

3D Weaving and 3D Woven Structures

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Applications?



Applications

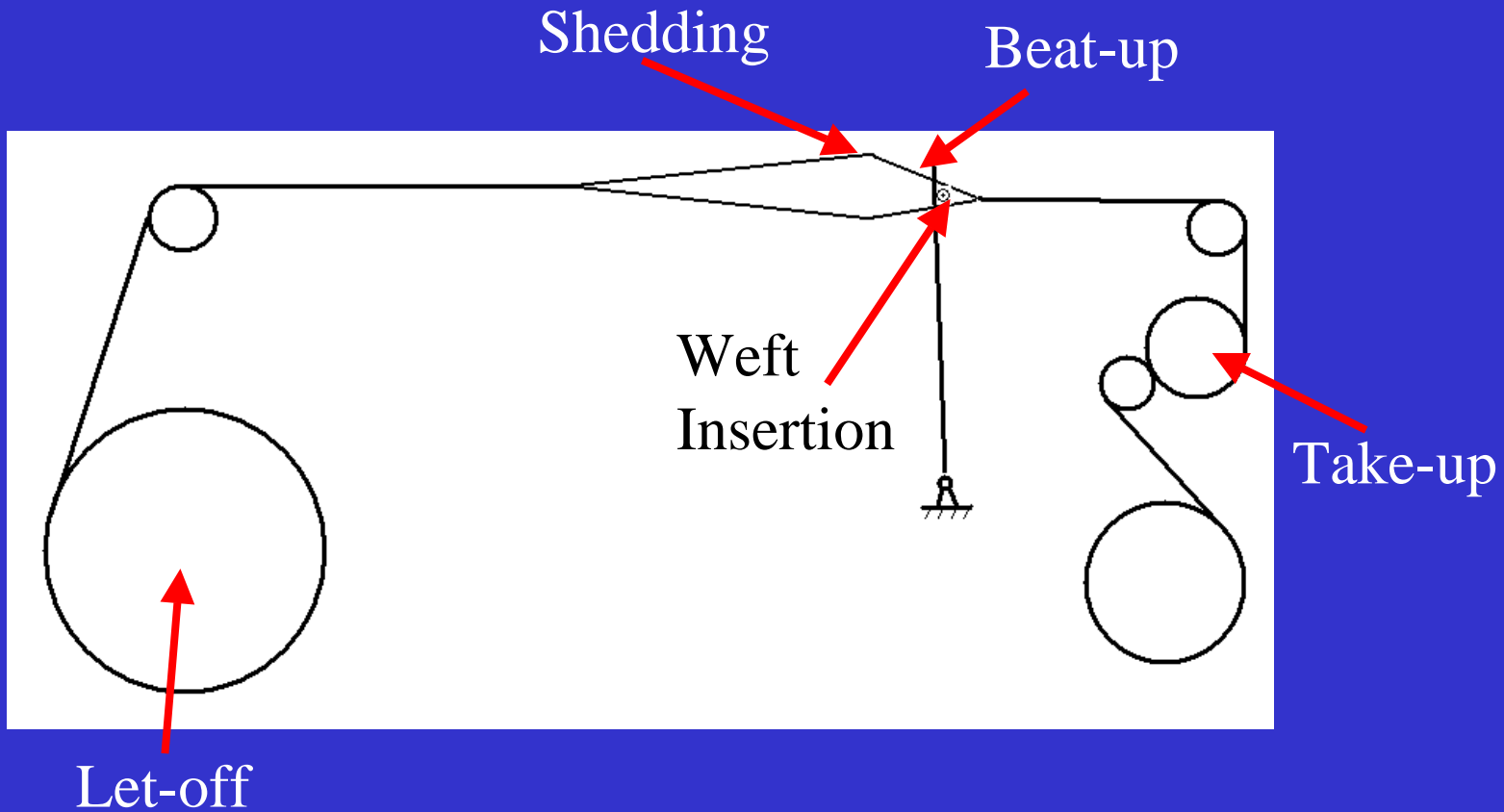
The main current applications of 3D woven fabrics are in composites made from textile preforms and in protective clothing.

Enterprising companies will find innovations for other markets.

Weaving Technology



The 5 Loom Motions

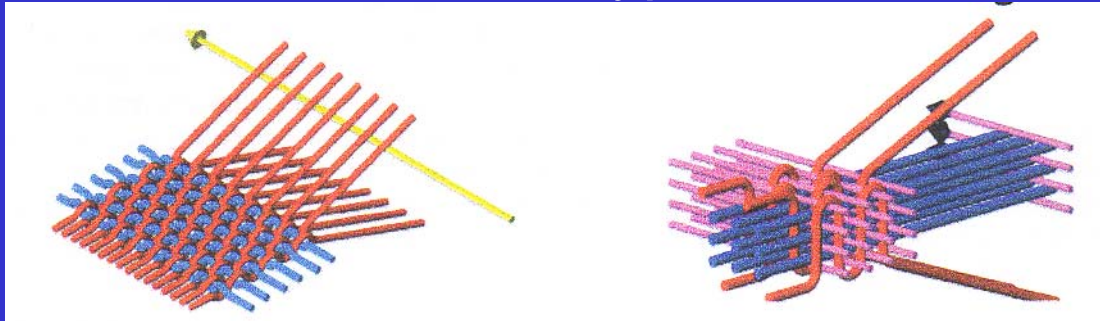


Loom Motions and Functions

Motion	Function
Shedding	Separate the warp sheet into upper and lower layers, known as a shed, in time for a new pick to be inserted into it to form fabric. The shed formation decides the fabric structure.
Weft insertion	Introduce a full length of new pick of the right choice into the shed. There are different methods for weft insertion.
Beat-up	Push the newly inserted pick into the fell (the meeting point of the fabric and the warp sheet) to form fabric. The movement of the reed carries this out.
Take-up	Draw away from fell the fabric formed at such a rate that the fabric will have the predetermined weft density. This is also to give space for the following pick to be woven into the fabric.
Let-off	Supply the correct amount of warp length from the weaver's beam into the weaving region. A constant warp tension level must be kept in order for the weaving process to continue.

What is 3D Weaving

- Definition 1
 - Making of fabrics with substantial thickness by layering
- Definition 2
 - Shedding and weft insertion horizontally and vertically
- Our view
 - Both are true, but different types



How 3D Fabrics Are Made

- Purpose-made 3D looms
 - Multi-layer warp ends, shedding in horizontal direction
 - Multi-layer warp ends, shedding in both horizontal and vertical directions
- Conventional looms
 - Solid, Hollow 3D
 - Flexible and economical

3D Potentials of Looms

- Shedding is very powerful
 - Dobby: controls tens of different warp ends through the use of heald frames
 - Jacquard: controls thousands of warp ends individually
- No limit on weft repeat
- Freedom in warp supply
 - Multi-beam
 - Creel
- Allows reasonable thickness of fabrics

Dobby



Jacquard



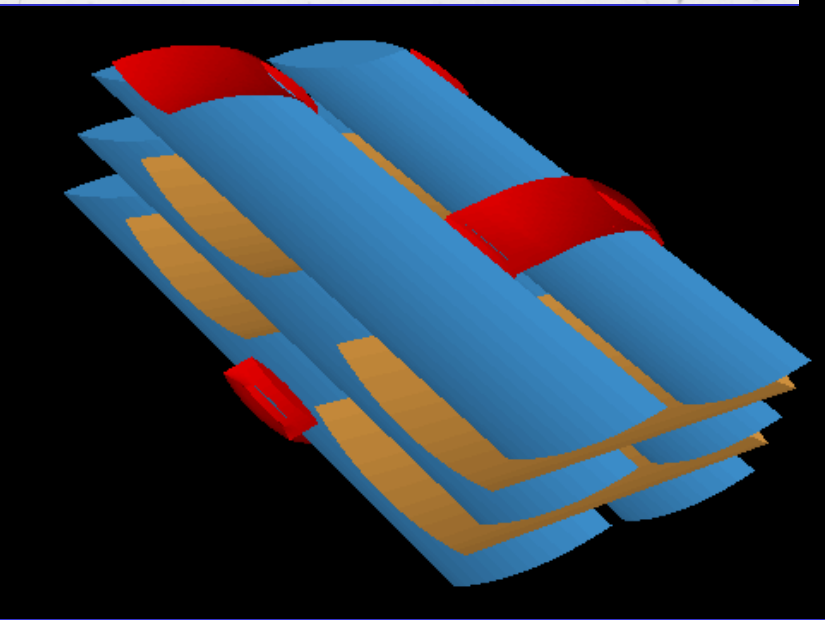
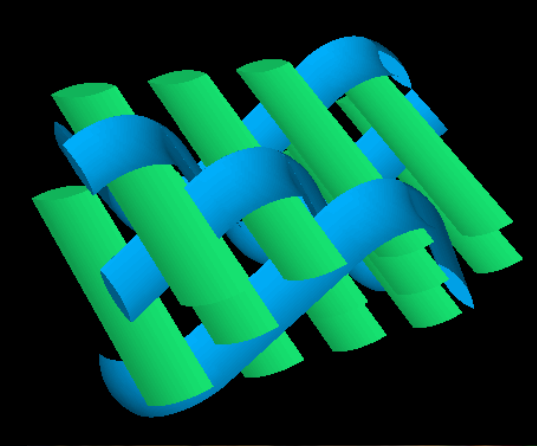
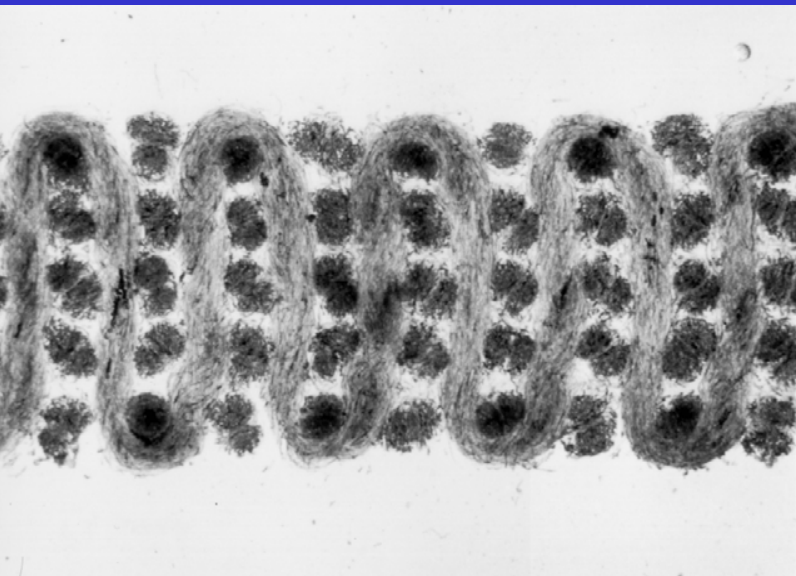
Warp Supply



Types of 3D Structures

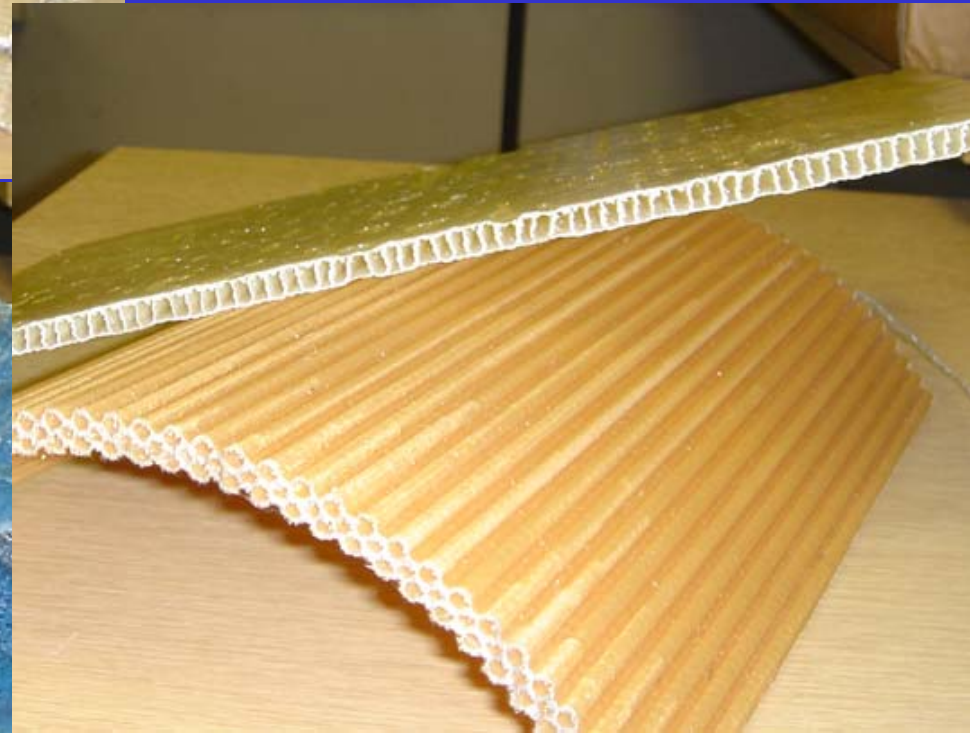
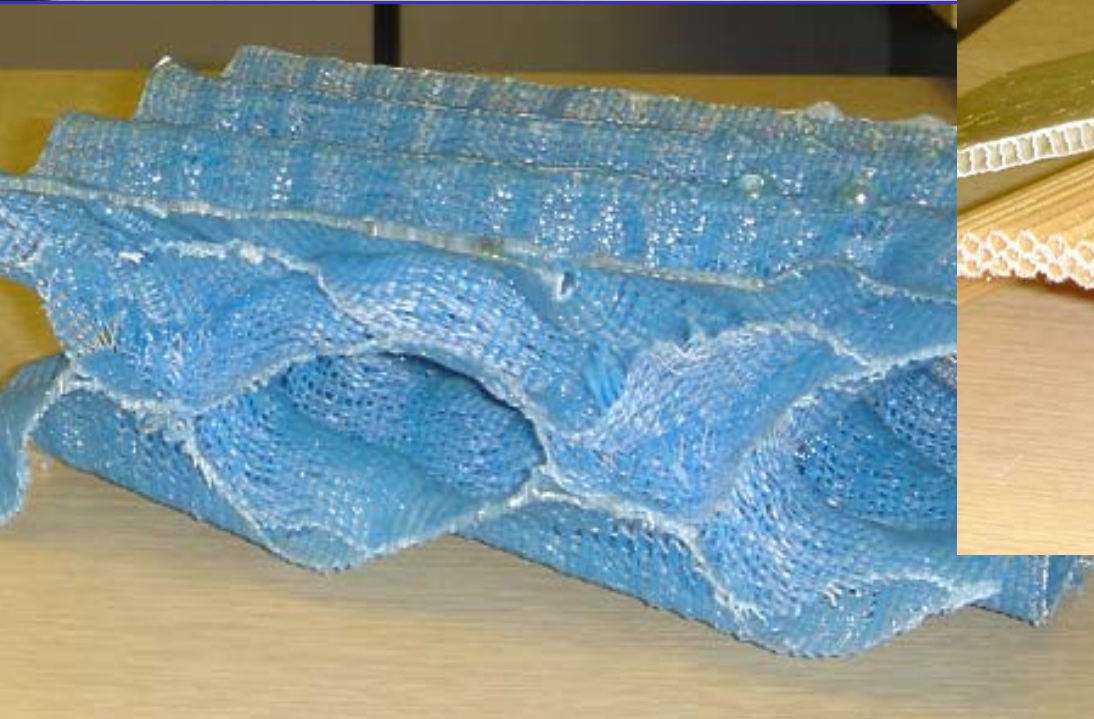
- 3D Solid
 - Multilayer
 - Orthogonal
 - Angle interlock
- 3D Hollow
 - Flat Surface
 - Uneven surface
- 3D Shell
 - By weave combination
 - By differential take-up
 - By moulding
- 3D Nodal

Solid

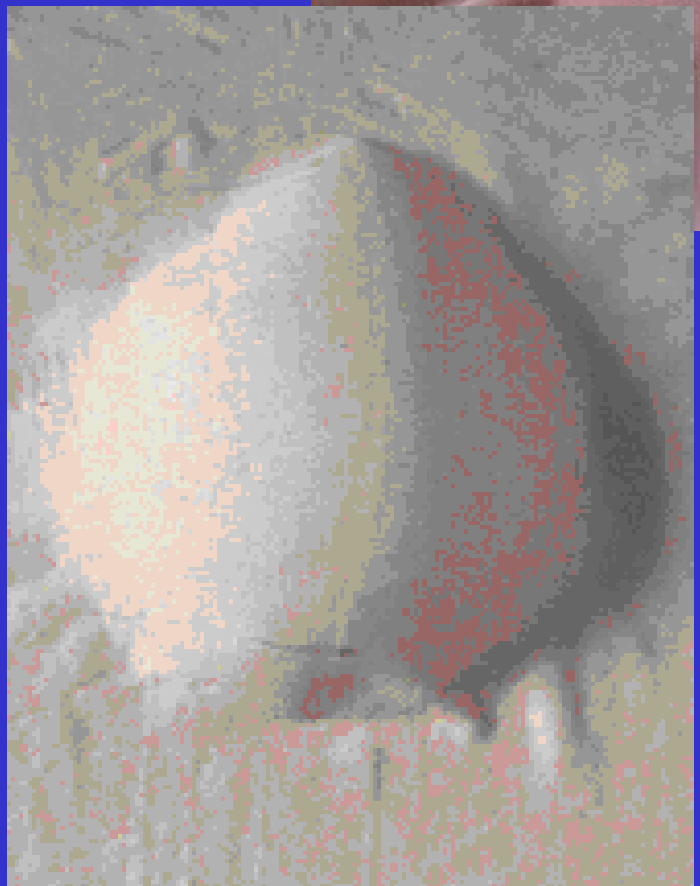


Combining the strengths of UMIST and
The Victoria University of Manchester

Hollow



Shell



Nodal



TexEng Software Ltd enables you to design 3D woven fabrics and program their weaving machines for their production.

For more details, please send email to:

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