Extraction of hemp fibres for load bearing composites. Minimisation of the extraction impact of processes such as scutching or "all fibre" extraction devices on the fibres mechanical properties.

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With the view to minimise the impact on the environment of composite materials all along their life cycle, numerous studies and reviews investigate the potential of renewable and recyclables fibres. Among them, bast fibres such as flax received a wide attention and commercial reinforcement products are now available on the market and are used in different composite load bearing applications (automotive, sport, furniture etc…). This is not the case of textiles based on hemp because the extraction techniques (hammer mills) are not adapted to minimise their impact on the fibres and severely reduce their properties.

In previous studies performed on hemp and linseed flax [1] using "all fibre" extraction device such as the one showed in Figure 1, it was showed that the extraction step may have a large impact on the tensile properties of individual fibres. The results showed that the initial potential of the fibres may be reduced to values lower than half. By optimising the process parameters, it is possible to reduce the decrease in tensile properties by only about ¼.

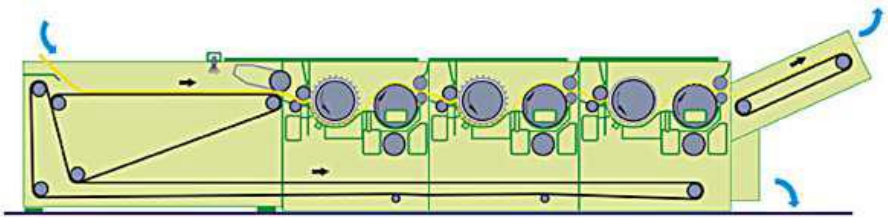

Figure 1: Laroche Cadette 1000 « all fibre » extraction device

If this result is particularly interesting and opens the potential use of linseed flax fibres as a good candidate for manufacturing reinforcement products for semi-structural composite or geotextiles applications, the need for the highest tensile properties for hemp fibres is required for load bearing composite uses. With this target in mind, a scutching laboratory extraction device was tested on dew retted hemp stems to investigate the potential of this equipment to minimise the decrease of the fibres tensile properties. The device is presented in Figure 2.

(a)

(b)

Figure 2: the main devices of the scutching laboratory extraction line: (a) breaker, (b) Scutcher

The impact of both “all fibre” and scutching extraction devices on the tensile and morphological properties of hemp fibres will be presented in the case of optimised process parameters and will be compared to results obtained on textile flax as a reference.

References

[1] Ouagne, P., B. Barthod-Malat, Ph. Evon, L. Labonne, and V. Placet. Fiber extraction from oleaginous flax for technical textile applications: influence of pre-processing parameters on fiber extraction yield, size distribution and mechanical properties. *Procedia Engineering*. 2017; 200: 213-220.