



Forward Thinking Machinery for Lamination



Dry heat Lamination – Laminated Materials for the Aerospace Industry

*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*

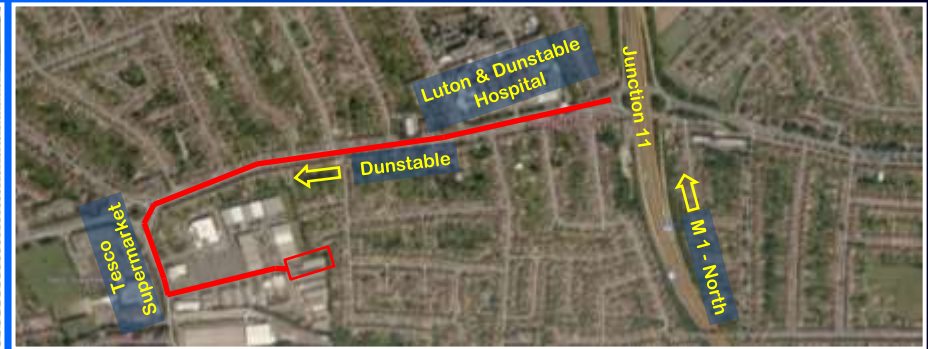
Company Profile





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



Company Profile





Where Reliant Equipment is Used



Automotive



Defence



Household

Prepregs



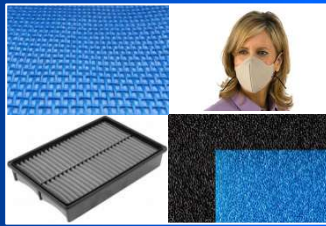
Medical



Leisure Industry



Composites

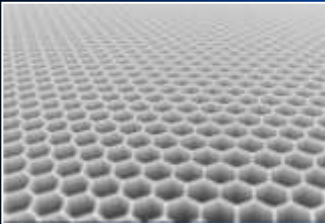


Filtration



Lingerie

Honeycomb



Nonwoven



Footwear



Aerospace



Technical Textiles

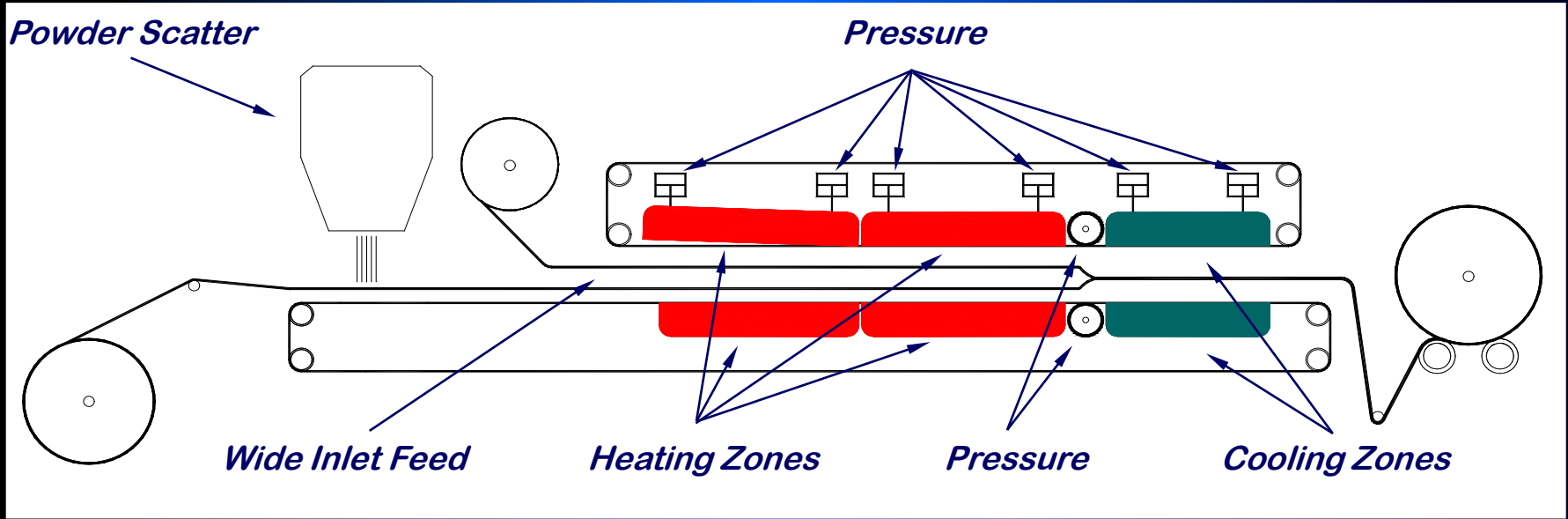


Office Furniture



Flexible Laminating Process

Powerbond HPC – High Pressure Compression Production Line



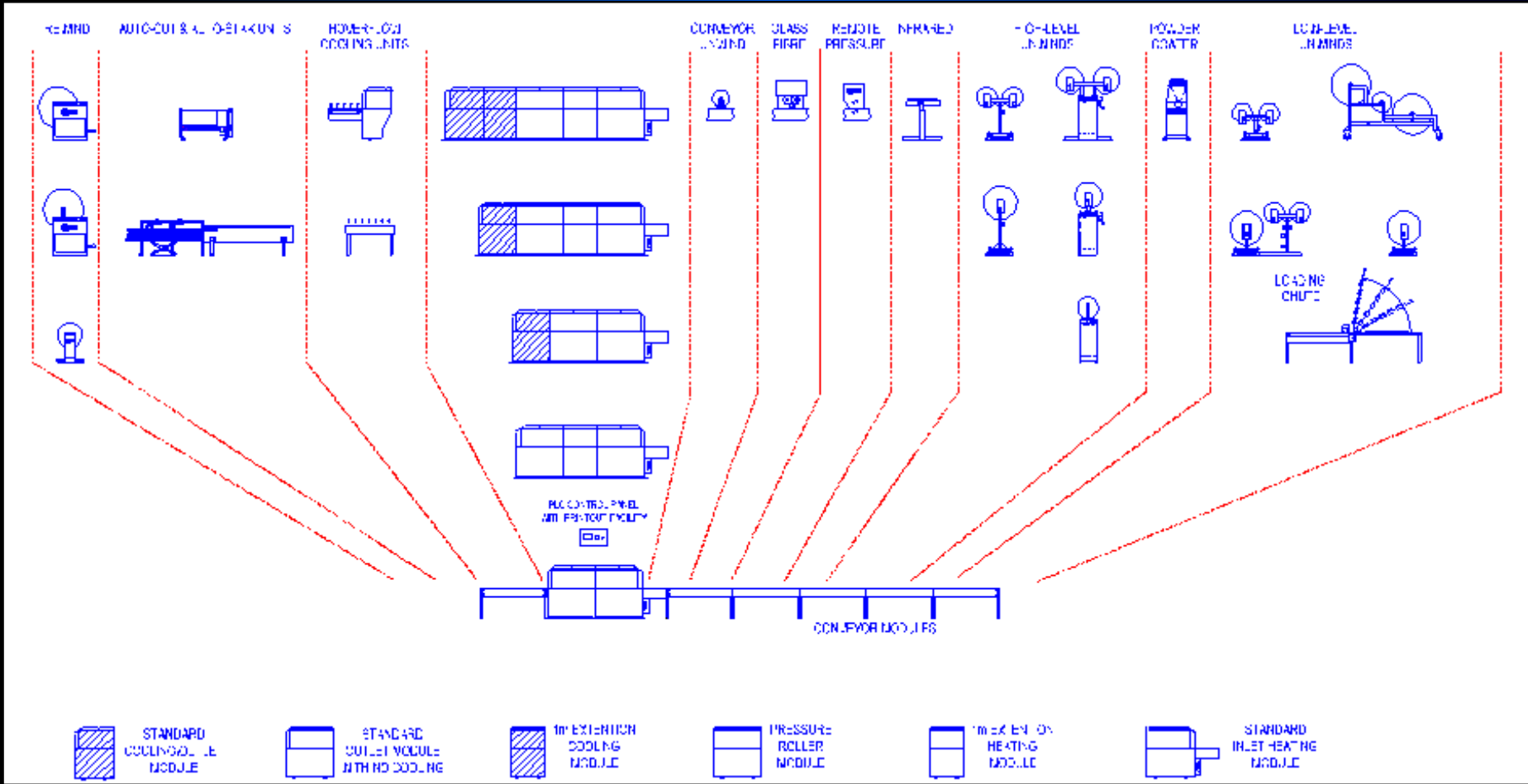
- ✓ Thick materials of low density, low modulus can be laminated and digested that are heating to be controlled independently
- ✓ Pressure can be applied during the heating and cooling process if required
- ✓ Thin and thick materials can be processed
- ✓ Up to one megapascal of pressure through the process completely "stress-free"
- ✓ Reel to reel and cut piece processing can be handled
- ✓ Multiple zones of heating and cooling can be individually pressurized
- ✓ Powder coating, films, webs, foams 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

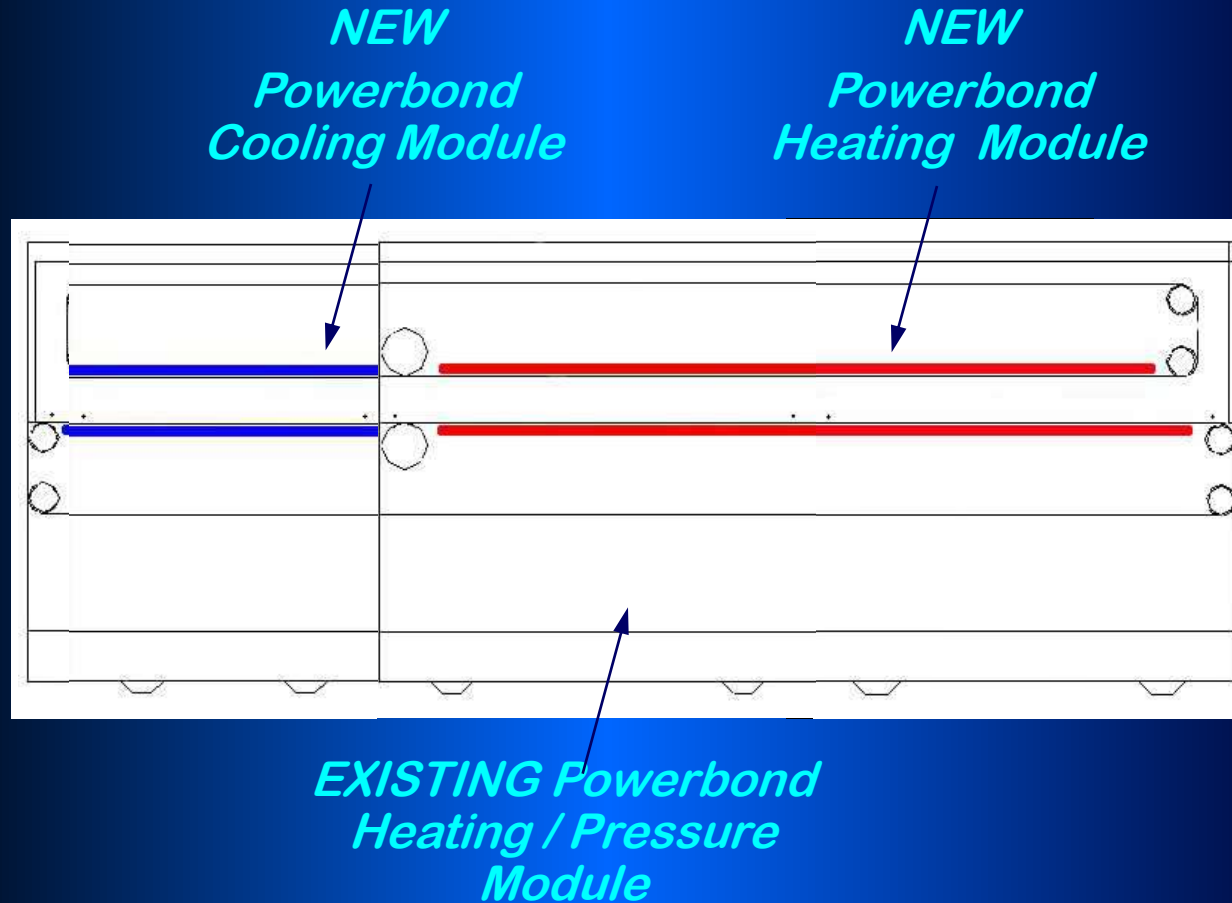


Company Profile





Reliant Unique Modular Concept



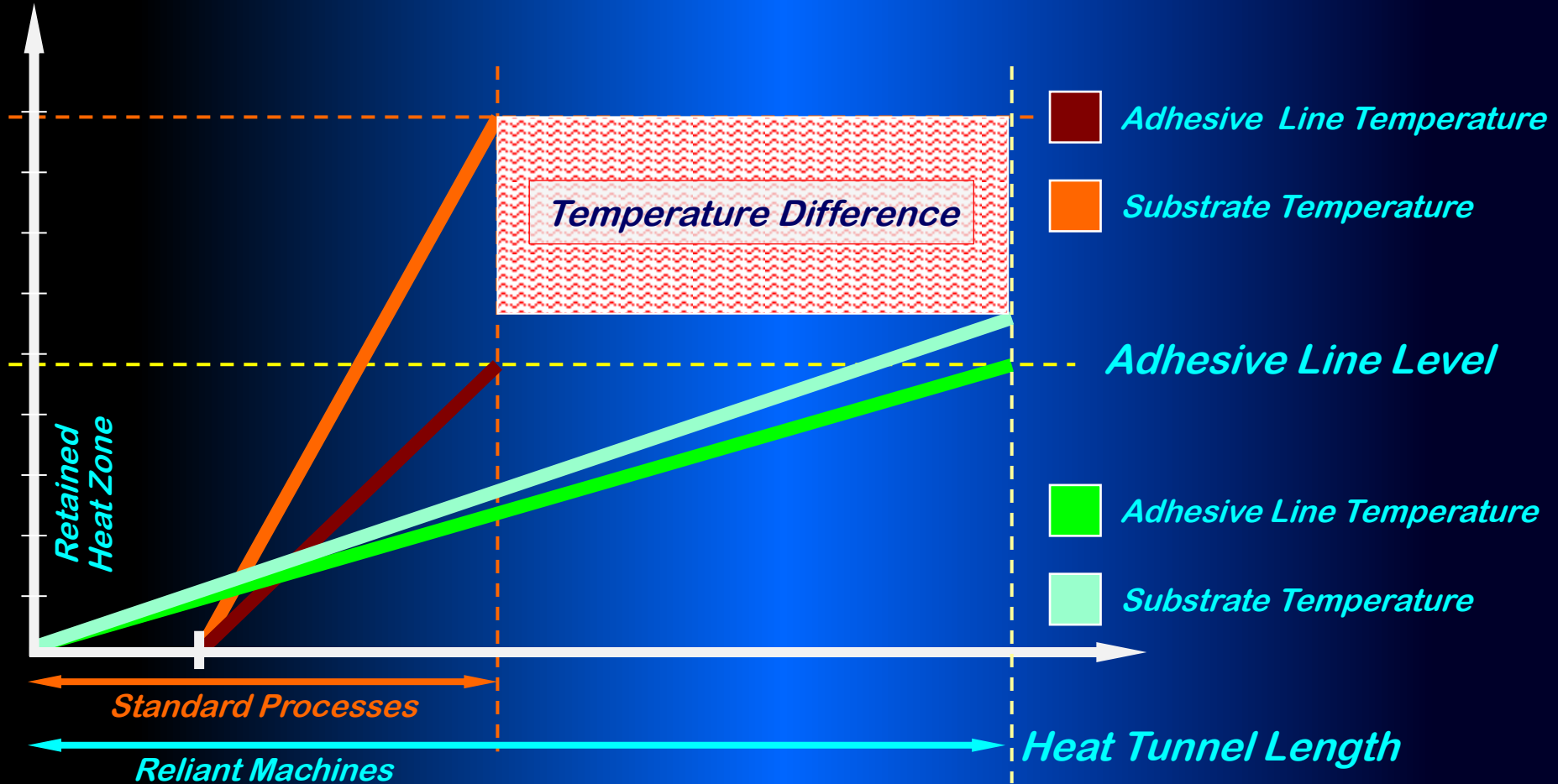
Company Profile





Advantages of Reliant Long Heat Tunnels

Temperature

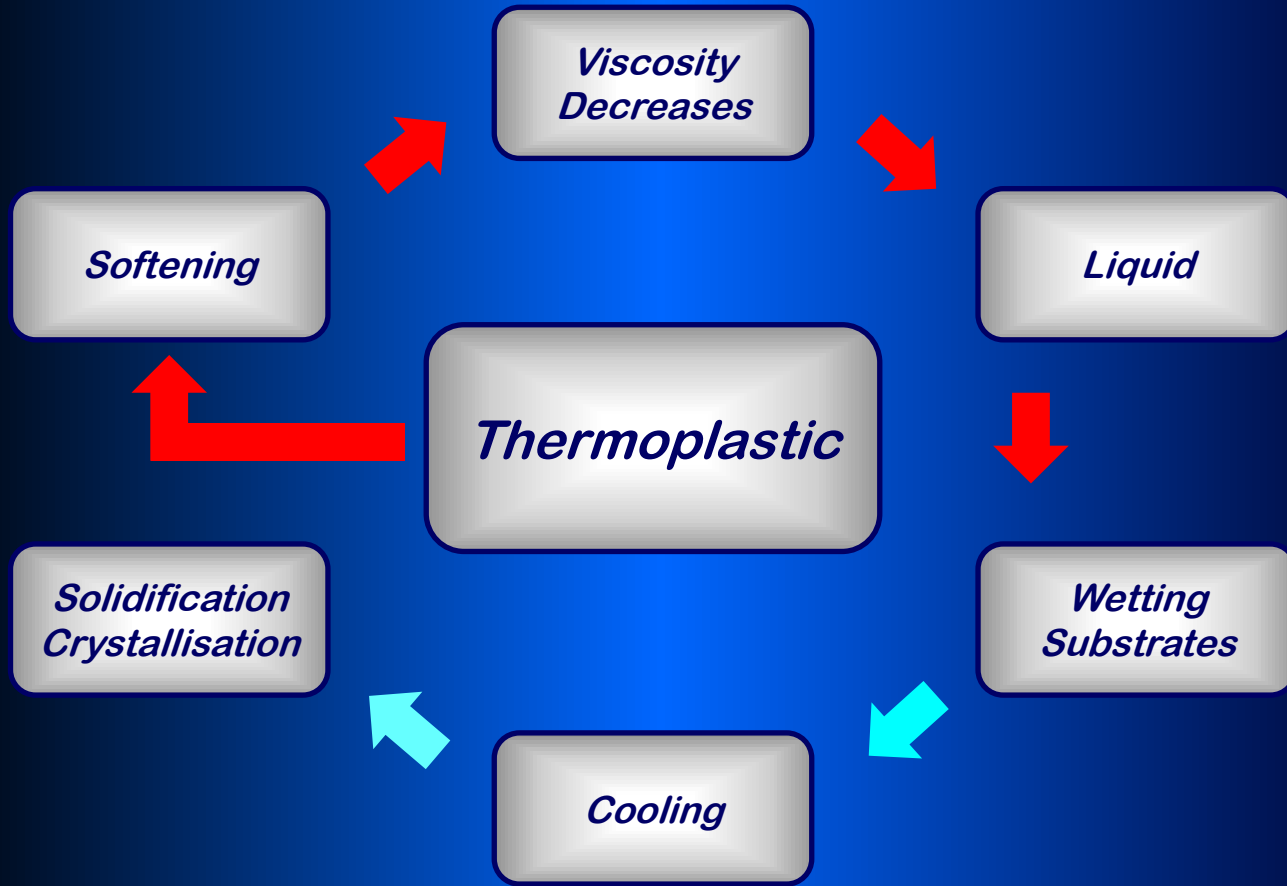


Company Profile





Laminating Technologies - Thermofilms



Technology – Process

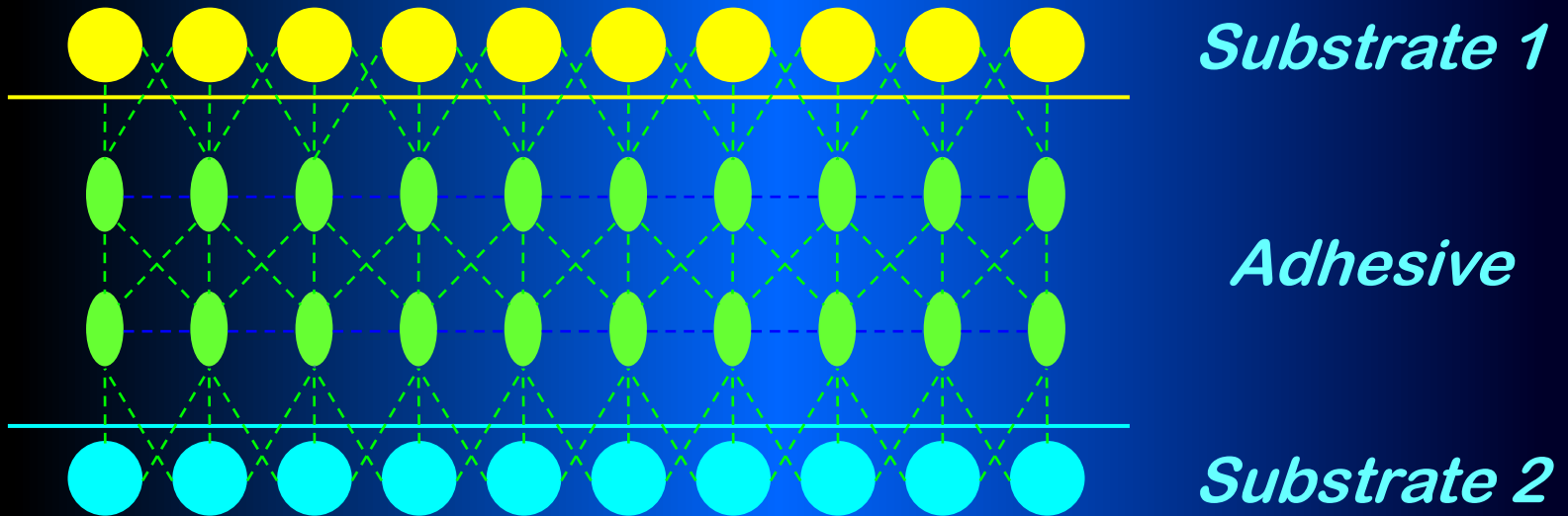




Laminating Technologies - Thermofilms

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 ...



Technology – Process

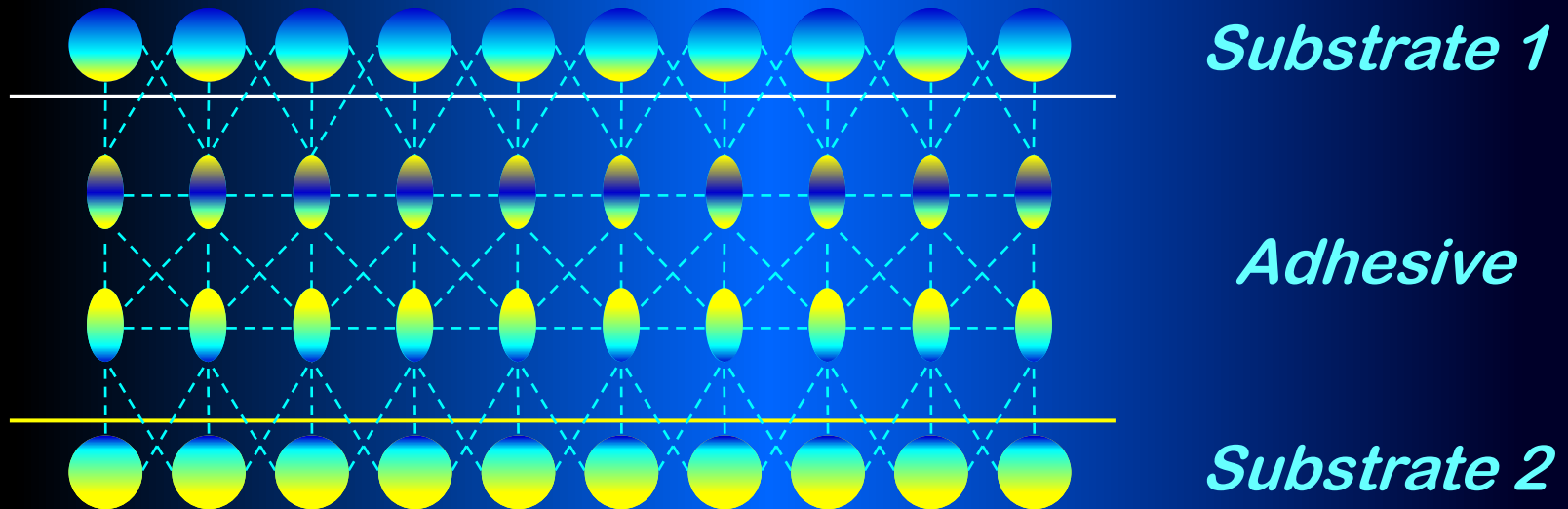




Laminating Technologies - Thermosettings

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.

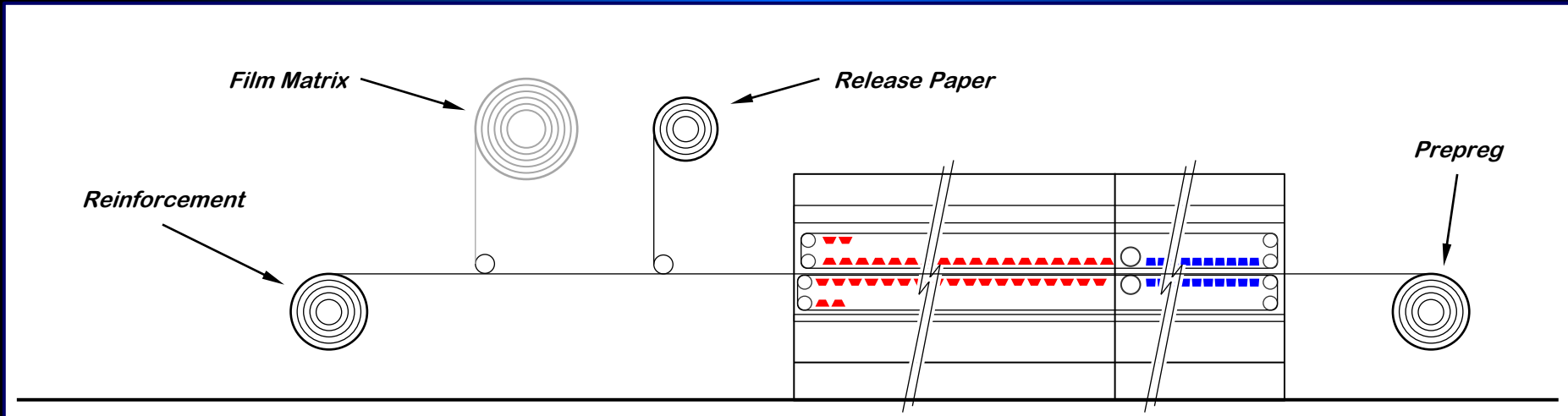
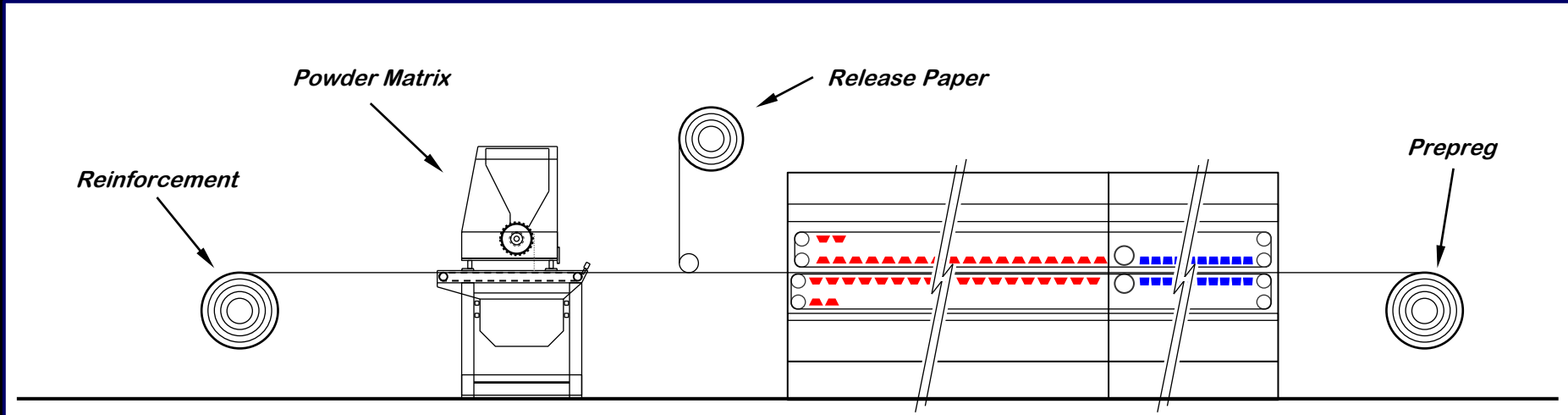


Technology – Process





Prepregs Lines

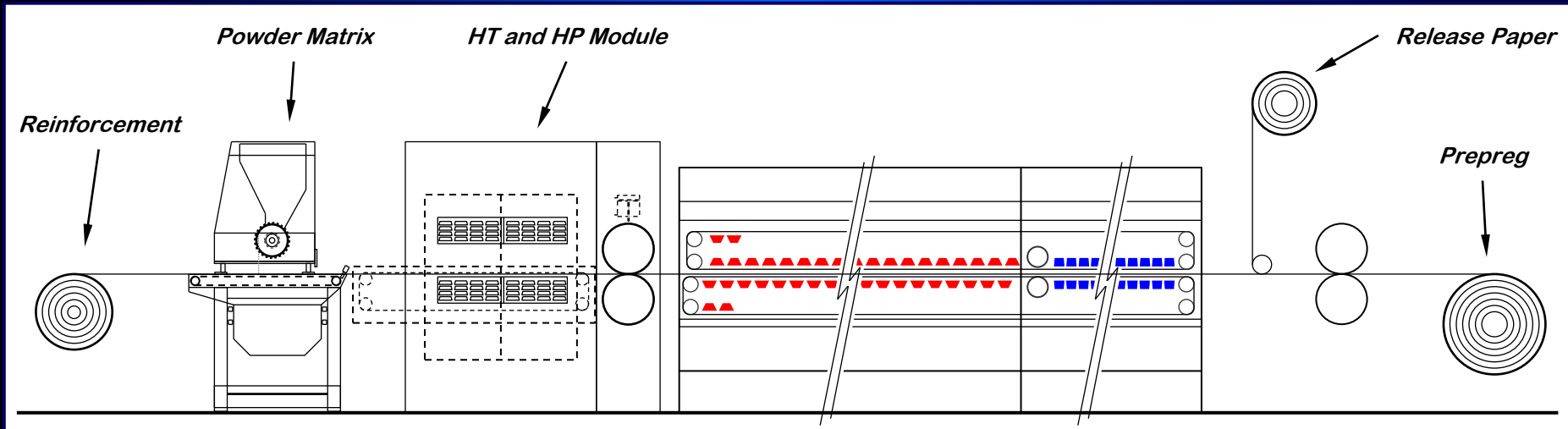
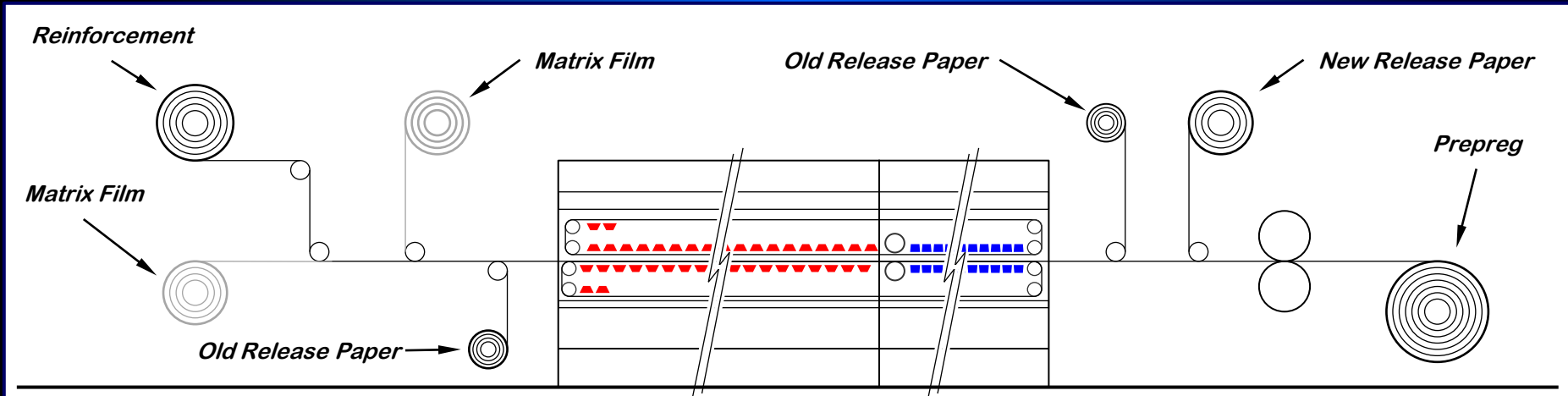


Technology – Process





Prepregs Lines



Technology – Process





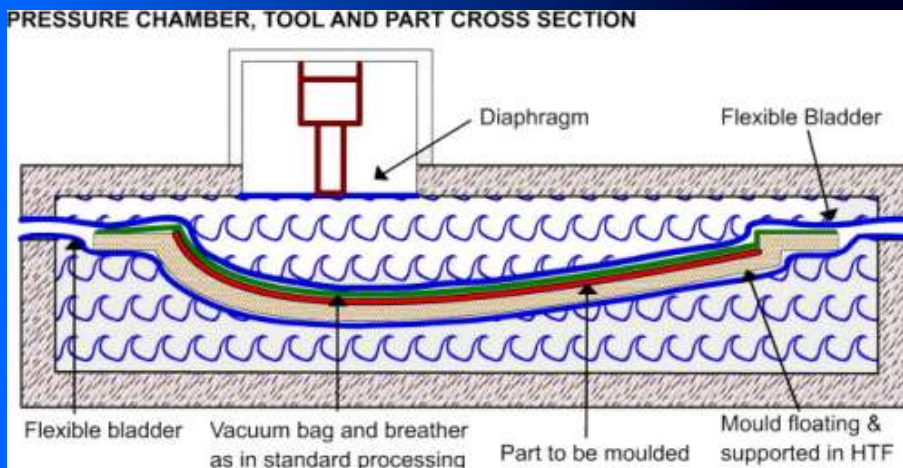
Curing Processes – Autoclaves



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.

Technology – Process





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)*

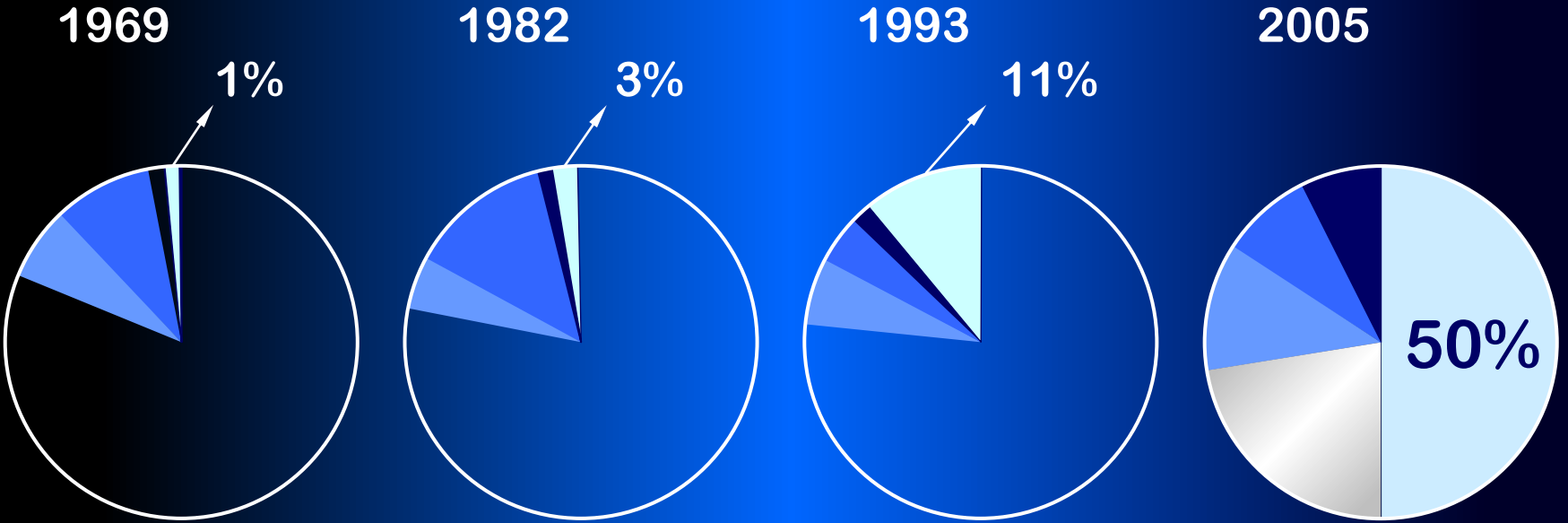
Technology – Process



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



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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



Boeing 747

1969 = 1%



Boeing 757 / 767

1982 = 3%



Boeing 777

1993 = 11%



Boeing 787

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



Efficiency Advantages

By using our advanced systems, we can help you reduce weight, improve safety, and increase efficiency in your aircraft seating process. Our seats are designed to be lightweight, comfortable, and easy to maintain. We can help you reduce weight, improve safety, and increase efficiency in your aircraft seating 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

V-Lap (Horizontal)

Spacer or 3D

Fibres

Aramids / Kevlar ®

Glass

Combinations with:

Carbon Fibre

Metallic Coated Fibres

Nanofibre

Fillers

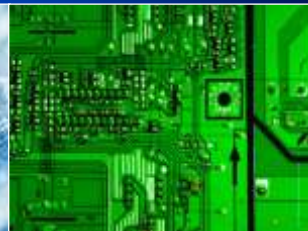
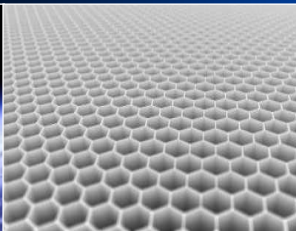
Gels, waxes, solids

Minerals

*AES - Alkaline Earth
Silicate Wool*

*RCF - Refractory
Ceramic Fibre*

Alumina Fibre

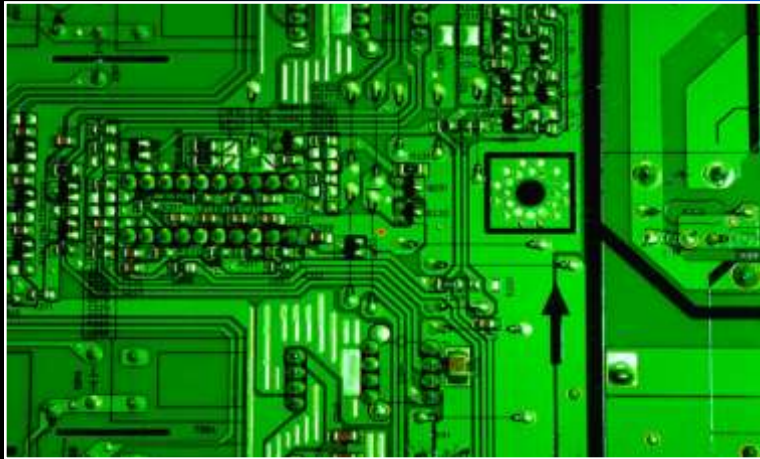


Insulation





High Performance Insulation



EMI Shielding

RFI Shielding

Static Dissipation

Radar Signature Management

Electrical & Thermal Conductivity

Dielectric

Corrosion & Chemical Resistance

Abrasion Resistance

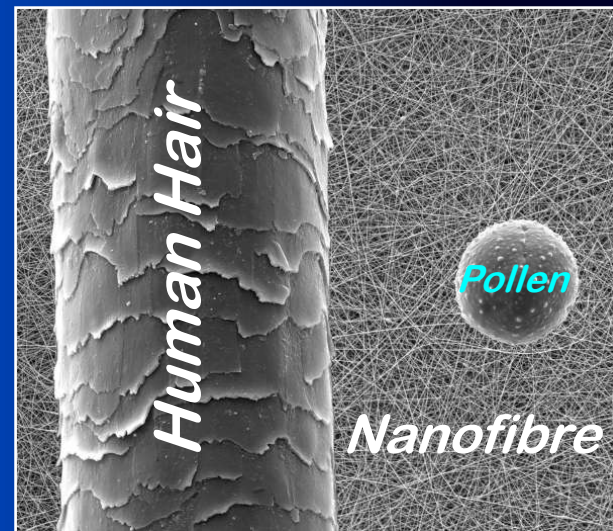


Insulation



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!*

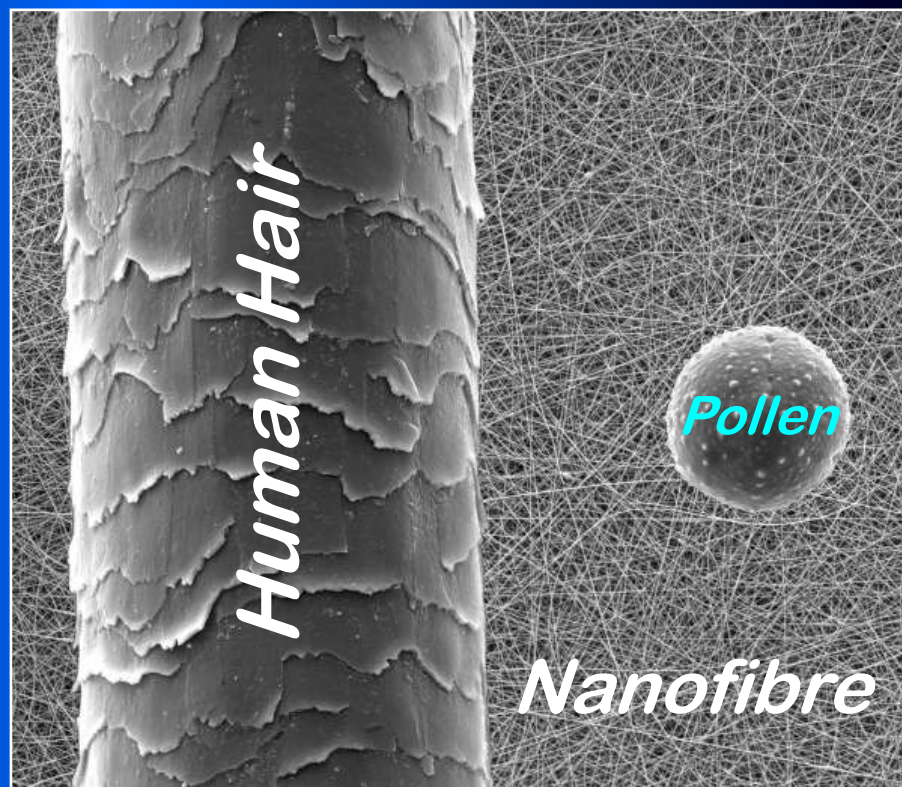




High Performance Nanofibre

Main Applications:

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

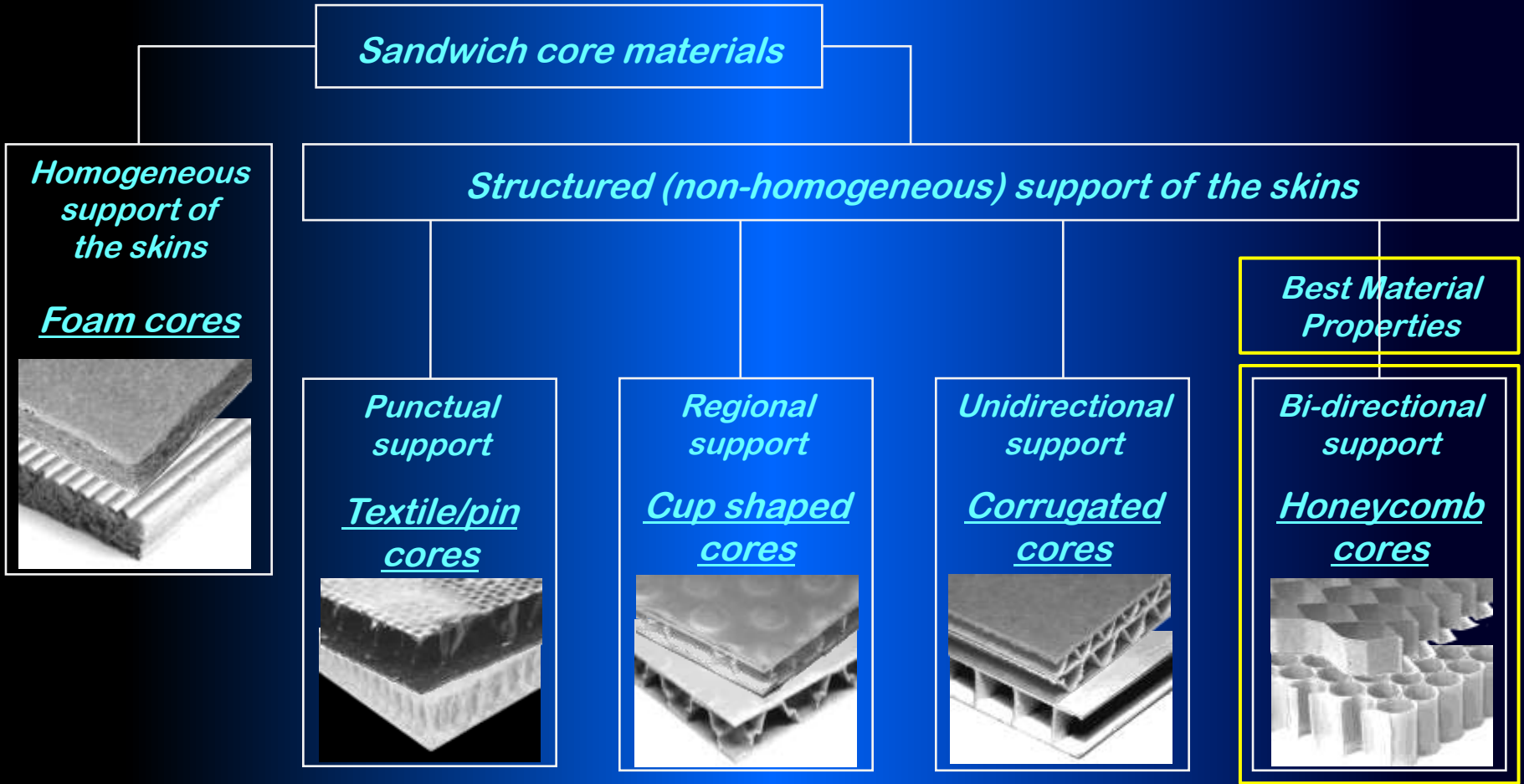


Insulation





Core Materials - Honeycomb



Sandwich Core Materials



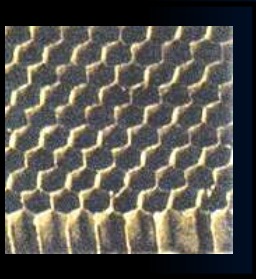


Core Materials - Honeycomb

Aerospace Industry

New Honeycomb Cores

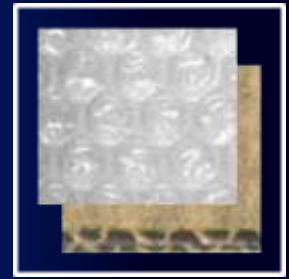
Packaging Industry



Internal structure and properties

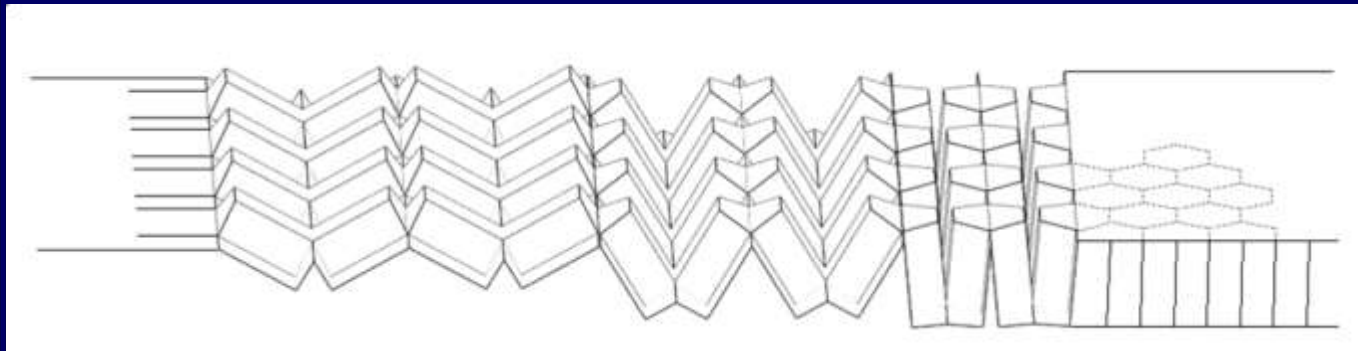
ThermeHex Thermoplastic Honeycomb

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

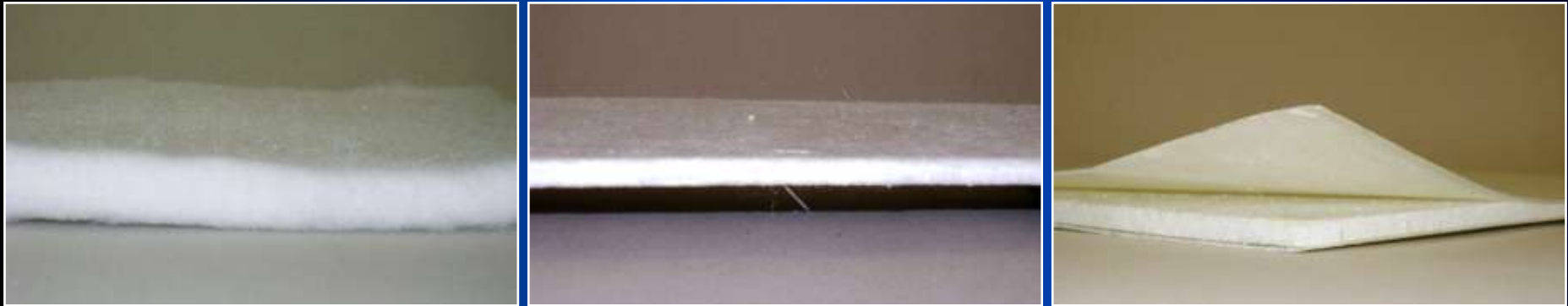
Sandwich Core Materials – Technology





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.

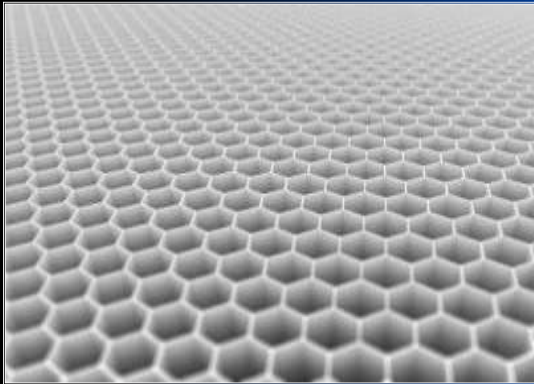
Sandwich Core Materials – Technology





Compression and Lamination Combined

Powerbond HPC



Sandwich Core Materials – Technology





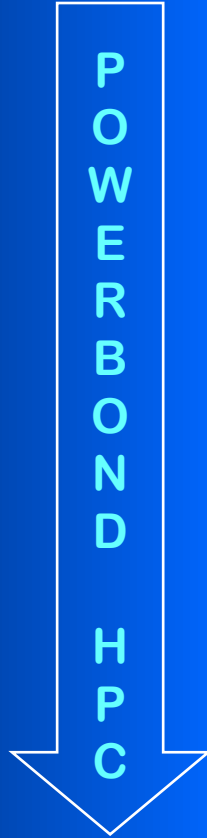
Compression and Lamination Combined



*Raw Material
Up to 150 mm thick*



*Raw Material
Compressed From 1 to 4 mm*



*Laminated
Isolation Panel*

Sandwich Core Materials – Technology





Sisal



Flax



Abaca



Hemp



Coconut



Cashew



Sugar Cane



Corn



Cork



Soya



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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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

Use of Composites for Interior and

Automotive Sector





Compressed Recycled Fibres



Compressed Recycled Fibres





Aramids / Kevlar® Fibre



Artificially Manufactured

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.

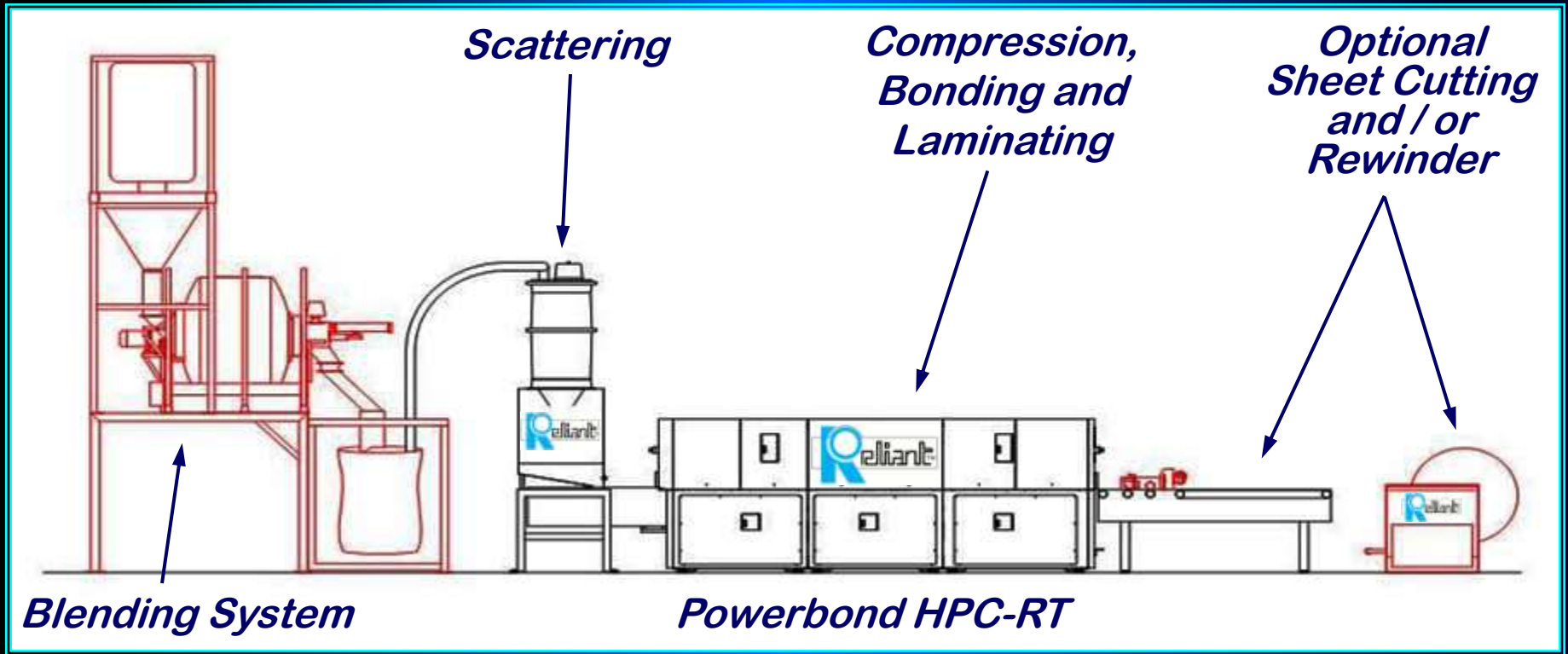


Recycled Tyres Matt





Rubber & Fleece Bonding System



Recycled Tyres Matt





Recycled Tyres Matt – Advantages

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



Recycled Tyres Matt





Recycled Tyres Matt – Uses

Some applications for rubber and fleece matt

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



Recycled Tyres Matt





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*



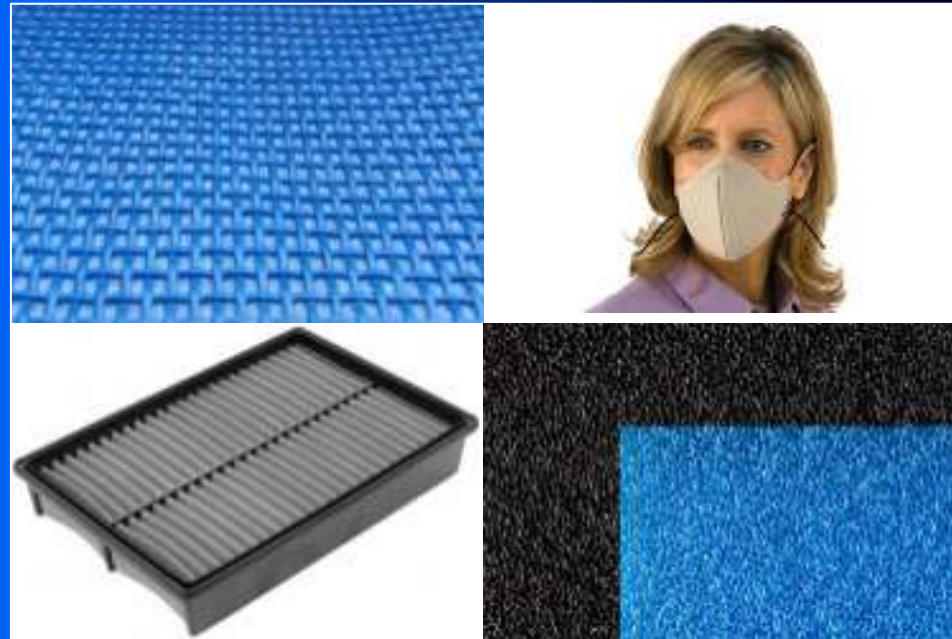
Recycled Tyres Matt





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 heel 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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