Turn industrial side streams into high-value products

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Biomass fractionation technologies



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Your side stream could be your next revenue stream

THE CHALLENGE

Underutilised biomass often carries handling costs while its valuable compounds remain untapped.

The key question is whether the resulting fractions can support a viable application, business case and go/no-go decision.

1. **Identify**
   valuable fractions
2. **Validate**
   at pilot scale
3. **Decide**
   whether to scale

LUPI connects feedstock knowledge, pilot processing, analytics and application testing to support the investment decision.

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What value can LUPI create for your company?

New products

Create higher-value fractions from an existing raw material.

Lower risk

Test performance before committing to major investment.

Faster development

Produce representative material for application trials.

Scale-up confidence

Combine pilot data with economics, environmental impact and scale-up analysis.

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Feedstocks we can help turn into value

Start with one side stream and one clearly defined opportunity.

1

Forest industry

Bark, sawdust, wood and logging residues

2

Food & agriculture

Straw, press cakes and fibre-rich side streams

3

Natural biomasses

Berries, leaves, mosses and other plant materials

4

Industrial streams

Bio-based side and waste streams

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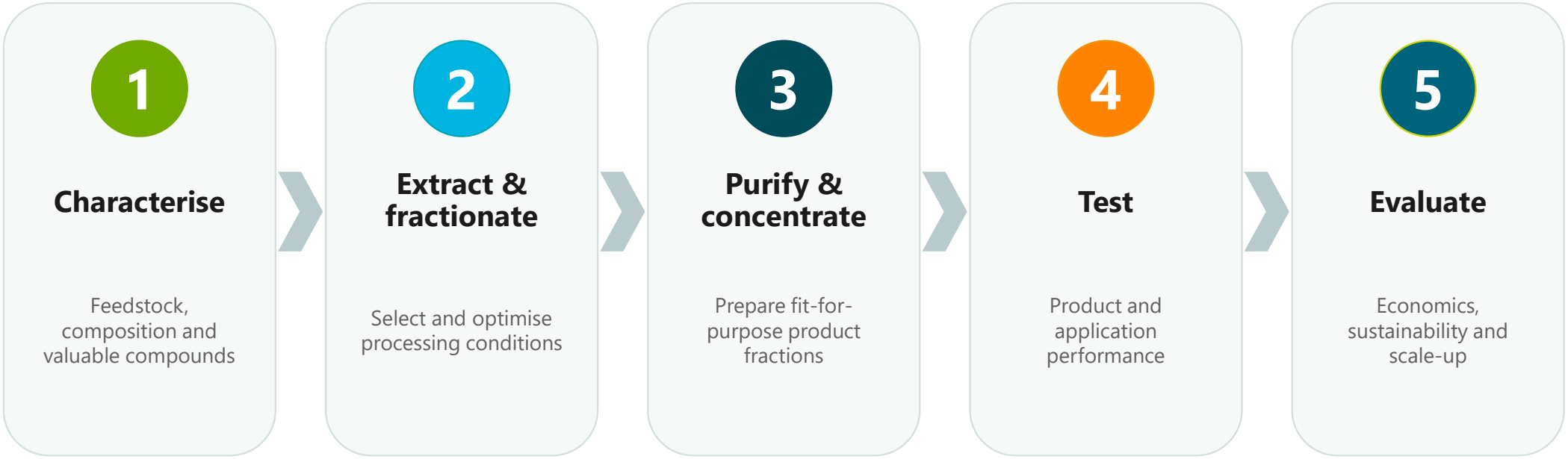
Explore higher-value industrial applications

Food, feed & health	Hemicellulose ingredients, antioxidants and bioactives
Cosmetics & specialty chemicals	Waxes, polyphenols, tannins and functional chemicals
Packaging & coatings	Barrier materials, films and antimicrobial coatings
Advanced materials	Fibres, composites, textiles and additive manufacturing
Construction & industrial uses	Adhesives, insulation, foams and water treatment

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A staged route to a go/no-go decision

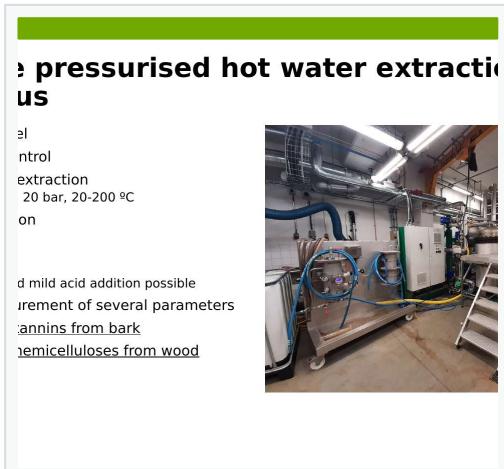


Each stage generates evidence for the next decision.

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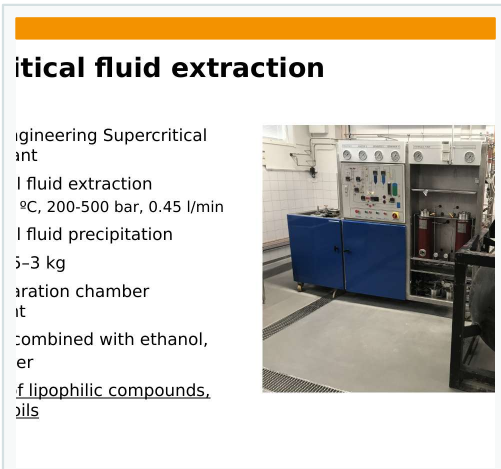
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Pilot-scale options matched to your target fraction



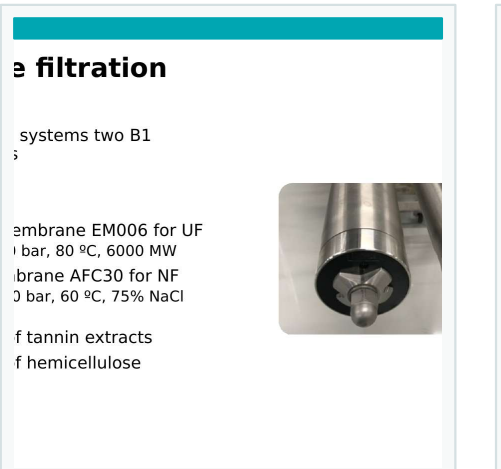
Pressurised hot water

For tannins and hemicelluloses: 300 L batch or flow-through processing.



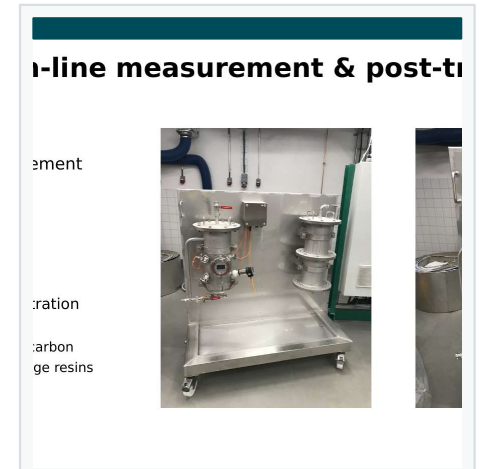
Supercritical CO_2

For waxes, oils and other lipophilic compounds: pilot extraction and precipitation.



Membrane processing

For fractionation and concentration: ultrafiltration and nanofiltration.



Post-treatment

For monitoring and purification: filtration, adsorption and ion exchange.

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One development path from feedstock analysis to scale-up evidence

What the collaboration adds

- Biomass and analytical expertise
- Pilot facilities in Lohja
- Collaboration with KCL
- Specialist laboratory support across Luke

Biomass supply

Environment and growth processes

Harvesting, storage and logistics

Biomass properties, quantity and quality

Biomass



Forest



Agro



Aqua



Side streams and residues

Groups of compounds

Extractives

- **Phenolic extractives** (condensed tannins, flavonoids, stilbenes etc.)
- **Terpenes & terpenoids** (incl. resin acids and steroids)
- **Fatty acids & alcohols**
- **Esters of fatty acids** (fats, waxes)
- **Pigments** (carotenoids etc.)

Proteins & peptides (proteinhydrolytes etc.)

Structural polymers

- Hemicellulose
- Cellulose
- Lignin
- Suberin

Applications



Food
- nutrition, food supplements
- thickeners, sweeteners, preservatives



Cosmetics
- emulsions
- waxes



Textile, packaging & coating
- Nanoparticles
- Biocolors, biowaxes



Waste water treatment



Plant health



Animal health



Pharmaceuticals



Construction materials
- glues, adhesives

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Start with one side stream and one clear opportunity



Define the first project

- One raw material or side stream
- One target application
- Clearly agreed success criteria

Flexible project formats

- Scoping or feasibility study
- Pilot campaign or customer project
- Joint funding proposal

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Let’s identify its highest-value use.

For an initial discussion, bring:

- Your raw material or side stream
- Current use, volumes and handling costs
- Target application and key business or technical question

NEXT STEP

Book a partner scoping meeting with Luke.

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Technical appendix: supercritical fluid extraction

Supercritical fluid extraction

- Chematur Engineering Supercritical Fluid Pilot Plant
- Supercritical fluid extraction
  - 40–100 °C, 200–500 bar, 0.45 l/min
- Supercritical fluid precipitation
- Capacity 0.5–3 kg
- Double separation chamber arrangement
- CO_2 or CO_2 combined with ethanol, ethanol-water
- Extraction of lipophilic compounds, waxes and oils



40–100 °C | 200–500 bar | 0.45 L/min | 0.5–3 kg capacity

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Technical appendix: pressurised hot-water extraction

300-litre pressurised hot water extraction apparatus

- 300-litre vessel
- Automated control
- Flow-through extraction
  - 20 l/min, 20 bar, 20–200 °C
- Batch extraction
- Steaming
- Water
  - Alkali and mild acid addition possible
- On-line measurement of several parameters
- Extraction of tannins from bark
- Extraction of hemicelluloses from wood



300 L vessel | 20 L/min | 20 bar | 20–200 °C | batch or flow-through

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Technical appendix: online measurement and post-treatment

Extract on-line measurement & post-treatment

- Mobile unit
- On-line measurement
  - pH
  - Brix
  - Conductivity
- Post-treatment
  - Bag filtration
  - Membrane filtration
  - Adsorbents
    - Activated carbon
    - Ion exchange resins





pH, Brix and conductivity | bag and membrane filtration | sorbents and ion exchange

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Technical appendix: membrane filtration

Membrane filtration

- PCI-membranes systems: two B1 tubular modules
- Length: 2.44 m
- Area: 1.75 m^2
- Modified PES membrane EM006 for UF
  - pH 1.5–12, 30 bar, 80 °C, 6000 MW
- Polyamide membrane AFC30 for NF
  - pH 1.5–9.5, 60 bar, 60 °C, 75% NaCl retention
- Concentration of tannin extracts
- Concentration of hemicellulose extracts



Tubular UF and NF modules | concentration of tannin and hemicellulose extracts

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Thank you!

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