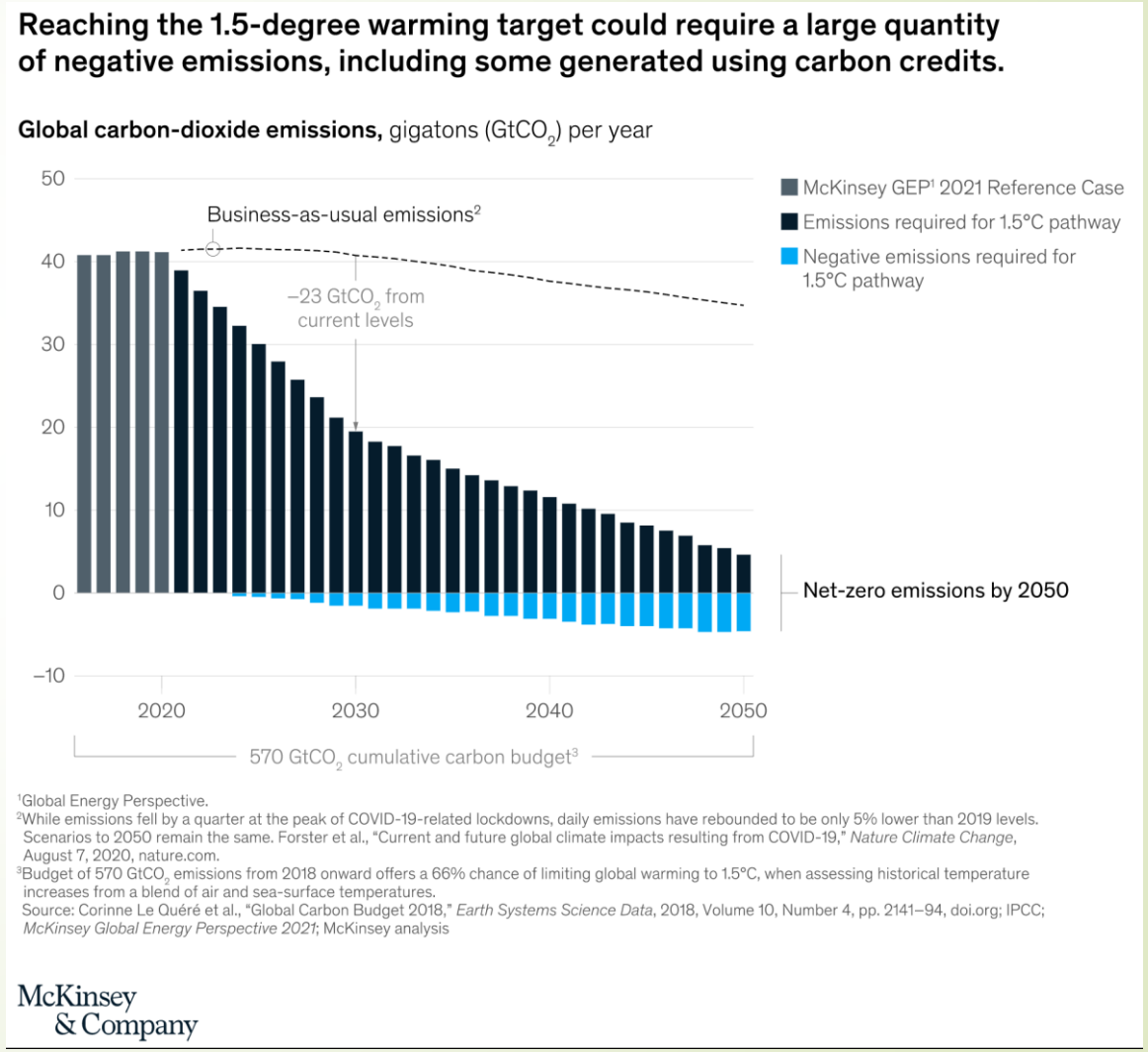
Süsiniku kasvatus – jätkusuutlik 21. sajandi rohepõllumajandus

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 CO2 ringlusest eemaldamist, soovitavalt naturaalsel meetodil



Dr Rathan Lal: 2% maast mahutab 100% antropogeenset CO2

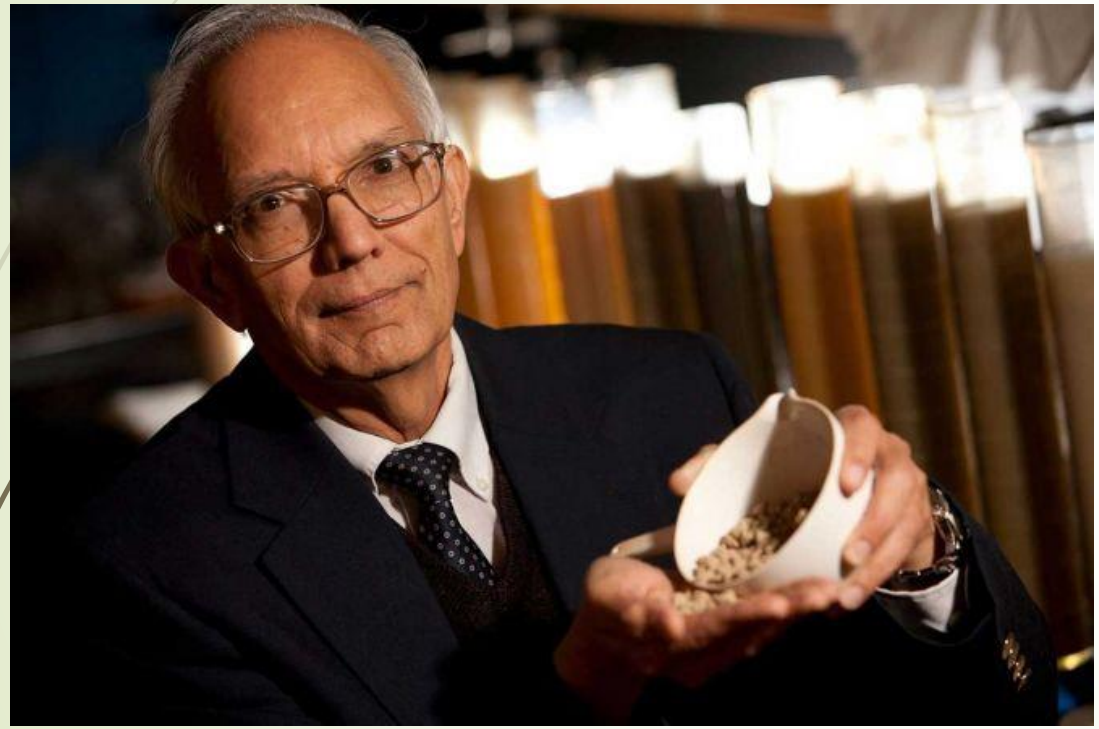


Foto: Dr Rattan Lal, Ohio Ülikool,2020 World Food Prize laureaat. copyright: Kind courtesy Worldfoodprize.org

- Taimed juba seovad õhus asuvat CO2, puudub vajadus kapitalimahuka Direct Air Capture[1] tehnoloogia järele
- Taimede söestamine ja seeläbi süsiniku mulda tagastamine parandab nii õhu kui ka mulla kvaliteeti

[1]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
- Luhaheina biomassist toodetud biosöe omadused, mõju mullale ja karjamaa raiheina biomassi saagile. lk 171
- Henn Raave, Jordi Escuer, Merrit Shanskiy

Maksimeerime süsiniku kogust - mineraalid ja toitaineid tagasi mulda

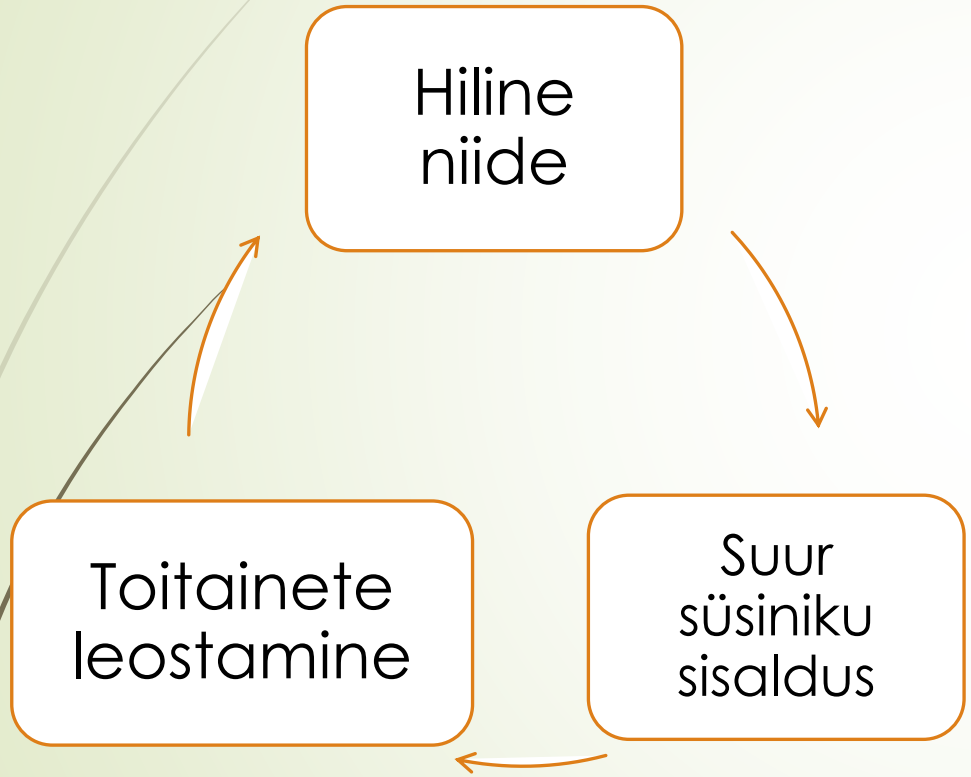


Foto: heina leostamise testimine, 2017 PRIA toetusega uuring. copyright: Leedi Talu, Taivo Roomann

Uniformer® - biogeense ainese rafineerimine

- Ainult taimse söe tootmisest ja CO2 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

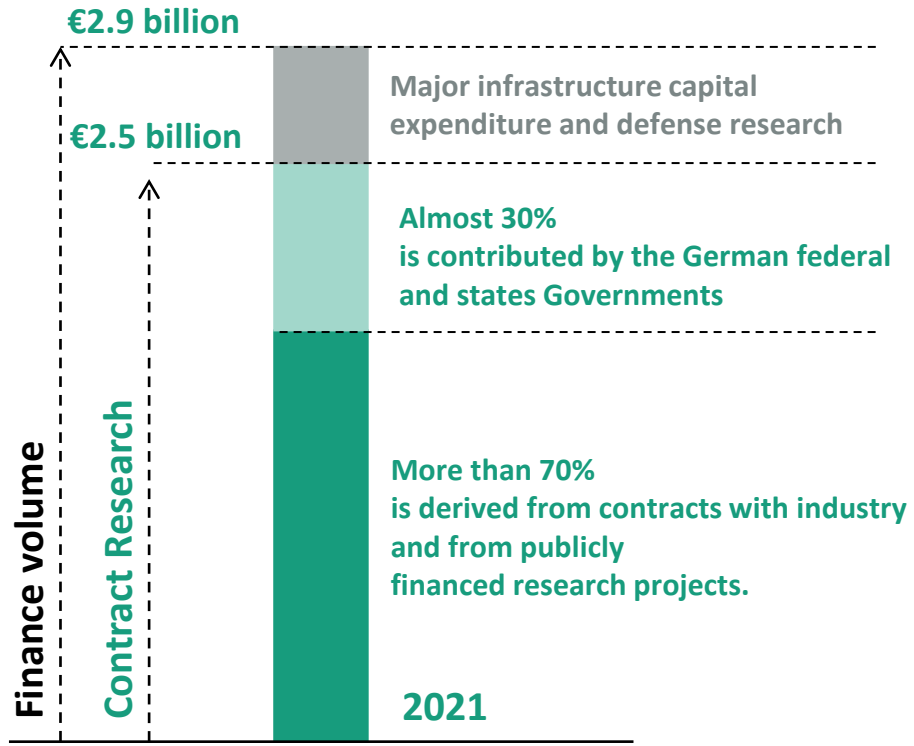
Fraunhofer-Gesellschaft

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



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

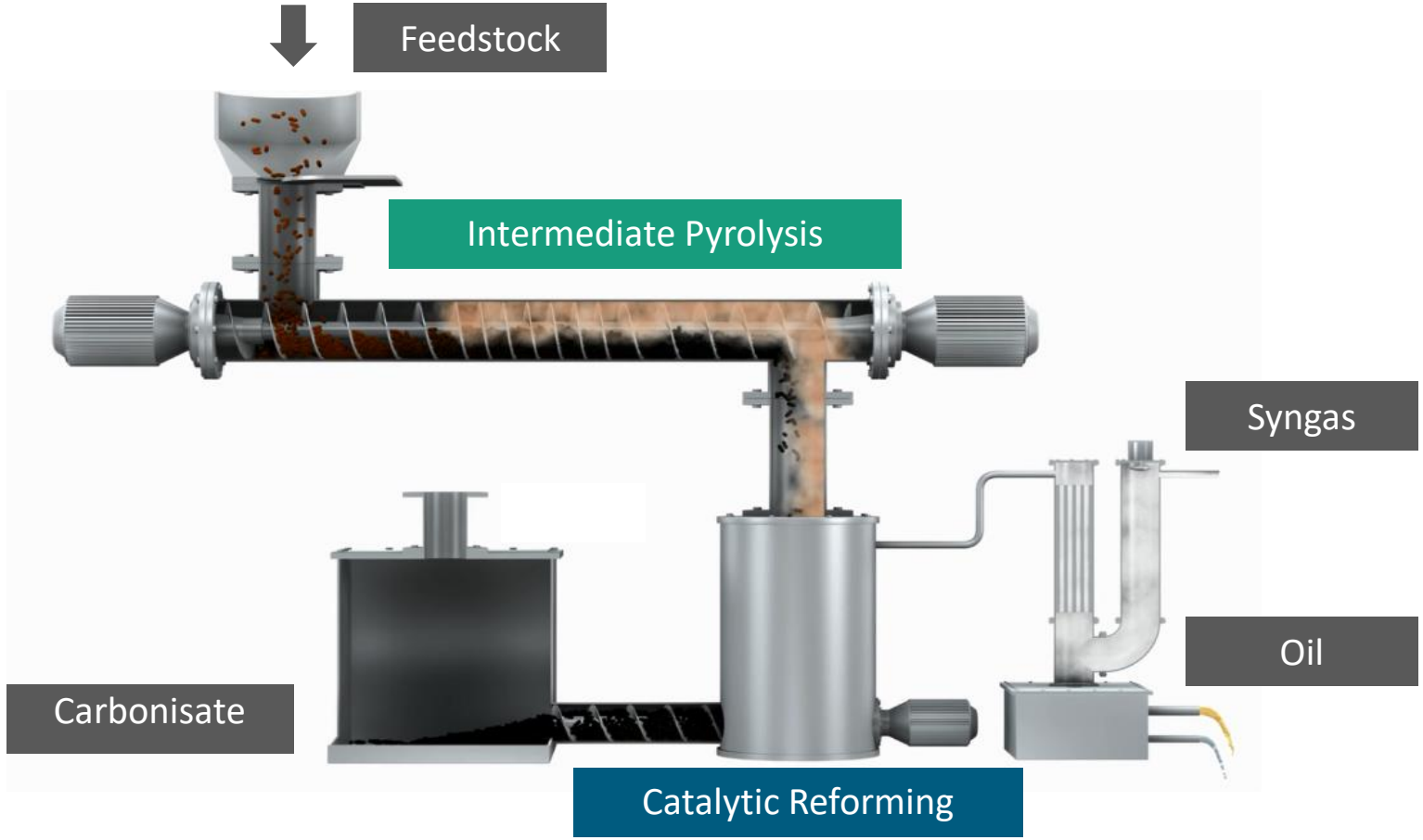
- Utilization of biogenic residues
  (no food vs. fuel discussion)
- Decentralised application possible
  (regional added value)
- Products with near-zero carbon footprint possible

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



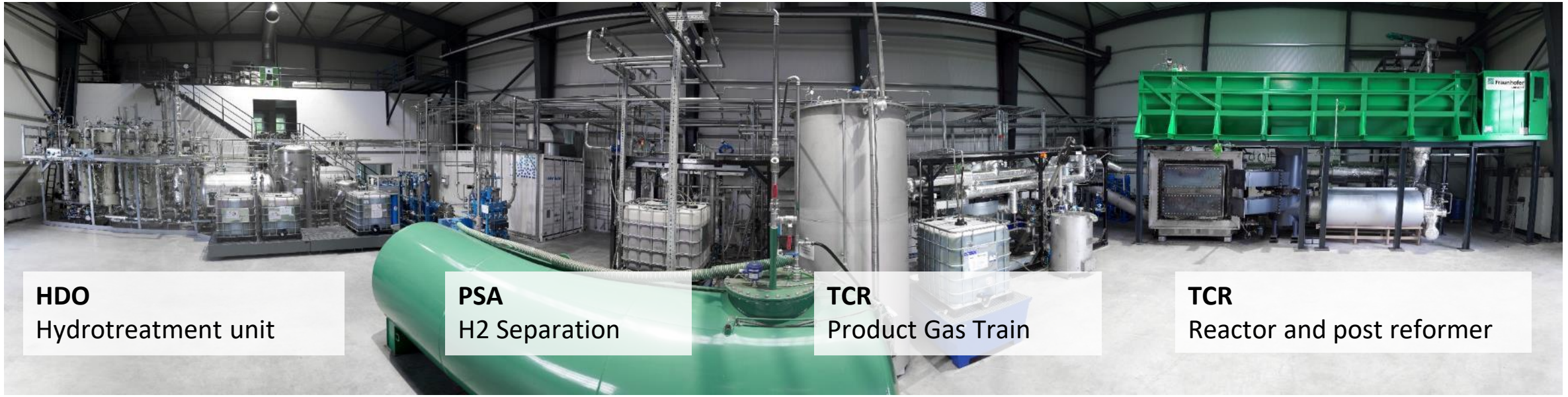
TCR-technology

Demonstration site for waste-to-fuel

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 745749

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)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 745749


Research
for a better
tomorrow
Fraunhofer
IGB
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

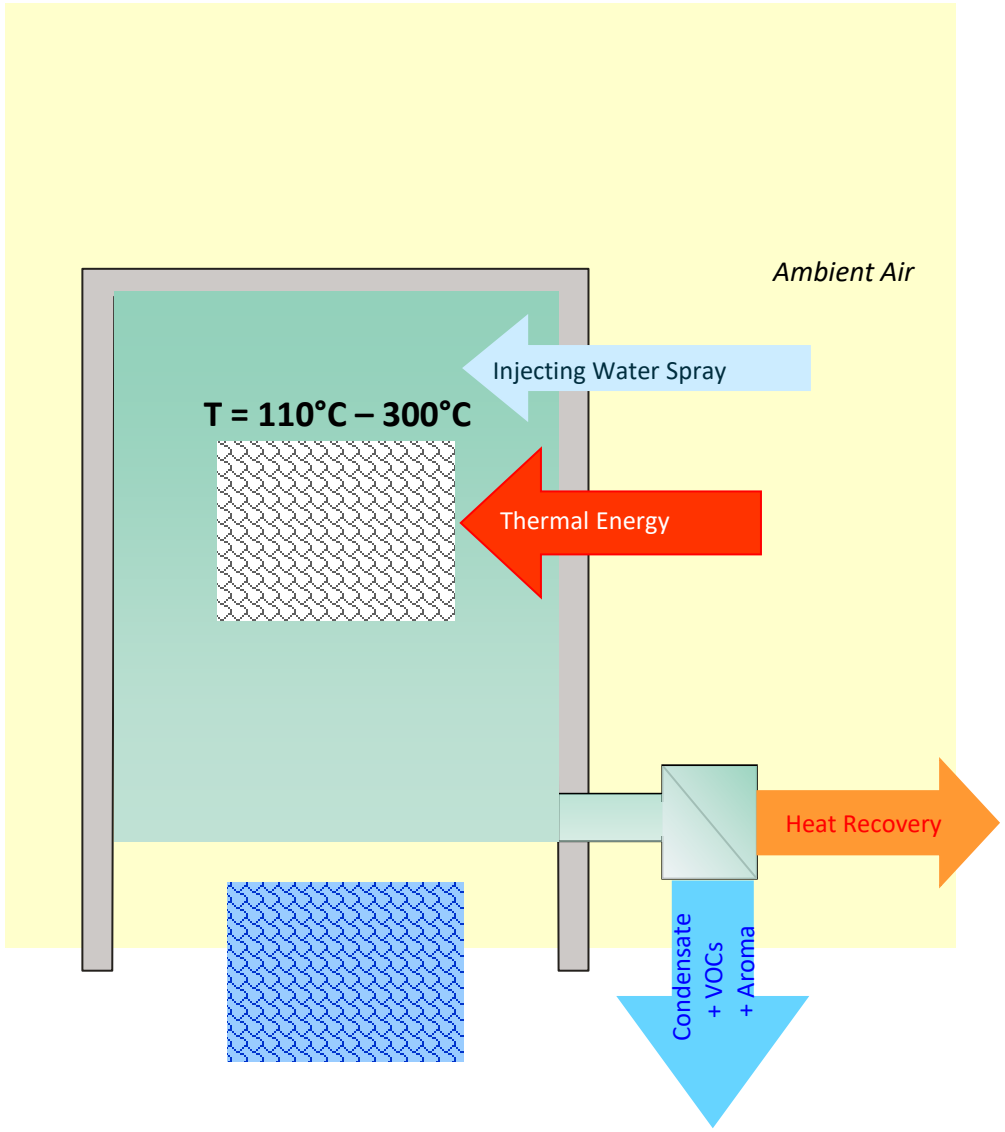
Loading material into the chamber;

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.



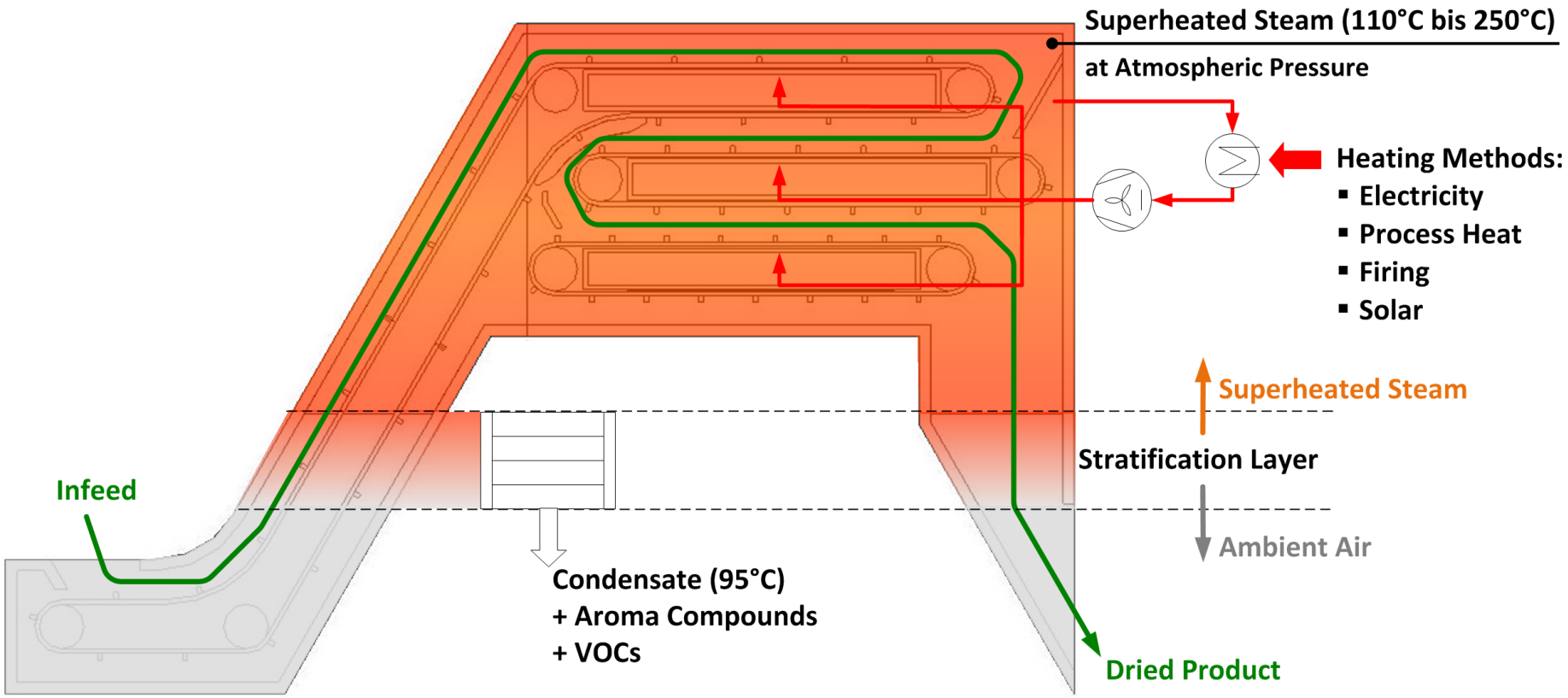
Superheated steam at atmospheric pressure

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

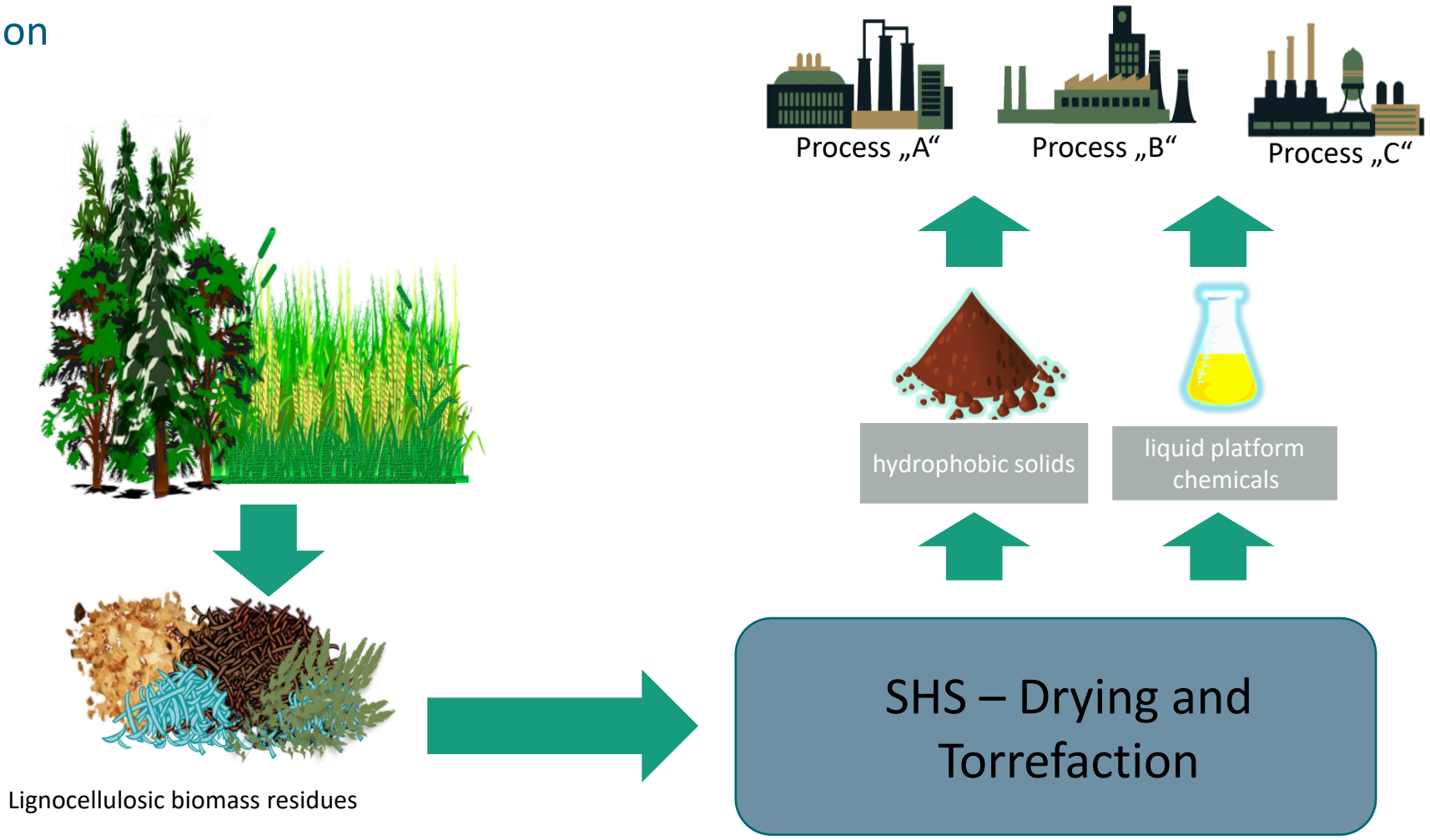
Superheated steam at atmospheric pressure

Example of system integration: belt conveyer



Superheated steam at atmospheric pressure

Possible Application



Täname!

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