | Carbon Sandwich | Other Composites | Aluminium | Titanium

50% Composites - About 55 tons per aircraft

1969 = 1%

1982 = 3%

1993 = 11%

2005 = 50%

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Aerospace Industry Over the Years

Aerospace Industry - Seating

No more sewing stitches

Aerospace Industry

Advantages

- ✓ Weight Saving
- ✓ Biological
- ✓ Aesthetic
- ✓ Efficiency

[illegible]

[illegible] process.

High Performance Insulation

Combination of fibres such as glass, aramids / Kevlar ®, AES, RCF and others, provides the most effective insulation at temperatures ranging from MINUS 190° C to 1600° C.

Examples of fibres and level of protection:

- ✓ Glass = 500° C
- ✓ Mineral Fibre = 850° C
- ✓ AES fibre = 1100 - 1300° C
- ✓ RCF fibre = 1300 – 1400° C
- ✓ Alumina fibre = 1550° C

Insulation

High Performance Nonwoven

Construction

- Spunlacing
- Needlepunch
- Staple
- Hydroentangling
- V-Lap (Horizontal)
- Spacer or 3D

Fibres

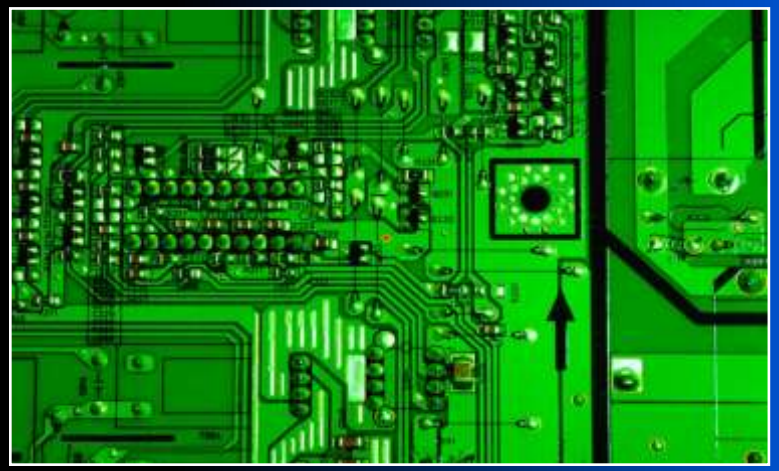
- Aramids / Kevlar ®
- Glass
- Combinations with:
- Carbon Fibre
- Metallic Coated Fibres
- Nanofibre

Fillers

- Gels, waxes, solids
- Minerals
- AES - Alkaline Earth Silicate Wool
- RCF - Refractory Ceramic Fibre
- Alumina Fibre

Insulation

High Performance Insulation



EMI Shielding

RFI Shielding

Static Dissipation

Radar Signature Management

Electrical & Thermal Conductivity

Dielectric

Corrosion & Chemical Resistance

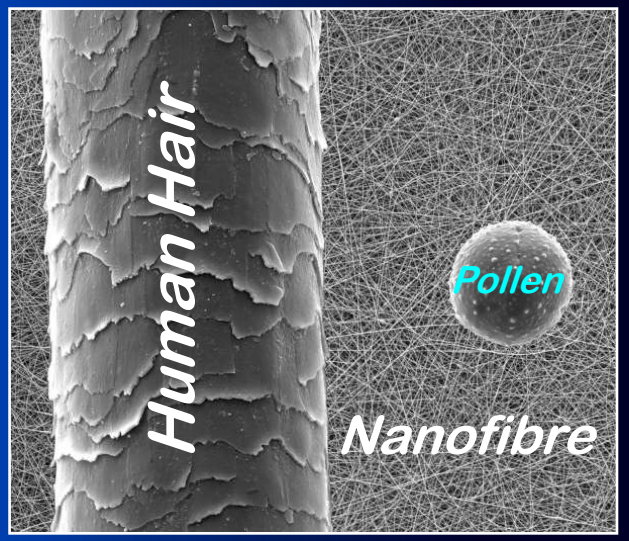
Abrasion Resistance

Insulation

High Performance Nanofibre

Properties of Nonwoven from Nanofibres:

- ✓ Low density of nanofibres
- ✓ Small pore size
- ✓ High porosity – good breathability
- ✓ Large specific surface area of nanofibres
- ✓ Possibility to incorporate different additives
- ✓ Excellent mechanical properties in proportion to weight
- ✓ The thermal insulating efficiency of fibre-based insulation is known to increase as the fibre size is reduced!



Insulation

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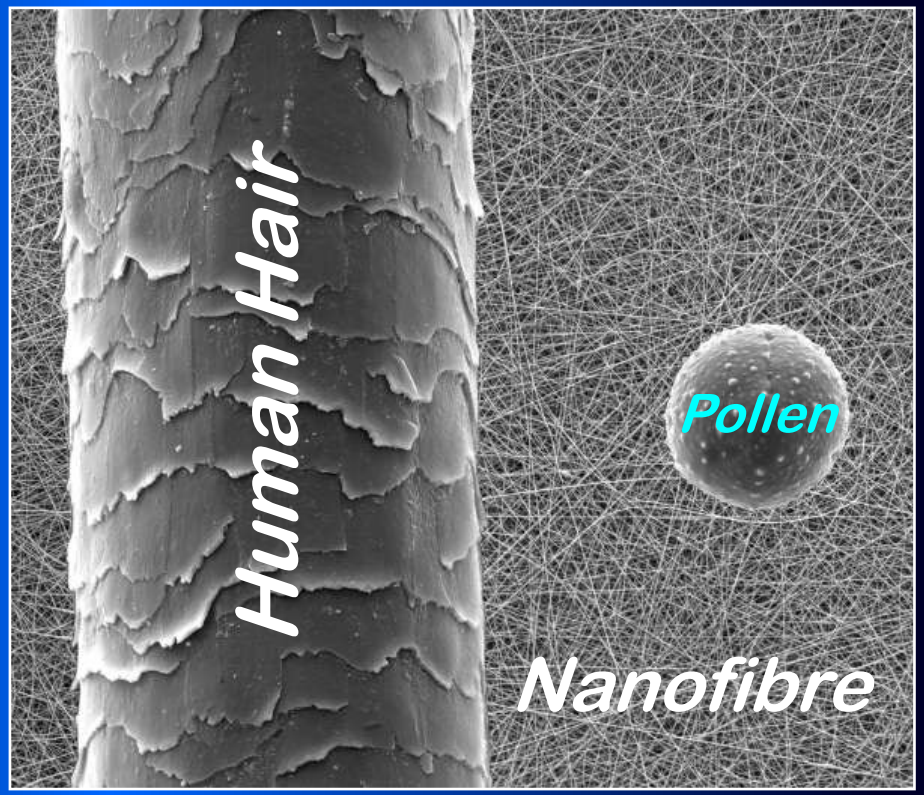
High Performance Nanofibre

Main Applications:

- ✓ Air filtration
- ✓ Depth air filtration
- ✓ HVAC reference filter
- ✓ Liquid filtration
- ✓ Performance apparel
- ✓ Acoustic
- ✓ Medicine
- ✓ Battery separators



Insulation

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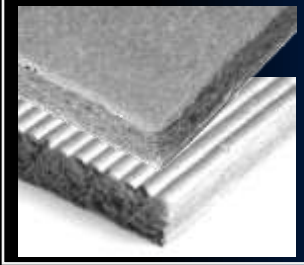
Core Materials - Honeycomb

Sandwich core materials

Homogeneous support of the skins

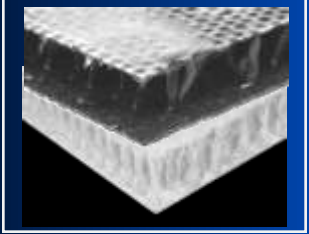
Foam cores



Structured (non-homogeneous) support of the skins

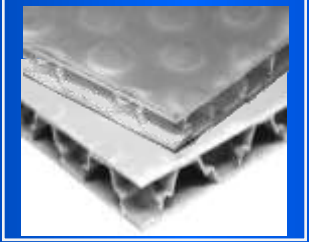
Punctual support

Textile/pin cores



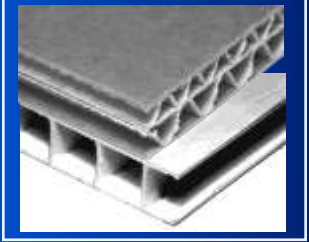
Regional support

Cup shaped cores



Unidirectional support

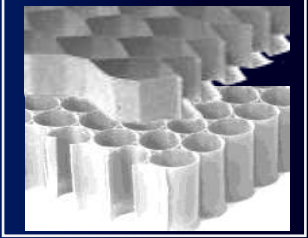
Corrugated cores



Best Material Properties

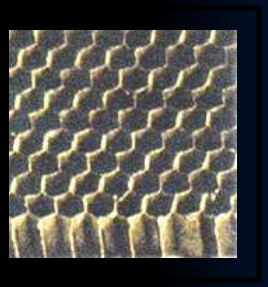
Bi-directional support

Honeycomb cores



Core Materials - Honeycomb

Aerospace Industry



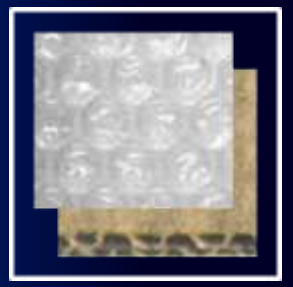
Internal structure and properties

New Honeycomb Cores

ThermeHex
Thermoplastic Honeycomb

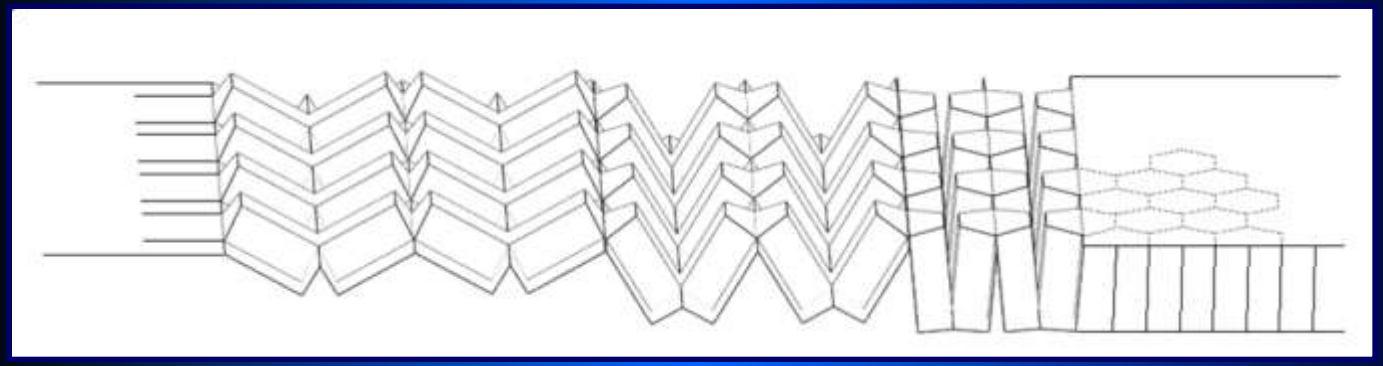
Packaging Industry

Production principle & technology



- ✓ Excellent mechanical properties
- ✓ Very low weight

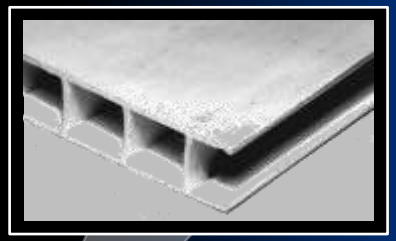
- ✓ Automated production
- ✓ Low production costs



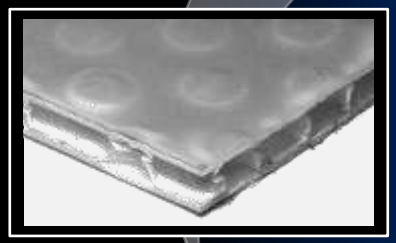
Automated in-line production leading to very low production costs
Direct lamination of skins allows in-line production of panels

Sandwich Materials - Honeycomb

PP-panel materials made in continuous automated production



PP-Twin sheet (fluted board)

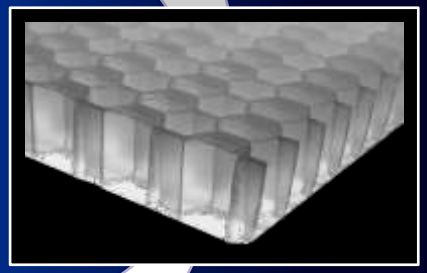


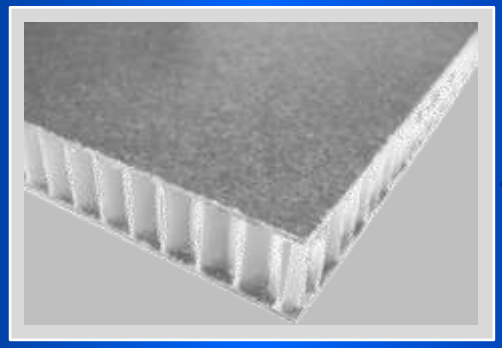
PP-cup-shaped board (bubble board)

Honeycombs with minimal use of material and best performance

Extruded PP-honeycombs

ThermHex honeycomb

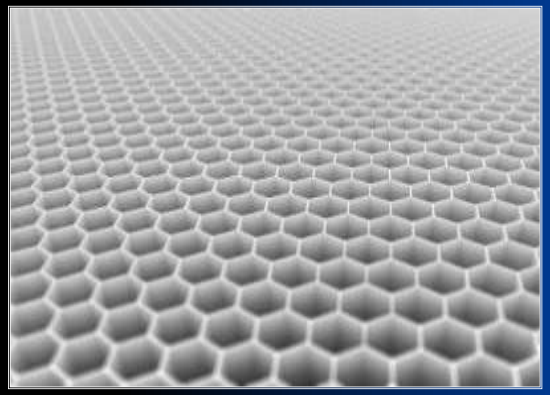




Continuously Produced Panels with Honeycomb

Compression and Lamination Combined

Powerbond HPC



Sandwich Core Materials – Technology

Compression and Lamination Combined

Raw Material
Up to 150 mm thick

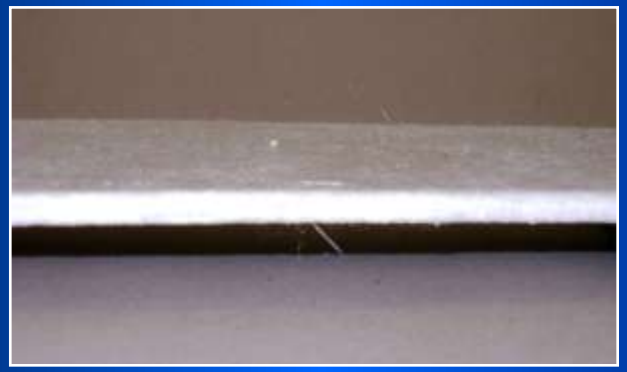
Raw Material
Compressed From 1 to 4 mm

POWERBOND HPC

Laminated
Isolation Panel

Compression and Lamination Combined

Spectra® fabric, also known as Ultra High Molecular Weight Polyethylene, is super lightweight, floats naturally on water, has high resistance to chemicals, water, and UV light. It offers a very low coefficient of friction, low dielectric constant, high tenacity, and excellent cut and abrasion resistance



UHMWPE is 15 times stronger than steel, and 40 percent lighter than aramid fibres on a per weight basis.

Automotive Sector

- ✓ ABC Pillar Covers
- ✓ Car Seat Covers
- ✓ Acoustic Products
- ✓ Carpet Compounds

Automotive Sector

Automotive Sector – High Pressure Compression

- ✓ Isolation Products
- ✓ Carpet Compounds
- ✓ Headliners Assembly

Parts

Parts

of Composites for Interior and

Renewable Resources – Bio Composites

Sisal

Flax

Abaca

Hemp

Coconut

Cashew

Sugar Cane

Corn

Cork

Soya

Renewable Resources – Bio Composites

Renewable Resources – Bio Composites

The race car is made from:

- ✓ Woven flax & carrot pulp
- ✓ Recycled carbon fibre
- ✓ Recycled resin
- ✓ It uses biodiesel
- ✓ Lubricated with plant oils

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Renewable Resources – Bio Composites

Compressed Recycled Fibres

Compressed Recycled Fibres

Aramids / Kevlar ® Fibre

Aramids / Kevlar ® Fibre

Defence Industry

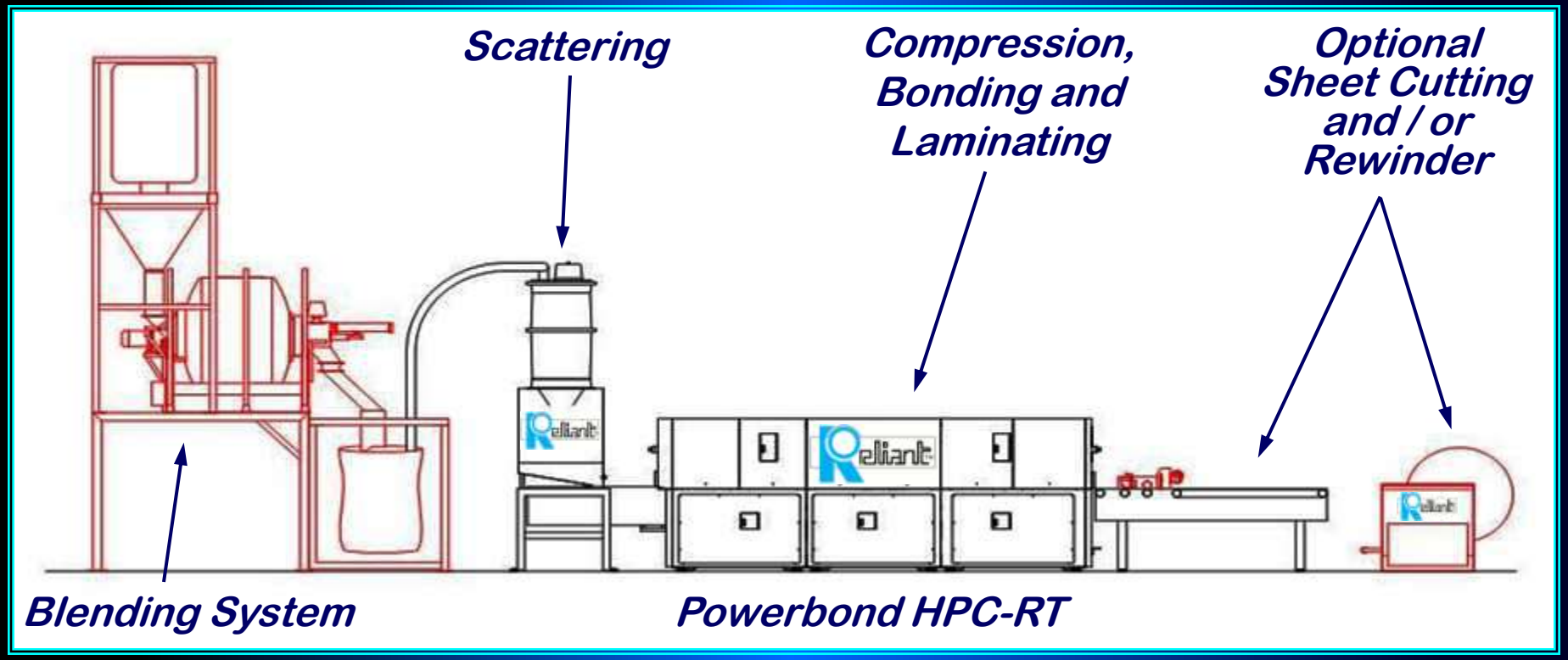
Defence Industry

Recycled Tyres Matt

The target – Economical, highly profitable and environmentally friendly system to produce rubber and fibre sheets or continuous rolls from recycled car and truck tyres.

Recycled Tyres Matt

Rubber & Fleece Bonding System



Recycled Tyres Matt

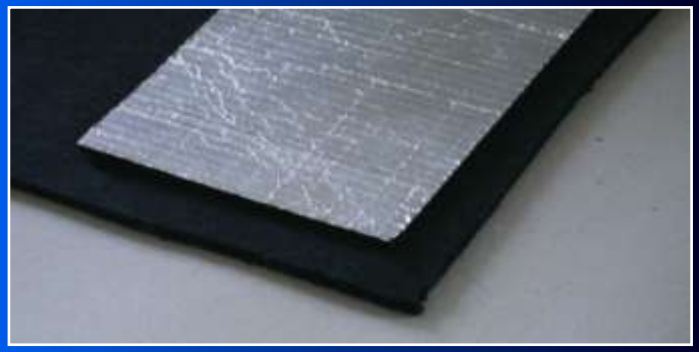
Recycled Tyres Matt – Advantages

- ✓ Highly flexible
- ✓ Noise dampening
- ✓ Shock absorbing
- ✓ Insulating
- ✓ Protecting
- ✓ Sealing

Recycled Tyres Matt – Uses

Some applications for rubber and fleece matt

- ✓ Building
- ✓ Roofing
- ✓ Flooring
- ✓ Plumbing
- ✓ Civil engineering
- ✓ Public transportation
- ✓ Automotive
- ✓ Packaging
- ✓ Sports



Office Furniture

- ✓ Wall and divider panelling
- ✓ Chairs
- ✓ Carpeting
- ✓ Window and divider blinds

Where Reliant Machines Is Used

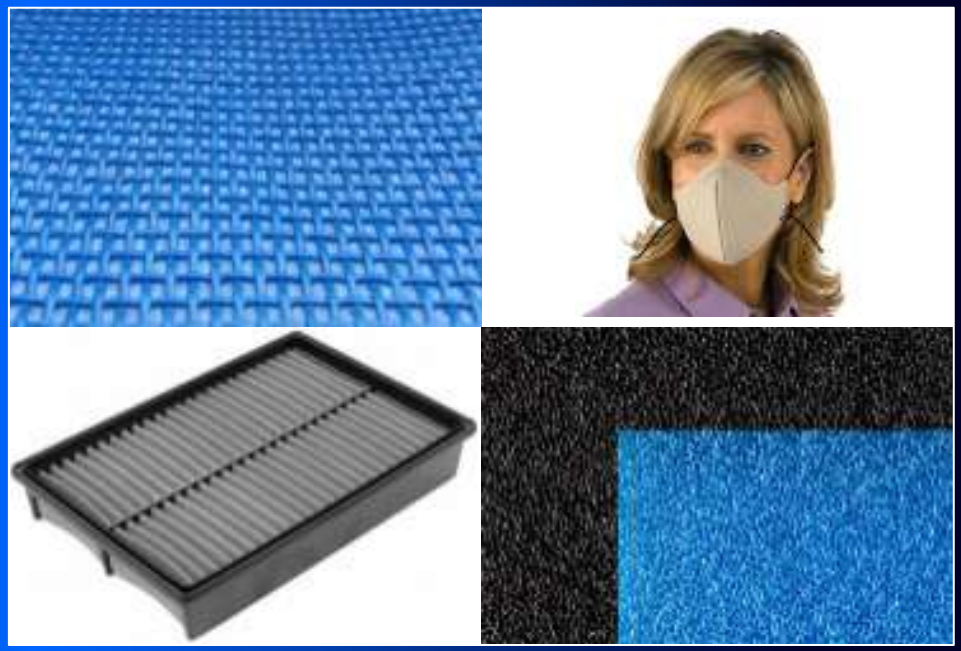
Household

- ✓ Curtains and blinds
- ✓ Underlay backing for carpets
- ✓ Tuft lock for carpets
- ✓ Floor tiles
- ✓ Waterbeds and beds upholstery
- ✓ Mattress Ticking
- ✓ Cleaning cloth
- ✓ Table mats
- ✓ Luggage linings and dividers

Recycled Tyres Matt

Filtration

- ✓ Compounds for air filtration
- ✓ Compounds for liquid filtration
- ✓ NBC defence materials
- ✓ Hydraulic, fuel, lubrication and air systems
- ✓ Medical devices, filtration papers, purification, wicking and emanation
- ✓ Electronics and pharmaceutical



Where Reliant Machines Is Used

Technical Textiles

- ✓ *Reflective tape*
- ✓ *Lining fabrics*
- ✓ *Foams (PU, PE's, Polystyrene, etc.*
- ✓ *Leather*
- ✓ *Padding*
- ✓ *PP woven and nonwovens*
- ✓ *Knitted fabrics*
- ✓ *Lycra, nylon*
- ✓ *Breathable films and fabrics*

Where Reliant Machines Is Used

Medical

- ✓ Porous and non-porous plasters and bandages
- ✓ Breathable fabrics and elastics
- ✓ Foot padding, supports and mouldings
- ✓ Filters
- ✓ Hydrophilic and hydrophobic laminates
- ✓ Breathable films and membranes
- ✓ Anti-microbial dressings

Where Reliant Machines Is Used

Leisure Industry

- ✓ Diving suits and board bags
- ✓ Breathable sportswear
- ✓ Body and head protectors
- ✓ Floor Mats

Where Reliant Machines Is Used

Lingerie

- ✓ Reliant Sure-Bra Laminating system for moulded bra cups
- ✓ Stretch fabrics and films for all types of lingerie applications
- ✓ Laminating and folding systems for straps
- ✓ Sew free processing for bras and other garments using powder film and web adhesive system

Where Reliant Machines Is Used

Shoe Industry

- ✓ Laminated uppers and soles for sport shoes
- ✓ Linings, insoles and supports
- ✓ Calibration of fibres
- ✓ Leather and Synthetic materials
- ✓ Production of all types of footwear is produced on Reliant laminators. From leather uppers and heal supports to rubber insoles and soft constructions with antibacterial chemicals.

Where Reliant Machines Is Used

Real Vision in
Laminating Technology

Thank you!!!

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