IEA Bioenergy
Technology Collaboration Programme

Task 33 Country report The Netherlands

June 2020

Berend

Online via Teams

Topics

- Transforming Industry – Brightsite
- RWE
- Eska
- Mavitec
- Synvalor
- BEN
- Gasunie
- Enerkem
- Torrgas
- Synova

Brightsite

Transforming industry

Towards Climate Proof Chemistry at industrial scale.

Proud partners

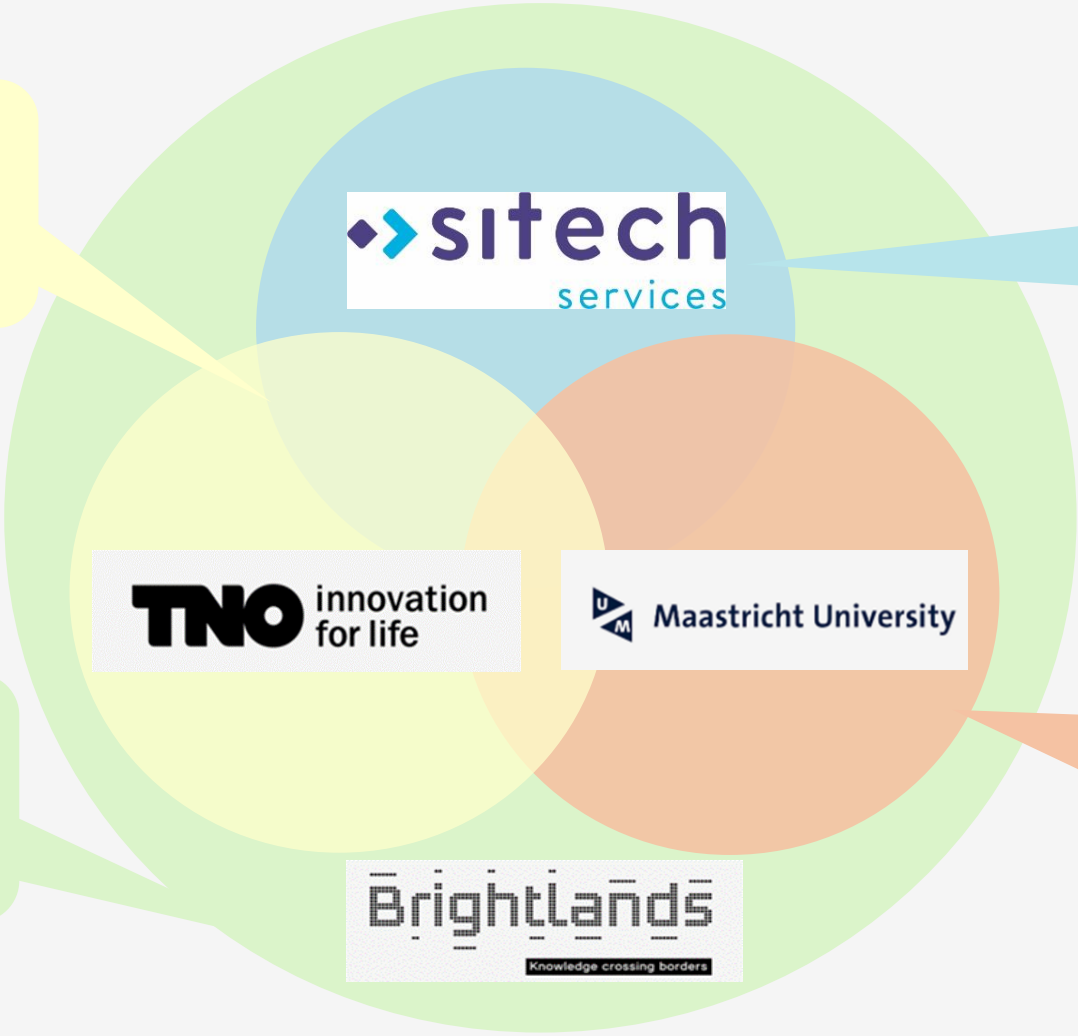
Sitech Services
TNO
Maastricht University
Brightlands Chemelot Campus

Brightsite Achieving Climate and Business Goals

Transforming industry

Develop and demonstrate **technology concepts**

Process **design, scaleup** and **implementation**

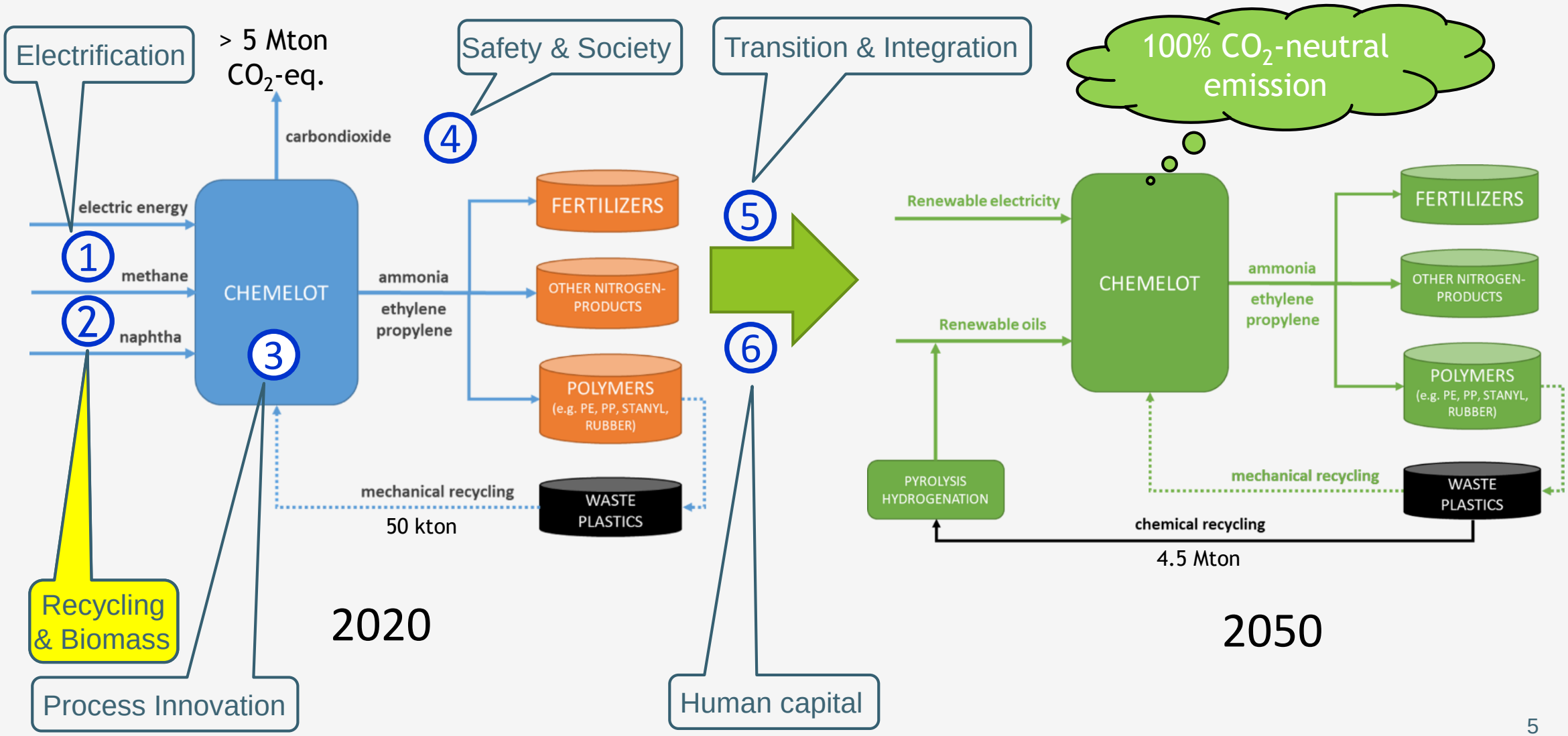


Develop Chemelot into the European **“CIRCULAR HUB”**

Provide required **education and research**

Brightsite The Chemelot transition

Transforming industry



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RWE Amer power station

The Amer-9 coal-fired power station with the waste wood

- Gasifier connected to a 600 MW_e coal fired power station
- 85 MW_{th} CFB gasifier based on Lurgi technology
- Currently off-line

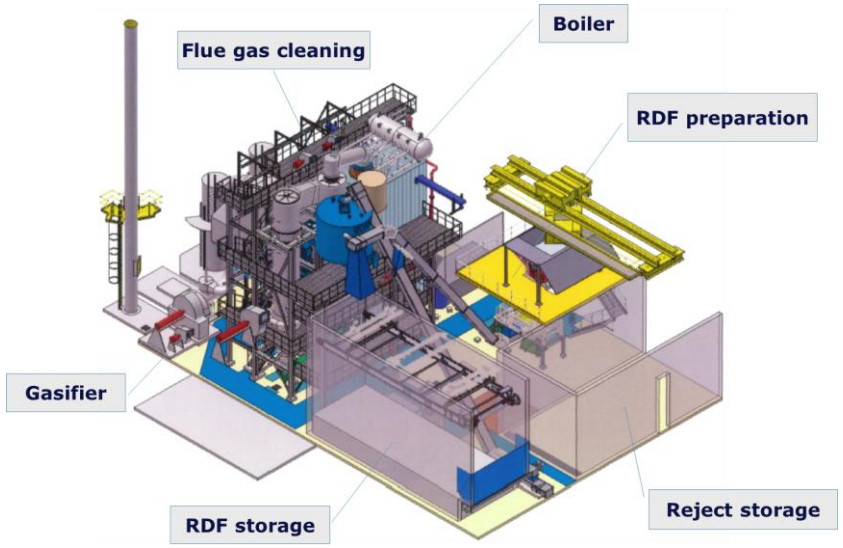
Project FUREC

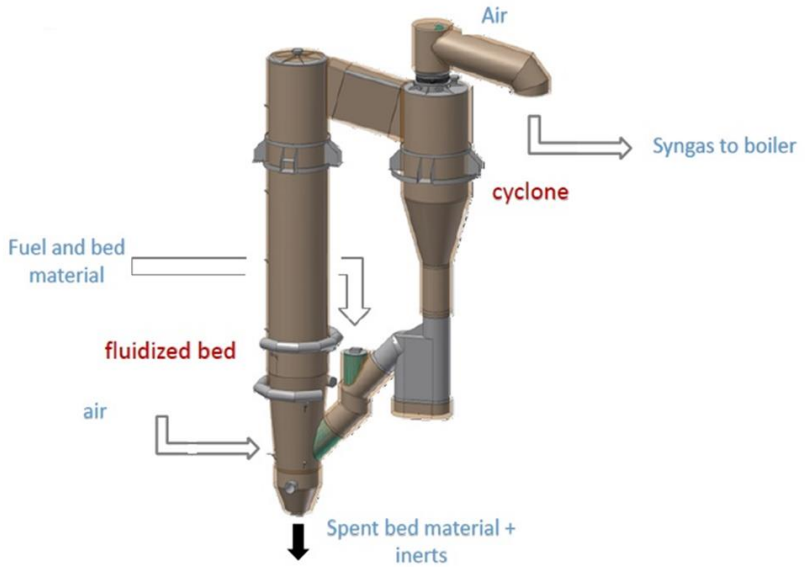
- Recycling of materials ‘back to feedstock’. Conversion of several kinds of waste into base chemicals including hydrogen
  - Via an innovative line-up of existing technologies
  - In joint cooperation with the chemical industry in the Netherlands (project FUREC)

ESKA paper reject gasification

- CFB technology supplied by Leroux & Lotz (TPS technology)
- 10 - 13 MWth input CFB gasifier, depending on LHV rejects
- Boiler produces 5 – 16 ton/h steam (196°C, 13,6 barg)
- Fully automatic operation
- Build in 2016, in operation since Oct-2016

Year	Uptime[h]	RDF [h]	Energy [GJ]
2017	5892	4335	156.292
2018	6402	5255	170.740
2019	5742	4350	151.575
June - 2020	2996	1813	68.664



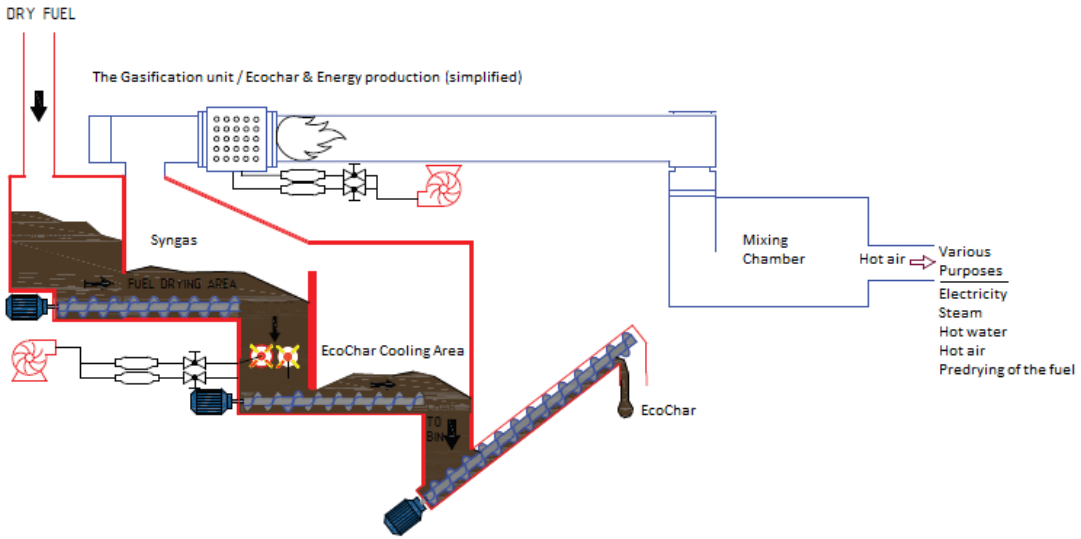


MAVITEC Green Energy

- Down draft fixed bed gasifier is the heart of the process.
- Products are a combustible gas and EcoChar

Capacity: ~2,2 tph @ 15% moisture, @ 12 MJ/kg cal. Value

Delivers: 4,5 – 5 MW_{th} , used for drying the sludge/manure



Turkey manure gasifier

Poultry gasifier

Digestate (cow manure) gasifier

Swine manure gasifier

MAVITEC Green Energy

Currently in operation in the US and Russia

1x turkey manure

2x layer manure

1x municipal solid waste

1x brewery spend grain

1x cow manure

Under construction

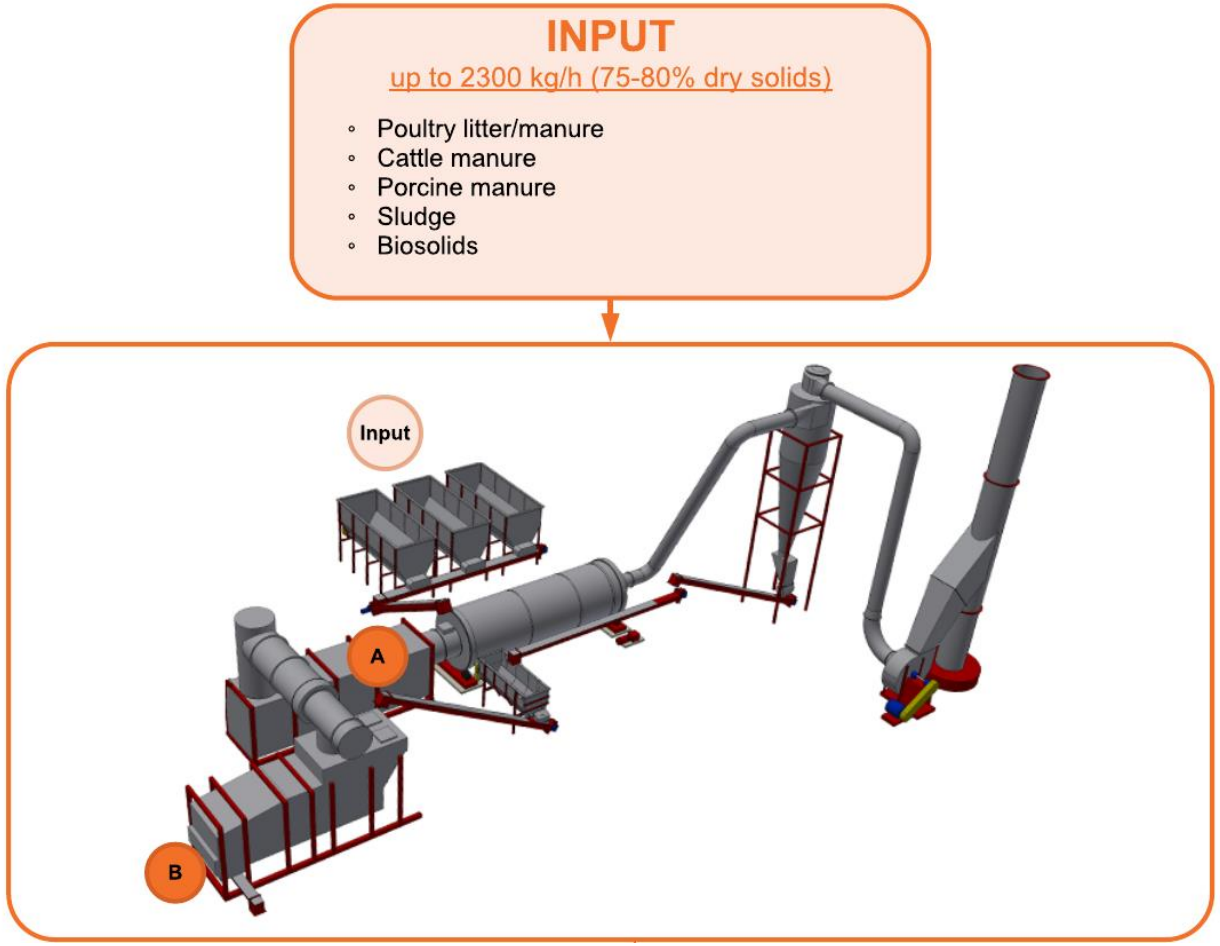
4x broiler manure in the Middle East

1x pork manure in the Netherlands

MAVITEC Environmental

Gasification: Input

- Manure
- Sludge
- Biosolids



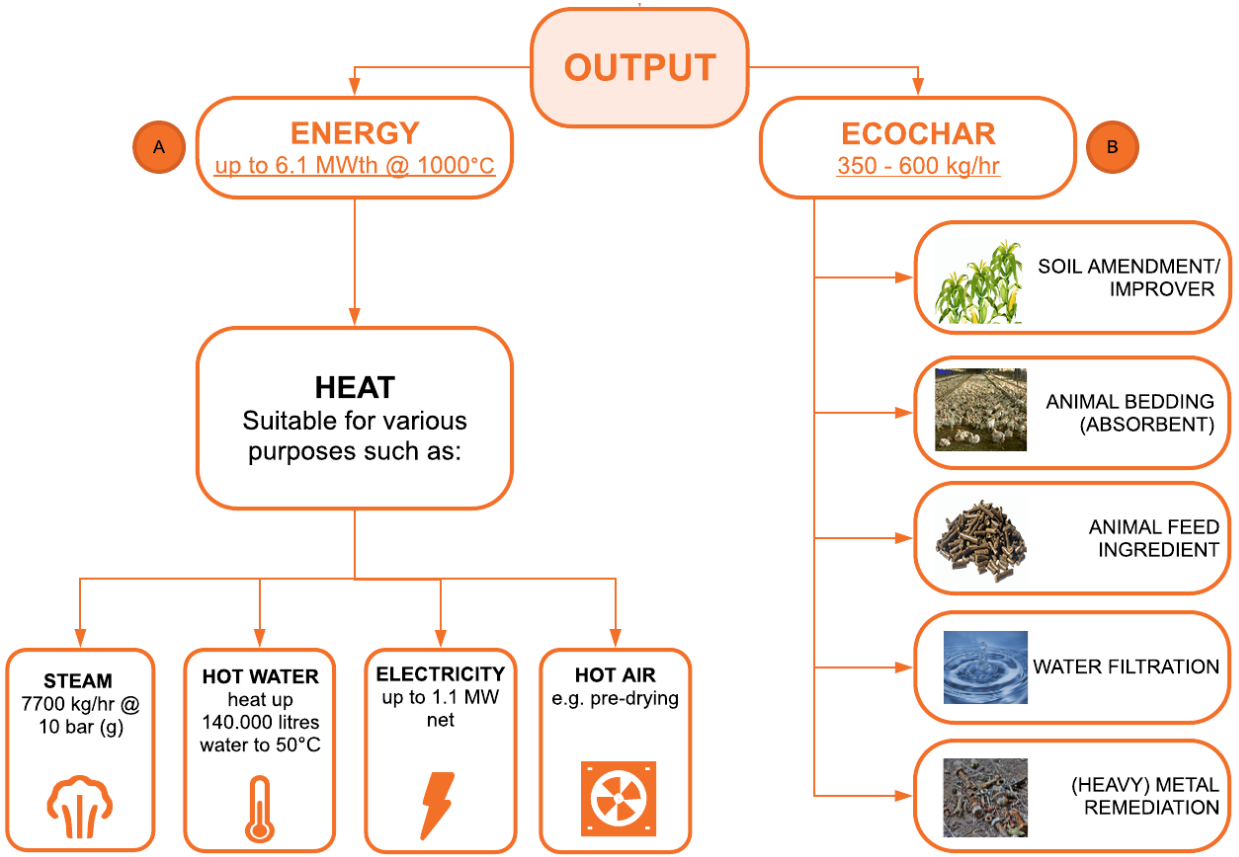
Gasification: Output

Energy (heat)

- Steam
- Hot water
- Electricity
- Hot air

EcoChar

- Soil amendment
- Animal bedding
- Animal feed
- Water filtration
- (Heavy) metal remediation



Advantages of EcoChar

- Valuable and carbon-rich: high P, K, Ca and Mg values
- Free from pathogens, E-coli, growth hormones and residues from medication (burned in gasifier)
- It can hold up to 2.5 times its own value in water
- Increases plant growth and improves the performance over time
- Increases the water retention properties of soil, so less water is needed to keep the soil moisturized
- Releases the amount of nutrients gradually and hereby lowers the amount of fertilizer and nutrients needed
- Commercial value between €100-800,- per ton, depending on composition and end-use purpose
- Surface (BET): up to 260 m2/gram

Values differ depending on type of input used

Main uses of EcoChar

1. Fertilizer

- In addition to essential nutrients, EcoChar also contains other supporting substances like carbon and sulphur
- EcoChar is able to absorb water
  - It retains the water until the plant needs it; it acts like a buffer
  - It is able to provide the plant with water for the short term

2. Bedding

- EcoChar can be used to counteract odour
- EcoChar reduces the ammonia-levels, which is harmful for (young) animals

3. Water filtration

- Biochar is already used for water filtration, EcoChar can be used with the same functions

4. Replacement of peat moss for potting soil

- EcoChar is cheaper than peat moss
- EcoChar is more sustainable than peat moss

5. Soil remediation

- EcoChar can immobilize the presence of contaminants (e.g. copper) in the soil through fixation

6. Compost

- EcoChar has great potential for reducing greenhouse gases and NH3 emissions when composing wet, nutrient-rich material

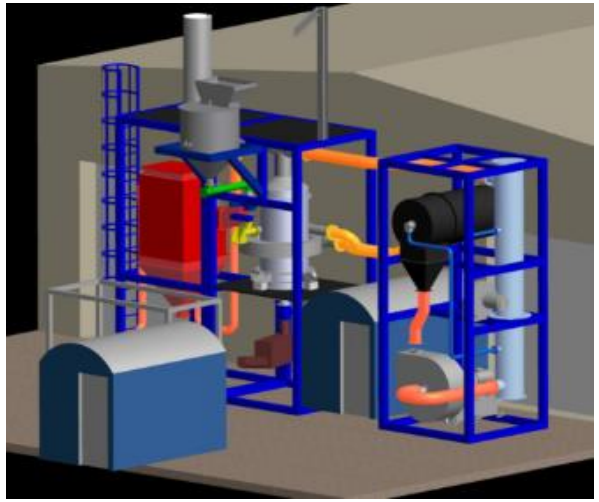
Economic value of EcoChar

- EcoChar still contains the mineral ash and fixed carbon which offers great environmental advantages and economic value

- EcoChar is valuable for improving stability in soil as it is retained in the soil over many hundred of years, unlike fertilisers which typically require annual application

Synvalor

- Multi Stage Vortex gasifier
- Goal is to produce low tar gas from difficult feedstocks



- Ownership for the plant in Mijdrecht has been transferred.
- Not yet started up

Bio Energy Netherlands - no update (start up phase)

- Based on Zero Point Clean Tech
- Fixed bed down draft technology
- 8 MW heat production
- 2 MW power production
- Started construction Nov-2017

- Future plans include
  - Hydrogen production
  - Carbon utilization as biochar
  - CO_2 utilization

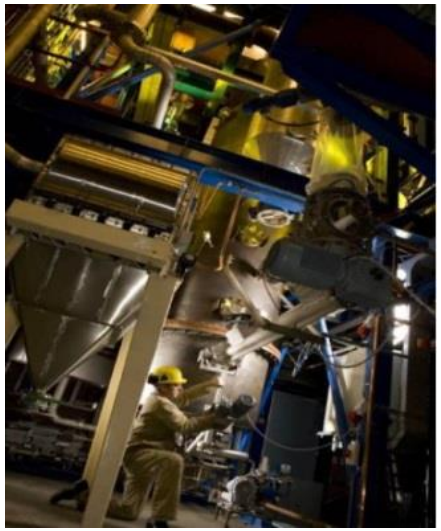
ZeroPoint (Ireland)

Artist impression of BEN (Amsterdam)

Gasunie supported initiatives - no update

AMBIGO Green Gas

- 4 MW_{th} indirect gasification
- Demolition wood
- T ~ 850°C
- P ~ 1 bar



tbc

SCW Green Gas

- 2 MW_{th} super critical
- Wet biomass
- T > 375°C
- P > 221 bar

Commissioning phase

Torrgas Green Gas

- 0,7 MW_{th} direct gasification
- Torrefied biomass
- T > 1050°C
- P ~ 1 bar

Development Waste to methanol - No update

- Waste to Methanol project Rotterdam

- Based on Enerkem technology
- O_2 blown BFB gasifier
- 360 kton/a waste → 220 kton/a MeOH

- Partners
- -Port of Rotterdam
- -Enerkem
- -Nouryon
- -Air Liquide
- -Shell

Photo: Enerkem plant in Canada

Torrgas

- One project on Green Gas in engineering phase → 25 MW_{th}
- FID expected to take place in September (some delays due to Corona)

- One project on Green Hydrogen in preparation → 50 MW_{th}
- Char and CO_2 help to improve the business case

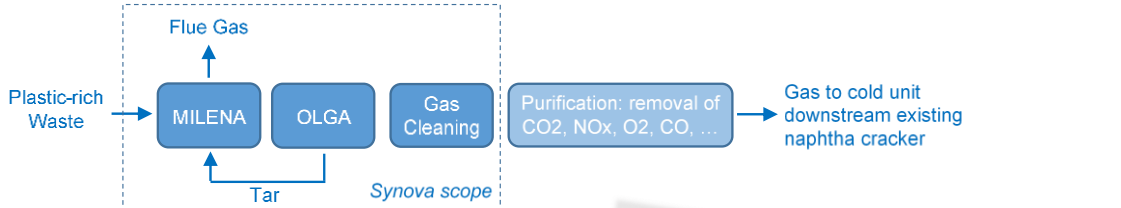
- Both plants designed for torrefied B-wood

SYNOVA
solution for chemical recycling for circular economy

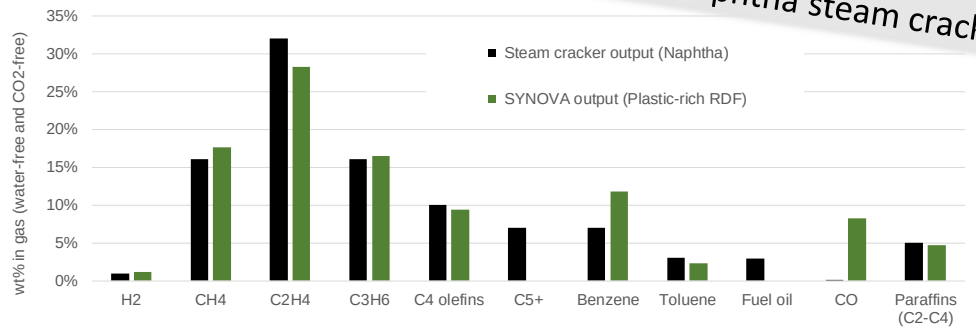
Plastic-rich waste conversion to new plastic building blocks:

- Does not need clean plastic, may be multi-layer, contaminated with food, glass, water, etc
- Up to 80% efficiency to chemicals, over 3 kg CO2 reduction per kg plastic waste, economically attractive
- Two options for plastic circularity:

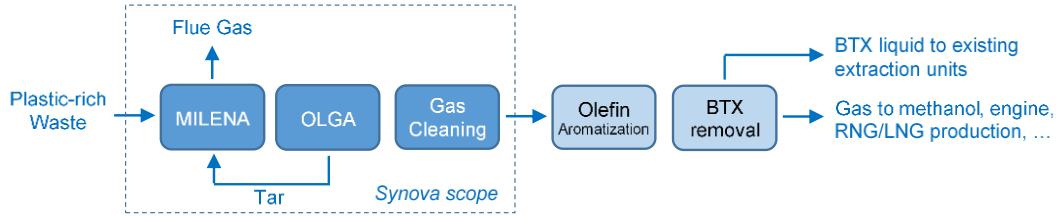
<u>Waste-to-Olefins:</u> cracking feedstock to gas, removing contaminants, but keeping olefins in play, purification with partner, gas to existing cold separation train downstream naphtha cracker

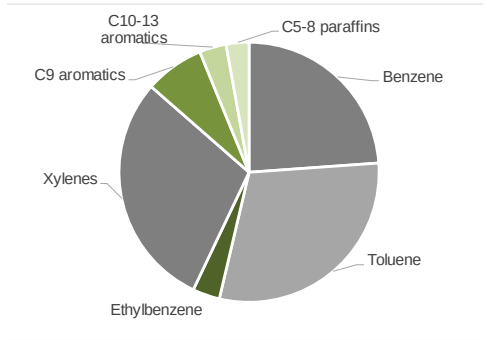


Gas very similar to gas from naphtha steam cracker



<u>Waste-to-BTX:</u> cracking feedstock to gas, removing contaminants, olefins aromatization with partner, condensation of BTX liquid, gas to application of choice





BTX composition example [wt%]

>40% energy to BTX

Berend
berend.vreugdenhil@tno.nl

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