

Advanced biofuels by gasification – Status of R&D work in Güssing

Reinhard Rauch

Institute of Chemical Engineering
Working Group Future Energy Technology
Prof. Hermann Hofbauer

- Scientific partners



bioenergy2020+

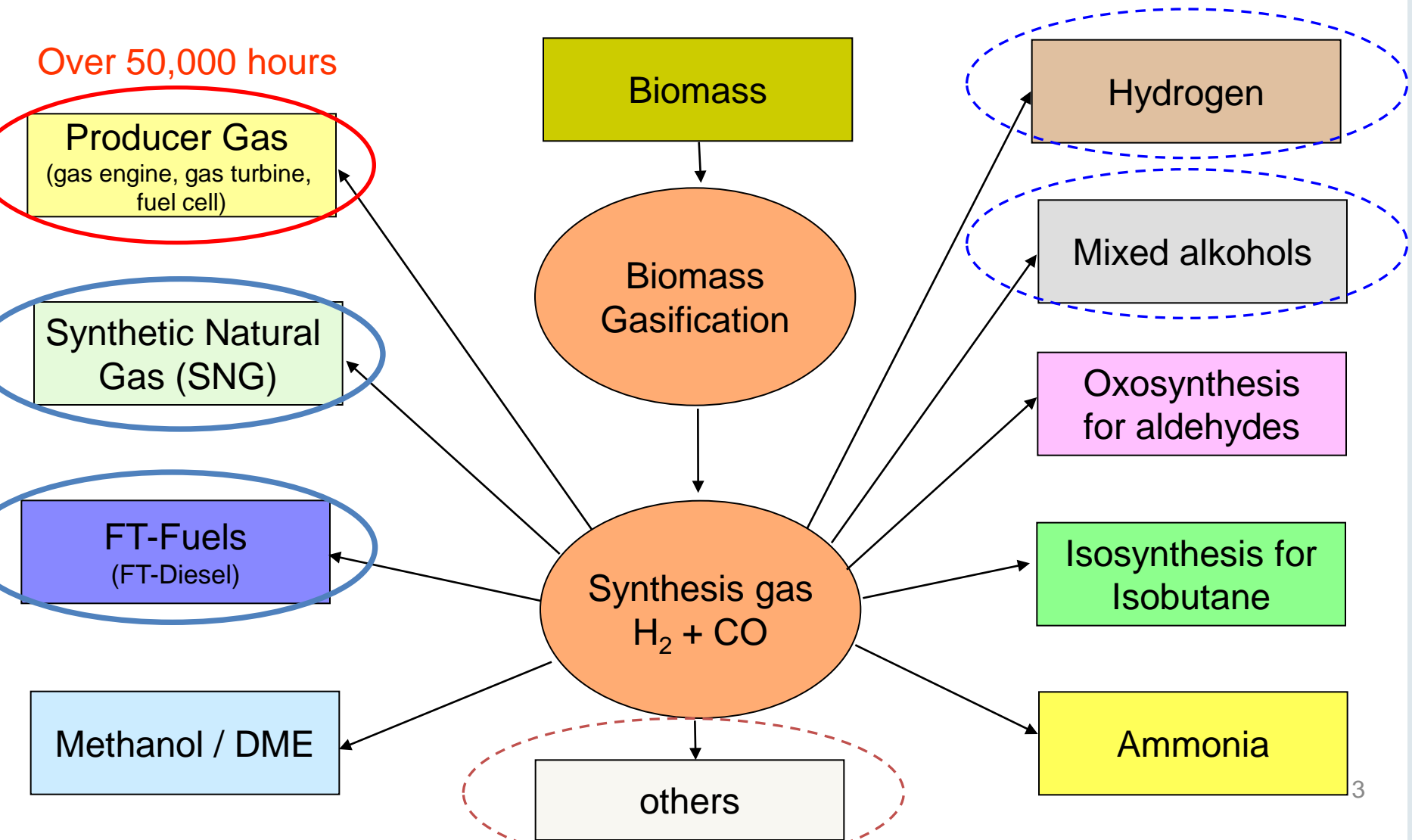
- Engineering (as example)



- Operators (as example)



The basic concept – “Green Chemistry”



Biomass CHP Güssing



Gasifier

BioSNG PDU

Technikum

Fuelling Station

Commercial FICFB gasifiers

Location	Product	Fuel / Product MW, MW	Start up	Status
Güssing, AT	Gas engine	8.0 _{fuel} / 2.0 _{el}	2002	Operational
Oberwart, AT	Gas engine / ORC	8.5 _{fuel} / 2.8 _{el}	2008	Operational
Villach, AT	Gas engine	15 _{fuel} / 3.7 _{el}	2010	Commissioning
Klagenfurt, AT	Gas engine	25 _{fuel} / 5.5 _{el}	2011	planing
Ulm, DE	Gas engine / ORC	14 _{fuel} / 5 _{el}	2011	Under construction
Göteborg, Sweden	BioSNG	32 _{fuel} /20 _{BioSNG}	2012	planing
Vienna, OMV	Hydrogen	50 _{fuel} /30 _{hydrogen}	2015	planing

Gas Composition (after gas cleaning)

Main Components		
H_2	%	35-45
CO	%	22-25
CH_4	%	~10
CO_2	%	20-25

Minor Components		
C_2H_4	%	2-3
C_2H_6	%	~0.5
C_3H_4	%	~0,4
O_2	%	< 0,1
N_2	%	1-3
C_6H_6	g/m ³	~8
C_7H_8	g/m ³	~0,5
$C_{10}H_8$	g/m ³	~2
TARS	mg/m ³	20-30

Possible poisons		
H_2S	mgS/Nm ³	~200
COS	mgS/Nm ³	~5
Mercaptans	mgS/Nm ³	~30
Thiophens	mgS/Nm ³	~7
HCl	ppm	~3
NH3	ppm	500-1000
HCN	ppm	~100
Dust	mg/Nm ³	< 20

$H_2:CO$ = from 1.7:1 to 2:1

Results

- December 2008: First conversion of product gas into rawSNG
- June 2009: BioSNG at H-Gas quality produced
- June 24th : inauguration – CNG cars were fuelled using BioSNG from wood
- June 2009 CNG-car was successfully used for 1000km with BioSNG



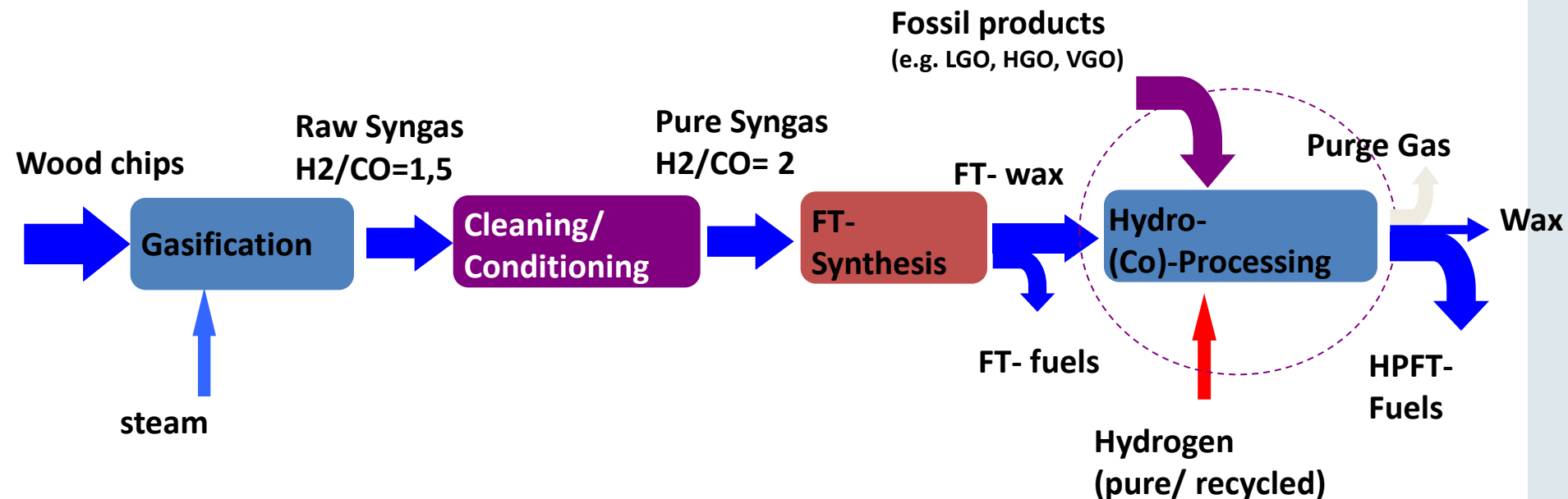
Synthetic biofuels (FT- Route)



Cellulose, Polyose (Hemicellulose)
Lignin

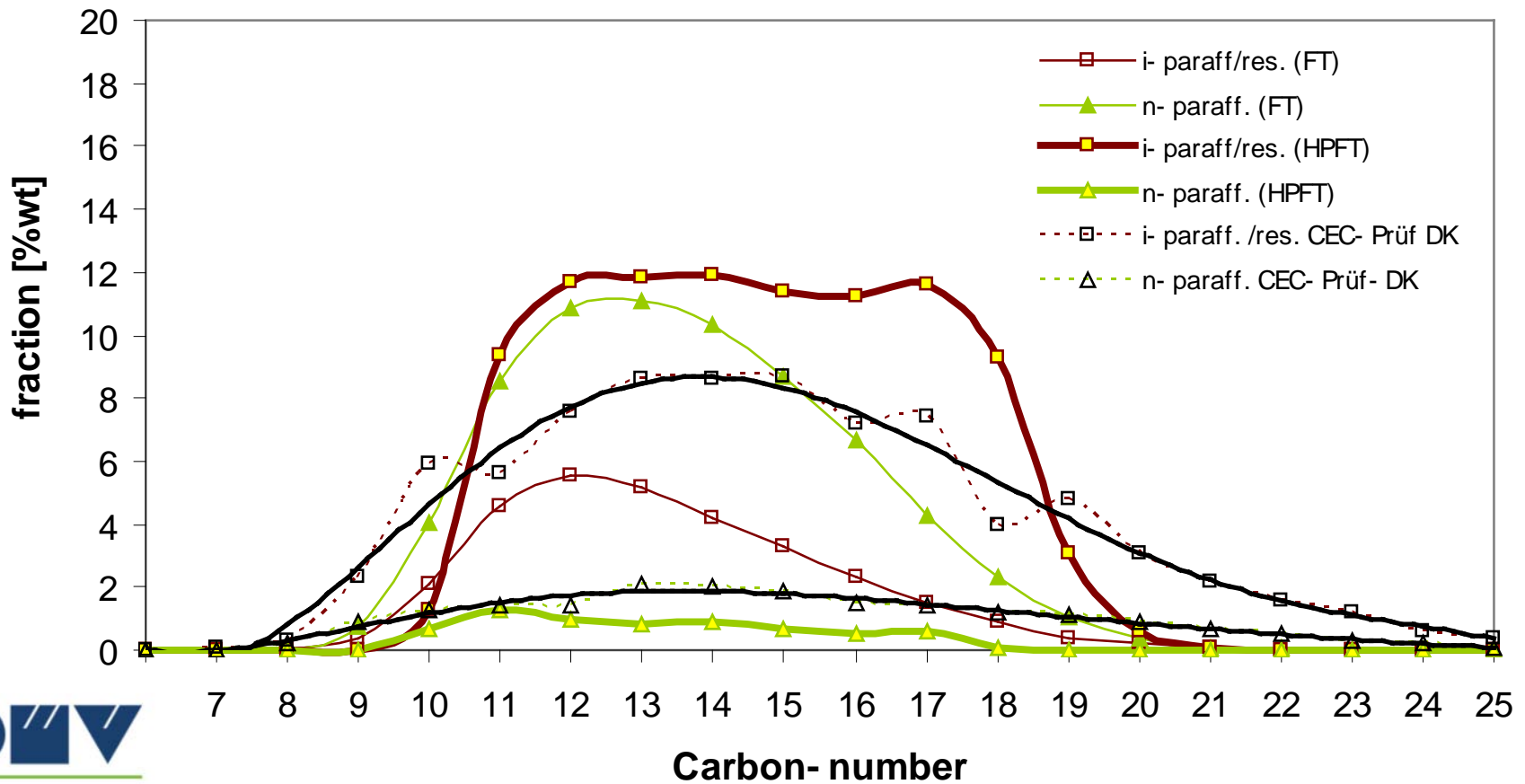


i/n- paraffins
(hydrocarbons)

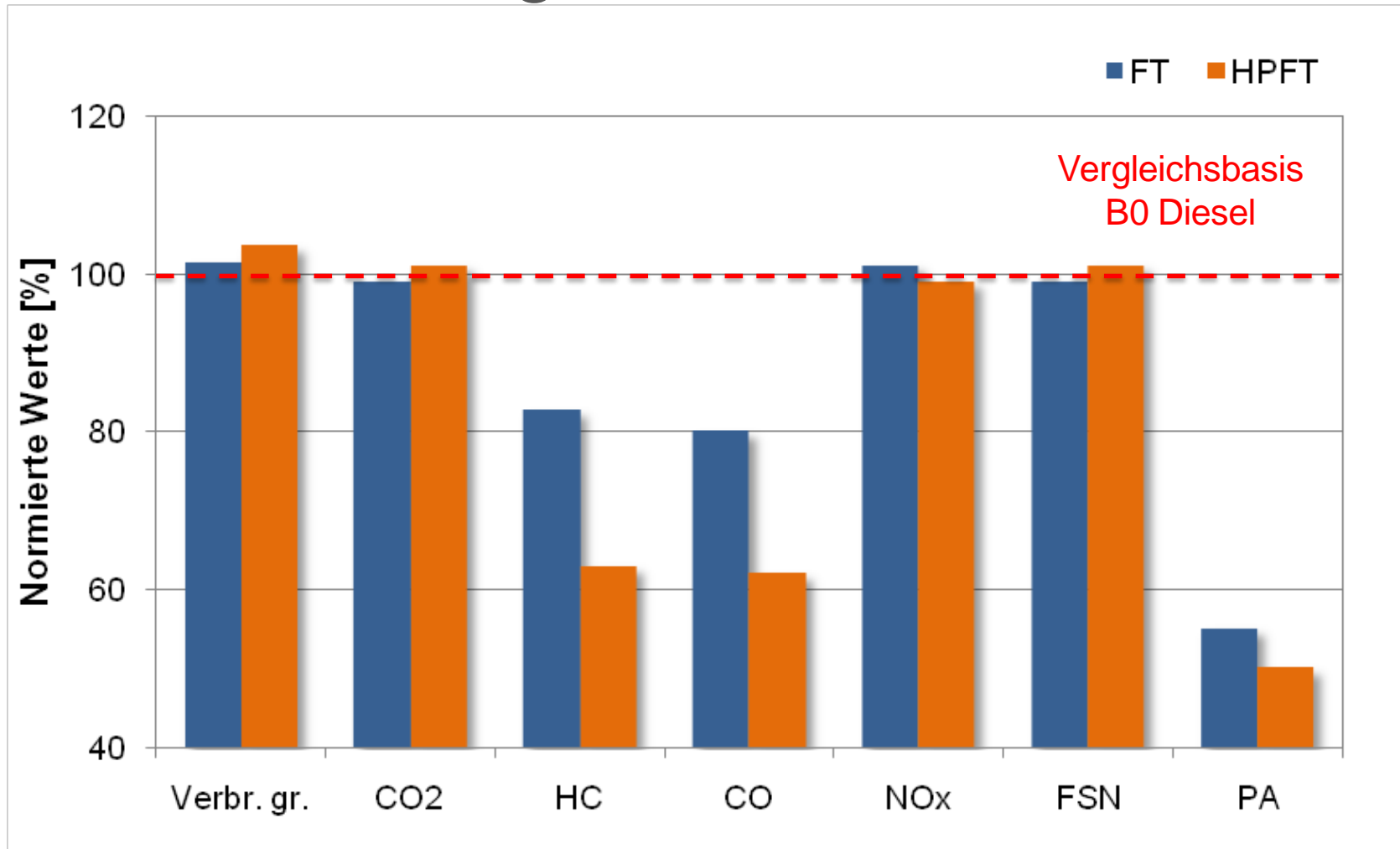


Comparison of produced FT Fuels

	FT- Diesel	HPFT- Diesel	CEC- Prüf.
ACN:	>72 $t_d = 2,5$ s	68,5 $t_d = 2,91$ s	>51,8 /
CFPP/CP/FP:	-12/ -9/ - °C	-62/ -60 / -98°C	-18/ -5 °C



Results on engine tests with 20% blends



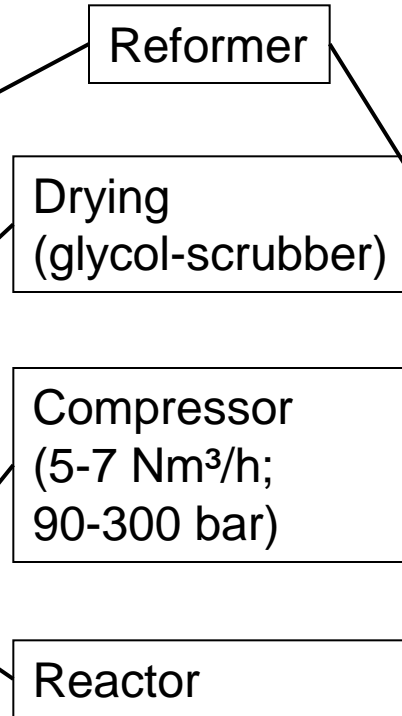
Mixed alcohols

- Funded by „Klima und Energiefonds“ and Bioenergy 2020+
- Aim is to get fundamental know how in the synthesis of mixed alcohols from biomass
- Main advantage is very simple gas cleaning, due to sulphur resistant catalyst

bioenergy2020+



Actual status: first experiments are done



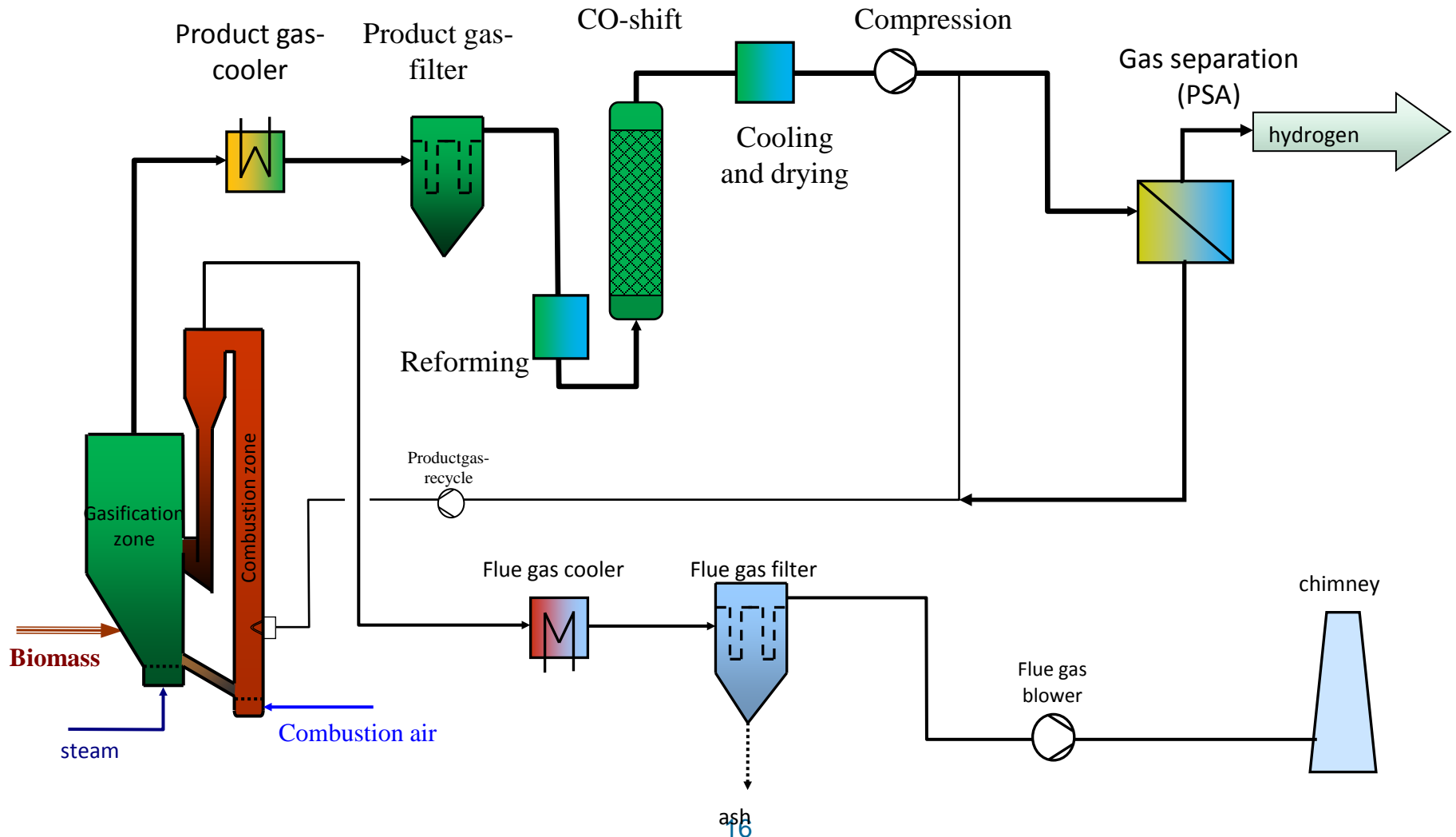
BioH2-4Refineries

Economic evaluation of production of hydrogen for a refinery

- Coordination by OMV
- 50 MW fuel plant to replace fossil hydrogen
- Evaluation of the biomass resources available for such a plant
- Basic - engineering of the gasifier as well as of all other sub units, including pipelines, utility systems, logistic needs
- Optimal use of by-products
- Economic evaluation



Simplified flow chart



Summary

- Biomass CHP Güssing has excellent frame conditions for R&D on synthesis gas applications
- Focus of R&D is on small CHP and on synthesis gas applications (BioSNG, Fischer Tropsch, Mixed Alcohols, Hydrogen)
- Gasification enables the conversion of biomass to many useful products

More info at

<http://www.ficfb.at>

<http://www.vt.tuwien.ac.at>

<http://www.bioenergy2020.eu>