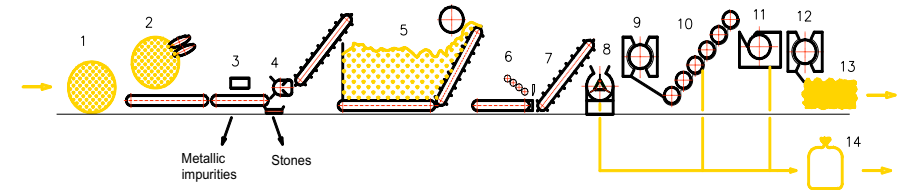


Results of the test- run of the fiber-extraction pilot plant of the Institute of Agricultural Engineering Bornim as well as Thoughts for an European project for a related quality-management-system and corresponding test procedures

Institute for Agricultural Engineering e.V. Potsdam-Bornim / Germany
Department of Post-harvest technologies
Brandenburg University of Technology Cottbus / Germany
Chair of Mineral Processing

Sponsored by Brandenburg Ministry of Science, Research and Culture
German Federal Ministry for Economy and Technology (AIF)

Machine line for processing of natural fibre plants



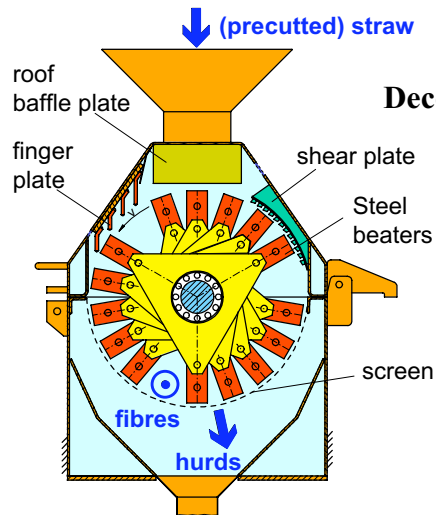
- | | | | |
|----------------------|---------------------------|-----------------------------|-----------------|
| 1 – Straw bale | 5 – Straw metering system | 9 - Condenser | 13 – Fibre bale |
| 2 - Bale cutting | 6 – Cutting machine | 10 – Multiple ultra cleaner | 14 - Shives |
| 3 – Metal detector | 7 - Conveyor | 11 – Saw tooth opener | |
| 4 – Stone eliminator | 8 – Decorticating machine | 12 - Condenser | |

Basic research activities

- Cutting of straw bales
- Metering of long straw stems
- Pre-cutting of stems and fibres into a defined length
- Fibre decortication by rebound stress
- Fibre cleaning and opening

Pilot plant for processing of natural fibre plants





Decortication by rebound stress



Cleaned hemp fibres



FIBRE YIELD

	Fibre yield %	
	Fibre length 20 to 160 mm	Fibre length < 20 mm
Hemp, less retted	22 to 24	3.6
Fibre linen, fresh harvested, not retted	27 to 29	2.4
Oil seed linen, fresh harvested, not retted	23 to 26	2.7

FIBRE LENGTH

at different roast rate and cut length of straw stems

	Theoretical cut length of straw stems mm	Fibre length mm acc to DIN 53808
Hemp, freshly harvested green	150	66
Hemp, less retted	180	95
Hemp, retted	150	140
Fibre linen, freshly harvested green	120	91
Fibre linen, freshly harvested green 2 passages	120	71
Oil seed linen, freshly harvested green	150	95

MECHANICAL CHARACTERISTICS

of processed fibres acc. to DIN EN ISO 1973 and 5059



	Fineness [tex]	Strength at break [N]	Strength [cN/tex]
Hemp, freshly harvested green	14.9	46.9	33.8
Hemp, less retted	8.1	64.3	38.9
Hemp, retted	7.4	72.6	43.2
Fibre linen, freshly harvested green	4.1	63.3	44.3
Fibre linen, freshly harvested green, 2 passages	3.3	48.1	32.5
Oil seed linen, freshly harvested green	2.7	57.3	38.4

REMAINING SHIVES CONTENT in the fibres



	Average remaining shives content %
Hemp, freshly harvested, green	1.89
Hemp, retted	1.36
Fibre linen, freshly harvested, green	4.4
Fibre linen, freshly harvested green, 2 passages	< 0.5
Oil seed linen, freshly harvested green	2.3
Oil seed linen, freshly harvested green, 2 passages	< 0.8

OPERATION DATA of the plant



Operating data	Unit	Flax	Hemp	Oil seed linen
Capacity	t/h	3	3	3
Straw consumption	t/year	4800	4800	4800
Straw yield	t/ha	4	8	2.5
Needed cultivated area	ha	1380	690	2208
Fibre yield	%	28	23	25,5
	kg/h	672	552	612
	t/month	112	92	102

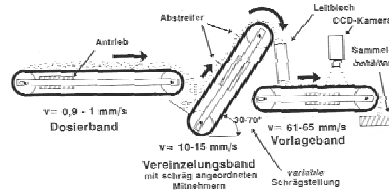
EXPECTED ECONOMIC DATA of fibre plant processing



Economic data	Unit	Flax	Hemp	Oil seed linen
Operating time	h/year	2000	2000	2000
Available machine time	%	80	80	80
Investment	EUR	1,400,000	1,400,000	1,400,000
Prime cost of straw	EUR/t	75	75	60
Operating staff incl. management	-	5	5	5
Fibre price	EUR/kg	0.50	0.50	0.50
Shives price	EUR/kg	0.15	0.15	0.15
Operating costs	EUR/h	530	524	490
Proceeds	EUR/h	580	538	556
Profit	EUR/h	50	14	66



- Climate chamber
- Material Testing machine (Zwick)
- Airflow apparatus
- “FibreShape” PC System (width & length)
- Colour measuring device
- Preparation, agglomeration, separation, size reduction



The diagram illustrates the hemp processing chain. It starts with 'Agriculture' (represented by a tractor and hemp stalks) leading to 'Processing' (represented by a box). From 'Processing', three arrows point to 'Finishing' (represented by a box): 'Hempseed' (dashed arrow), 'HEMP FIBRE' (solid grey arrow), and 'Shives' (dashed arrow). Below the 'Agriculture' section, there is a reference to '[n. Basetti u.a. 1998, veränd.]' and a large question mark over a stylized hemp stalk, indicating a focus on the processing of hemp fibre.



☐ fibre fineness



digital camcorder
Resolution ~ 1 Megapixel

- fibre fineness (Airflow)
- fibre tenacity (Stelometer)
- fibre length (Almeter)
- content of dust and foreign matter (Trashtester, gravimetr.)
- Content of shives (gravimetr.)
- mould of shives

[illegible]

SME-1 - **Co-operative Research (CRAFT)** - all areas of science and technology

Co-operative Research is a scheme whereby a **number of SMEs** from different countries, having **specific problems or needs**, assign a significant part of the required scientific and technological **research to RTD performers**. In all cases the SMEs retain the ownership of the results. These activities may also be carried out by innovative and high-tech SMEs in co-operation with research centres and universities.

Co-operative Research contributes to the objectives of the Sixth Framework Programme as regards the SMEs and, in particular:

- supports SMEs to respond to the pressures for continuous innovation and technological adaptations that are exacerbated by the completion of the European internal market and the intensification of competition;
- facilitates transnational co-operation in research between SMEs, research institutions and other organisations, which is essential to SMEs' competitiveness and international strategy, and
- facilitates co-operative relations in research activities between SMEs, research institutions and other organisations and enables SMEs to benefit from the many advantages of networking for innovation.

Projects are relatively short term: duration must be at least one year and with a maximum of two years.



Development of Testing Methods to Objectify Fibre Testing and to Achieve Relevant Fibre Property Information

NEED & RELEVANCE

Failure-free fibre processing e.g. in spinning mills depends on the quality of the processed fibre material. Constant, homogeneous raw material is therefore the central basis for constant product quality. Only with fibre properties known in detail reasonable quality can be achieved.

Although fibres are processed for a long time there are still many unsolved problems and therefore fields of research in fibre testing that might be solved with new technologies:

- For some natural fibres still manual, subjective testing methods or methods with inordinate accuracy are used.
- Fibre properties of different types of fibres cannot be compared to each other, although they are processed in blendings.
- Testing methods and laboratories have to be harmonised; an important basis is the development of valid reference testing methods and the availability of well defined reference material.
- Fibre testing has to be enhanced to additional fibre properties that are relevant for fibre processing and fibre products.

SME-2 - **Collective Research** - all areas of science and technology

Carried out by RTD performers on behalf of **industrial associations** or industry groupings in sectors where SMEs are prominent.

Collective Research is a scheme where RTD performers undertake **scientific and technological research** activities on behalf of Industrial Associations or Groupings in order to expand the knowledge base of large communities of **SMEs** and thus **improve their general standard of competitiveness**. In all cases the Industrial Associations/Groupings retain the ownership of the results.

Collective Research Projects may address **pre-normative research issues**, technological problems related to the development and implementation of legislation, and **technological problems of whole industrial sectors** that could not possibly be addressed by Co-operative Research Projects. The dissemination of results to large communities of SMEs and the training of staff from SMEs and Industrial Associations/Groupings will be expected to be major components of these projects.

Collective Research Projects will be substantial projects of 2 to 3 years duration conducted on a European basis. A project of longer duration could be accepted if it is necessary to deliver its objectives and when duly justified.