



CH

BIOFORCE

FROM WASTE TO VALUE

Oljen arvoketju kuntoon!

| Petri Tolonen | petri.tolonen@ch-bioforce.com

CH-Bioforce is making the world more sustainable by converting waste to high value



Battle towards sustainability is changing the world around us

The shortage of fossil energy, increasingly severe environmental pollution and global climate change are pushing consumers, companies and countries all over the world to actively seek cleaner and more renewable solutions



Lignocellulosic biomass has all the properties to be a valuable aid in the battle

A highly potential solution for the battle is lignocellulosic biomass, which is inexpensive and the most abundant bio-renewable material on earth found on all plant dry matter such as wood, agricultural residues and forestry residues



The applications of lignocellulosic biomass are vast and constantly increasing

Lignocellulosic biomass is composed of three components – cellulose, hemicellulose and lignin – which all already have a myriad of applications in a wide range of industries and new applications are constantly being researched



The potential of lignocellulosic biomass is however currently significantly underutilized

Many current technical solutions of utilizing lignocellulosic biomass use wood as feedstock and significantly underutilize the potential – for example in the pulping industry, only cellulose is extracted, and a large fraction of the biomass is burned to energy



CH-Bioforce has developed a revolutionary technology for fully utilizing the potential of lignocellulosic biomass

CH-Bioforce's revolutionary Bioforsense technology can fractionate all three components – cellulose, hemicellulose and lignin – in a single process from almost any kind of biomass in an economic, profitable and environmentally-friendly way

Bioforsense technology is ready to be made commercially available

CH-Bioforce's progressive Bioforsense technology and its applications have been developed since 2011 and are about to be made commercially available in a larger capacity

2011

Co-founders Lari Vähäsalo, Sebastian von Schoultz and Nicholas Lax discover the fractionation technology and file the first patents

2017

Current pilot plant is built in Raisio, Finland with the support from Business Finland

2019

Construction of an automated pilot production line begins & EU Horizon SME funding boosts innovation

2022

New collaborations and CH-Bioforce's technology used in commercial customer products

2025

New mid-scale plant begins its operations, capacity 20,000 tons/year

2016

CH-Bioforce Oy established with Oy Chemec Ab as the main shareholder

2018

Financial analysis, technology validation, material evaluation

2020

Technology develops and CH-Bioforce enters global rankings

2023

Financing round for the new mid-scale plant to be built in Raisio, Finland

2030

New large-scale plant targeted to begin its operations, capacity 100,000–400,000 tons/year

The revolutionary Bioforsense technology and its applications have been profoundly and successfully researched since 2011

The technology is now ready to be made commercially available and the extensive trials conducted with potential customers have provided strong demand for the product and enable the scaling of the operations

CH-Bioforce is aiming to commercialize the technology with own production plants – first with a mid-scale plant in Raisio, Finland, and later with additional larger factories globally – as well as by licensing the technology

Revolutionary Bioforsense technology in brief

CH-Bioforce's Bioforsense technology can fractionate all three biomass constituents – cellulose, hemicellulose and lignin – in a single process in an economic, profitable and environmentally friendly way

Raw materials are utilized maximally

Material efficiency is up to 90 %

Agricultural residues



Mechanical wood processing residues



Other biomass

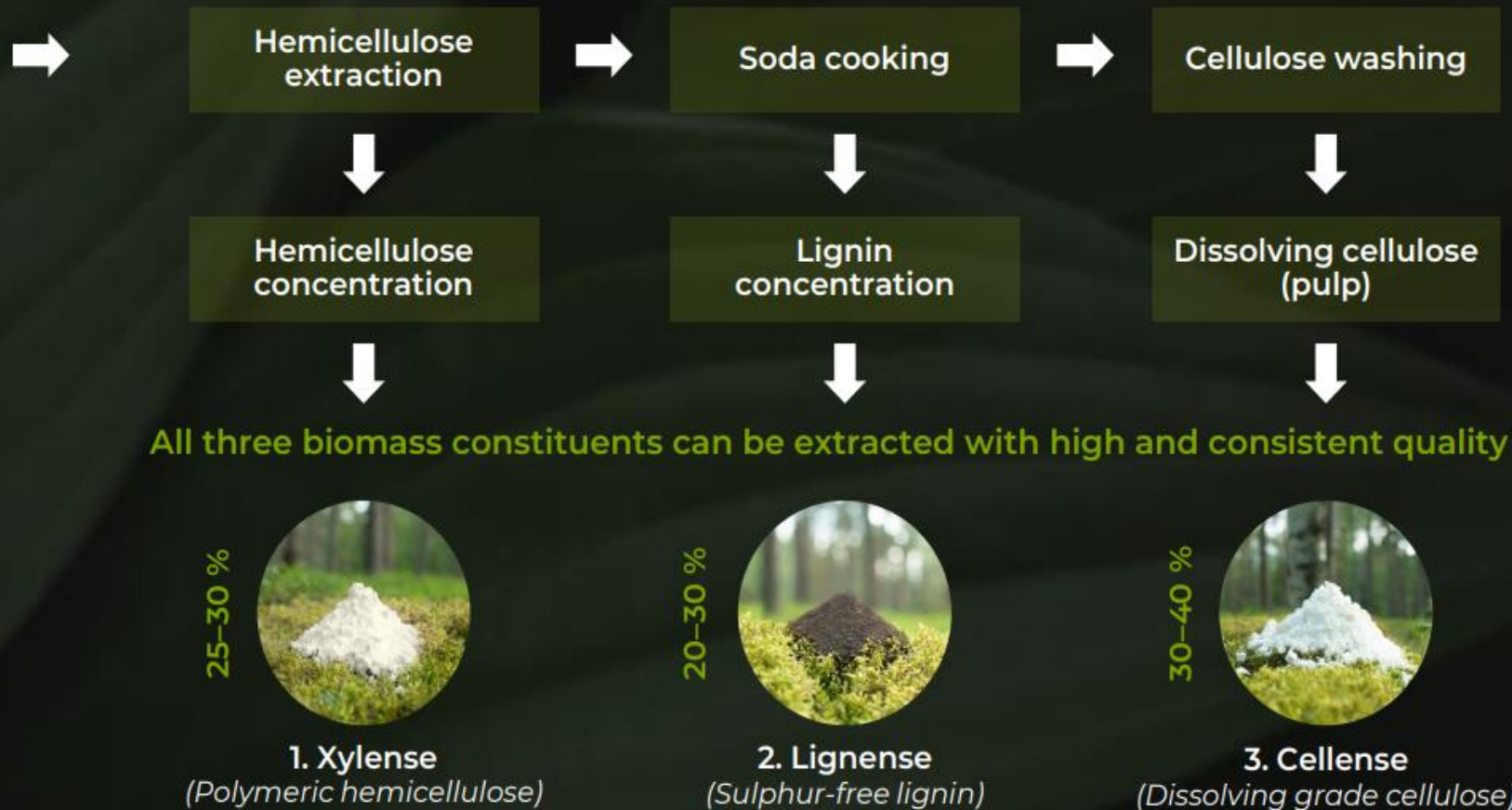


Low freshwater consumption



Highly sustainable production process

No harsh chemicals are used, freshwater consumption is extremely low, and the process is carbon-neutral



Sustainability is in the DNA of CH-Bioforce

CH-Bioforce contributes to several UN Sustainable Development Goals with its technological solution

2
ZERO
HUNGER



CH-Bioforce's biopolymers can replace cotton which frees the limited farming land for food production, especially in the less developed regions. Cotton production is high water consuming and polluting.

13
CLIMATE
ACTION



CO₂ emissions in CH-Bioforce's production process is only 1% compared to state-of-the-art Kraft pulp mill. The process uses industrial and agricultural side streams that would otherwise be burnt, causing significant emissions.

9
INDUSTRY, INNOVATION
AND INFRASTRUCTURE



CH-Bioforce provides an innovative, carbon neutral, and cost-effective technology for the production of high-quality biopolymers.

15
LIFE
ON LAND



The process uses sustainable feedstock, such as straw, wood chips, and industrial side streams, to produce high-quality biopolymers.

12
RESPONSIBLE
CONSUMPTION
AND PRODUCTION



CH-Bioforce provides a new bio-based feedstock option, produced from sustainable sources. The circular economy is an integral part of its solution, as it can utilize agricultural and other cellulose-containing side streams.

17
PARTNERSHIPS
FOR THE GOALS



CH-Bioforce's target is that there is a fleet of biorefineries based on Bioforsense technology all over the world. Licensing the Bioforsense technology is one of the ways to achieve this goal.

Production concept and products

CH-Bioforce's sustainably produced high-quality polymers can be used in numerous applications across different industries, providing a large and differentiated customer base



Business Model

1. Own production and direct sales to our customers
2. License our technology to companies aiming to produce biopolymers

First in the World



Spinnova
The Sustainable Fibre Company.



Example of one Value Chain Hemicellulose

COSMETICS INDUSTRY

FARMERS/STRAW



COLLECTOR & SUPPLIER

HIGH QUALITY
POLYMERIC
HEMICELLULOSE



MANUFACTURER

RETAIL &
CONSUMERS



Benefits of the technology and value proposition

Bioforsense technology has several benefits over other methods for separating biopolymers, enabling a unique market positioning for CH-Bioforce

- ✓ Carbon-neutral process producing carbon-binding products
- ✓ Ultra-low freshwater consumption
- ✓ A wide range of biomass, industrial and agricultural side streams can be used as raw material
- ✓ All three biomass constituents – cellulose, hemicellulose and lignin – fractionated in one process in high-quality form
- ✓ Material efficiency more than twice as good as in a traditional pulping process
- ✓ Production costs are over 40 % lower per ton produced compared to traditional pulp production¹

CH

BIOFORCE

The Bioforce of Nature

Value proposition to own customers:

We offer high-quality, cost-competitive, completely bio-based and carbon-neutral polymers, which are produced from sustainable sources

Value proposition to licensing partners:

We offer a unique and patented technology to produce high quality and sustainable biopolymers in a cost-effective way, satisfying the current and future market demand for sustainable feedstock

¹ Analysis by Sweco AB in 2021. In the analysis, variable production costs (excluding labor) per tons produced have been compared between CH-Bioforce's new mid-scale plant with the annual raw material input of 20,000 tons and a modern dissolving birch pulp mill with annual production of over 650,000 tons. For comparison, CH-Bioforce's plant has been assumed to use dry birch chips as feedstock.

Key investment highlights

An opportunity to invest into a novel and patented Bioforce fractionation technology that allows the extraction of all three biomass constituents in a sustainable, efficient and cost-competitive way

- 1. Revolutionary and unique fractionation method**
Bioforce technology enables the production of all three polymers – hemicellulose, cellulose and lignin in one process, with wide range of biomass used as the feedstock
- 2. Efficient and cost-competitive**
Material efficiency over twice as good and OPEX & CAPEX are considerably lower compared to a traditional pulp mill, making even a small plant profitable
- 3. Proven and protected technology**
The Bioforce fractionation technology has been thoroughly developed and tested, and is protected by own patent portfolio
- 4. Highly sustainable process**
Process is carbon neutral or even carbon storage, uses no harsh chemicals, has a very low freshwater consumption and decreases the use of wood by utilizing side streams as feedstock
- 5. Strong demand in a wide range of applications**
The polymers produced all already have multiple applications in a wide range of industries and new applications are constantly being researched
- 6. Major contributor to green transition**
CH-Bioforce has potential to be at the forefront of accelerating the green transition by providing cost-efficient and eco-friendly solutions to a myriad of industries

The logo consists of the letters 'C' and 'H' in a bold, white, sans-serif font. The 'C' is on the left and the 'H' is on the right, with a small gap between them.

BIOFORCE

The Bioforce of Nature

Making the world more sustainable by converting waste to high value

Unique and game-changing technology has a full freedom to operate

Over 70 granted patents (as of August 2023)

NAME OF THE PATENT	GRANTED PATENTS	PENDING PATENTS
Method for extracting biomass <i>(WO2014009604)</i>	Brazil, Canada, China, EPO (27 countries), Finland, India, US	-
Method for extracting lignin <i>(WO2015104460)</i>	Brazil, Canada, China, Finland, Russia, South Africa, US	EPO, India
Method of producing hemicellulose extracts <i>(WO2017168051)</i>	China, Finland, India, Russia, US	Brazil, Canada, EPO, South Africa
Method of converting biomass <i>(WO2018002451)</i>	Brazil, EPO (27 countries), Finland, India, Russia, US	Canada, China, South Africa
Cross-linkable xylans and methods of producing the same and their uses <i>(WO20215354)</i>	Finland	PCT
Extracted lignocellulosic material as an adsorbent and uses thereof <i>(WO2018178515)</i>	China, EPO (4 countries), Finland, US	

Organization and employees

CH-Bioforce's multidisciplinary team is responsible for innovations with several international patents & has strong connections to the industry and the academic world

Business & Operations



Mr. Petri Tolonen
Chief Executive Officer



Mr. Sebastian von Schoultz
*Chief Business Officer,
Co-founder*



Ms. Mari Taipale
Chief Operating Officer

Technology



Mr. Nicholas Lax
CTO, Co-founder



Mr. Mattias Strandberg
Process Engineer



Mr. Karri Koho
Technician



Mr. Jorma Jäntti
Technician

Research & Development



Dr. Lari Vähäsalo
R&D Director, Co-founder



Ms. Irina Saarinen
Laboratory Analyst



Ms. Sanna Tammi
Laboratory Analyst

CH

BIOFORCE

The Bioforce of Nature

MAKING THE WORLD MORE
SUSTAINABLE BY CONVERTING
WASTE TO HIGH VALUE