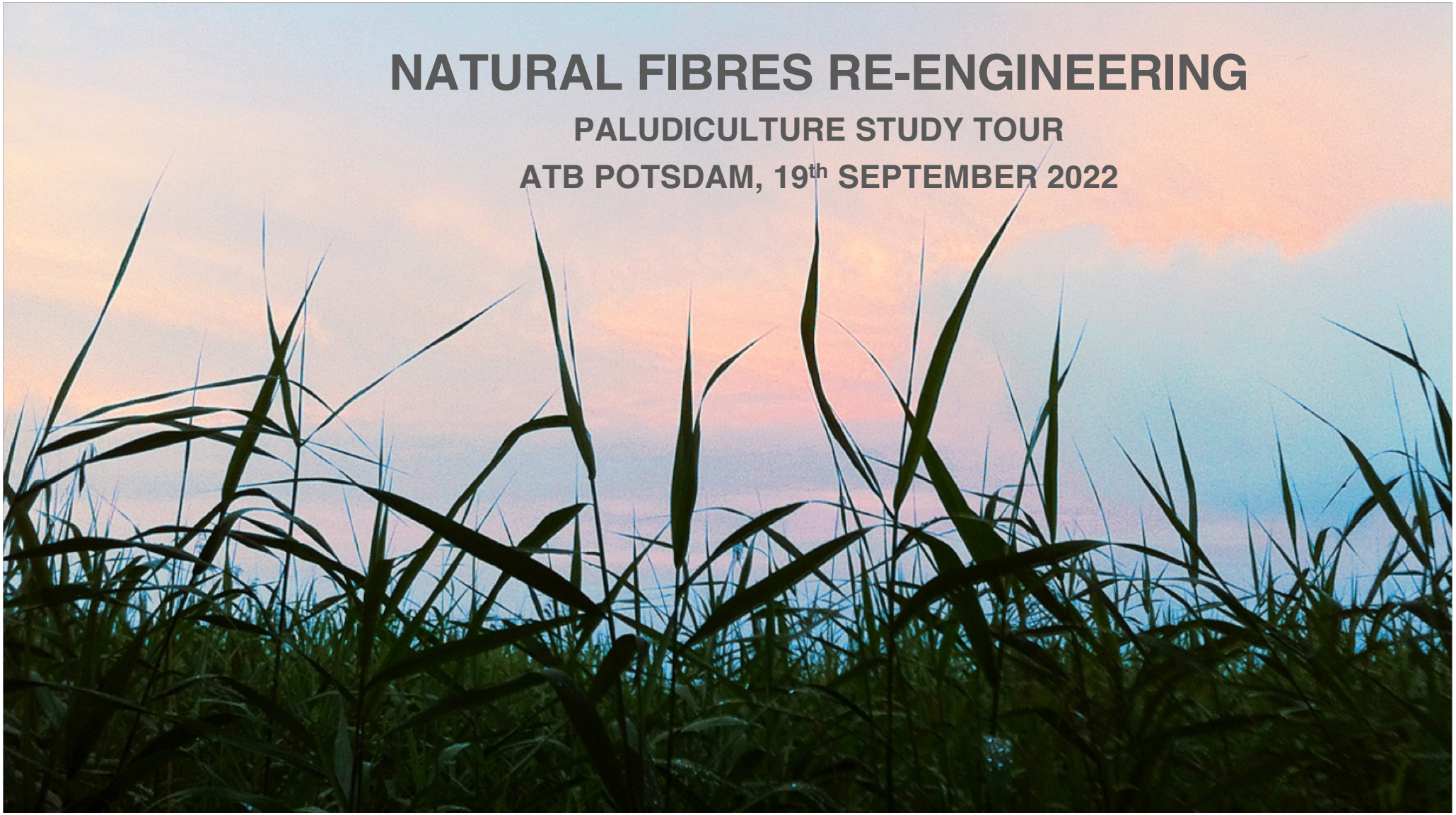

NATURAL FIBRES RE-ENGINEERING

PALUDICULTURE STUDY TOUR

ATB POTSDAM, 19th SEPTEMBER 2022

Zelfo® TECHNOLOGY

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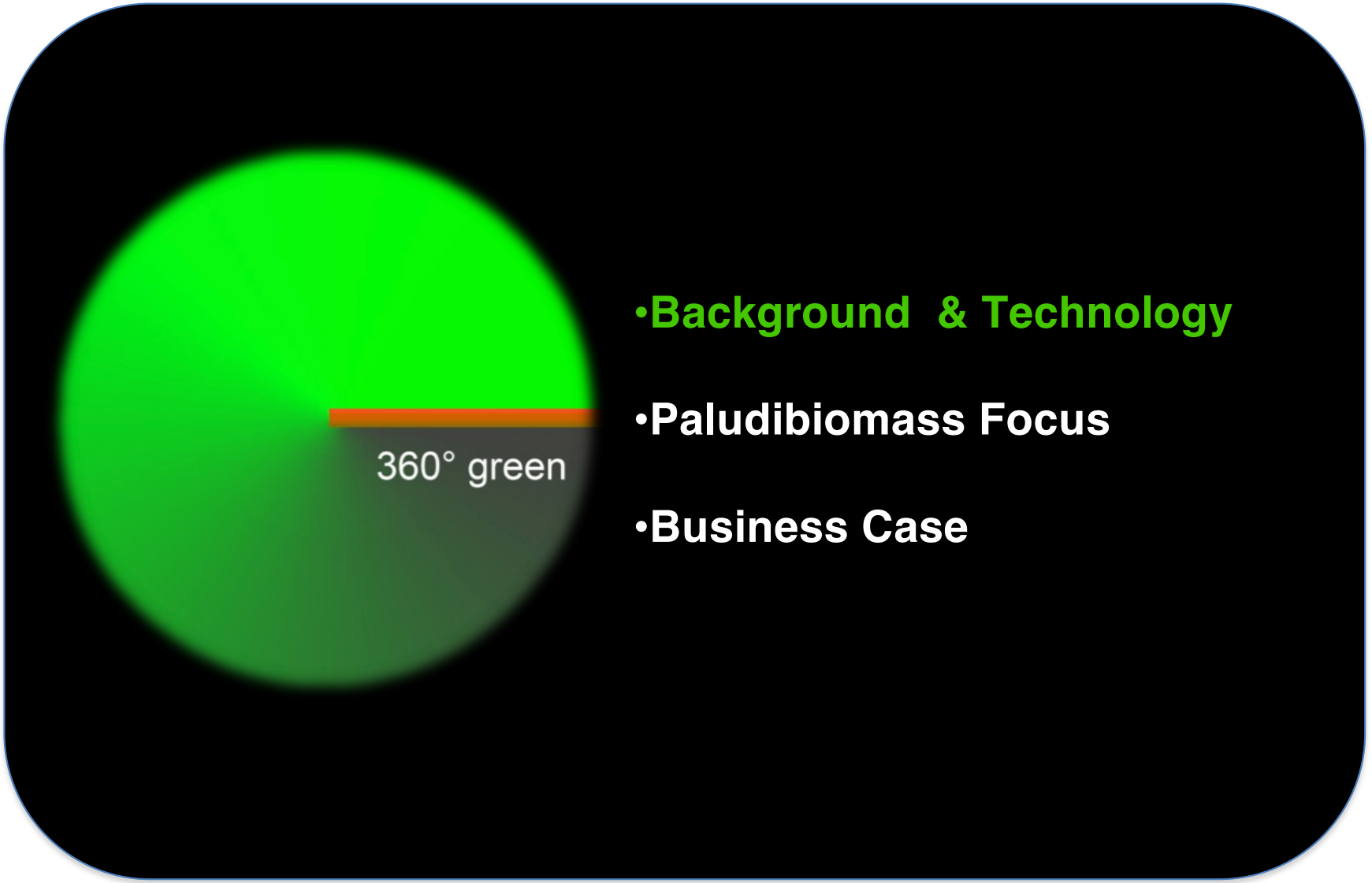
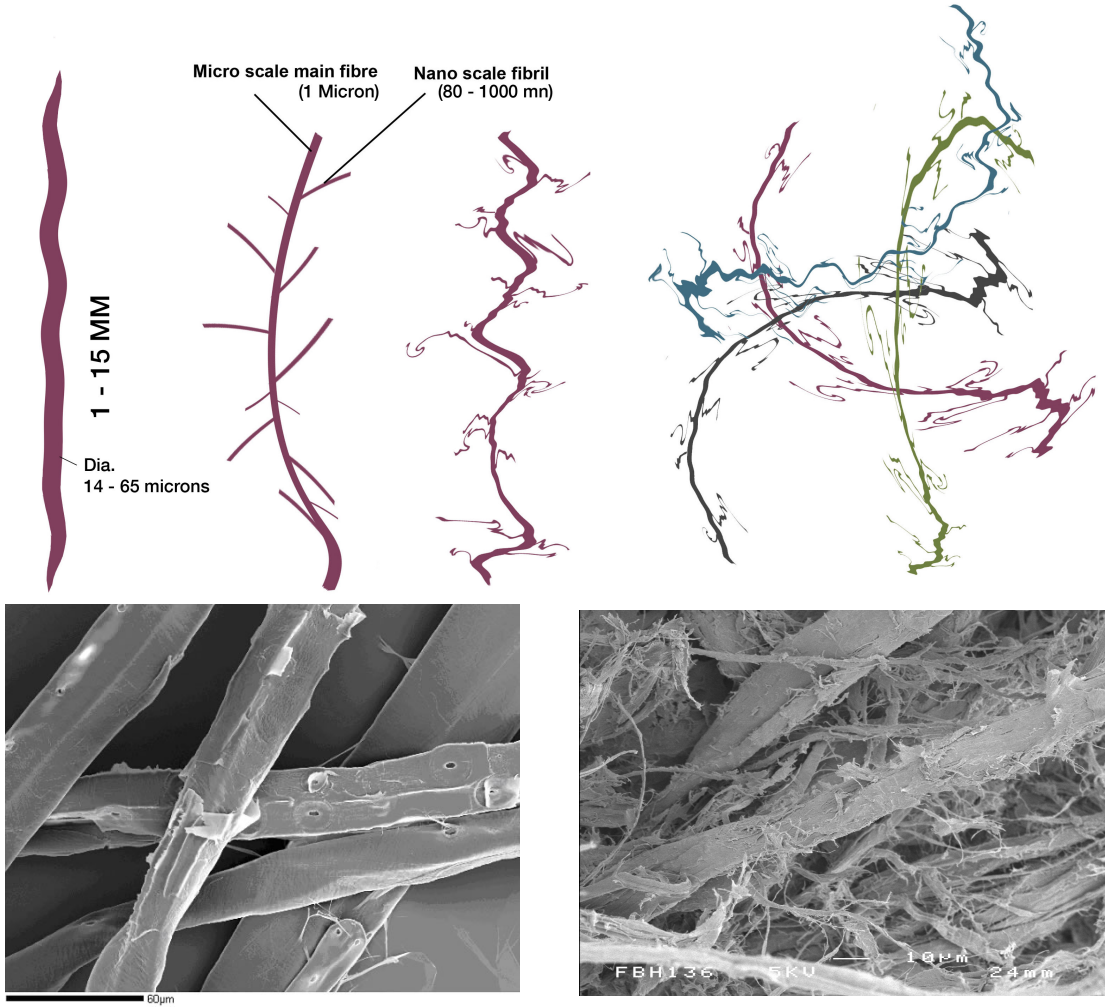

360° green
•Background & Technology
•Paludibiomass Focus
•Business Case

Introduction

- **Established 2011,** Joachimstahl, Unesco Biosphere, Germany
- **Pilot Plant Location:** Schwedt, Germany
- **Patented key IP:** 2 patents (2011), 4 patent applications.
- **Extensive fibre modification know-how:** ZT has proprietary processing technology to transform ligno-cellulosic material into Macro, Micro & Nano Fibrillated Cellulose.

ZELFO TECHNOLOGY'S MISSION IS TO UPGRADE AND VALORIZE A WIDE RANGE OF NEW, RECYCLED AND RESIDUAL CELLULOSE FIBRES

Technology Principle



Ligno-cellulosic fibres are rendered ‘self-binding’ by increasing mechanical networking and multiplying the hydrogen bonds between the fibrils.

Technology USPs

Technical Advantages of the ZT fibre engineering process:

- Raw materials flexibility (pure cellulose, agro-materials, industrial waste etc,…)
- Fibre morphology and refining intensity range: 15 to 80° SR
- Water saving: between 30 & 60% solids
- Multiple inline material treatment opportunities (chemicals, colours, fibre ‘cleaning’, Bio-extracts, etc..)
- Mobile technology: - scale-able from rural to industrial size plants

Bio-Refinery Concept

Zelfo has developed a unique Bio-refinery Concept, which consists of using each constituent of ligno-cellulosic materials where they are most useful:

- Ligno-cellulosic fibres: packaging,
- Nutrients / organic components: fertilizer or biogas applications etc.

The effluent produced from various materials will need to be evaluated on a case by case basis (valorisation vs disposal cost).

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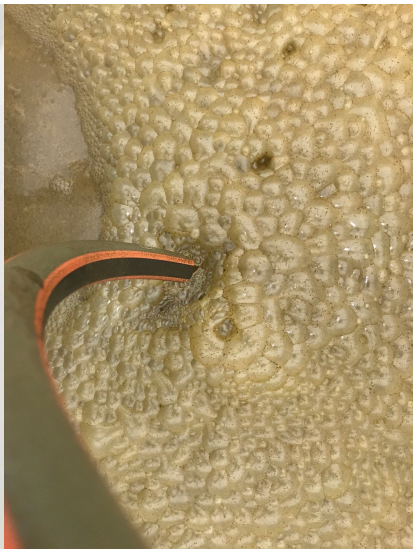

Applications - Packaging

Problematic Post consumer, Industrial and Agricultural Residuals
Up-cycled into materials and end products

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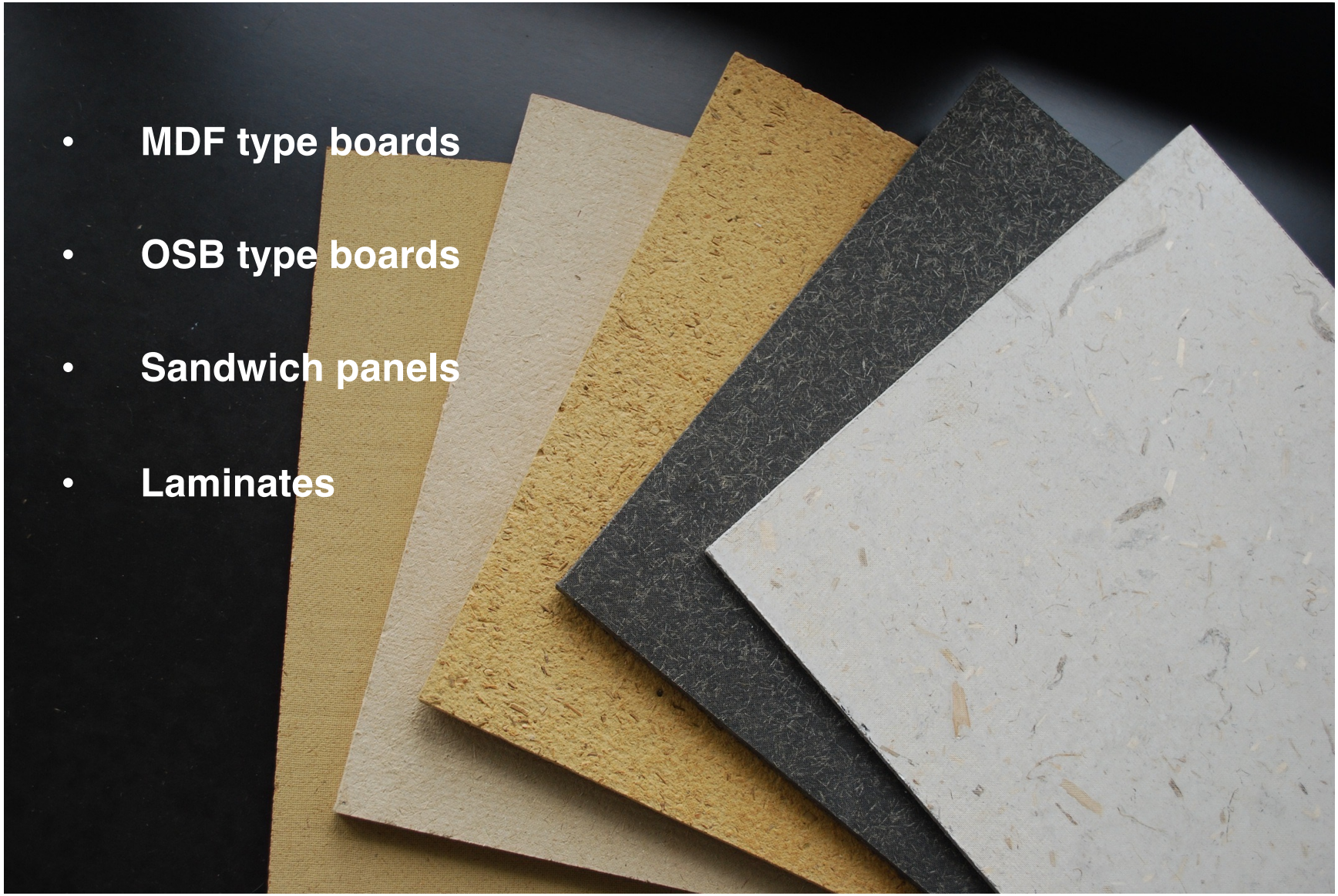
Applications - Fibreboards



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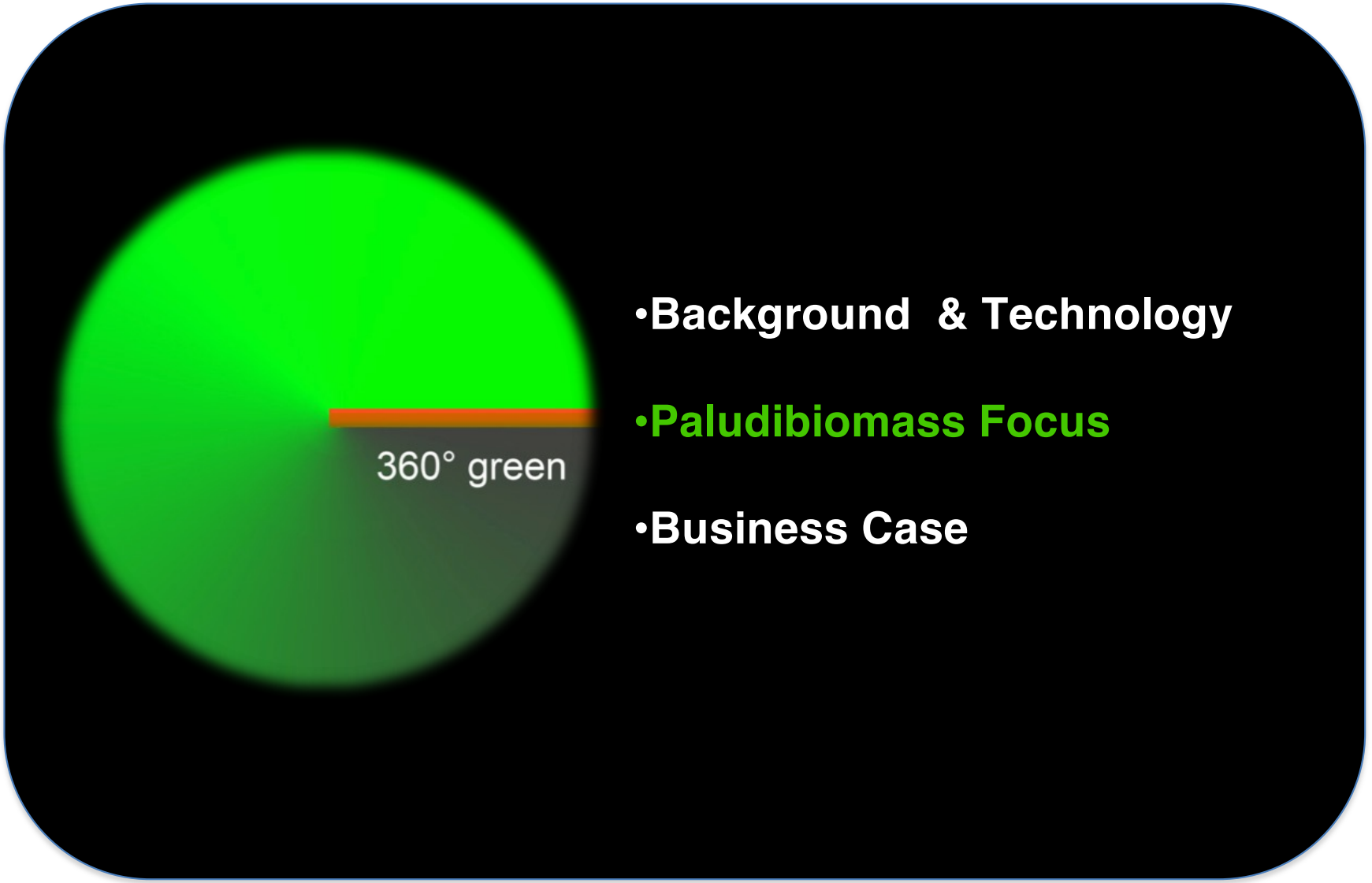
360° green
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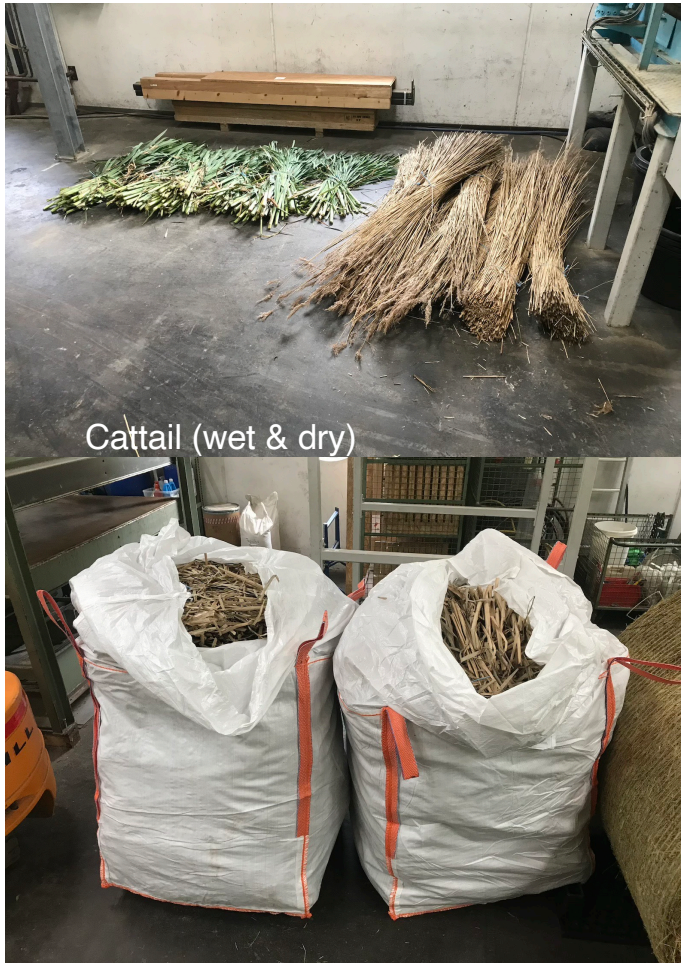
ZT experience with Paludibiomass

ZT has worked and is working on numerous projects to valorize wetland plants, for both packaging and board applications:

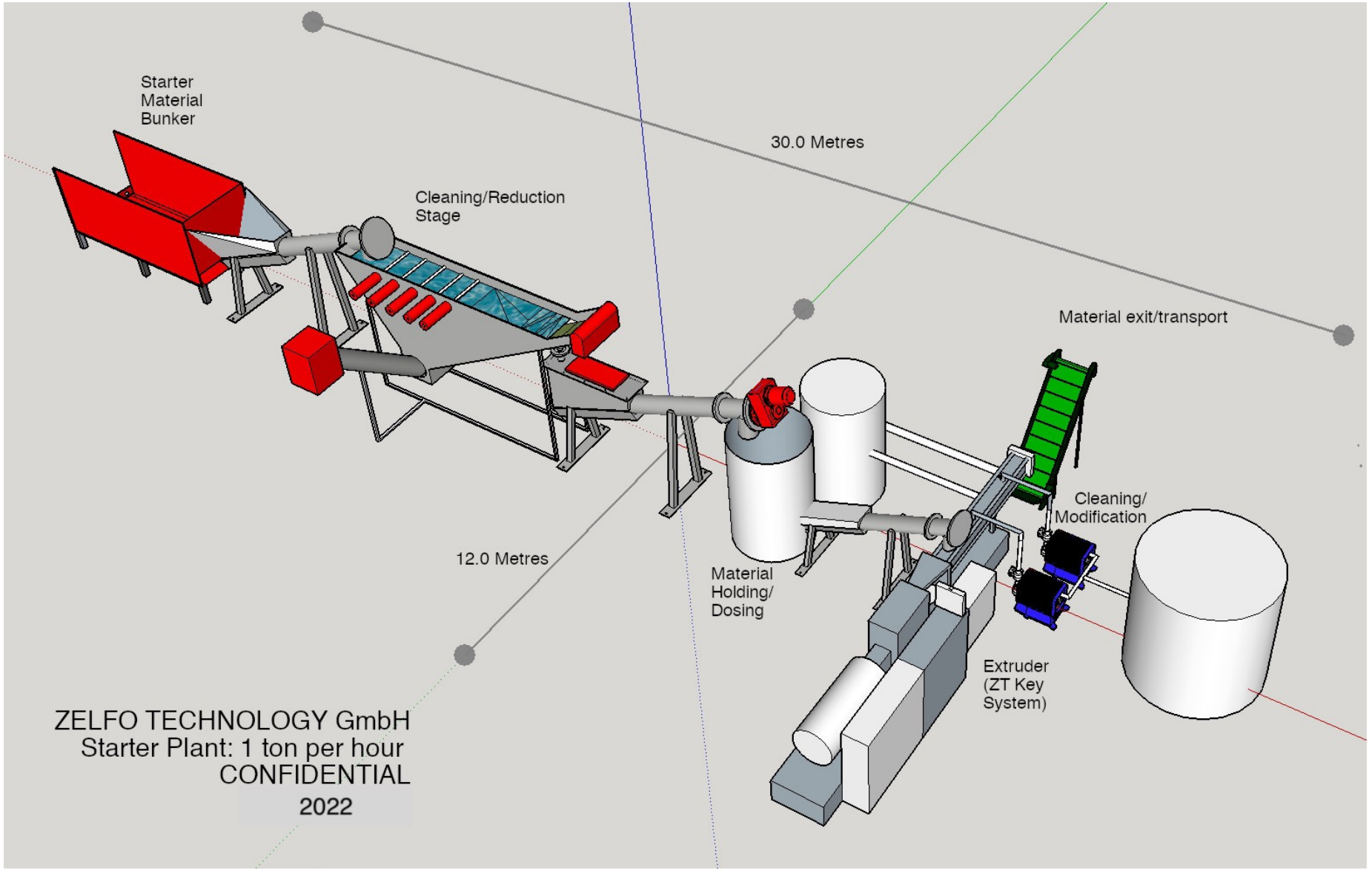
- Wetlands Product Foundation
- Moor Initiative
- Tiny-House Project (Moor & More)
- Kazakhstan Visit
- Greifswald University
- National Park Unteres Odertal
- Donaumoos (in collaboration with Leipa)

Paludibiomass types

Numerous wetland fibres have been trialed at the ZT pilot plant in Schwedt:



Process Walkthrough (1/3)



Process Walkthrough (2/3)

Materials reduction: hay & sedgegrass

Materials processing: re-engineered fibres and liquid effluents

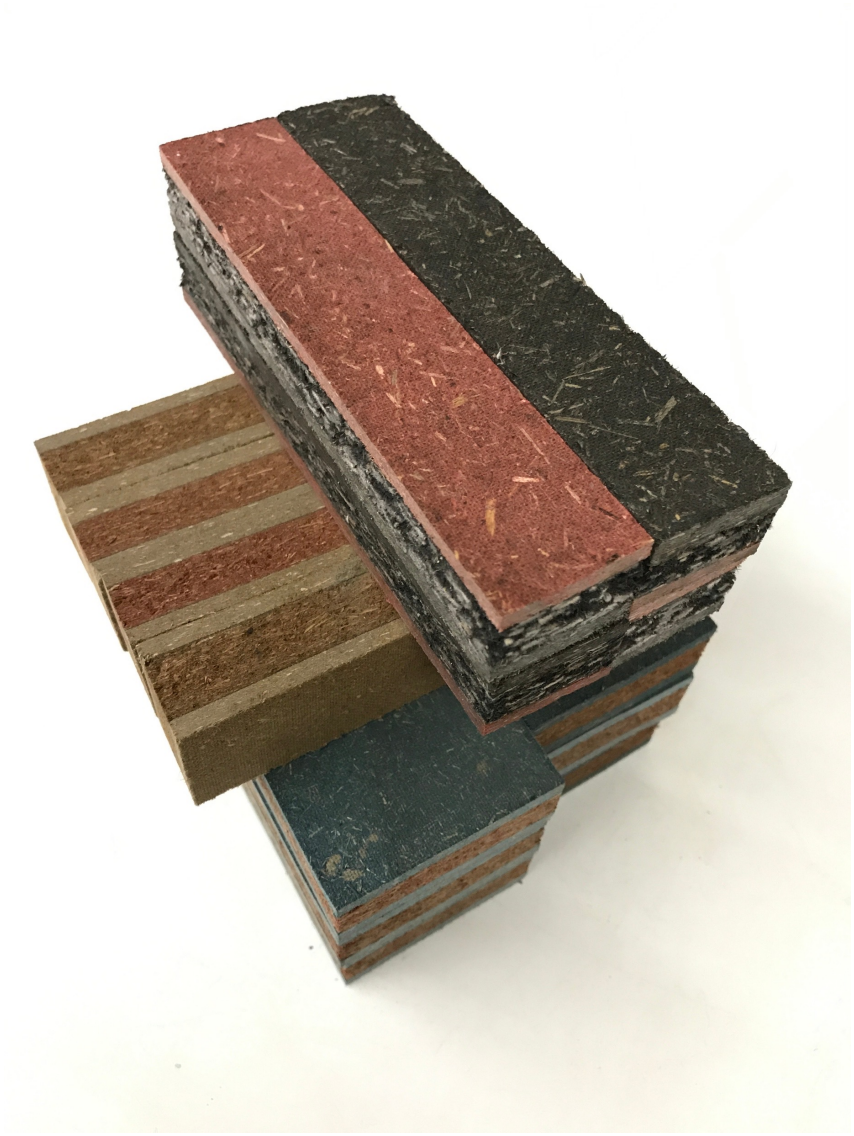
Process Walkthrough (3/3)

Hotpressed in a oil press using sieves to allow for water evaporation

Formed in a fibre mat (in this case 50% re-engineered fibres & 50% granulated fibres)

End products (1/3)

End products (2/3)



End products (3/3)

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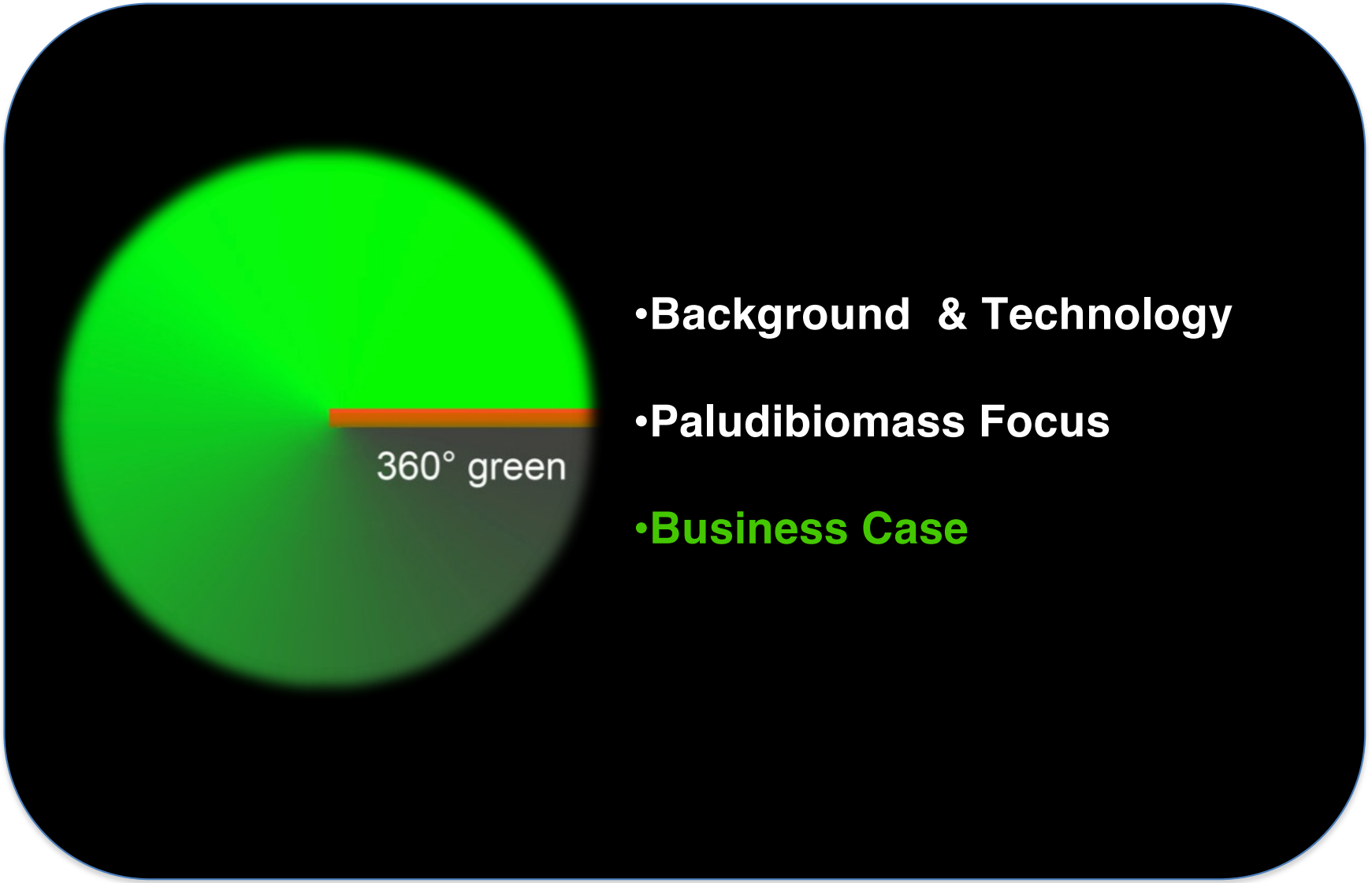
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Business Model

ZT is a technology company that proposes its IP under License.

- **Flat Fee/Advance on Royalties upon License signature**
- **On-going Royalties per ton produced or % of the sales price of the products**

In the course of development project, ZT also offers:

- **Product & material trials up to industrial scale.**
- **Technology Transfer & Staff Training.**

Plug & Play Package

FIBRE ENGINEERING TECHNOLOGY:
ZT has partnered with twin-screw extruder company STEER (Bangalore, India) to develop fibre industry specific processing equipment.

MATERIAL PREPARTION:
ZT has a dedicated partner for; cleaning / size reduction / mixing technologies

Overview:-

- Throughput of 1 dry ton/hour using fibre specific proprietary components
- Derivatives extraction option.
- Proprietary easy access / maintenance machine construction.

Industrial Production – Investment Estimate

ZT is a technology provider, not an end-product manufacturer, so all figures disclosed below are estimates for a 24 ton/day manufacturing unit.

Raw material storage/Pre-processing equipment, Foreign body removal, Feeding:	100 SqM	800,000
Refining equipment:	200 SqM	700,000
Forming, Pressing, Drying, Surface finishing, Packing:	200 SqM	1,500,000
Fibre sales line: Separation, Drying, Bagging, Storage:	200 SqM	500,000
Office/Lab:	100 SqM	250,000
Building costs (Eco concept) @ €1000 per square metre:	1000 SqM	1,000,000
Technology/Market/Promotional, consultants costs: 2 years	@ 15,000 per month	360,000
Total costs:		€ 5,110,000

Extruder Capacities & Prices

Capacity	100 kg/hour	250 kg/hour	500kg/h	1 Ton/hour
Price estimate	250K€	350K€	500K€	700k€
Annual production – 1 shift	280 tons	700 tons	1400 tons	2800 tons
Annual production – 3 shifts	840 tons	2100 tons	4200 tons	8400 tons

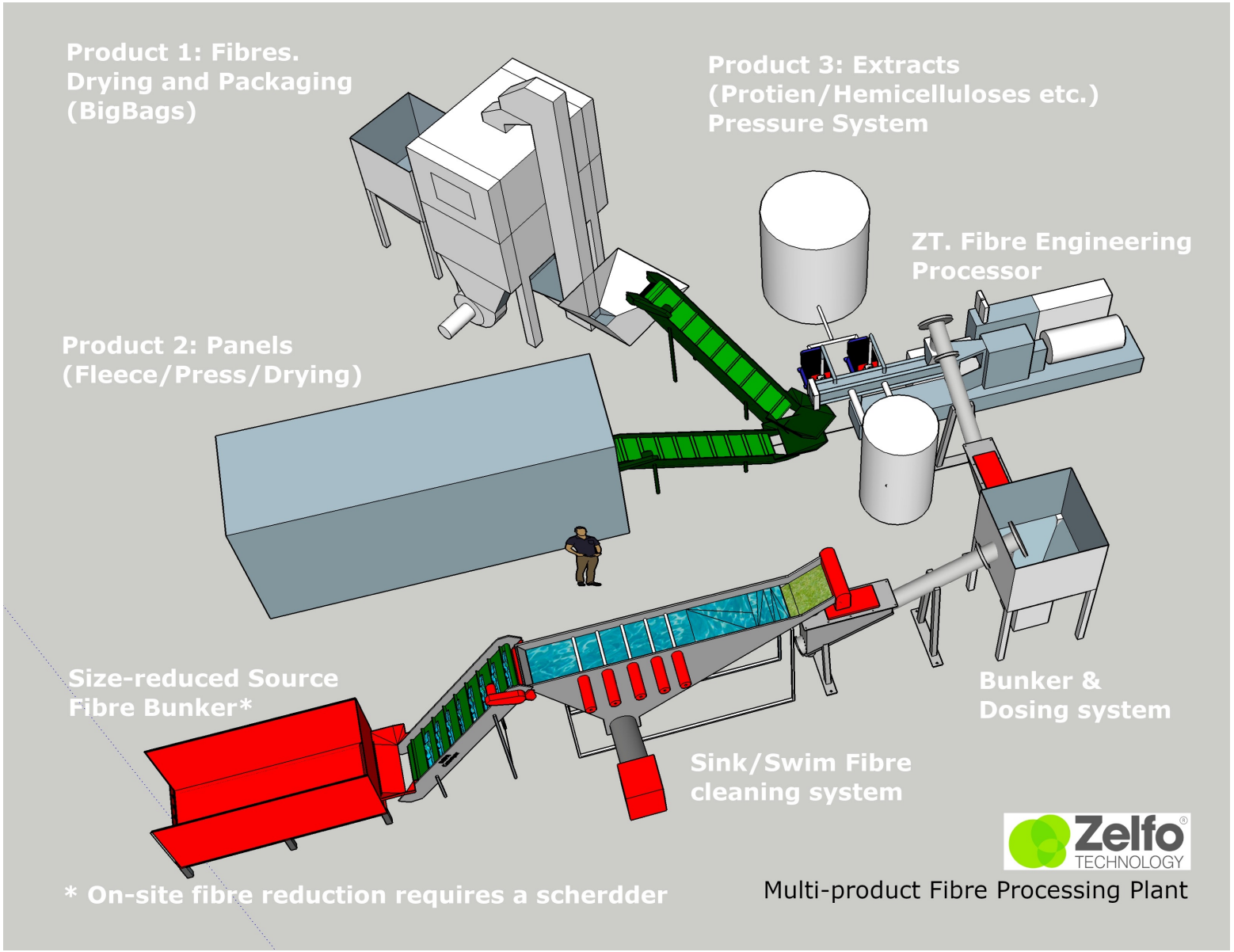
- Hypothesis are 8 hour production shifts, 350 days/year
- Smaller production units could be mobile and transported via containers
- Processing costs are estimated between 150 & 250€/ton
- Selling price of the fibres will depend on end-product manufactured

Steer Extruder Systems

OMEGA SERIES

‘CORE’ Technology

Into the future: Multi-product line



Zelfo:- Engineered Fibre for Optimised Results

Thank you!