Institut für Naturstoffverarbeitung

HOCHSCHULE DER MEDIEN | Forschungscampus Lenningen

SUSTAINABLE PAPER REVOLUTION: THE USE OF HEMP FOR A GREENER FUTURE

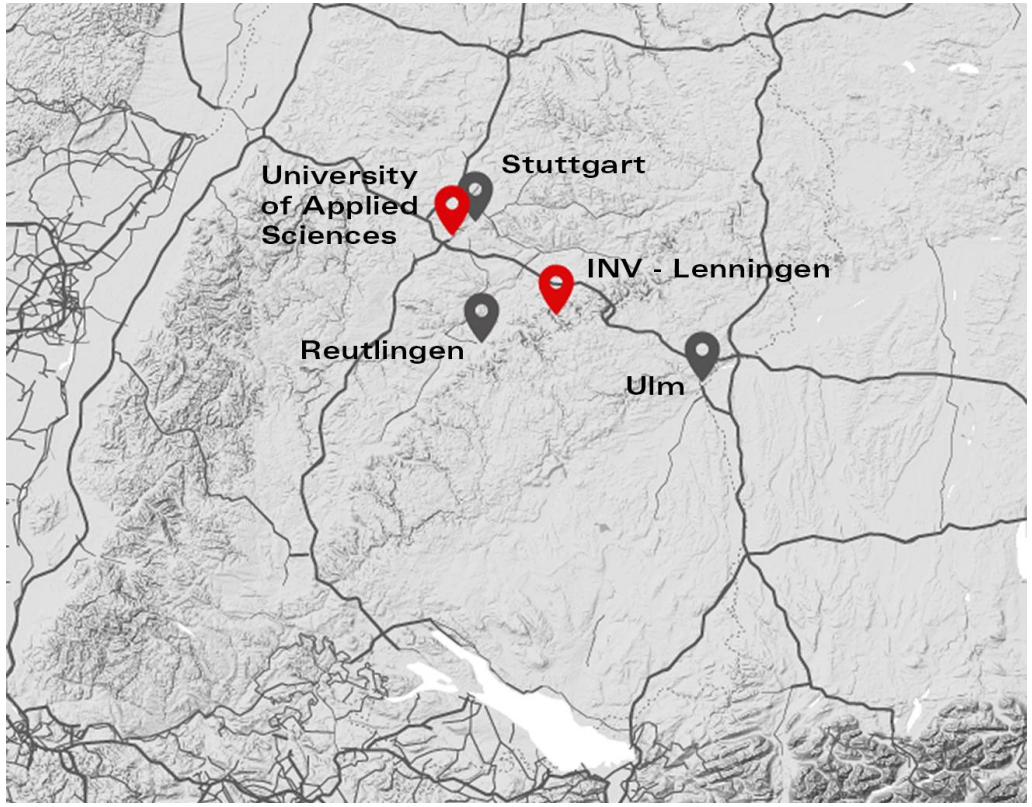
USAGE OF HEMP RESIDUES IN PULP AND PAPER

VIKTOR HAHNEMANN & CHRISTOPH BOJE

OUTLINE

- Introduction
- Equipment at INV
- Processing of hemp residues
- Hemp based products

INTRODUCTION TEAM



- Packaging
- Paper
- Printing
- Textile
- Mechanical Engineering
- Agricultural technology

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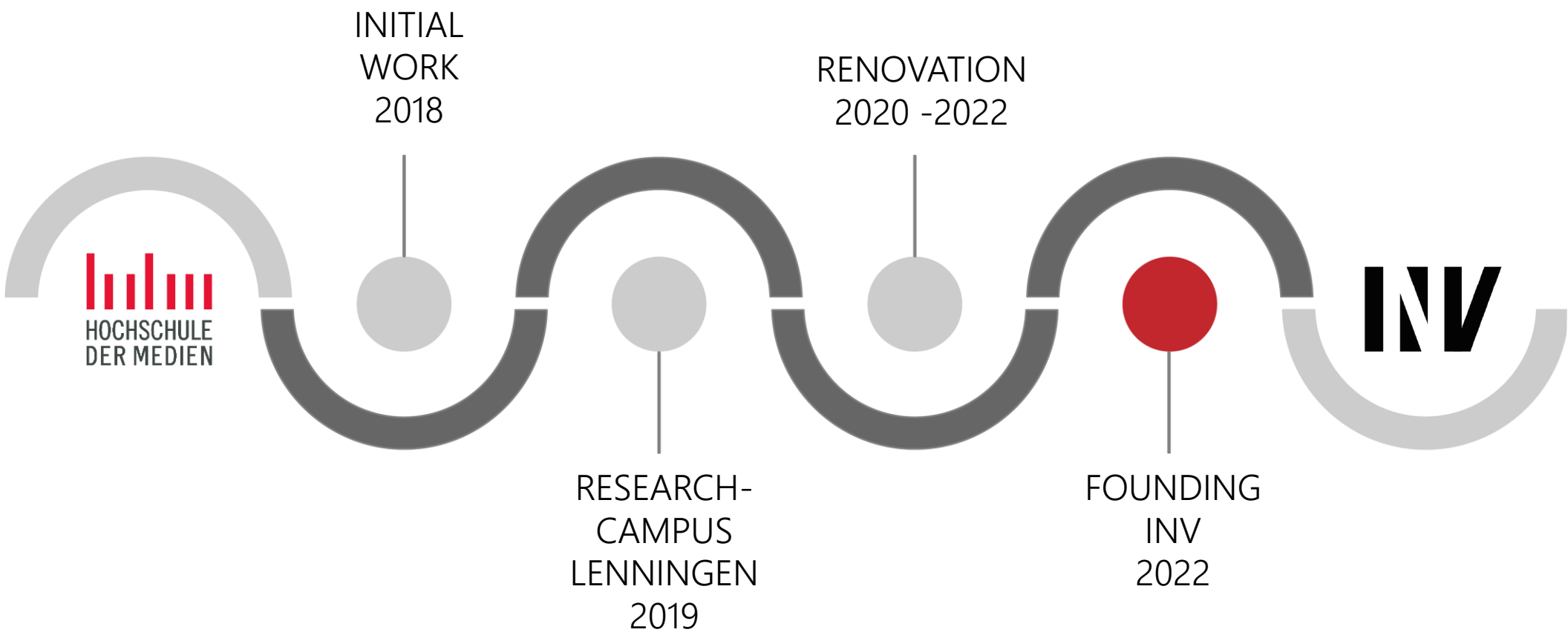
INTRODUCTION PATH



„The goal is to master natural substances

in a reliable and reproduceable way in order to

substitute plastics in a purposeful manner.”

INTRODUCTION RESEARCH SUBJECTS

Preparation of natural material

- Factors before usage
- Methods and processes of pulping/preparation
- Factors influencing fibre separation and processing

Production with natural material

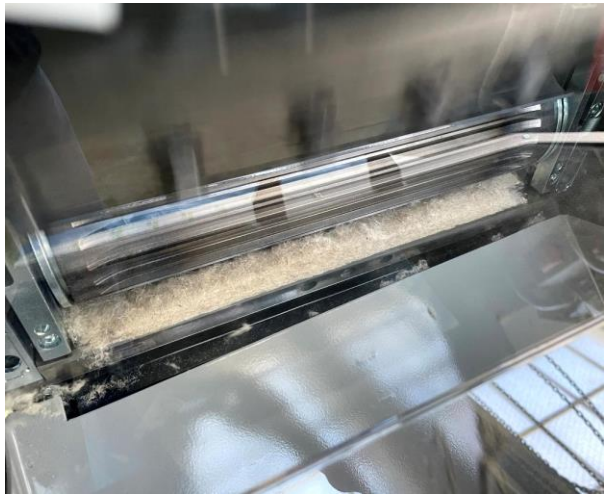
- Production methods
- Influencing factors during production

Gefördert durch
Baden-Württemberg
MINISTERIUM FÜR LÄNDLICHEN RAUM UND VERBRAUCHERSCHUTZ

EQUIPMENT MECHANICAL FIBRE PROCESSING

dry → wet

Textile machines
in cooperation with
Reutlingen university.



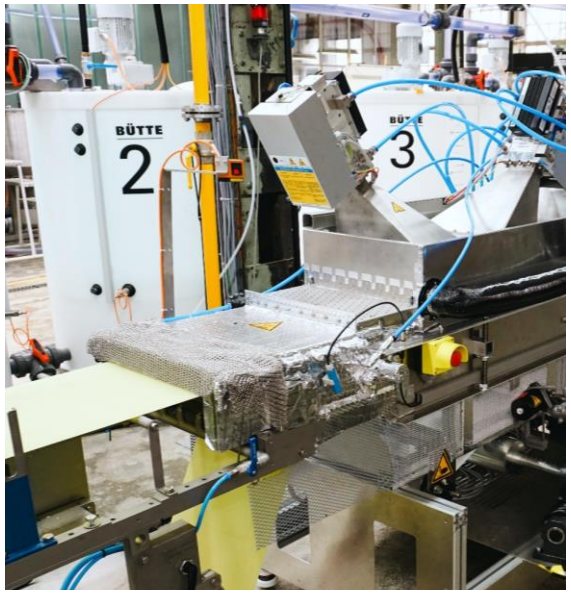
Cutting machines
(guillotine, cutting mill)

Various pulper
and deflaker

Various refiner and
a Valley Beater

PILOT PLANT WETLAID

Wetlaid machine



Microwave drying

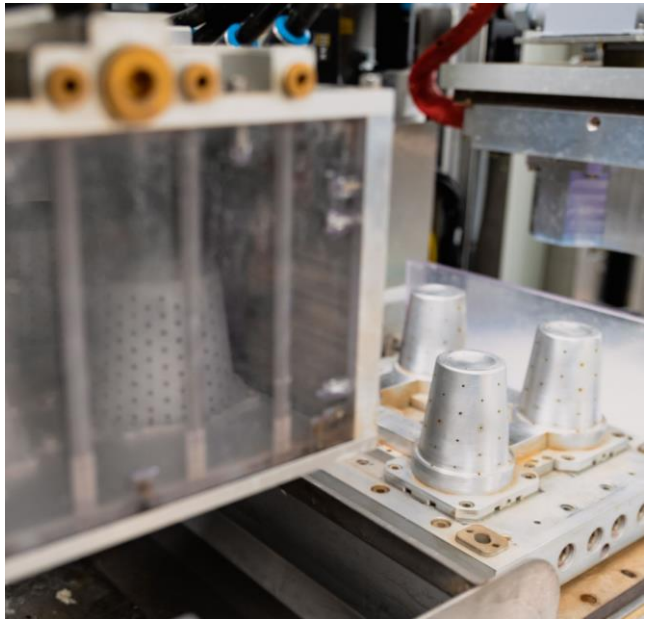
Convection drying

Contact drying

+ Various coating systems

PILOT PLANT PULP MOULDING

Pulp moulding machine
(Type 3 - thermoforming)



Traditional tool sets

3D-printed tool sets
(inhouse)

HEMP FOR PULP PRODUCTION

Advantages of Hemp

- low lignin content
- good water absorption capacity
- high length/diameter ratio
- high fibre flexibility

	Hemp	Softwood	Hardwood
Lignin	ca. 4 %	25-30 %	20-30 %
Hemicellulose	ca. 14 %	17-24 %	18-35 %
L/D ratio	1000:1	60:1-100:1	2:1-60:1

Contents depending on source and origin.
Source: Blechschmid Naujock 2021, Haudek Viti 1978

THE USE OF HEMP AT INV

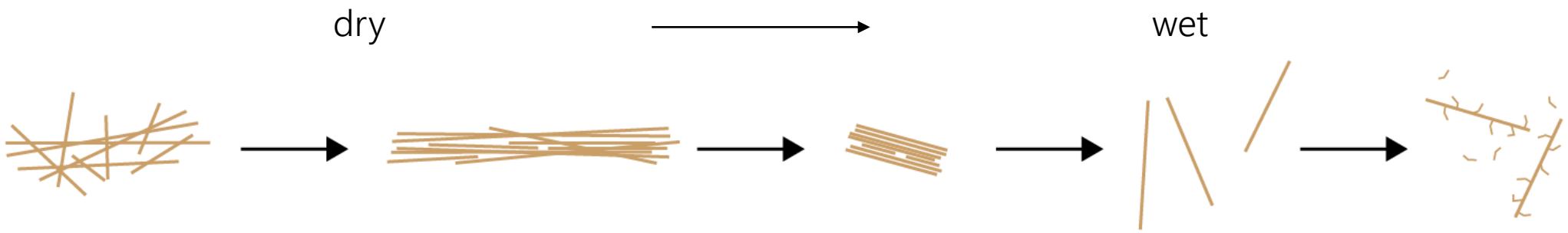
Raw materials used:

- Hemp residues from textile industry – (textile) short fibres <10 mm
- Inferior parts of the plant - lignified components, shives

Our demands

- Fibre length of 2-6 mm
- Good pulpability/desintegration
- Good separation of fibre and shive
- Pure mechanical processing!

PROCESSING OF HEMP RESIDUES TO PULP



Dissolve fibre flakes
Tearing or carding

= Relevant for fibre separation, fractionation and clean cutting

Cutting fibres
Guillotine or cutting mill

= important for pulpability
-> avoiding knotting

Deflaking fibres
Deflaker or refiner

= important for refining quality improvement and fibre separation

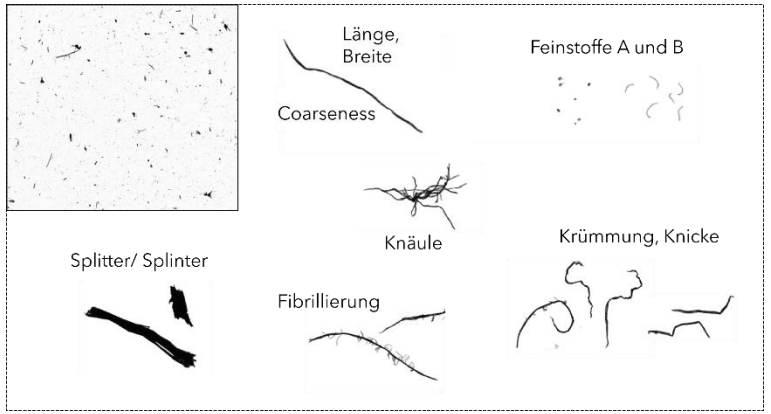
Refine fibres
Refiner or Valley Beater

= important for sheet strength improvement and surface quality (eveness).

PROCESSING OF HEMP RESIDUES TO PULP

PROCESSING OF HEMP MORPHOLOGICAL ANALYSIS

Valmet Fiber Analyzer
< 7 mm
Fibrelength

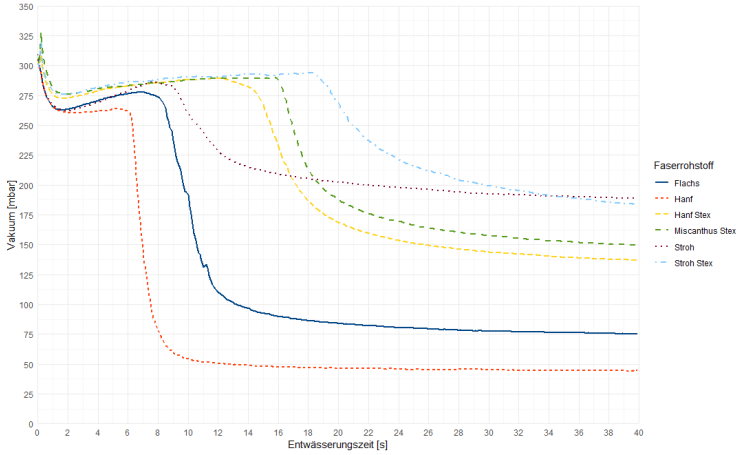


Schopper-Riegler

Pulpeye Dynamic Drainage Analyzer

Dewatering resistance
= Schopper-Riegler Degree

Drainage Speed/Rate with specific screen and at specific vacuum.



PRODUCTS

Nonwoven
(Hemp residues)

Pulp moulded
(Hemp residues)

Pulp moulded
(Hemp shives + CTMP)

Nonwoven
(Spelt hulls/seed + Hemp residues)

Wet-formed
(Hemp residues)

Pulp moulded
(Hemp shives + CTMP)

THANK YOU.

HdM Researchcampus

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Gefördert durch

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