



Universität Stuttgart

Institut für Feuerungs- und Kraftwerkstechnik

Prof. Dr. techn. G. Scheffknecht

Institute of Combustion and Power Plant Technology

Department of Fuels and Flue
Gas Cleaning (BuR)

Nelson Felipe Rincón Soto, M.Sc
Marc Oliver Schmid, M.Sc.

Picture: Power Plant and Institute of Combustion and Power Plant Technology

Agenda

About us

Institut of Combustion and Power Plant Technology (IFK)
Department of Fuels and Flue Gas Cleaning (BuR)

Our Research lines

Flue Gas Cleaning – Removal of SO_x , NO_x , Heavy Metals
Biogas upgrading – Removal of CO_2

Available Research Projects

Automation and startup of a Biogas technical-scale plant
 NO_x removal from biomass combustion flue gas
Treatment and cleaning of ship engine-related flue gas

Contact us



About us



Institut of Combustion and
Power Plant Technology (IFK)

Department of Fuels and Flue
Gas Cleaning (BuR)





Institut of Combustion and Power Plant Technology

Picture: Power Plant at IFK



Univ.-Prof. Dr. techn. Günter Scheffknecht
Head of the Institute

Apl. Prof. Dr.-Ing. Uwe Schnell
Deputy head of the institute

Administration and Workshop

Research departments

Marc Oliver Schmid, M.Sc.
Fuels and Flue Gas Cleaning (BuR)

Apl. Prof. Dr.-Ing. Uwe Schnell

Combustion and Steam Boiler Simulation (FDS)

Dr.-Ing. Ulrich Vogt
Air Quality Control (RdL)

Max Schmid, M.Sc.
Decentralized Energy Conversion (DEU)

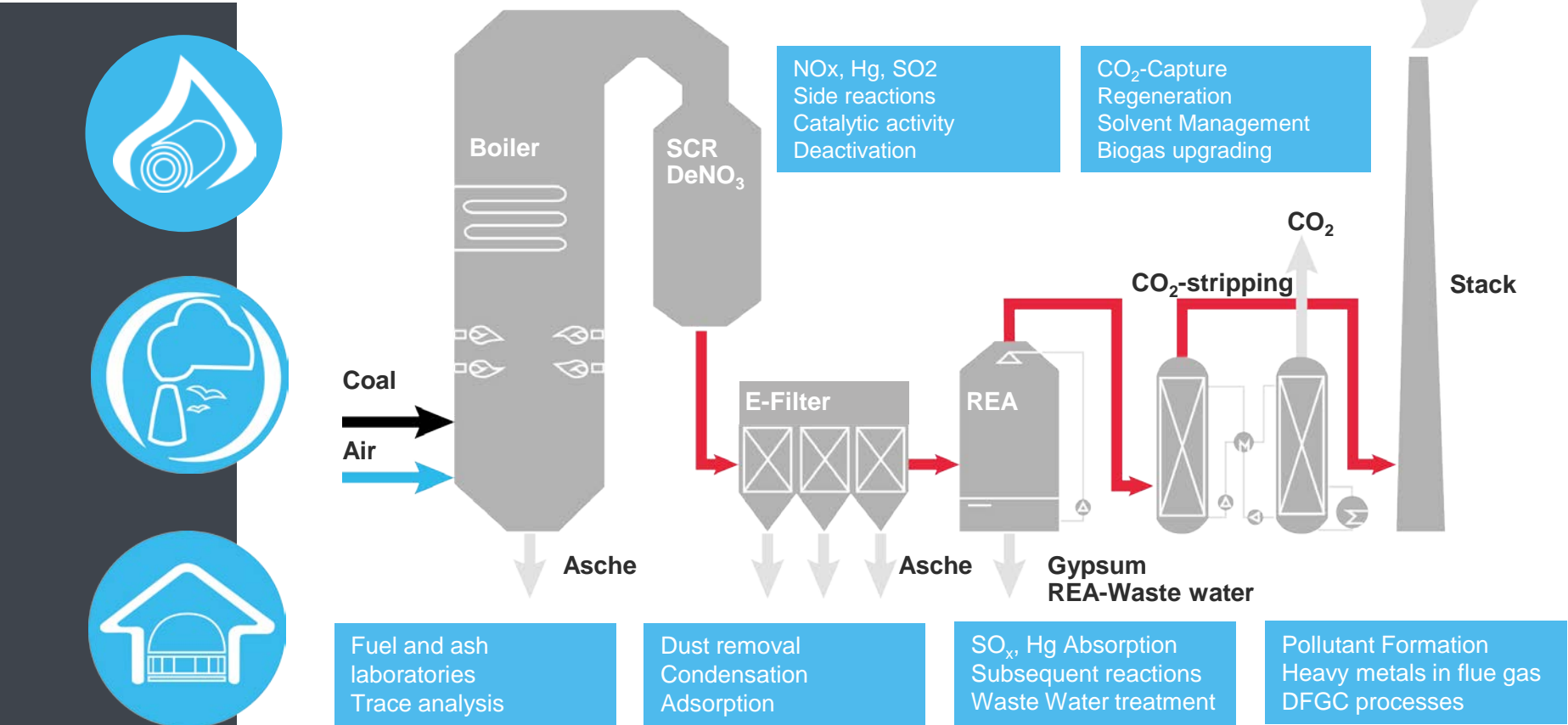
Univ.-Prof. Dr.-Ing. Hendrik Lens

Power Generation and Automatic Control (SuA)

Dipl.—Ing. Jörg Maier
Firing Systems (KWF)

Department of Fuels and Flue Gas Cleaning

Our research lines



Our Research Lines



Flue Gas Cleaning – Removal of SO_x , NO_x ,
Heavy Metals

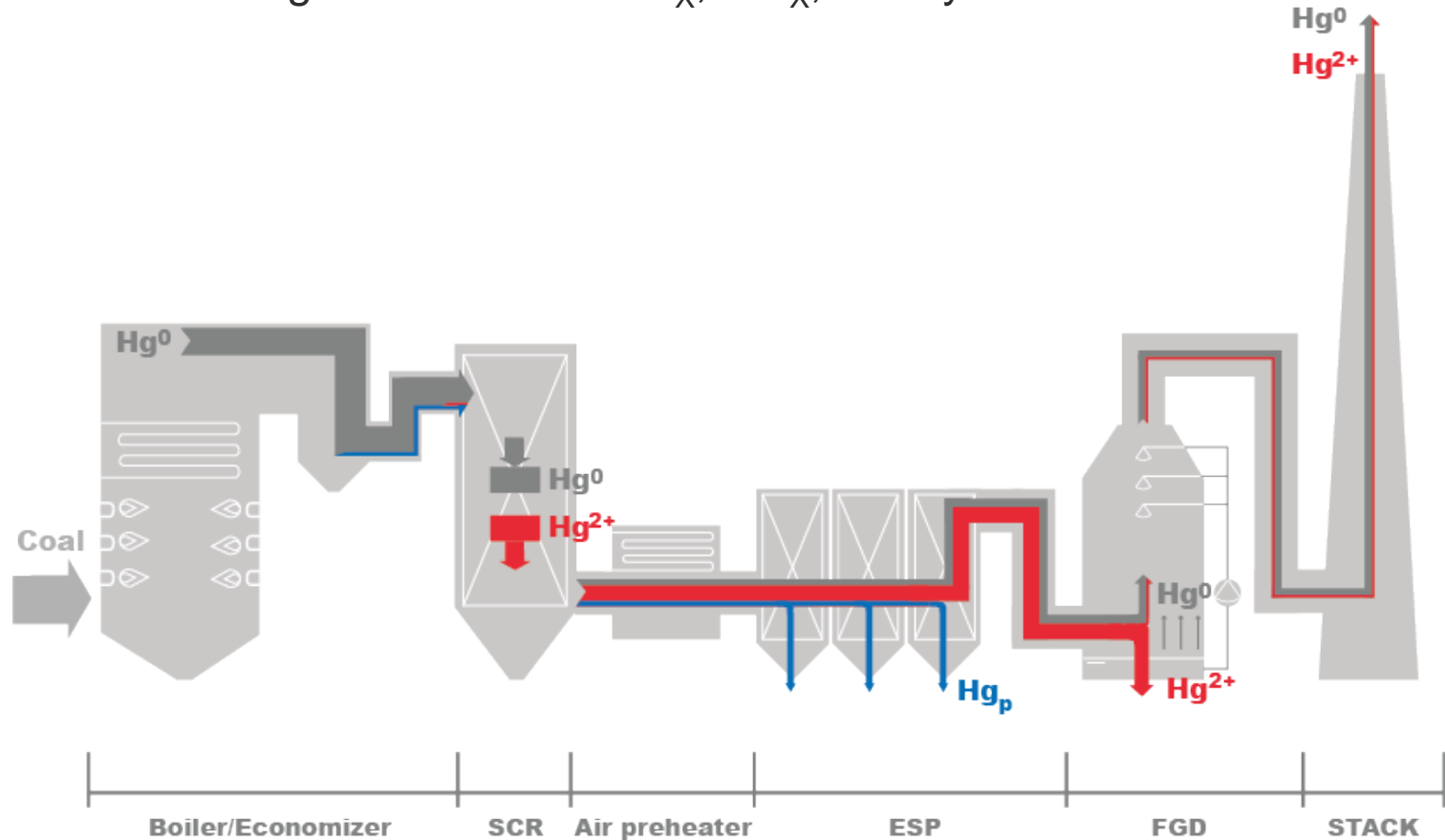
Biogas upgrading – Removal of CO_2





Our Research Lines

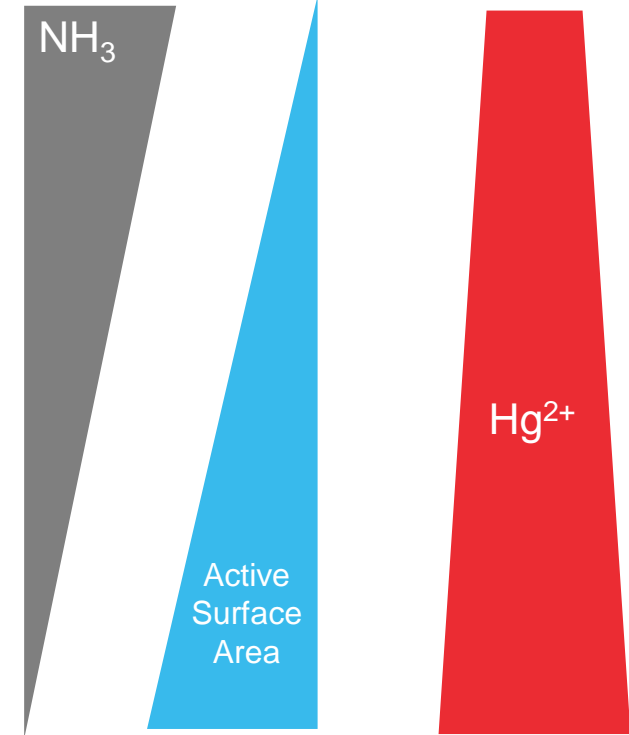
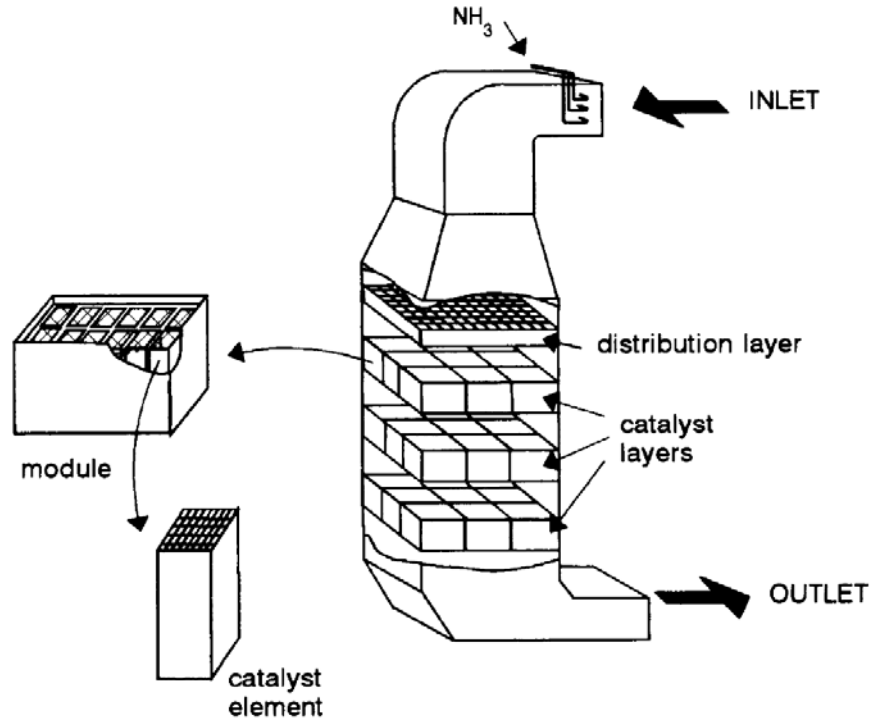
Flue Gas Cleaning – Removal of SO_x , NO_x , Heavy Metals





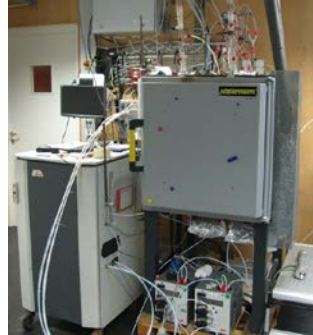
Our Research Lines

Flue Gas Cleaning – Removal of SO_x , NO_x , Heavy Metals



Our Research Lines

Research on SCR-Catalysis



SCR	Micro-Reactor	Lab-scale	Bench reactor
Scaling factor	1	10	1
Flue Gas [m ³ /h]	0,5 - 1 (Synthetic)	1 – 2,5 (Coal)	?
Channels	3x3 ; 4 Reactors	4x4	Solid reactor
Equilibrium [h]	~1	~2	?



Our Research Lines

Flue Gas Cleaning – Removal of SO_x , NO_x , Heavy Metals

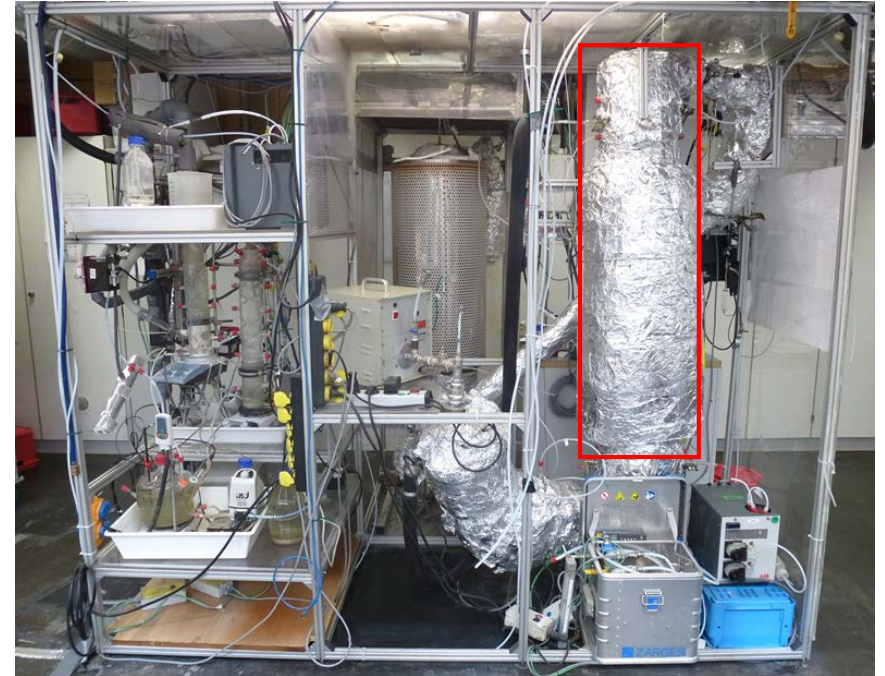
Real flue gas from coal firing

SCR-DeNO_x-catalyst

- Temperature: 280°C to 420°C
- Plate- or Honeycomb Catalysts

Research

- DeNO_x-activity
- Hg-oxidation
- SO_2/SO_3 -conversion





Our Research Lines

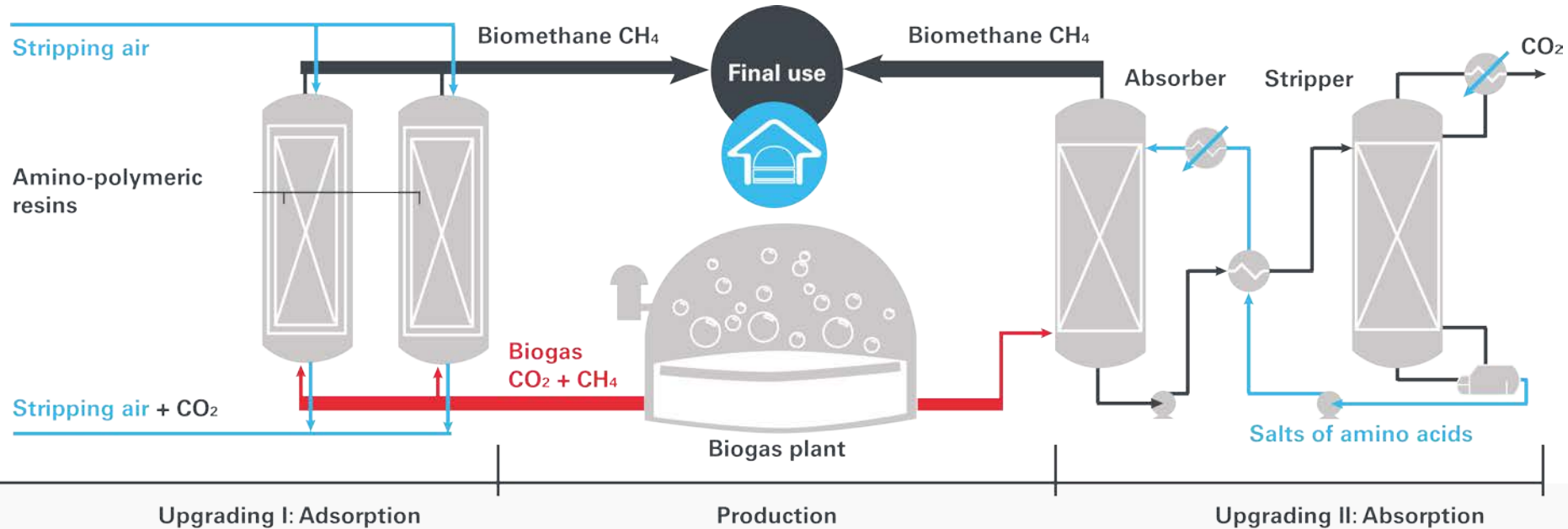
Flue Gas Cleaning – Removal of SO_x , NO_x , Heavy Metals

- Synthetic flue gas, SCR-Kat for Hg-Oxidation
- Detailed experiments for SO_2 and HgX_2 scrubbing
- Influence of the chemistry on Hg scrubbing and re-emissions
- Experiments with different flocculants/precipitants and Additives.
- Influence on the gypsum quality



Our Research Lines

Biogas upgrading – Removal of CO_2



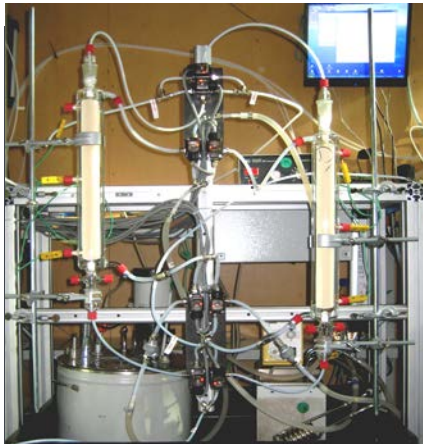
Our Research Lines

Biogas upgrading – Removal of CO₂



Chemical adsorption-based plants:

Amino-functionalized polymeric resins



0,1 m³/h Biogas



2 m³/h Biogas

Chemical absorption-based plants:

Spray tower



120 m³/h Biogas

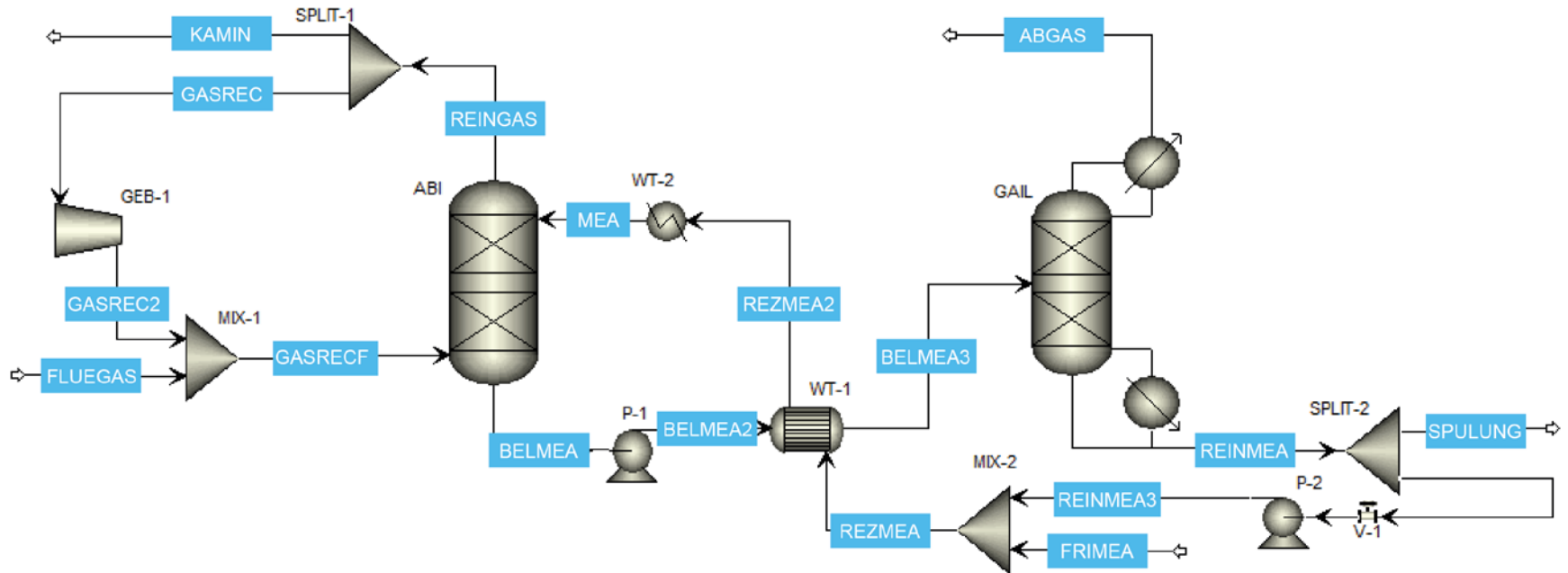
Packed column



30 m³/h Biogas

Our Research Lines

Biogas upgrading – Removal of CO₂



Available Research Projects



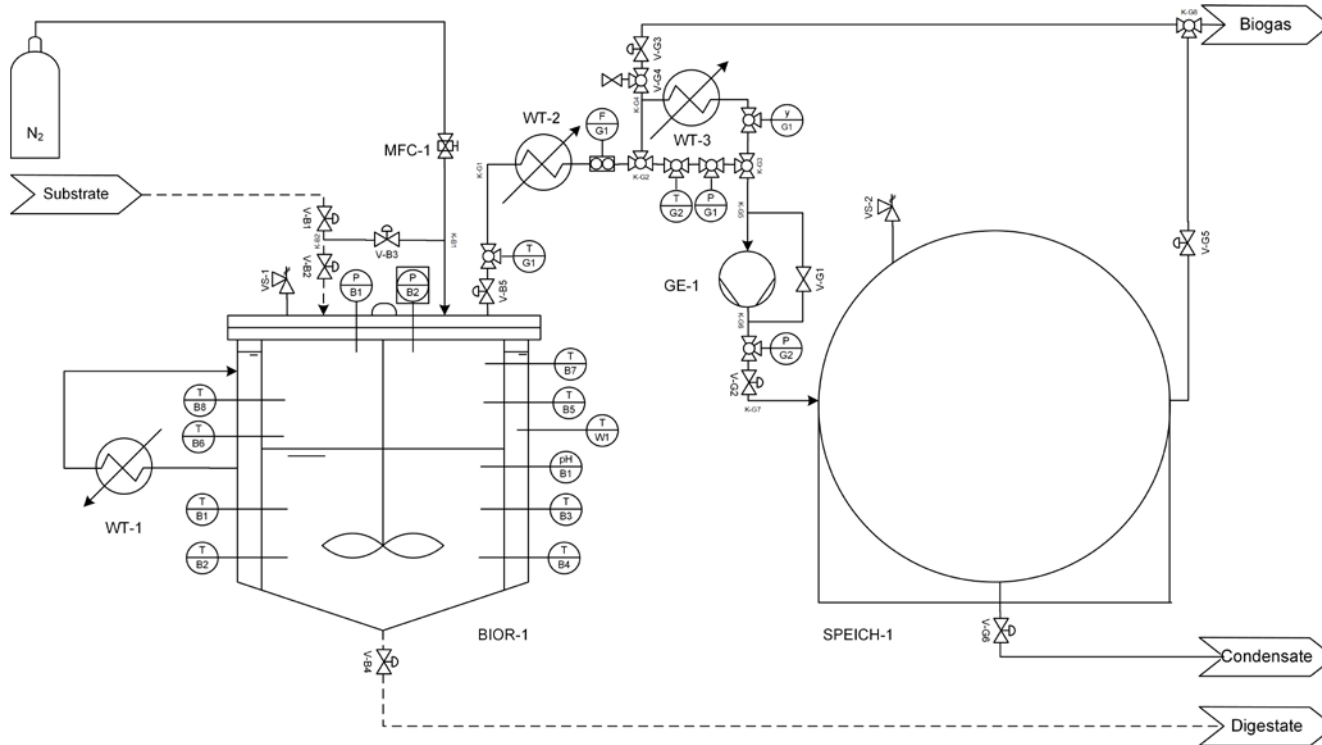
Automation and startup of a Biogas technical-scale plant
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Treatment and cleaning of ship engine-related flue gas





Available Research Projects

Automation and startup of a Biogas technical-scale plant



- Master Thesis or Student research Project
- Practical and theoretical work
- Advanced Knowledge of LabView
- Supervisor: Nelson Felipe Rincón Soto

Available Research Projects

NO_x removal from biomass combustion flue gas - Co

- **SRP or Master Thesis**

Integrated catalyst for NO_x removal

Further coupling with a wet stripping tower for particle removal, desulphurization

- Background: Process Engineering/Chemical Engineering
- Fluent German

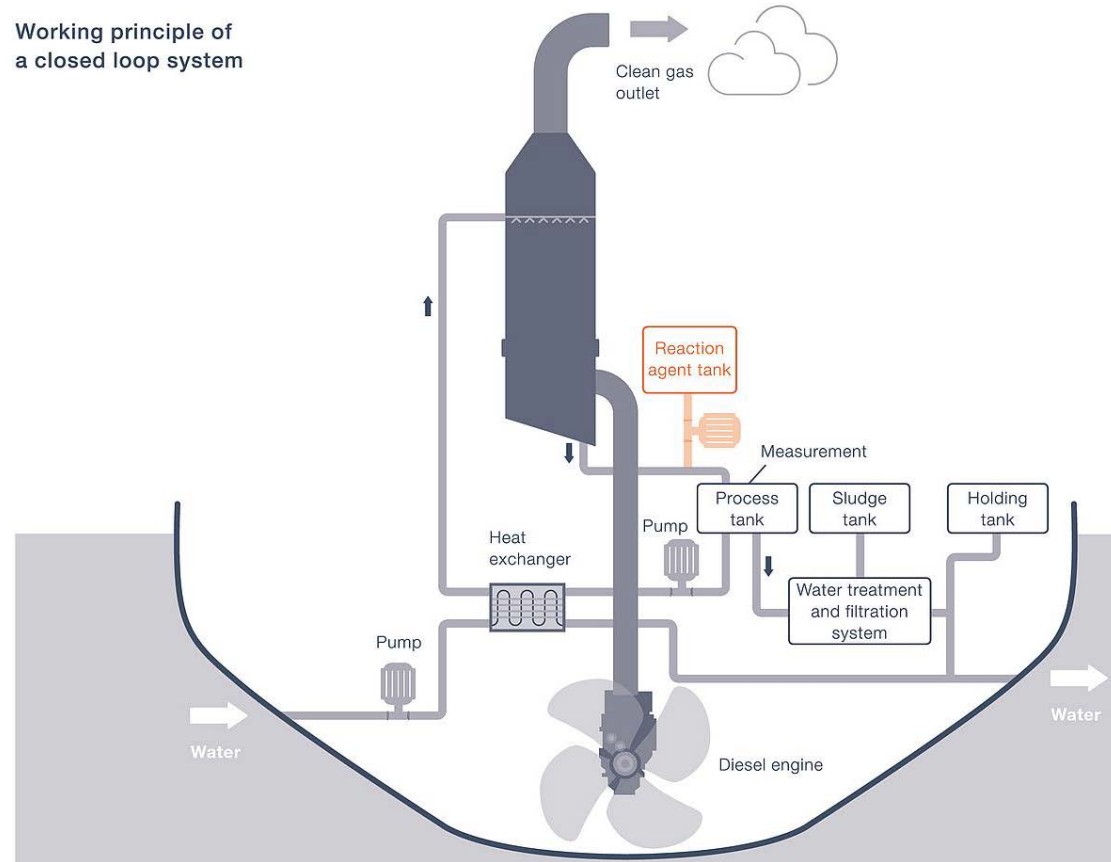
- Biomass
 - Pellets
 - Wood chips
 - Waste wood
 - Agricultural byproducts
 - Digestate
- Waste fuels
 - Old wood
 - Refuse-derived fuel
 - Residual waste



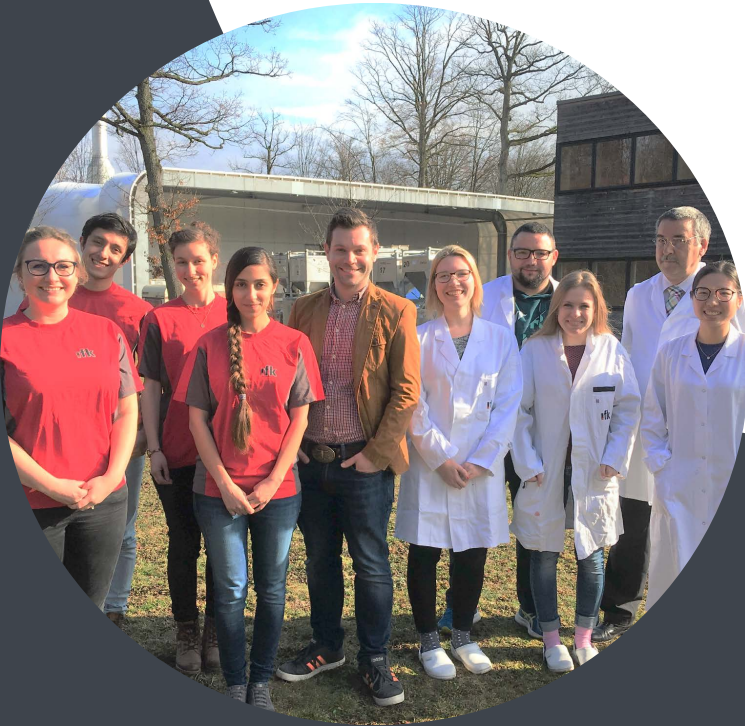
Available Research Projects

Treatment and cleaning of ship engine-related flue gas – SO₂ removal concept

- SRP or Master Thesis
- SO₂-removal via a salt water loop featuring additives
 - NaOH, Mg(OH)₂, Ca(OH)₂, NaHCO₃
- Precipitate byproducts must be stored
Recovery?



Contact us





Universität Stuttgart

Vielen Dank!



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Further Projects: Coupled adsorption-based biogas upgrading

Recirculation of CO_2 back into the fermenter

