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NOURYACT® TO CURE BIOFIBER COMPOSITES

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Crosslinking, Thermoset and Polymer Additives

NOURYON

Your partner in essential solutions
for a sustainable future



Nouryact® in hemp fiber composites



COBALT CURE IN NATURAL FIBERS

- Cobalt is standard used as accelerator in unsaturated polyester (UP) resins
- Cobalt carboxylates are sensitive to hydrolysis under the influence of water and then become unreactive for the curing process
- Using natural fibers in UP resins is difficult due to water in the fibers (up to 12 wt%), affecting the curing process using standard cobalt
- Therefore, the fibers need to be dried first
- This requires a large amount of energy and has a negative impact on the carbon footprint
- In addition, the dried fibers need to be stored in confined conditions to avoid absorbing moisture from the air
- Wet fibers do have a benefit on durability of the composite (Aart van Vuure)

NOURYACT CURE IN NATURAL FIBERS

- Cobalt (CMR) free
- Fast and powerful cure
- Not sensitive to hydrolysis (as cobalt is)
- Curing in humid conditions (wet filler and when using natural fibres), no need to dry prior to use. This is not possible with standard cobalt
- Since the pre-drying and separate storage of dried natural fibers is no longer needed, it makes the use of these natural fibers easier and cheaper. This can allow more companies to start using bio-fibers for their composite end-products

MOISTURE IN THE BIOFIBER FABRIC

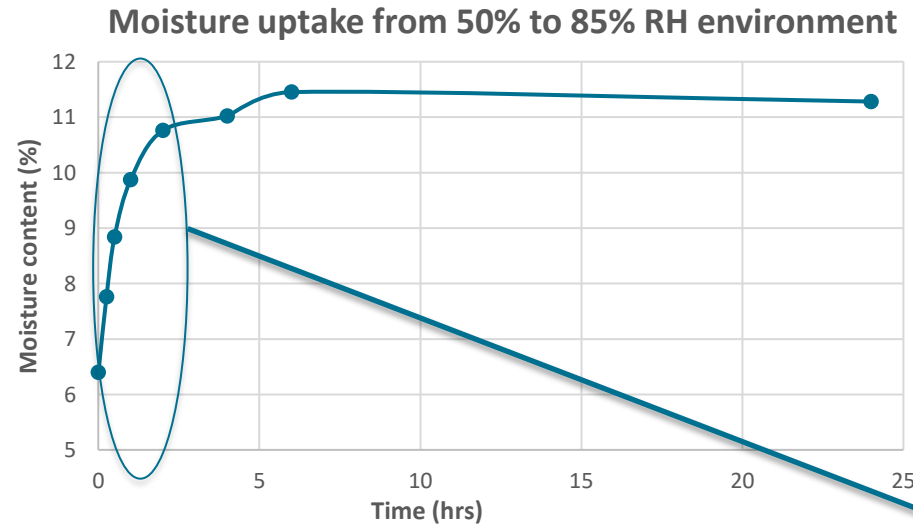
- The hemp fabric was stored for 24 hrs at a certain humidity at 20 °C (glovebox).
- Water content was determined with a heat balance (105 °C, 5 min).

Relative humidity (%)	Water content In fabric (%)
25	4.5
50	6.5
75	8
85	11

- Moisture uptake is significant at higher RH's.

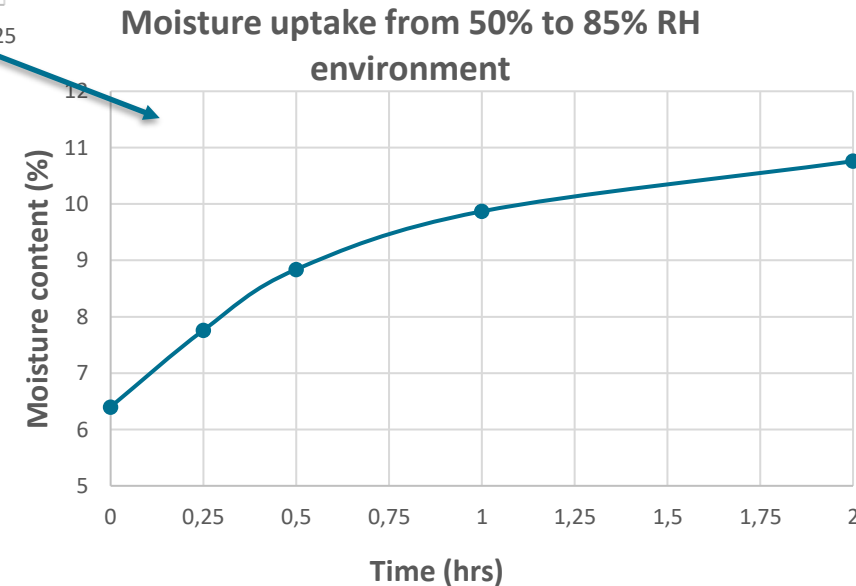


MOISTURE IN THE BIOFIBER FABRIC



The speed of moisture uptake is very fast. After 2 hours in a humid environment (85%), water content increased from 6.5 to 11%.

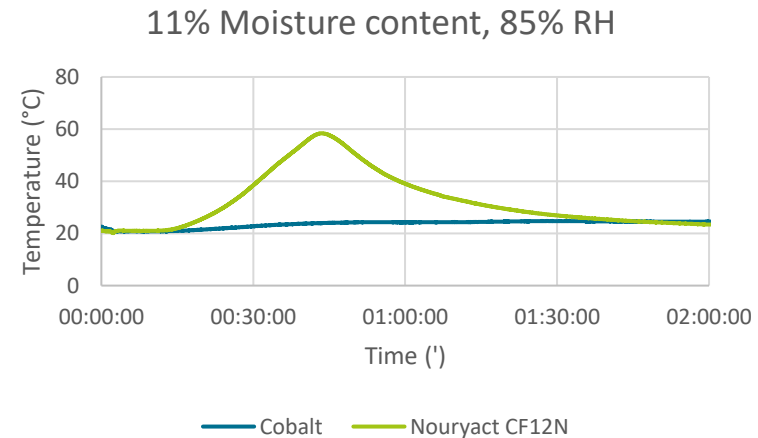
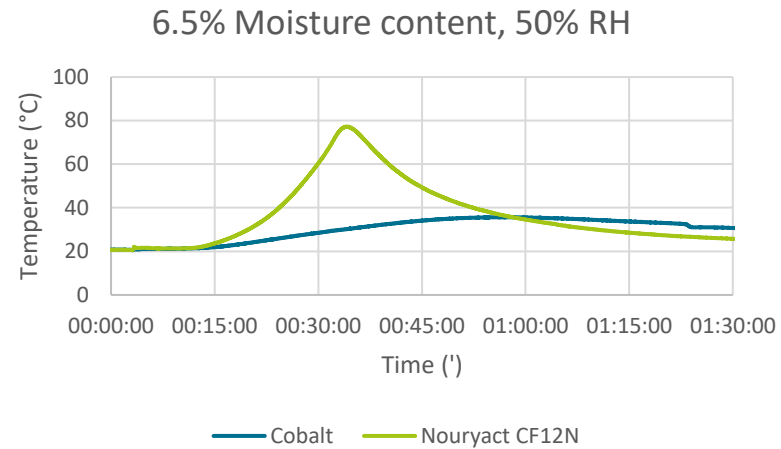
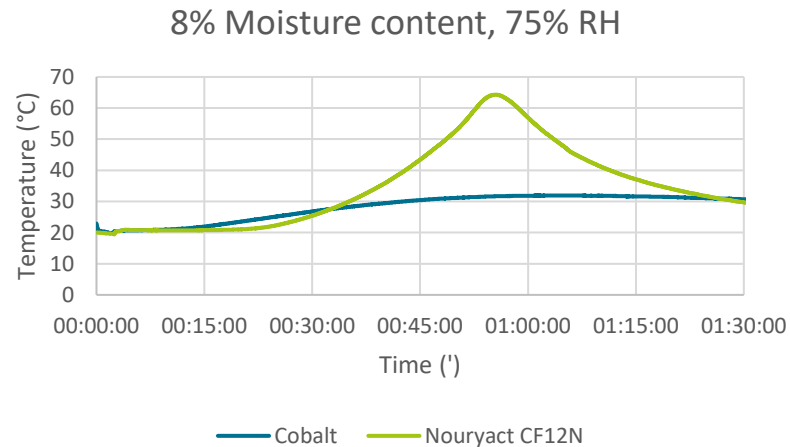
So, in humid environment, after drying the hemp fabric, it should be used very fast!



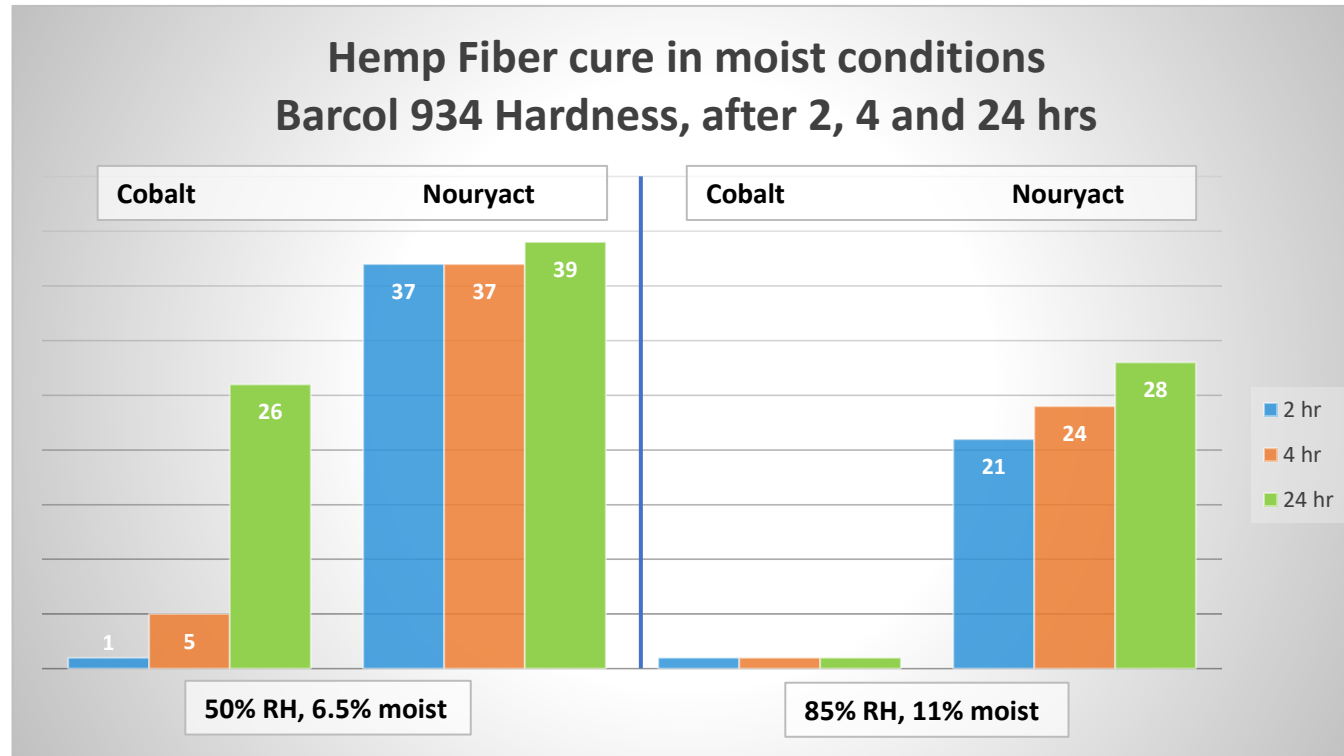
CURE USING BIOFIBER FABRIC IN UP

Cure in 4 mm laminates
Unsaturated Polyester resin
(orthophthalic)

- 1.5 phr Butanox M-50 (MEKP)
- 1.0 phr Accelerator

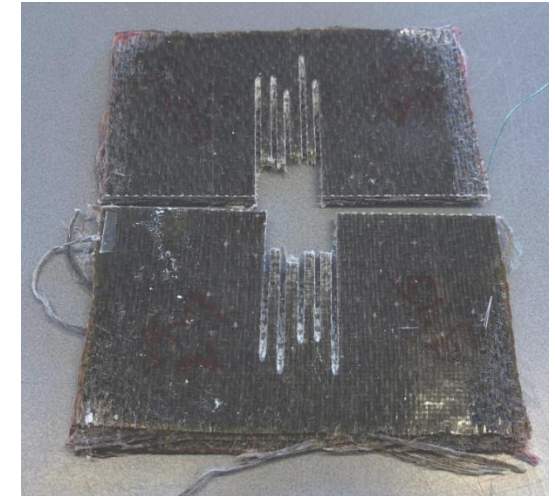


CURE USING HEMP FIBER FABRIC IN UP



Cobalt; Accelerator NL-49PN/ Nouryact CF12N

Poor hardness build-up using Co accelerator in hemp-fabric at higher RH and moisture content



CONCLUSION

- Using Nouryact cobalt free accelerators, pre-drying of hemp fibers is not needed
- At higher humidity's, still cure and hardness build-up whereas cure using cobalt is lower or even stops
- If cobalt should be used, hemp fibers need to be pre-dried in humid conditions and used fast because water uptake from environment is fast
- Dried fibers are not preferred since wet fibers have a durability benefit



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