IFIB2024,
Bio-based industries
3th October 2024, @15.45 – 16.00

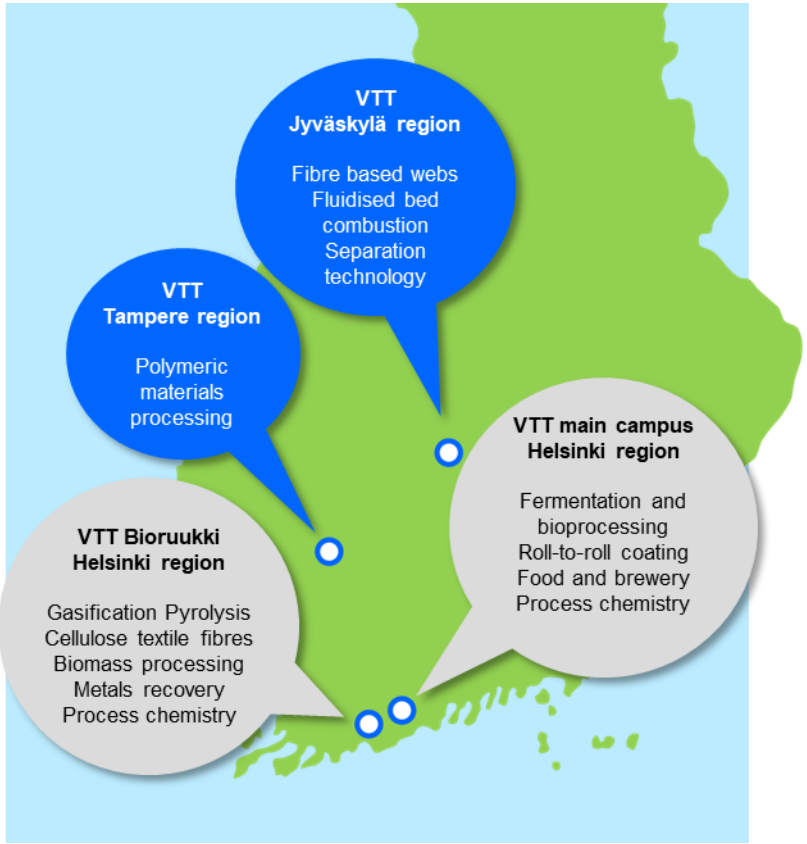
Scaling-up the bioeconomy: the role of a shared pilot facility

Ali Harlin, Jaakko Asikainen

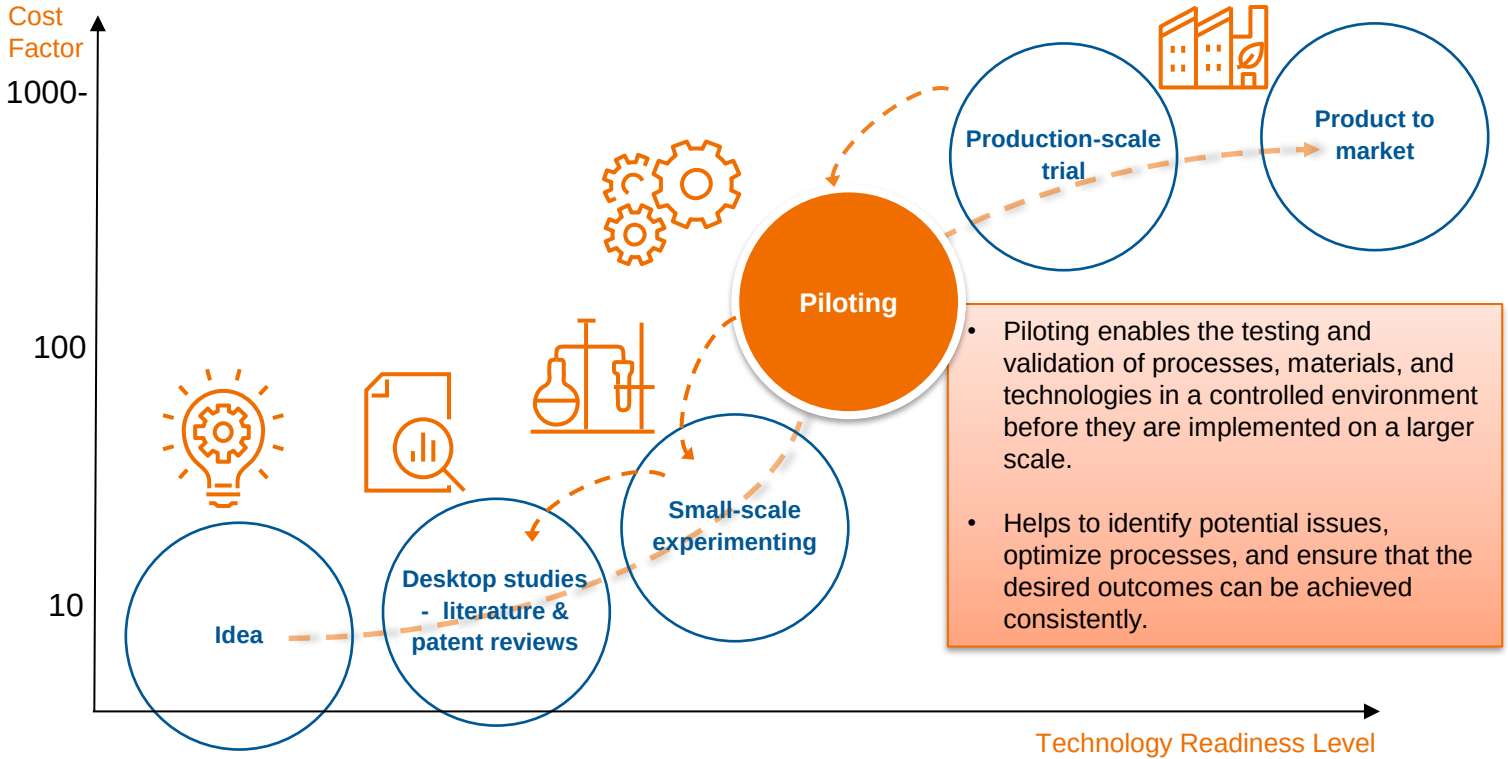
VTT Technical Research Centre of Finland – Piloting in the core of research

- VTT and key figures 2023:
  - State ownership steering of the Ministry of Economic Affairs and Employment of Finland
  - Turnover 261 M€, net 165 M€ of which 45% from abroad
  - Personnel 2213

- VTT Pilot facilities in bio and circular economy
  - Regional innovation centres with national, European and global impact.



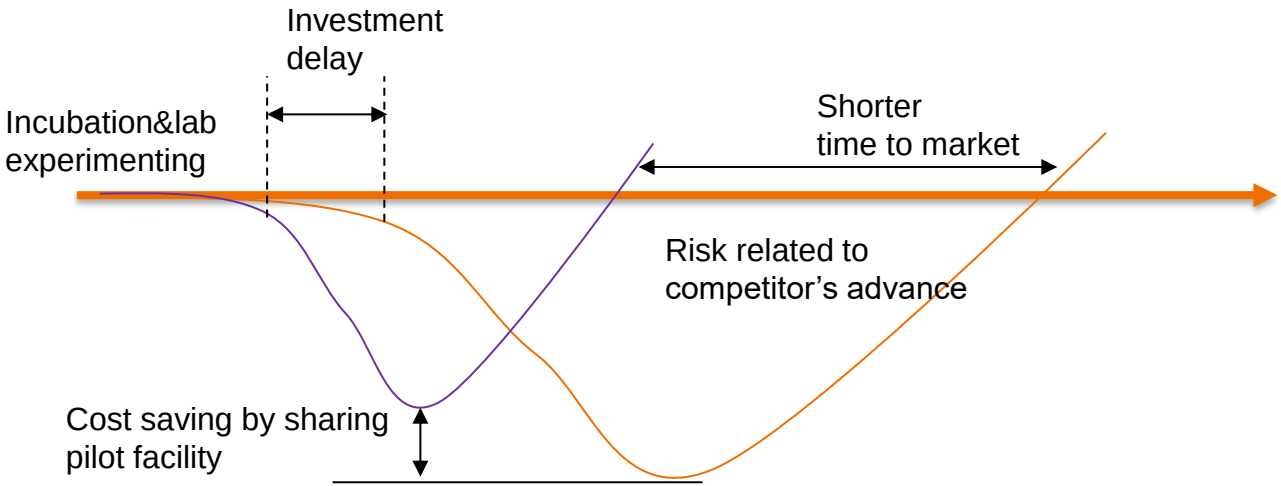
Piloting serves as bridge between laboratory experiments and full-scale production



- Piloting enables the testing and validation of processes, materials, and technologies in a controlled environment before they are implemented on a larger scale.
- Helps to identify potential issues, optimize processes, and ensure that the desired outcomes can be achieved consistently.

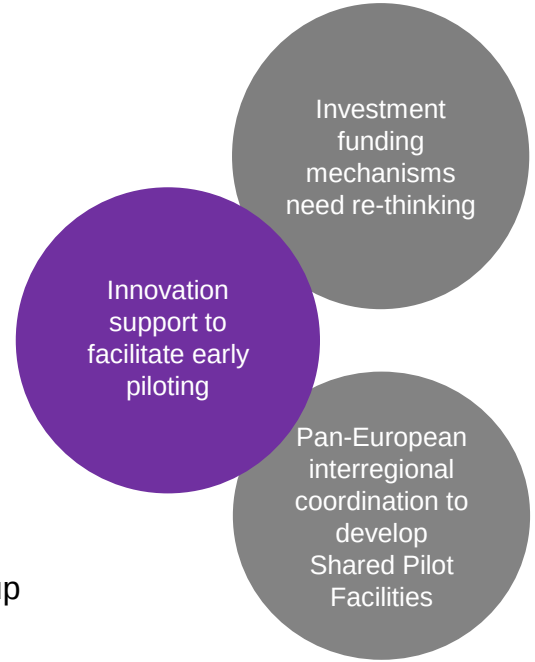
Piloting costs are substantial – lower cost with shared facilities

- Investments, operation, maintenance, development, modifications
- Shared piloting facility lower the R&D cost for companies and shortens the time to market



Challenges in setting-up, developing and operating shared pilot facilities

1. **Scope** of the pilot – often designed for a wide variety of process conditions and products: large operation window required
   - Easy modularity required for rebuilds
2. Investment **funding** mechanisms
   - Risk sharing, depreciation of the investment
   - Wide commitment from industry and research partners needed
3. **Innovation support** is not structured to facilitate early piloting
   - High cost of piloting
   - IPR in up-scaling
4. Interregional **coordination** to develop shared piloting facilities
   - Cover the value chain from raw material to converting
   - Avoid overlaps
   - Share the risk (investment costs)
   - Stronger as network – reach to wider competence and partners
   - Successful case example: EU_INNPRESSME Testbed Platform
     - Open Innovation Test Bed with 16 pilot facilities in EU for scaling-up sustainable biomaterials and processes
     - www.inn-pressme.eu

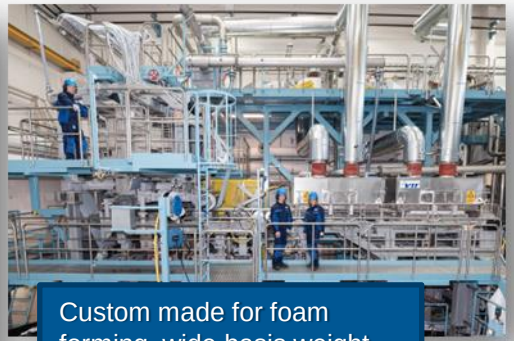


Examples of VTT operated pilots for development and scale-up of new technologies, raw materials, process concepts for bio-based products

SUORA

World's only pilot scale foam forming process and technology infra at speeds up to 1000 m/min

SAMPO



Custom made for foam forming, wide basis weight range from 15 to >1000 g/m^2

New air-laid pilot, start-up October 2025

Main research themes: Headbox and forming section development, foam forming, low-energy processing (dry-forming), bio-based materials replacing plastics including MFC film development

Size of investments: Approximately 3 to 5 M€ for a pilot, in total 25 M€ with modifications and accessories

Features: Wide operation ranges, modular and flexible for changes and modifications

Users: Open facilities, over 80 companies worldwide (Customer and VTT jointly funded projects)

Case example #1 – Piloting of fibre-based products by foaming

1. Idea: can foam be used create low-density cushioning material with natural fibres? Cushioning material to replace EPS.
   - Critical properties: Material performance – strength to density ratio
   - Wide range of biobased raw materials with variable morphologies
2. Laboratory experimenting:
   - Design of experiments, iteration
   - Testing of surfactants, mixing conditions to generate foam that produces right material density, testing of additives chemistry
   - Selecting and testing strength additives to meet the performance targets
   - Testing of material properties
3. Pilot-scale testing with the best recipe:
   - Dynamic production conditions (time delays, mixing, pumping, flow properties, fibre orientation, drying)
4. Production scale trials

Involved stakeholders
- Engineering companies
- Machine suppliers
- Chemical suppliers
- Fibre producers
- Product manufacturers
- Brand owners

Case example #1: Fibre-based products by foaming – insulation and acoustic panels are now in industrial scale-up stage in two start-up companies

Case example #2: Demonstration of post-consumer textile waste recycling at VTT Bioruukki Pilot Centre

Textile fibre recycling demonstrations

- Start-up company to scale-up
- Process industry and fashion brands to commercialise
- VTT Bioruukki provides the infra and expertise

Textile fibre spinning pilot line

- Recycling of post-consumer textile waste
- The key process steps in the production chain:
  - raw material pre-treatment
  - chemical modification and fibre spinning
  - staple fibre post-treatment

The Infinited Fiber Company®

Leverage from the EU 2014–2020

European Union
European Regional Development Fund

Shared piloting in up-scaling - Summary

Piloting plays a crucial role in up-scaling by serving as a bridge between small-scale laboratory experiments and full-scale production

1. Identifying and mitigating risks associated with scaling up.
2. Optimizing processes and technologies for larger-scale production.
3. Ensuring the feasibility and reliability of the scaled-up processes.
4. Providing valuable data and insights for further development and improvement.

Benefits of shared piloting

1. Reduced cost for up-scaling
2. Shorter time to market
3. Large coverage of value chains with flexible and modular pilots
4. Access to wider competence in required fields, if cross-disciplinary knowledge is available

VTT

beyond

the obvious

Thank you!

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