

# Süsiniku kasvatus – jätkusuutlik 21. sajandi rohepõllumajandus

Tommy Biene, New Standard Oil, asutaja

Dr-Ing. Antoine Dalibard, FhG IGB

Dr-Ing. Robert Daschner, FhG UMS



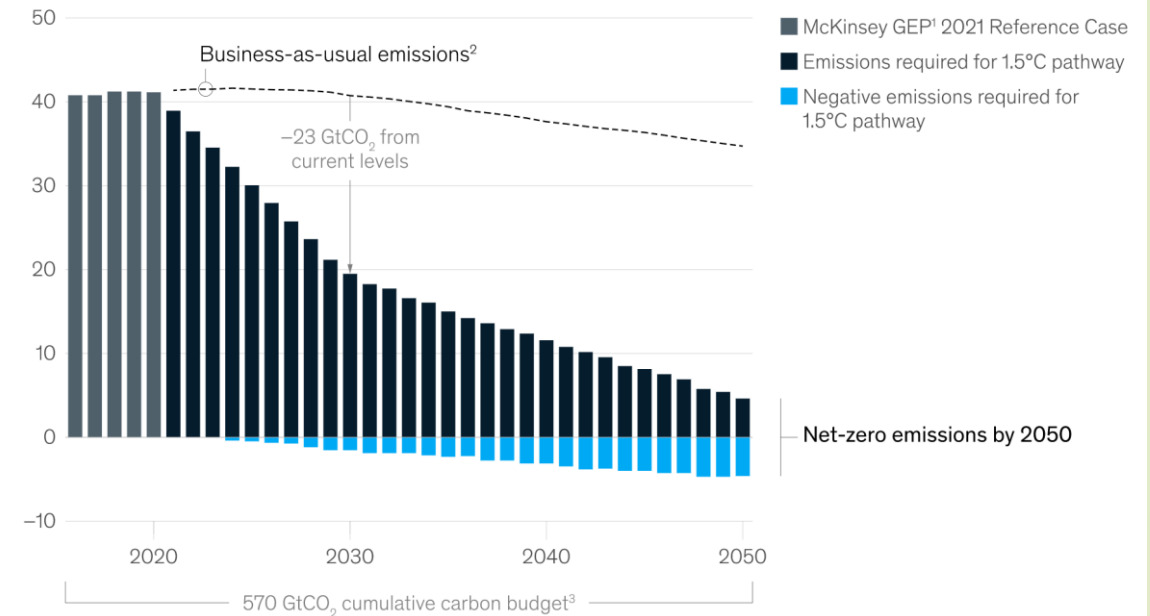
Euroopa Maaelu Arengu  
Põllumajandusfond  
Euroopa investeeringud  
maapiirkondadesse

# Tegutseda mõõdetavate tulemuste nimel

- Laialt levitatud poliitiline eesmärk on kliima soojenemise kasvu pidurdamine
- Toetada saaks ja tuleks mõõdetavat CO<sub>2</sub> ringlusest eemaldamist, soovitatavalt naturaalsel meetodil

Reaching the 1.5-degree warming target could require a large quantity of negative emissions, including some generated using carbon credits.

Global carbon-dioxide emissions, gigatons (GtCO<sub>2</sub>) per year



<sup>1</sup>Global Energy Perspective.

<sup>2</sup>While emissions fell by a quarter at the peak of COVID-19-related lockdowns, daily emissions have rebounded to be only 5% lower than 2019 levels. Scenarios to 2050 remain the same. Forster et al., "Current and future global climate impacts resulting from COVID-19," *Nature Climate Change*, August 7, 2020, nature.com.

<sup>3</sup>Budget of 570 GtCO<sub>2</sub>, emissions from 2018 onward offers a 66% chance of limiting global warming to 1.5°C, when assessing historical temperature increases from a blend of air and sea-surface temperatures. Source: Corinne Le Quéré et al., "Global Carbon Budget 2018," *Earth Systems Science Data*, 2018, Volume 10, Number 4, pp. 2141–94, doi.org; IPCC; McKinsey *Global Energy Perspective 2021*; McKinsey analysis

# Dr Rathan Lal: 2% maast mahutab 100% antropogeenset CO<sub>2</sub>

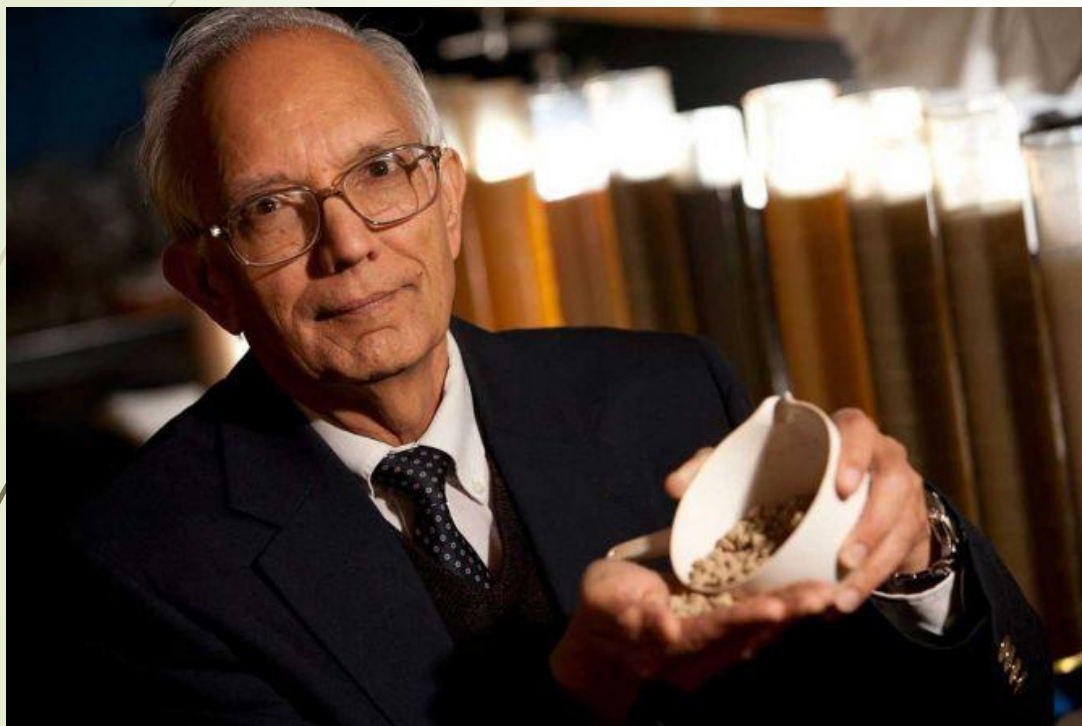


Foto: Dr Rattan Lal, Ohio Ülikool, 2020 World Food Prize laureaat. copyright: Kind courtesy Worldfoodprize.org

- Taimed juba seovad õhus asuvat CO<sub>2</sub>, puudub vajadus kapitalimahuka Direct Air Capture<sup>1</sup> tehnoloogia järele
- Taimede söestamine ja seeläbi süsiniku mulda tagastamine parandab nii õhu kui ka mulla kvaliteeti

<sup>1</sup><https://www.iea.org/reports/direct-air-capture>

# Söestatud hein ja põhk mulda tagasi, miks ja kuidas?

- ▶ Mulla happesuse vähenemine aga kas on veel mingit kasu?
- ▶ Kui palju hektari kohta, kas 50 tonni on palju?
- ▶ EMÜ – AGRONOOMIA 2018
- ▶ Luhahaina biomassist toodetud biosöe omadused, mõju mullale ja karjamaa raiheina biomassiga saagile. lk 171
- ▶ Henn Raave, Jordi Escuer, Merrit Shanskiy



# Maksimeerime süsiniku kogust - mineraalid ja toitaineid tagasi mulda

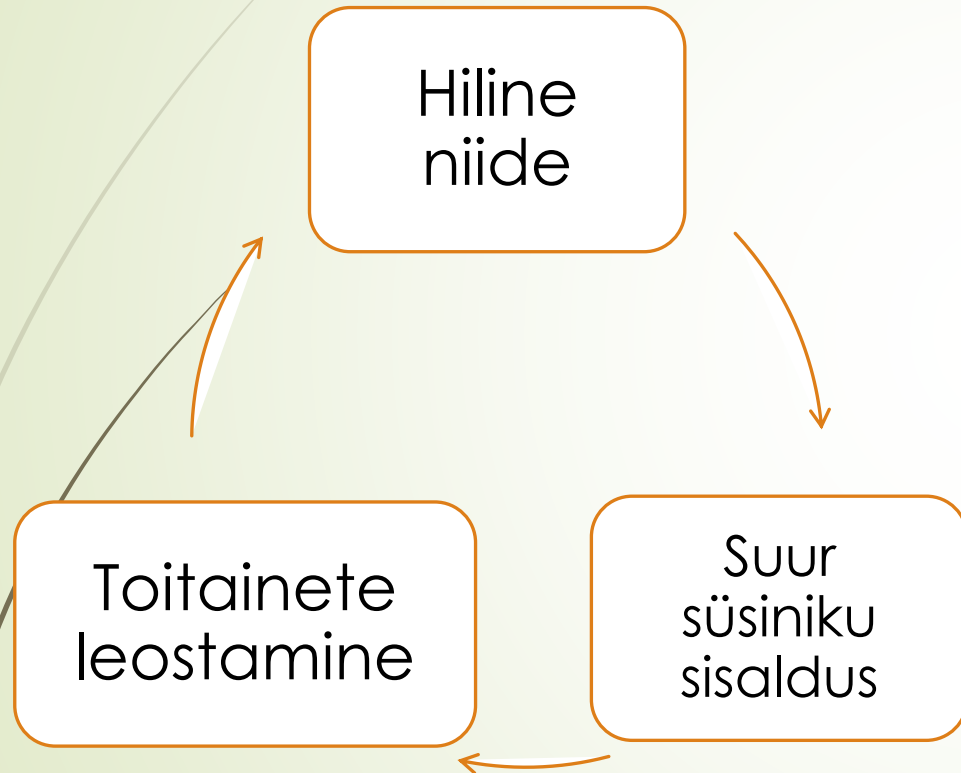


Foto: heina leostamise testimine, 2017 PRIA toetusega uuring. copyright: Leedi Talu, Taivo Roomann

# Uniformer® - biogeense ainese rafineerimine

- Ainult taimse söe tootmisest ja CO<sub>2</sub> sidumise teenuse müügist äriliselt ei piisa
- Kaskaadtehnoloogia osad loodi kümme aastat tagasi Fraunhofer IGB-s ja UMSICHT-is
- 02-2023 käivitati edukalt, esimene tööstuslik prototüüp, 2024 esimene piloottehas



Foto: Uniformer MVP\_1, copyright New Standard Oil

# Fraunhofer-Gesellschaft

## At a Glance

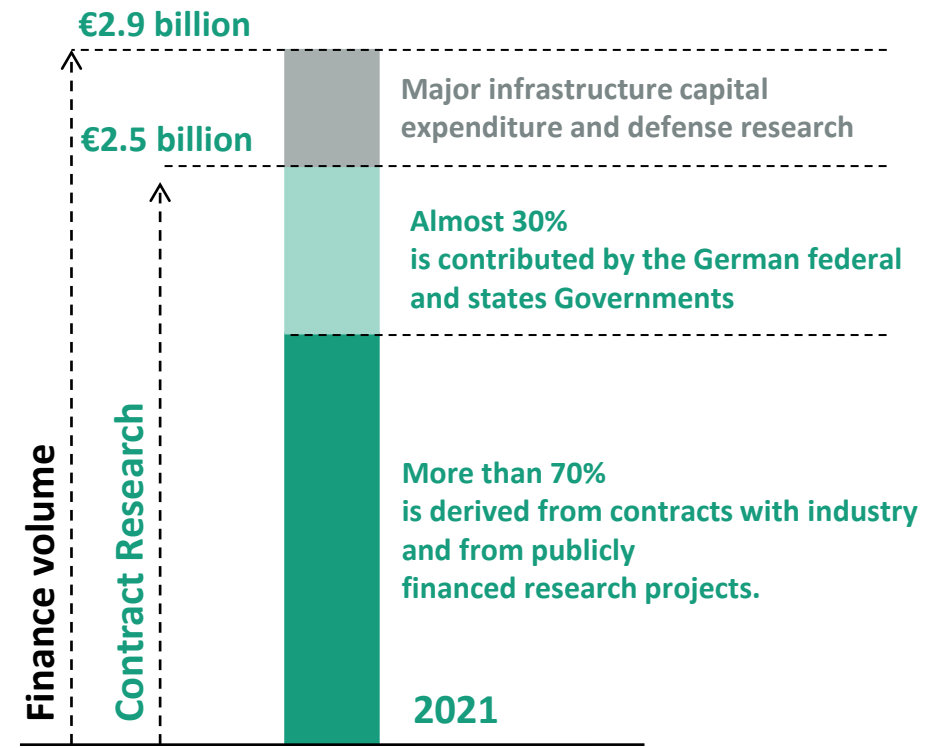
Applied research organization prioritizing key future-relevant technologies and commercializing its findings in business and industry. A trailblazer and trendsetter in innovative developments and research excellence.



30 000 staff



76 institutes and research units



A satellite view of Earth from space, showing a large cyclone or storm system over the Indian Ocean. The cyclone is characterized by a dense, swirling cloud pattern with a clear eye. The surrounding landmasses, including parts of Asia and Australia, are visible in shades of green and brown. The ocean is a deep blue, and the atmosphere is a lighter blue. A semi-transparent teal banner is overlaid on the bottom left of the image.

Fraunhofer UMSICHT - Pioneer for a sustainable world

---

Concepts and technologies for shaping the energy and raw materials transition.



# The Thermo Catalytic Reforming Technology (TCR)

## Patented Conversion of biogenic residues into sustainable products

---

### Use cases and outcome

- Utilization of biogenic residues (no food vs. fuel discussion)
- Decentralised application possible (regional added value)
- Products with near-zero carbon footprint possible

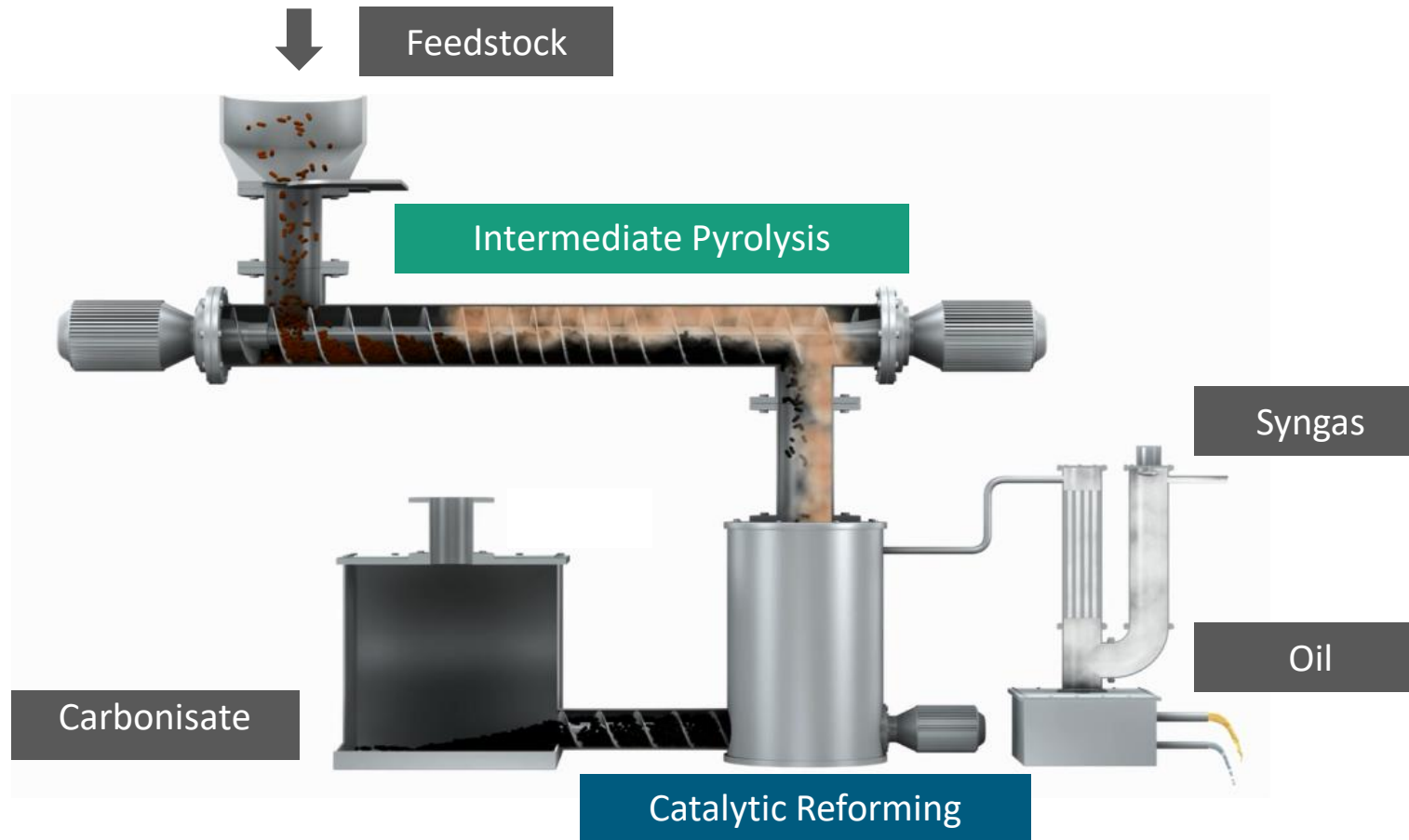
### Products

- Syngas with up to 50 % green hydrogen
- Oil with high thermal stability for processing into standard fuels
- Coal for soil application / storage / energetic use



# TCR - Functional principle

Intermediate pyrolysis with integrated catalytic reforming step



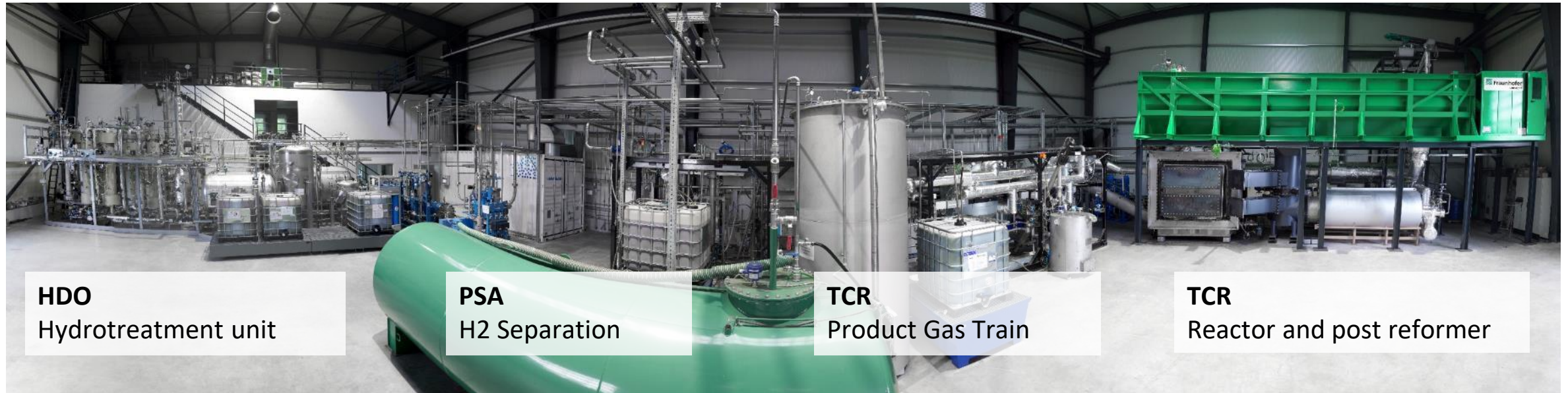
# TCR-technology

## Demonstration site for waste-to-fuel



# TCR-technology

## Demonstration site for waste-to-fuel



- Pre-commercial demonstrator in Hohenburg, Bavaria, Germany
- Value chain from feedstock via conversion unit (TCR), separation of Hydrogen from synthesis gas (PSA) and upgrading of bio-oil to fuel quality (HDO)





Research  
for a **better**  
tomorrow



Fraunhofer Institute for Interfacial  
Engineering and Biotechnology IGB

We  
combine **Biology**  
and **Engineering**

# Superheated steam at atmospheric pressure

## Working principle

### Commissioning

Heating the air inside the chamber to the desired operational temperature;

Creating the atmosphere superheated steam through the evaporation of fine water droplets (or injection of saturated steam);

### Continuous operation

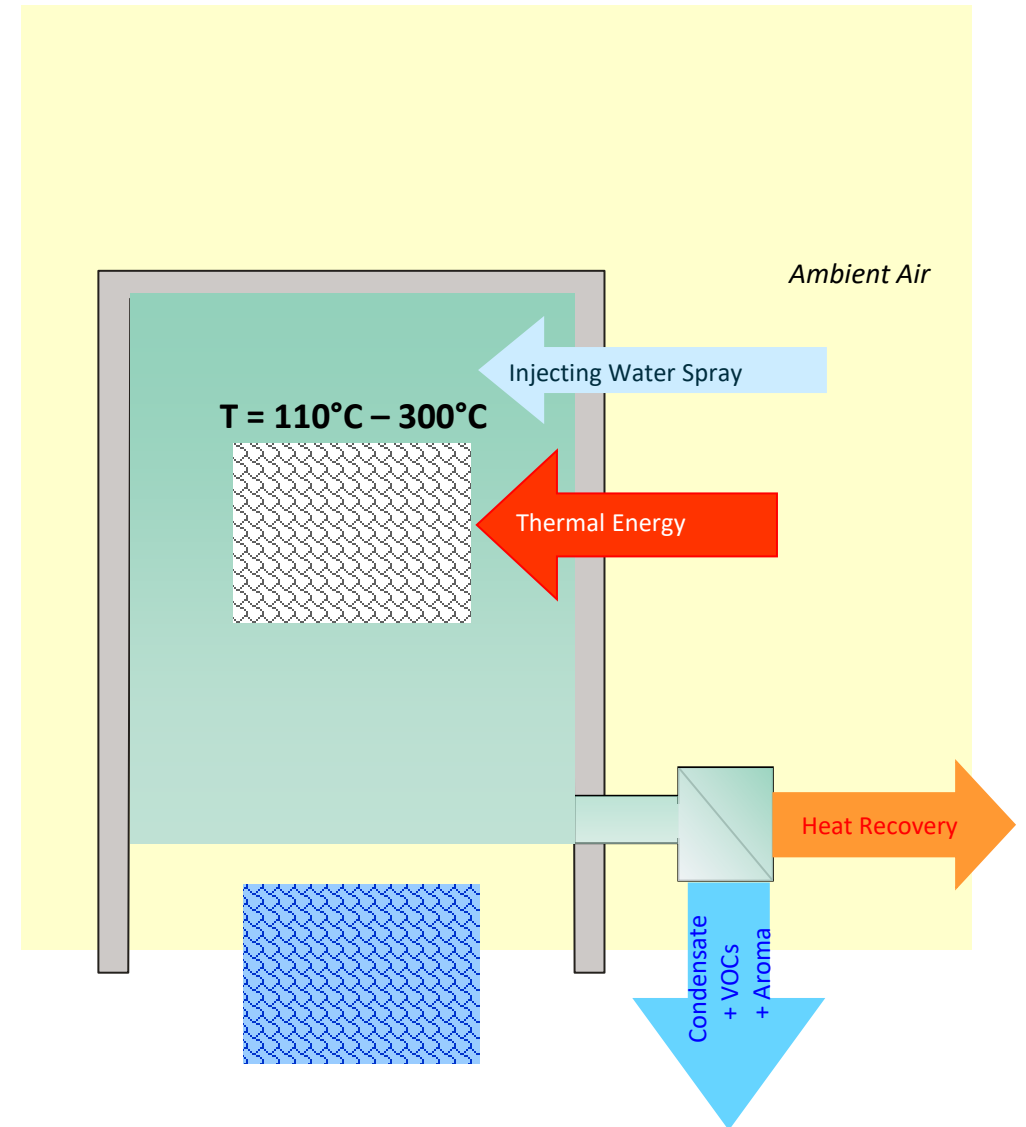
Loading material into the chamber;

Volume expansion of superheated steam due to carried-off vapour

→ excess steam;

→ recovery of heat and VOCs;

Take out the dried material and recharge again.



# Superheated steam at atmospheric pressure

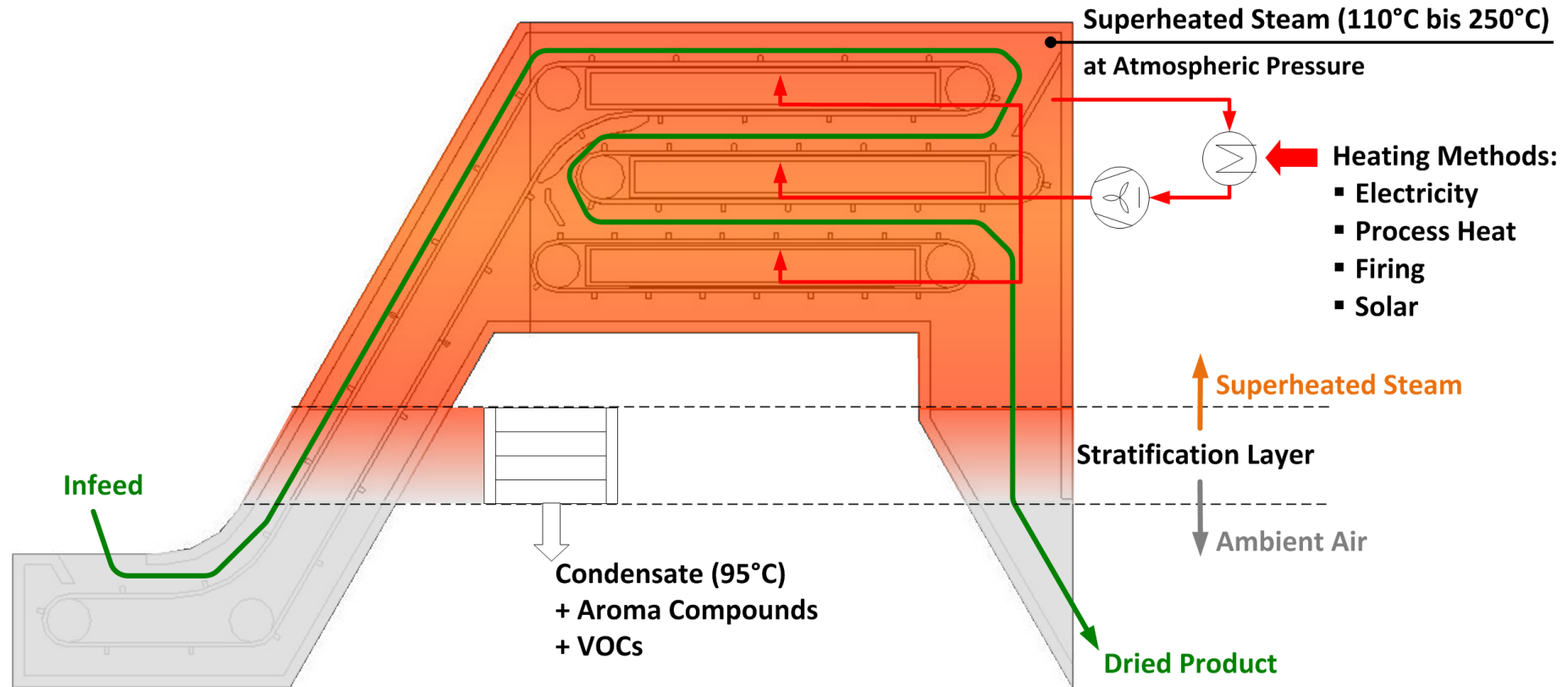
## Advantages of superheated steam (SHS) drying/torrefaction

---

- Increased heat transfer due to thermodynamic properties of SHS
- Free choice of conveying principles due to operation at atmospheric pressure
- High energy efficiency → Up to 90% of supplied energy recoverable
- No oxidative reactions and explosion risks (oxygen-free atmosphere)
- Varying the operational temperature above 120°C allows a range of product treatments from mild drying up to roasting/torrefaction.
- Recovery of condensate as demineralised water at 90°C to 95°C and flavours/aroma compounds (e.g. essential oils) or VOCs
- Recovery of valuable chemicals is possible when operating at torrefaction conditions (200-300°C)
- No harmful emissions and odour nuisances

# Superheated steam at atmospheric pressure

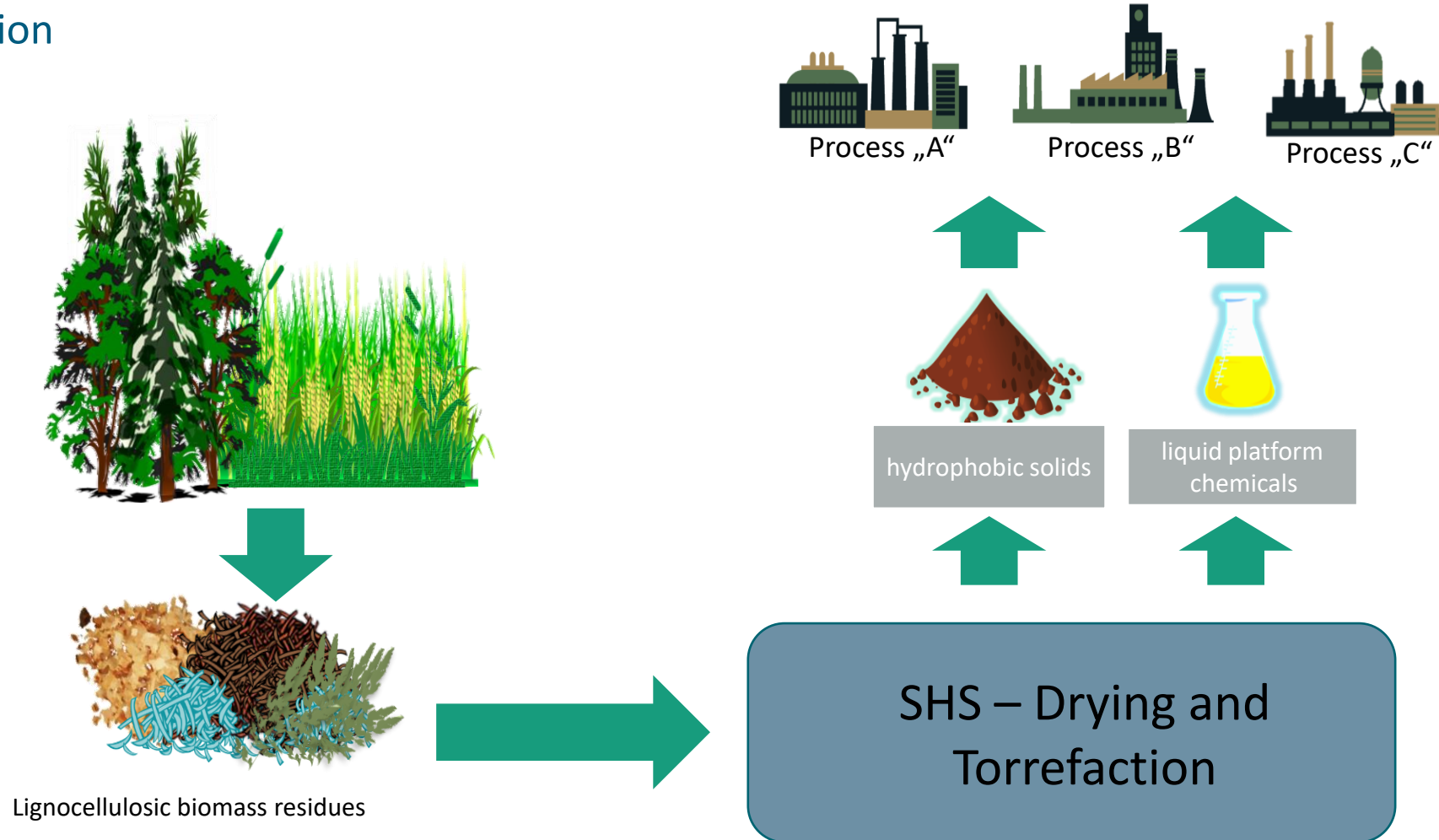
## Example of system integration: belt conveyer





# Superheated steam at atmospheric pressure

## Possible Application





Täname!

Lisainformatsioon: [info@newstandardoil.eu](mailto:info@newstandardoil.eu)

