

Advanced Decortication Technology for Bast Fibres and Coir

Munder, F.*, Füll, Ch., Hempel, H.

1. Situation and purpose of research

Efficient technologies are already being employed for the cultivation and harvest of natural fibre plants. However, the economic processing and exploitation of natural fibres must still be improved to ensure capacities and qualities, acceptable to set up powerful process plants successfully. For that purpose a complete new machine line was developed by the Institute of Agricultural Engineering, which includes all process stages from pick-up and cutting of straw bales till to the separate cleaning of the final products fibres and shives.

2. Technology for Processing of natural fibrous plants and equipment configuration

Fibre plants, such as hemp, flax and linseed are processed with the same technology that suits both freshly harvested green and retted plants.

New effective principles are used to carry out the process stages:

- Cutting of straw bales
- Metering of long straw stems
- Fibre decortications by rebound stress
- Fibre cleaning and opening.

Based on results of previous research activities a pilot plant was established in 50%-scale of a commercial plant at the Institute of Agricultural Engineering for testing the complete machine line getting ensured operation and economic data.

3. Test results

The developed decorticating machine ensures complete fibre decortication, efficient fibre yield of up to 26 % at hemp and up to 29 % at flax. The fibre loss is only 2 to 4 %. Simultaneously, more than 50 % of the shives are separated inside this machine already.

The cleaning of the fibres consisting of a multiple ultra cleaner and a saw-tooth cleaner/opener. Normally the shives content is reduced to about 5 % after the first and to less than 2 % after the second cleaning stage.

		Flax	Hemp	Linseed
Fibre yield referring to input mass, total	%	27 - 29	23 - 26	17 - 23
Fibre length, adjustable	mm	50 - 150	50 - 120	50 - 100
Remaining shive content of fibres	%	0.5 - 4.4	1.3 - 2.0	0.8 - 2.3
Fineness of fibres	tex	3.3 - 4.1	7.4 - 14.9	2.7
Tensile strength of fibres	cN/tex	32 - 44	33 - 43	38
Particle size of shives	mm	< 1 - 6	< 1 - 6	< 1 - 5

First test results processing coir are promising that the same technology is suitable.

4. Conclusions

A capacity of 3 t/h of straw and the low investment permit manufacturing of natural fibres at competitive prices while meeting the requirements of many industrial applications.