BEST

Bioenergy and Sustainable Technologies

FFG Forschung wirkt.

Bundesministerium Arbeit und Wirtschaft

Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie

wirtschaftsagentur wien | Für die Stadt Wien

Das Land Steiermark
Wirtschaft, Tourismus, Regionen, Wissenschaft und Forschung

SFG
NEUES DENKEN. NEUES FÖRDERN.

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The role of product gas cleaning for successful synthesis

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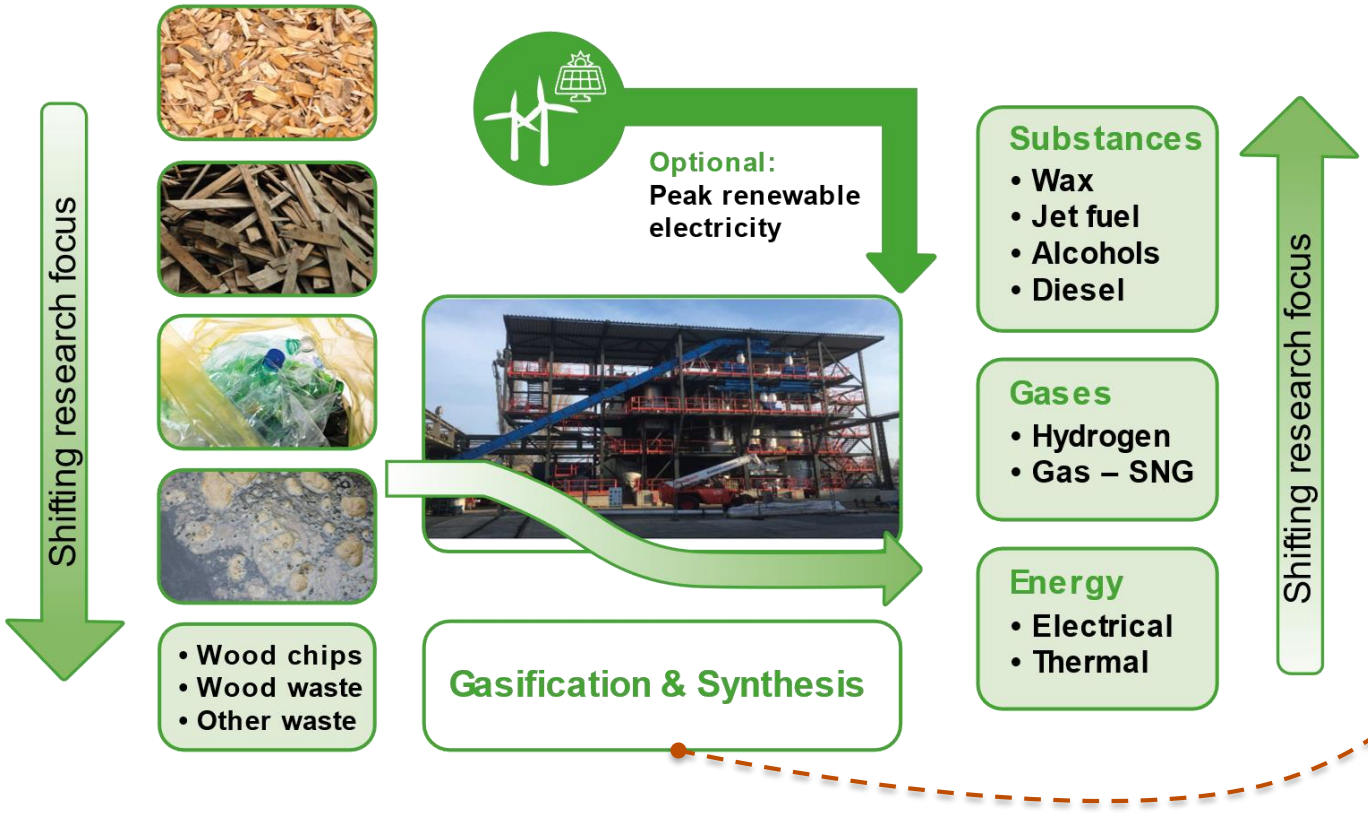
SYNGAS PLATFORM VIENNA

A **research hub** featuring a Waste2Value process chain: 1 MW **DFB gasification +** 250 kW **Fischer-Tropsch** synthesis demo

A connected **laboratory** supplied **with real syngas** for gas cleaning and upgrading

Gasification & Synthesis: State of research



Syngas Platform Vienna – Unique infrastructure

Pilot fine gas cleaning

Pilot scale FTS

Pilot Scale

Lab scale gas cleaning

Lab scale FTS

Lab scale APR

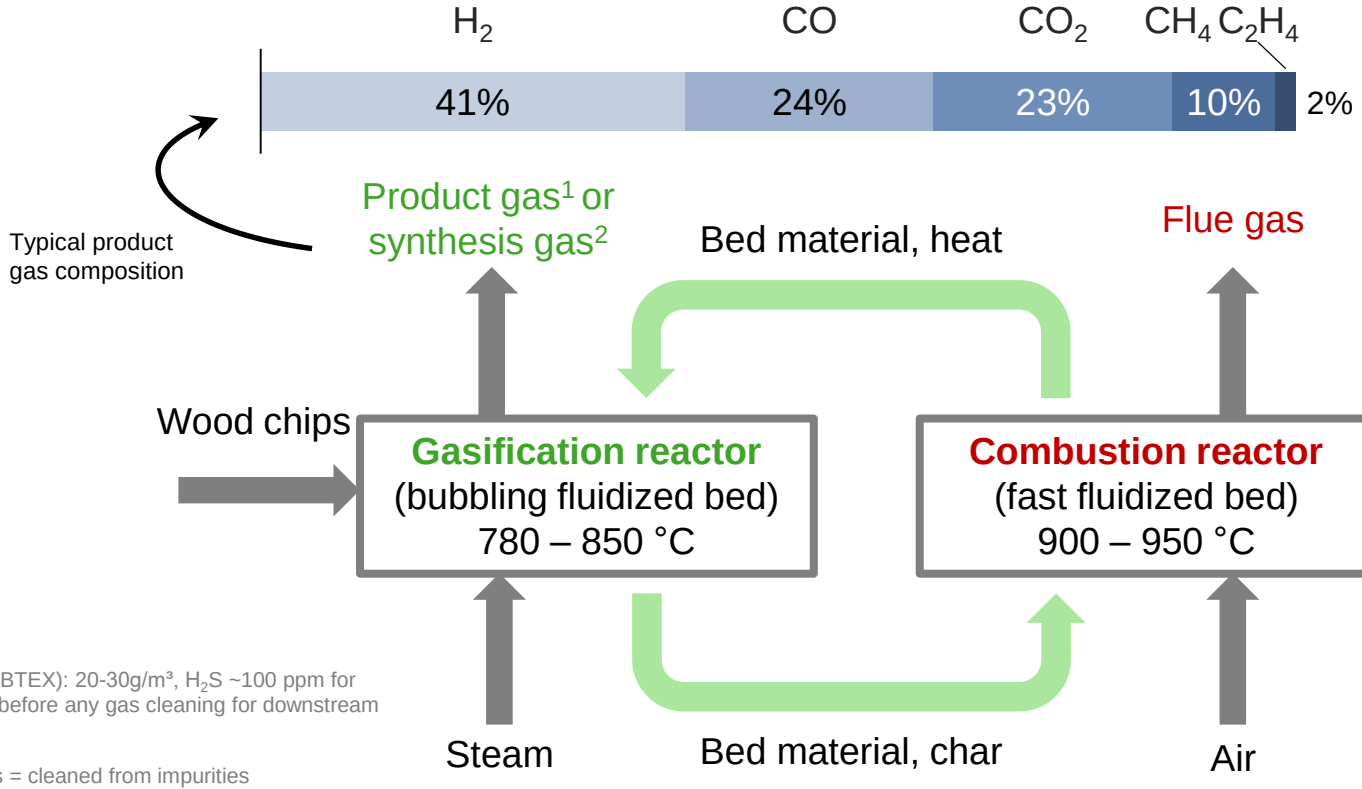
Lab Scale

Gas production

Gas cleaning

Synthesis

Syngas from DFB gasification

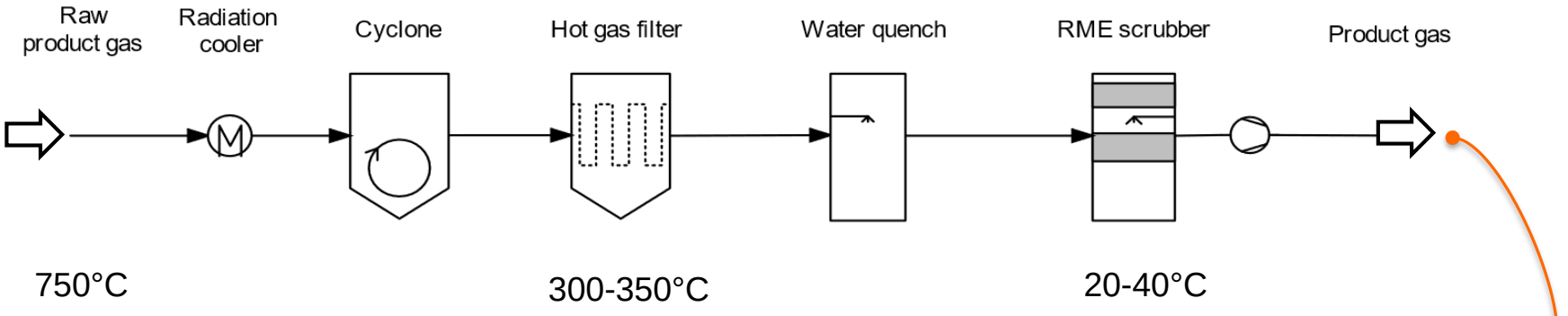


1 e.g. tar (incl. BTEX): 20-30g/m³, H_2S ~100 ppm for biomass fuel before any gas cleaning for downstream processing

2 Synthesis gas = cleaned from impurities

Jointly developed by:

Coarse gas cleaning



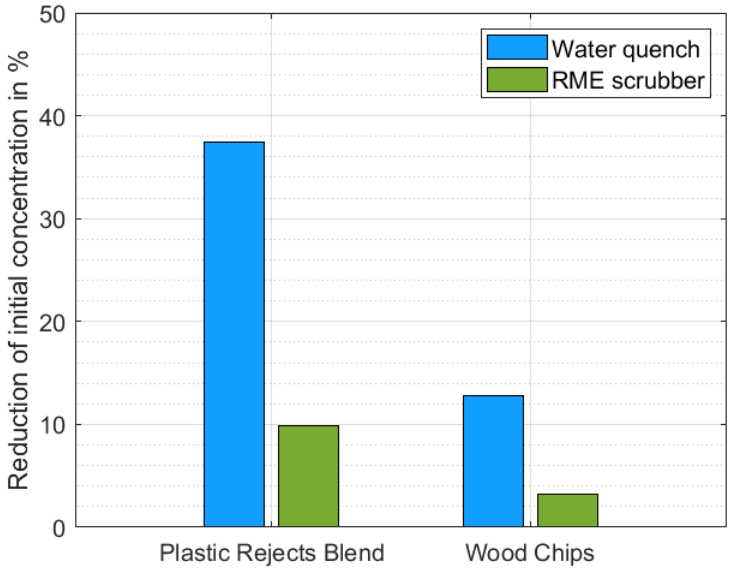
Integrated gas cleaning units and recycling of

- Fly char
- Rich RME

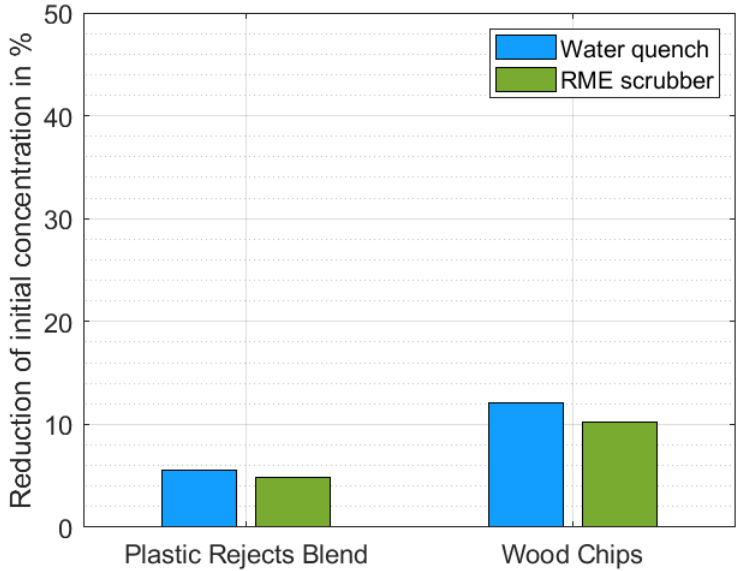
GCMS tars	< 1 g / Nm³
HCl	< 1 ppm
H_2S	50 ppm
NH_3	5 - 900 ppm

Coarse gas cleaning - Tar Reduction

GCMS Tars

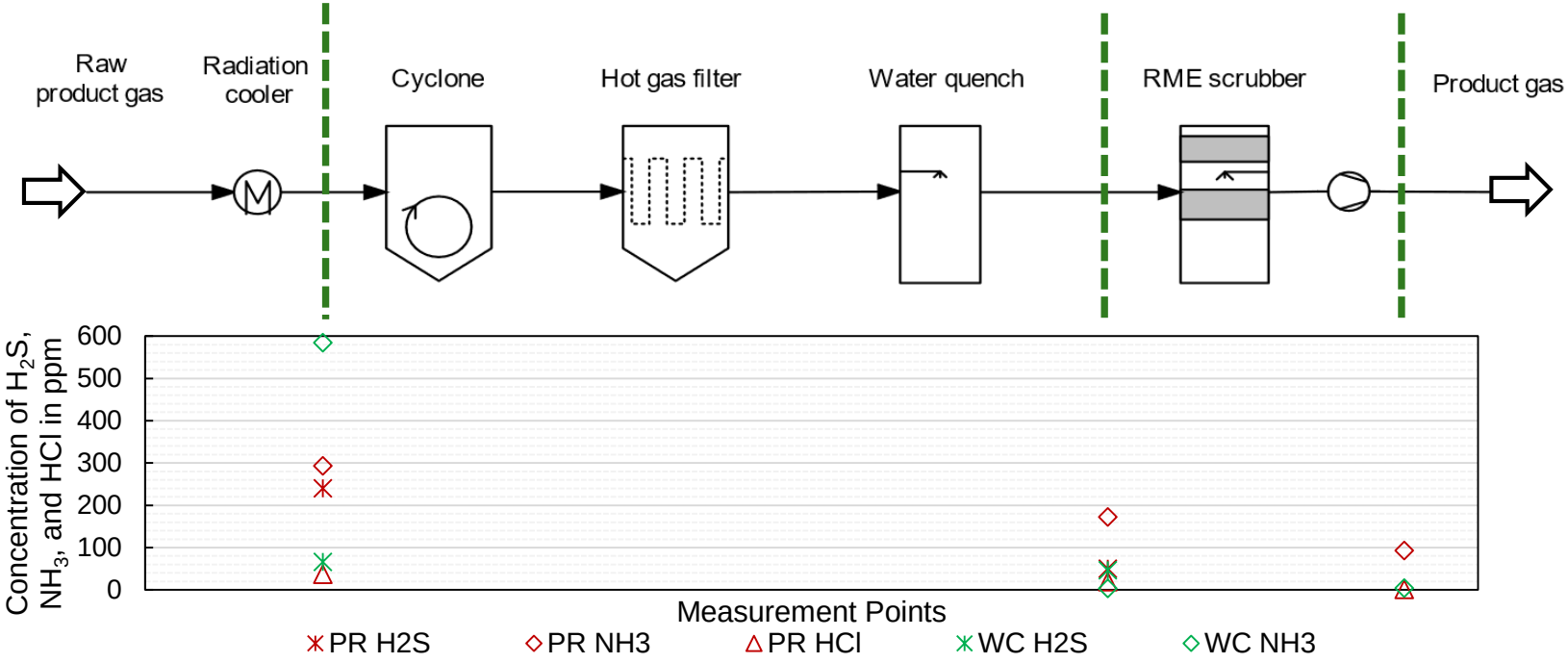


Gravimetric Tars

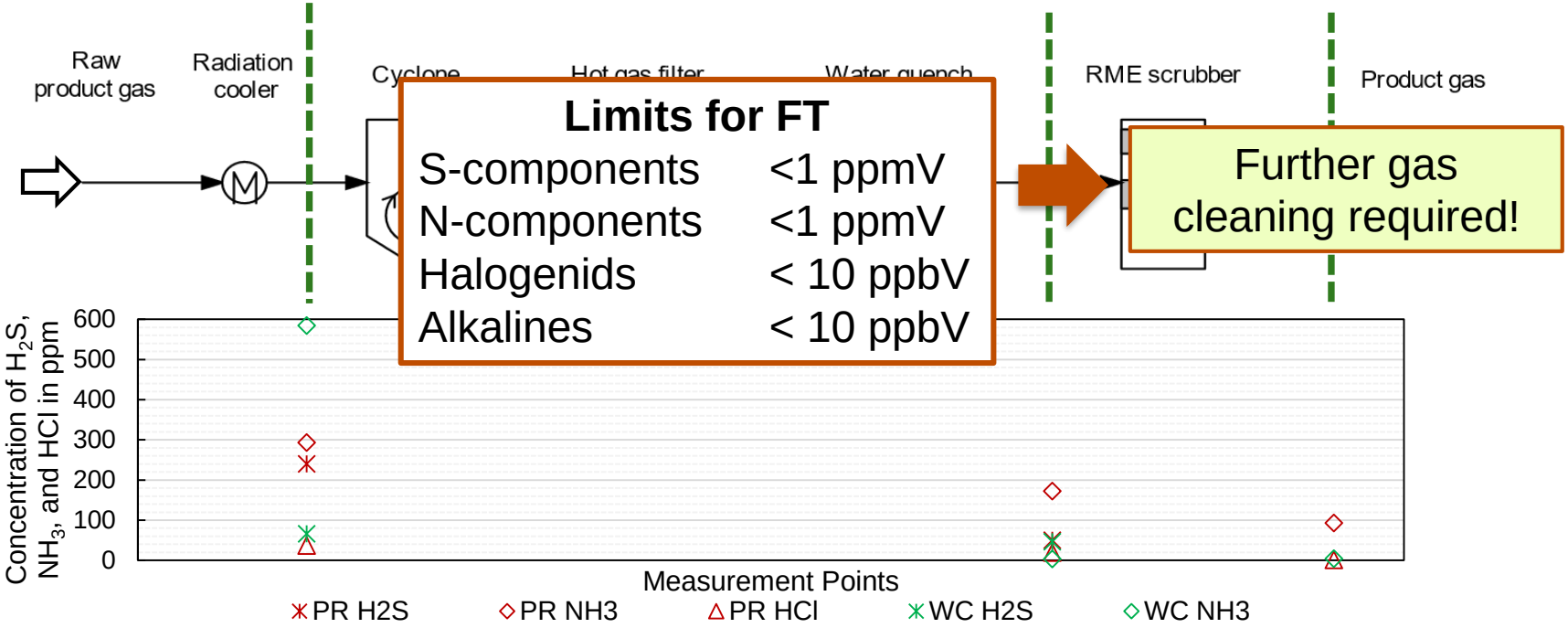


After the RME Scrubber a relative reduction to below 10 % was achieved

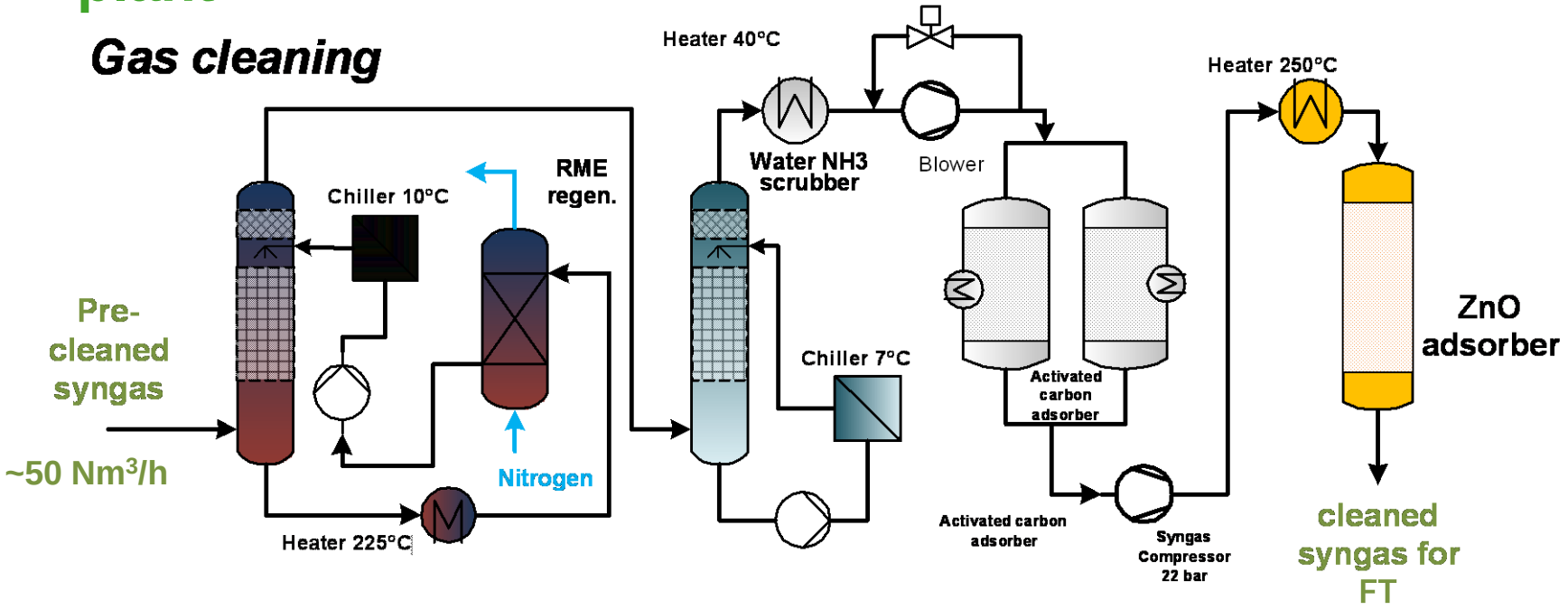
Coarse gas cleaning - Inorganic Impurities



Coarse gas cleaning - Inorganic Impurities

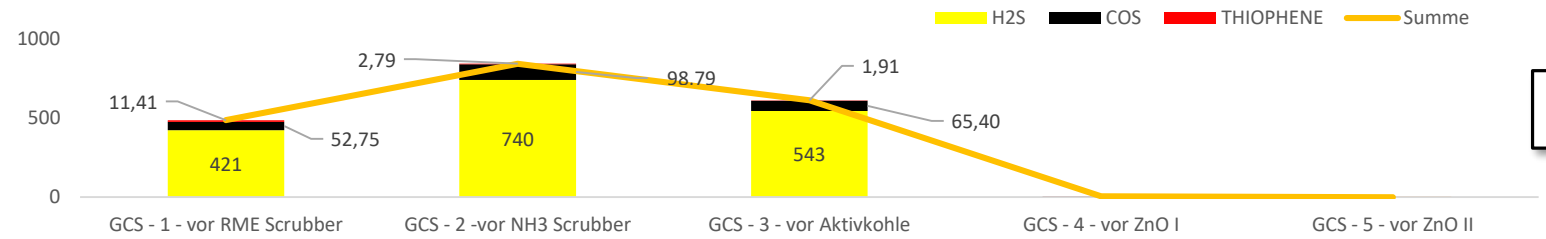


Fine Gas Cleaning of the Fischer Tropsch pilot plant

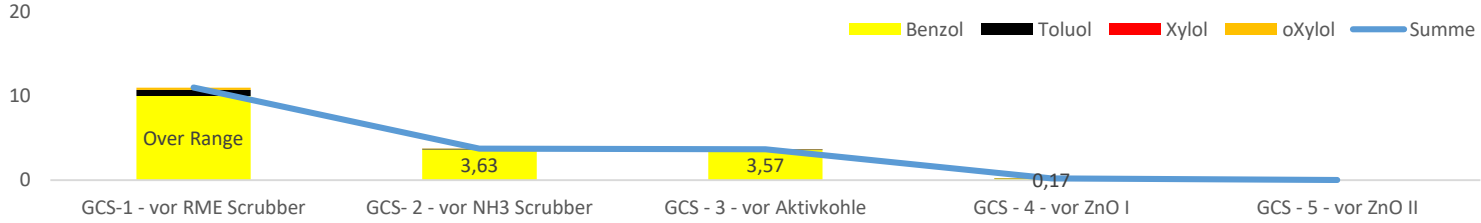


Measurement using bark pellets

Product gas | RME Scrubber | NH3 Scrubber | Activated Carbon | ZnO I | ZnO II | FTS



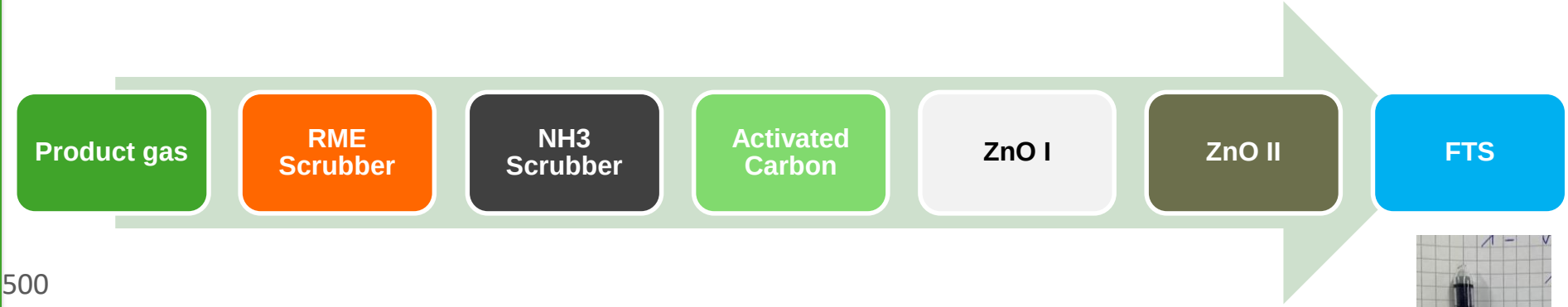
ppm_v

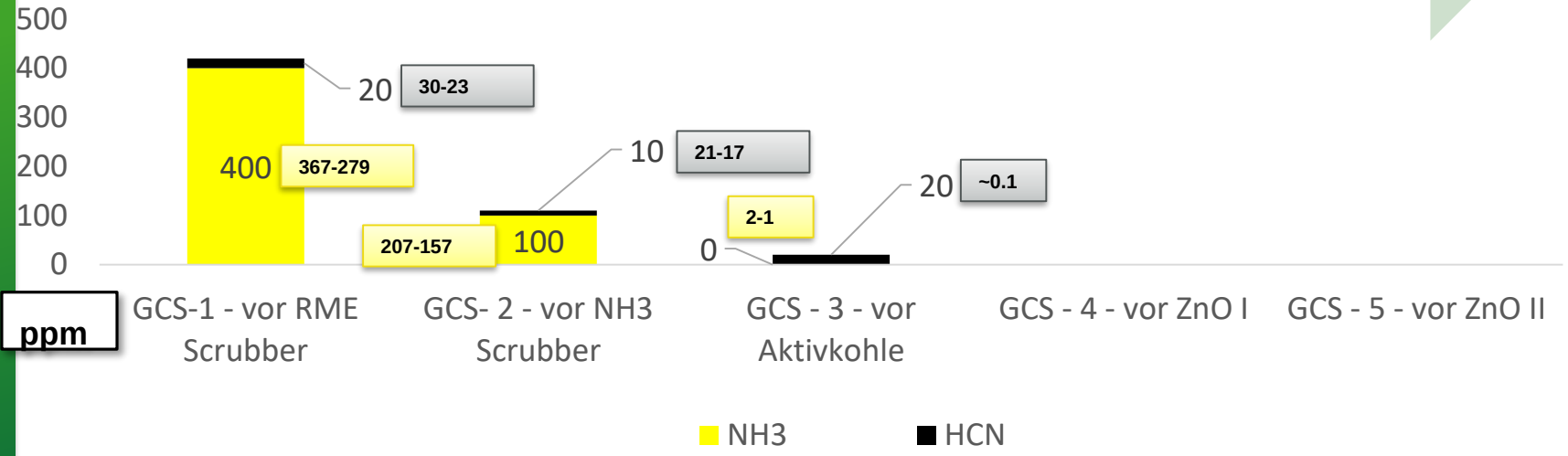


g/Nm3

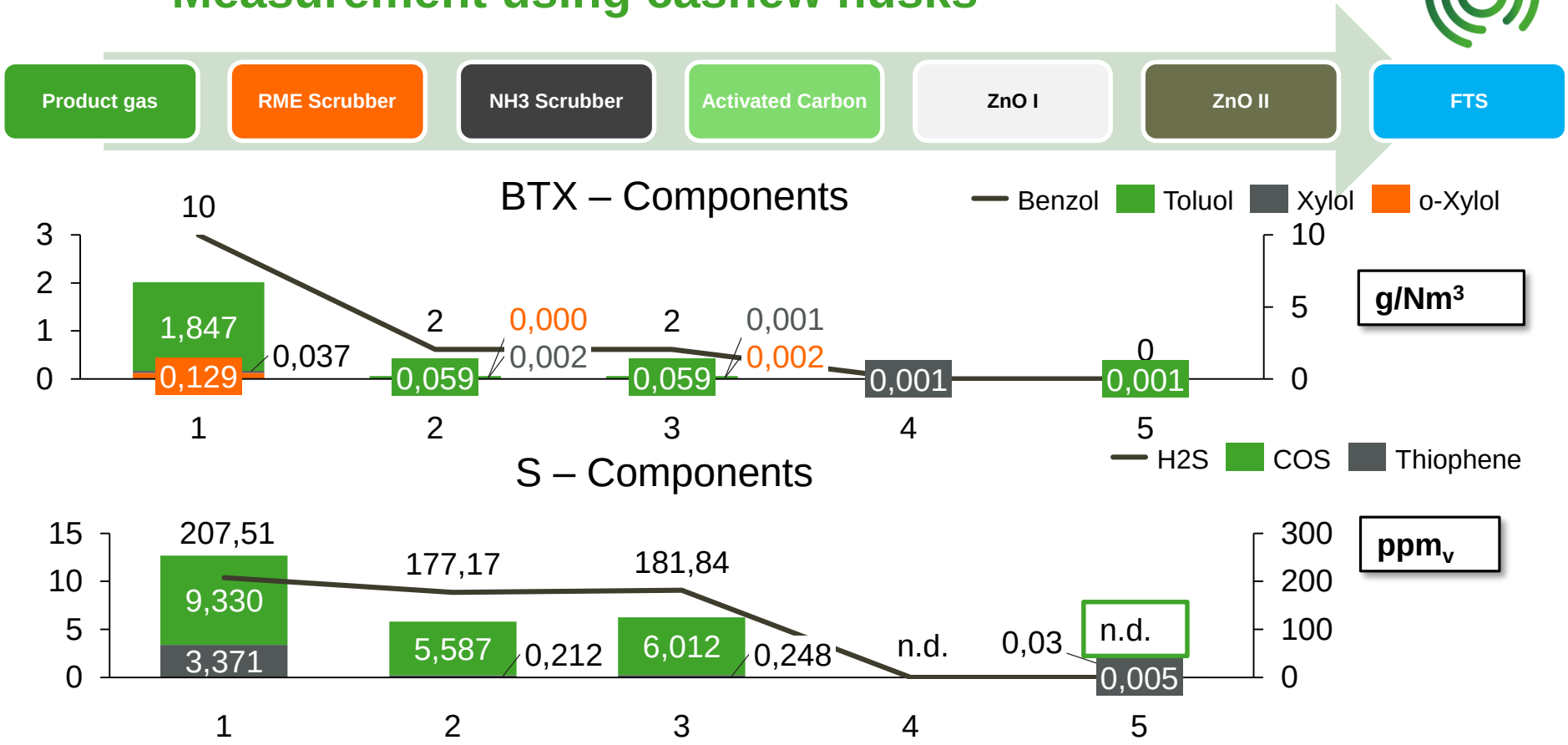
ppm_v

Sample tubes vs. wet chemical measurements

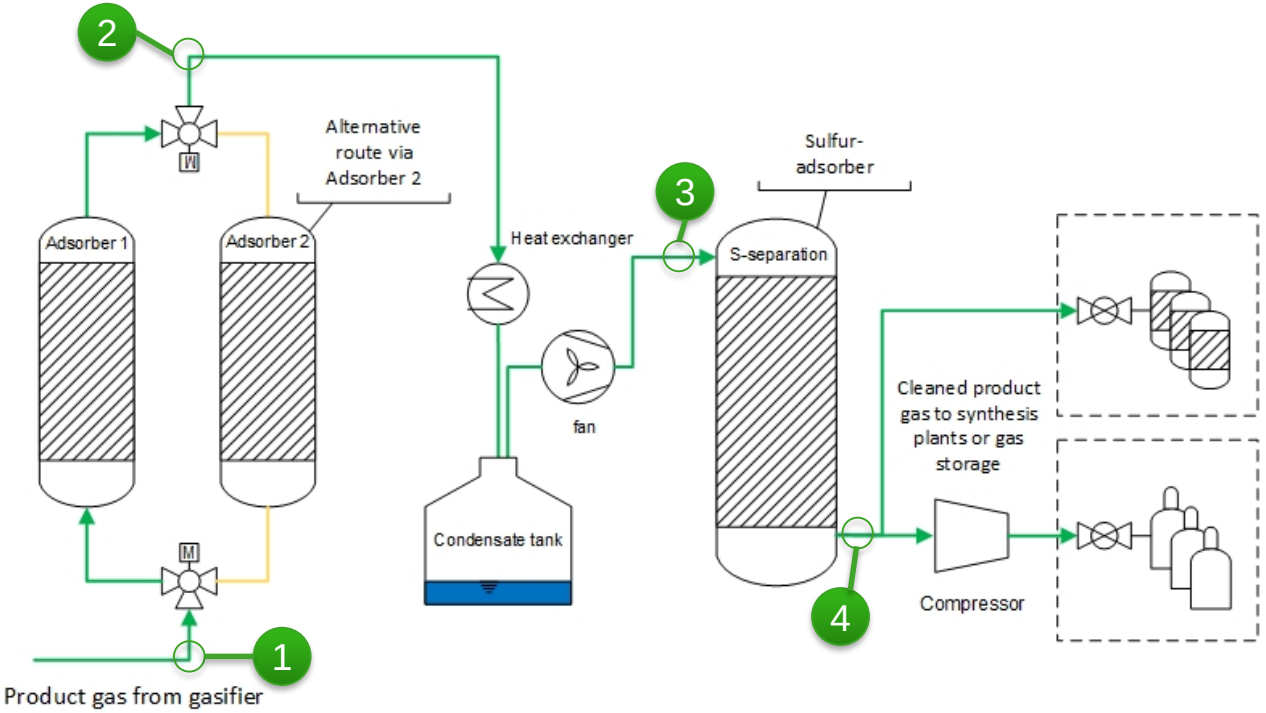




Measurement using cashew husks

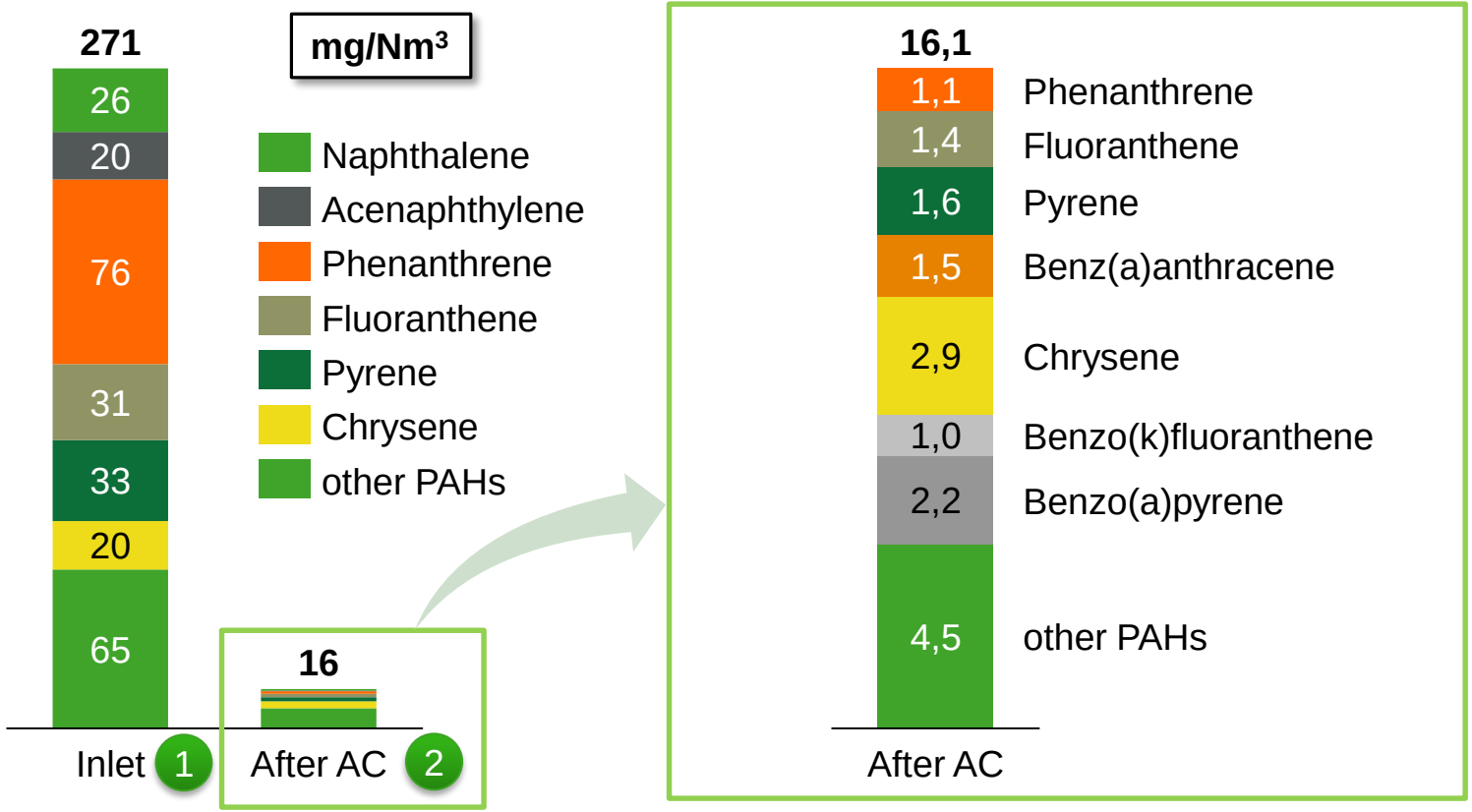


Alternative fine gas cleaning – temperature swing adsorption



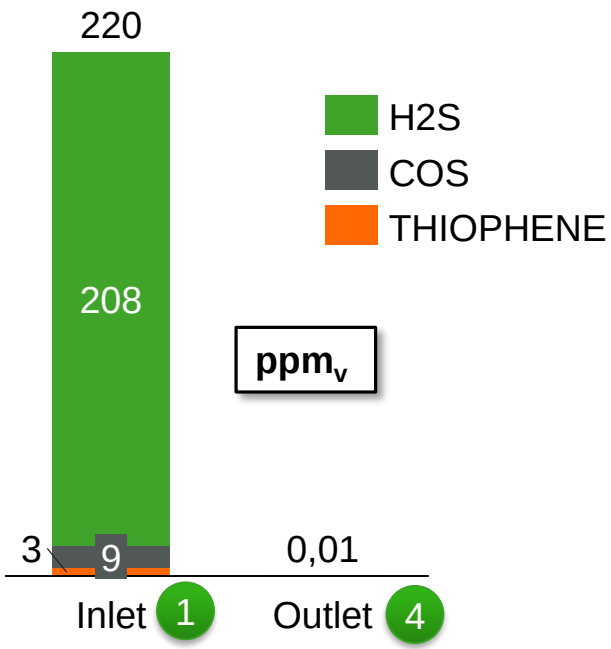
1. Entry
2. After Adsorber 1/2
3. After blower
4. Exit Cleaning unit

Cashew nut shells

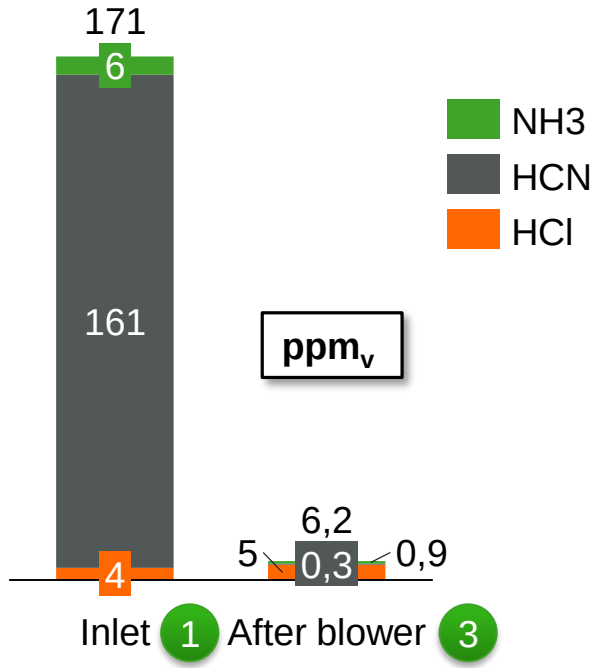


Green Fuel and Chemicals (GFC)
TSA: Results cashew husks autumn campaign

S – Components



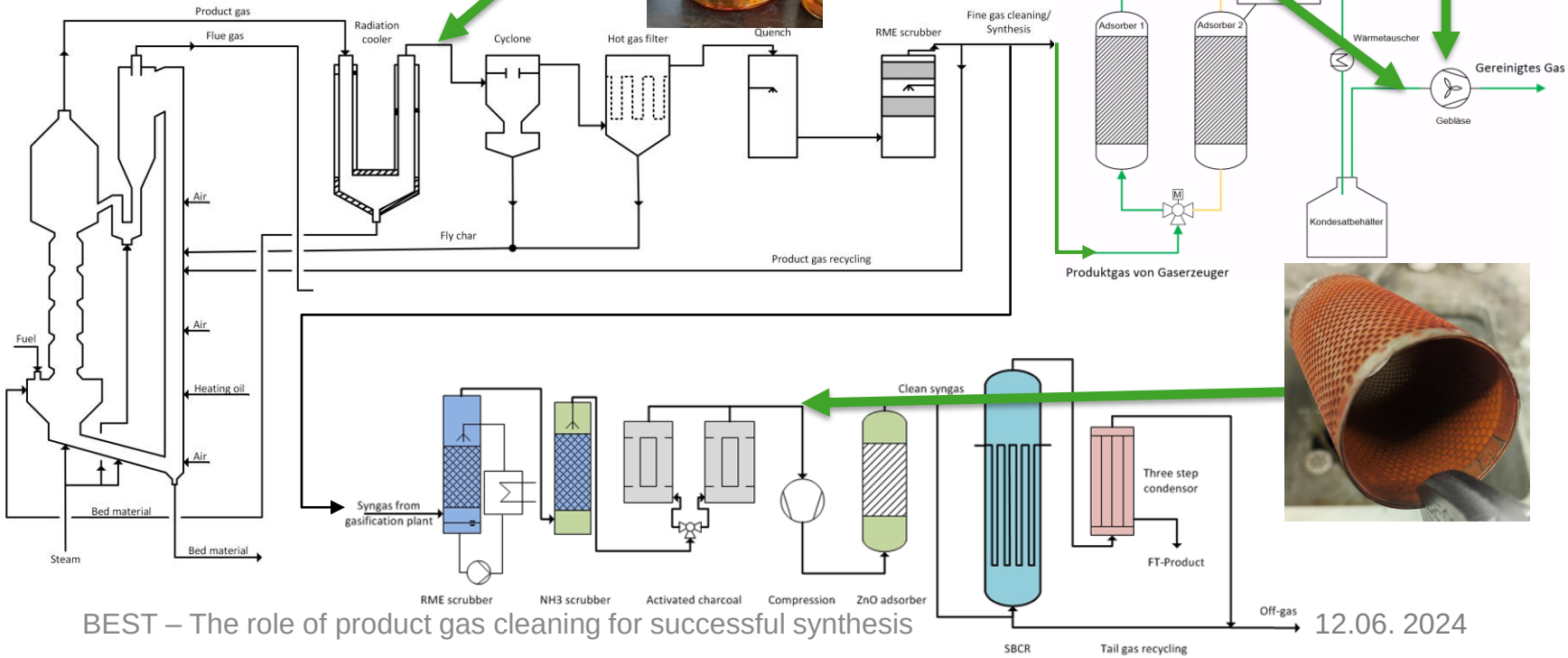
Other inorganic – Components



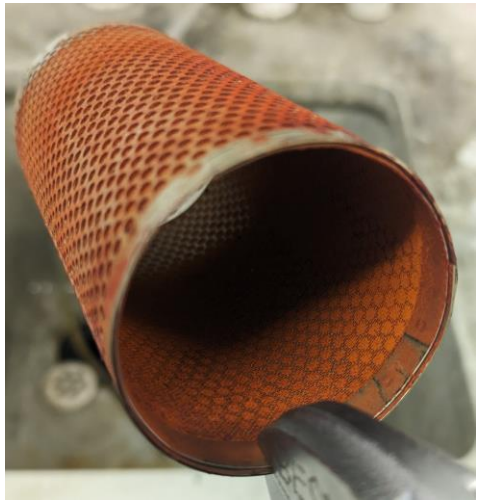
Available clean syngas gas bundles

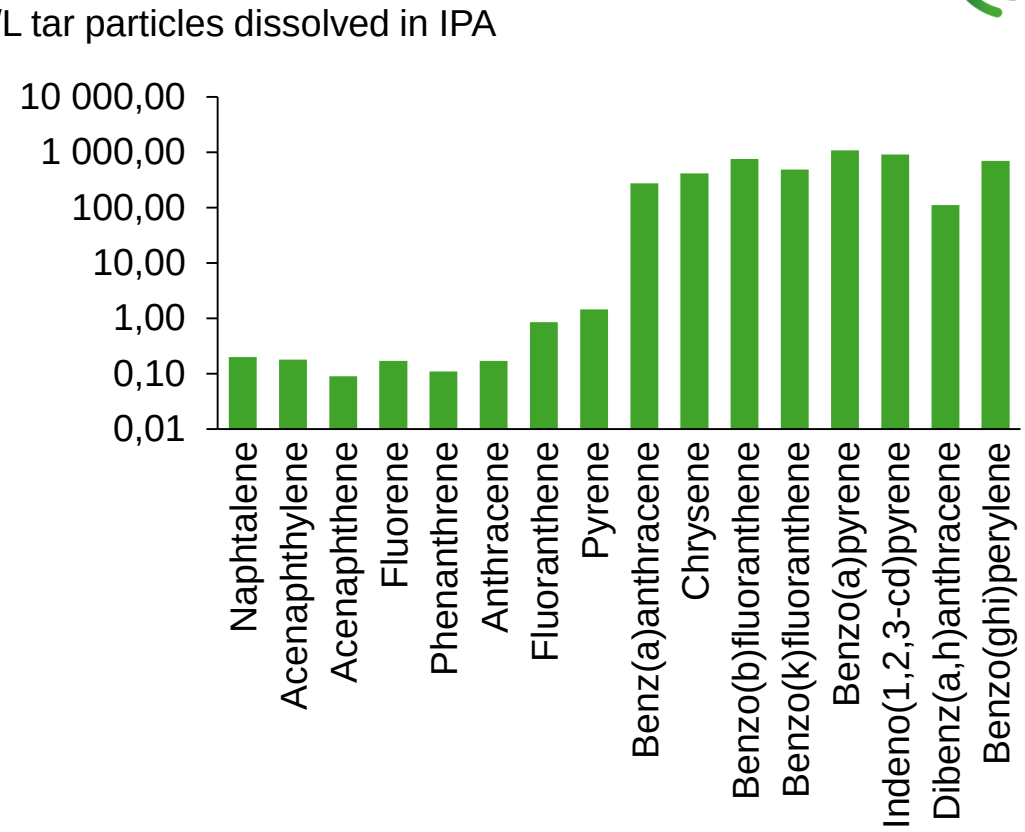
	Unit	Cashew nut shells	Wood chips	Paper sludge+wood chips
Volume	Nm^3	45	57	87
H_2/CO	-	2,7	1,5	Currently in Evaluation
Benzene	g/m^3	Not determined		
Toluene	g/m^3			
Xylene	g/m^3			
o-Xylene	g/m^3			
H_2S	ppm			
COS	ppm			
Thiophene	ppm			

Problems with removal of heavy tars



Analysis of tar particles





Conclusion

Coarse gas cleaning:

- Reduction of inorganic impurities of 60% to 99%, depending of feedstock
- Reduction of tars from 6.8 to 0.1 g/Nm^3 and decrease of tar dew point from 167°C to 86°C

Fine gas cleaning:

- Catalyst limits reachable with pilot scale fine gas cleaning (before FT)
- Promising results for TSA regarding tar reduction

→ But: Tar removal is still insufficient and problematic for both fine gas cleaning setups


A team with
hands-on experience

Contact

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