

# Natural Insulation

## The Positive Impacts

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The Intelligent Insulation System



**ASBP**



**therma  
fleece**<sup>®</sup>  
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# Insulation Priorities



Cost



Fabric



Health



Heat



Fire



Value



Sound



Sustainability



Space



Moisture

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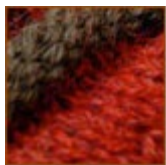
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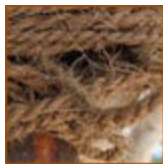
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# Common Natural Fibres

- Annual production of commercially significant fibres >36 mmt p.a. (excl. Wood, straw, paper) = 60+ mmt CO<sub>2</sub> sequestered



Alpaca



Coir



Abaca



Silk



Straw



Cashmere



Cellulose  
Paper



Jute



Wool



Ramie



Cotton



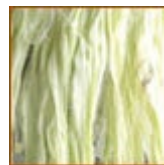
Angora



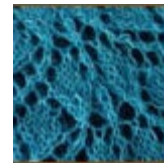
Wood  
Fibre



Hemp



Sisal



Mohair



Flax



Camel

# What's Good for Insulation

- Need to be affordable and readily available



Coir



Straw



Cellulose  
Paper



Jute



Wool



Cotton



Wood  
Fibre



Hemp



Sisal



Flax

# What's Good for Insulation

- Fibres need to be fine



Straw



Cellulose  
Paper



Jute



Wool



Cotton



Wood  
Fibre



Hemp



Flax

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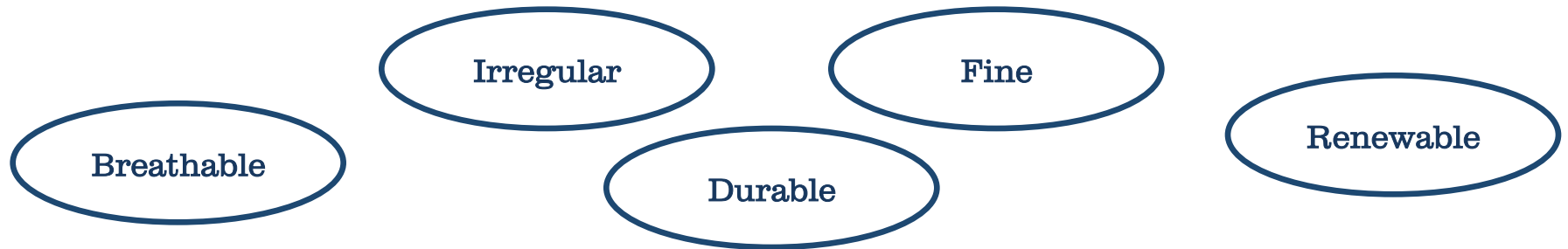
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# What's Special About Natural Fibres



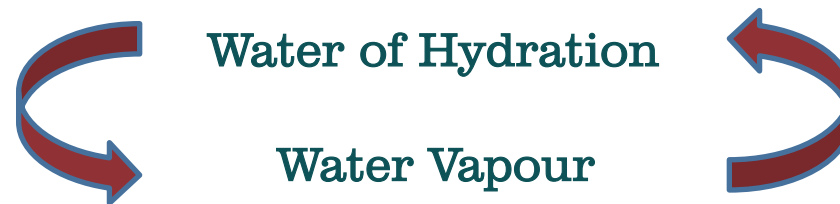
Individual properties provide performance but performance is enhanced when properties work together. For example:

Fine fibre = high internal surface area combined with breathability = extremely large breathable surface = efficient moisture control

Renewable fibres = carbon sequestration combined with durability = larger carbon sink

# Breathability

- Unique to Natural Fibres
- Natural fibres bind water vapour through hydrogen bonding.
- **No liquid water involved.** Water is constantly bound as water of hydration and released as water vapour (gas).



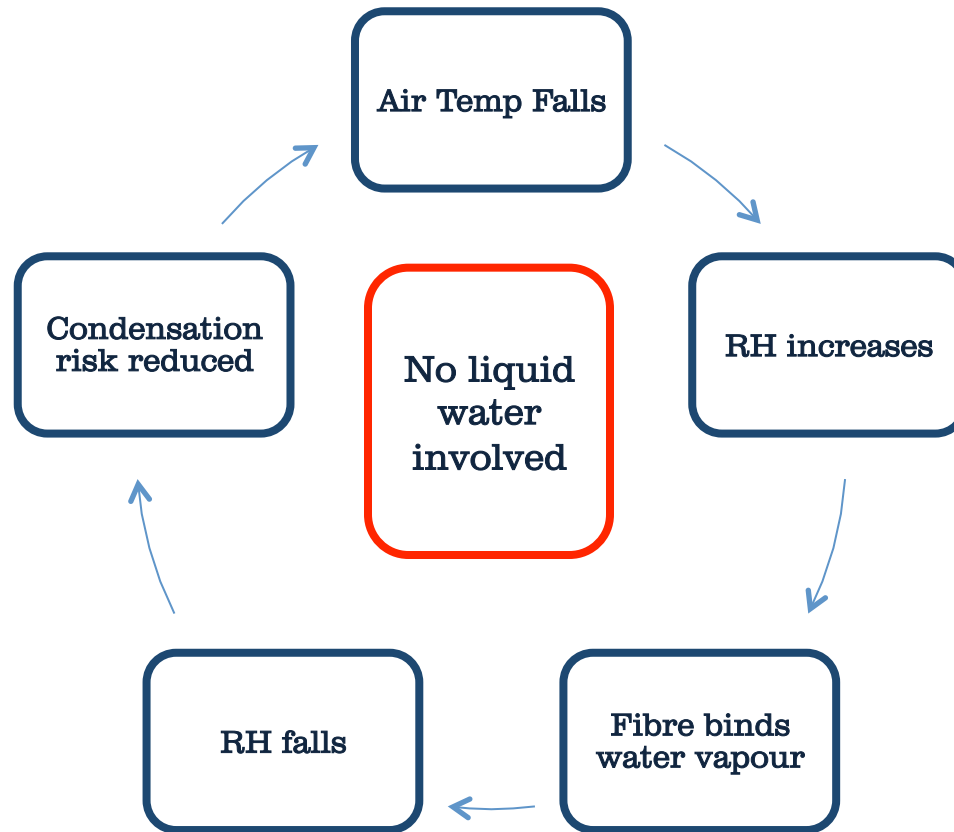
- Process is driven by the fibre trying to achieve an equilibrium moisture content (emc) with surrounding air
- **emc** is achieved when fibre is not losing or gaining water
- As relative humidity (RH) increases fibre needs to reach a higher emc and vice versa.

# Breathability

- Since NFI uses fine fibres most of the activity is at the fibre surface.
- Combine with high internal surface area means efficient capture and release of water since very little energy is taken to transport moisture from and to the fibre surface.
- emc varies very little with temperature so its ability to absorb and release moisture is almost entire dependent on the RH of the surrounding air.
- E.g. @ 70% RH the emc of wool is 17% at 25°C and 5°C
- Over the same temperature range the amount of water vapour air can hold @ 70% RH falls from 16g/m<sup>3</sup> to 5g/m<sup>3</sup>.



# Breathability



# Acoustics

Natural Fibre Insulation can provide comparable or better acoustic insulation compared to mineral based products at a lower density.

Variation in fibre diameter and length help absorb different frequencies.

**Absorption coefficient** – fraction of sound energy absorbed by a material at a given frequency.

1 = 100%, 0 = 0%

		Frequency (Hertz)					
		125	250	500	1K	2K	4K
Product 50mm	Nominal Density	Practical Absorption Coefficient					
Rockwool RWA 45	45 kgm <sup>-3</sup>	0.20	0.50	0.85	1.00	1.00	1.00
Rockwool RW 3	60 kgm <sup>-3</sup>	0.11	0.60	0.96	0.94	0.92	0.82
Thermafleece UltraWool	31 kgm <sup>-3</sup>	0.20	0.55	0.85	0.90	1.00	1.00

# Heat

- Thermal conductivity of natural fibre insulation varies between  $0.035 \text{ WmK}^{-1}$  to  $0.044 \text{ WmK}^{-1}$
- Value varies little with moisture content up to the fibre saturation point (approx 30% mc)
- Makes insulation vary stable across a range of humidities

# Sustainability

- Local
- Safe to handle
- Rapidly renewable
- Impacts are beneficial and vary depending on product and source but all natural fibres sequester atmospheric carbon for their lifetime.

# Finally

- Consider all your priorities.
- Natural fibres are often the best answer.

THANK YOU

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